Title: **Advanced Underwater Power Source** (Battery/Fuel Cell/Renewable Energy)

Operational Requirement:

The requirement for this submission is for a power source for marine-based unattended sensors but may have applicability to a land-based sensor power source requested in a separate submission. Power for unattended underwater sensors is currently provided by a variety of batteries including silver-zinc, alkaline, and lead-acid. Batteries currently used are limited to about 250 Watt-hrs/kg. The batteries are reliable but are unsuitable for providing power for extended periods. Operations for long periods require either the emplacement of many batteries or frequent battery resupply. Emplacement of many batteries may not be a counterdetection threat but may not be feasible because of transport capacity of personnel or equipment. Frequent battery resupply and disposal may not be possible depending on the sensor location or mission priorities. Special Operations Forces require advanced underwater power sources that provide greater power density to power unattended sensors for extended time periods. Power requirements vary widely. An unattended sensor may require an average of about 200 mA whereas a docking station that recharges and exchanges data with a Unmanned Underwater Vehicle may have periodic requirements of several amps.

- Improvements to a chemical battery-type system would be limited to increased power density.
- A fuel cell-type system could be considered beneficial even if the basic system does not exceed the power density of batteries if the resupply of fuel or reactants were easier than current battery resupply and disposal. Scalable fuel or reactant reservoirs may also improve power density of the system.
- A renewable energy system could be considered beneficial given sufficient power delivery or if coupled with an energy storage system with sufficient power delivery.

Desired Deliverable: Fieldable Prototype

The Advanced Underwater Power Source will have the following attributes:

- Unattended operation
- Waterproof and operational at seawater depths to 150ft
- Waterproof for transport to seawater depths to 300ft
- Safe to transport and operate

The following capabilities are not required for the prototype but must be attainable:

- Low probability of detection (visibility, noise, discharge)
- Able to meet requirements for transport within submarines.
- Operable under a wide range of climatic conditions.

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Requesting Activity: Naval Special Warfare Group THREE

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