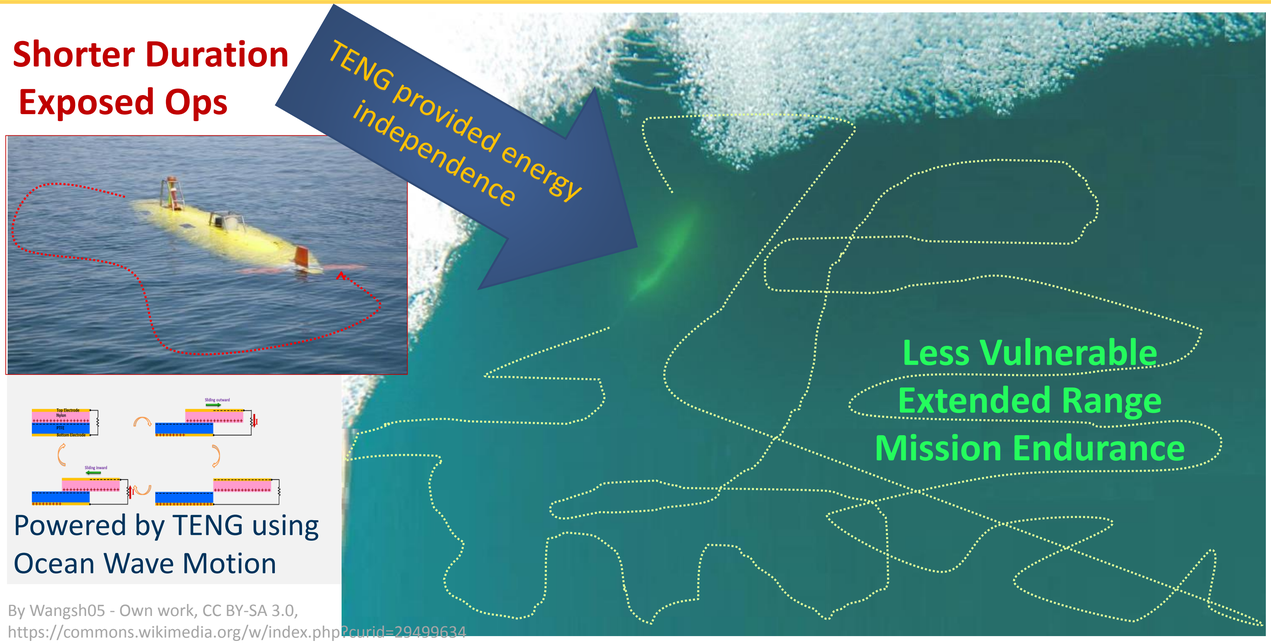
Self Powering of AUVs via Energy Harvesting from Ocean Wave Energy

CRUSER
Consortium for Robotics and Unmanned Systems Education and Research



Decouple energy dependence in AUVs from external sources using TENG.

BACKGROUND

- The U.S. Navy is interested in expanding its global reach of autonomous underwater vehicles for use in operational missions supporting the warfighter.
- New mission requirements dictate longer endurance and covertness at sea
  - AUVs need to stay on station longer, have greater range to support the mission
  - "Refueling" reduces availability and exposes the vehicle to adversarial threats
- Similar to most manned vessels, energy availability is a critical constraint
  - Ability to harvest energy from the operational environment removes constraint and eliminates "refueling"
- ***Endurance is increased, vulnerability is reduced by removing dependence on external energy sources.***

METHODOLOGY

- Multi-disciplinary approach involving the SE and MAE departments incorporating hydrodynamics, device design, test & evaluation and modeling & simulation.
  - Expands upon previous student work using wave generator and tow tank.
  - **Moves TENG technology from the conceptual phase into the test & evaluation phase in order to demonstrate the application for implementation in AUVs to support the warfighter.**
  - Insight into feasibility and scalability of AUVs harvesting energy from waves
  - Builds on evolving relevant research programs in energy and hydrodynamics by NPS faculty with involvement from thesis students and interns.
- Follow-on work partnerships with U.S. Naval Academy, USCG, academia and industry partners possible.

IMPORTANCE

- Reliance on unmanned systems as a universal command, control and communications (C3) asset is ever expanding, and is a *must-have* for the warfighter.
  - Unmanned Systems must be on station, for extended periods, without downtime.
  - **AUV are vulnerable on the surface awaiting recharge, refuel, or resupply. Energy independence via harvesting wave energy using TENG provides energy security and sustained mission performance.**
- Research outcomes:
  - Informs future decisions on the scalability and feasibility of TENG power generation for future design of unmanned systems operating at sea.
  - Provides AUVs energy security in remote and austere operating environments.

FY20 Call for Proposals

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