L3HARRIS™
FAST. FORWARD.

ALUMINUM-WATER (AL-H_2O) ENERGY MODULES FOR STATIC APPLICATIONS

Al-H_2O Energy Modules are designed for undersea power generation and are scalable and modular.

TECHNOLOGY

Al-H_2O technology harnesses the significant electrochemical energy stored in aluminum metal to safely deliver an unprecedented energy density for undersea power generation. Al-H_2O provides safe, cost competitive, depth-tolerant, energy dense solutions for a variety of undersea applications.

L3Harris' energy modules offer a 2-10x improvement in endurance vs. alternative chemistries and can be integrated into dynamic applications, such as UUVs, and static applications such as seabed systems or expendables in the water column. Our systems can be placed in stasis and lie dormant in storage or at the seabottom until activated in sequence to support evolving mission requirements.

Energy modules are scalable and modular to enable rapid, cost effective customization. Al-H_2O produces a hydrogen byproduct that has been verified as inert by the Naval Warfare Center Carderock across a variety of abusive conditions that would cause lithium-ion or even silver-zinc batteries to fail dangerously. Modules are safe for deployment via submarine and can be hand carried on commercial flights.

CHEMISTRY

Our system consists of three main components:

- Activated aluminum anode
- Aqueous alkaline electrolyte
- Hydrogen-evolving cathode

Note the injection of water as an oxidizer into the system, and the removal of the nontoxic aluminum hydroxide and hydrogen gas byproducts. This mass transfer can be done continuously or intermittently.

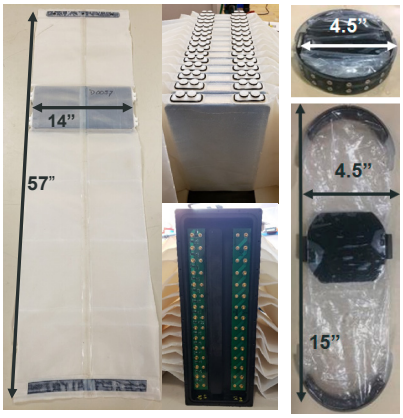
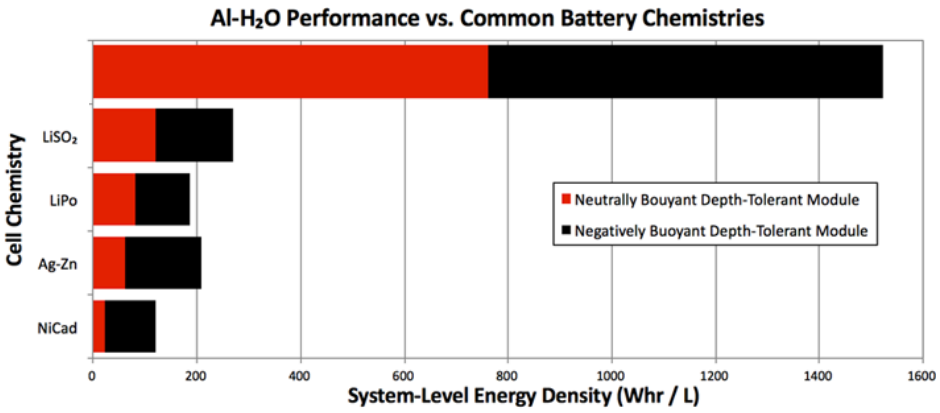


Figure 1 - Subsea Stack (left) and an A- Size Sonobouy Cell



STATIC ENERGY MODULES

- Optimized for long-endurance, high energy density, and lower power applications
- Pressure tolerant cells and health monitoring electronics operate at ambient pressure (simulated 6000m demonstrated)
- Systems store compressed at <40% height to maximize pre-deployment energy density
- Scalable system: A-size (4.875 in diameter sonobuoy sized unit) to 150 kWh seabed systems
- Designed to be put into "stasis" (dormant state) for up to 5 years
- Modular system, easily adapted to customer power and energy specifications

Available in two variants

- Negatively Buoyant (Seabottom)
- Neutrally Buoyant (Floating in Water Column)

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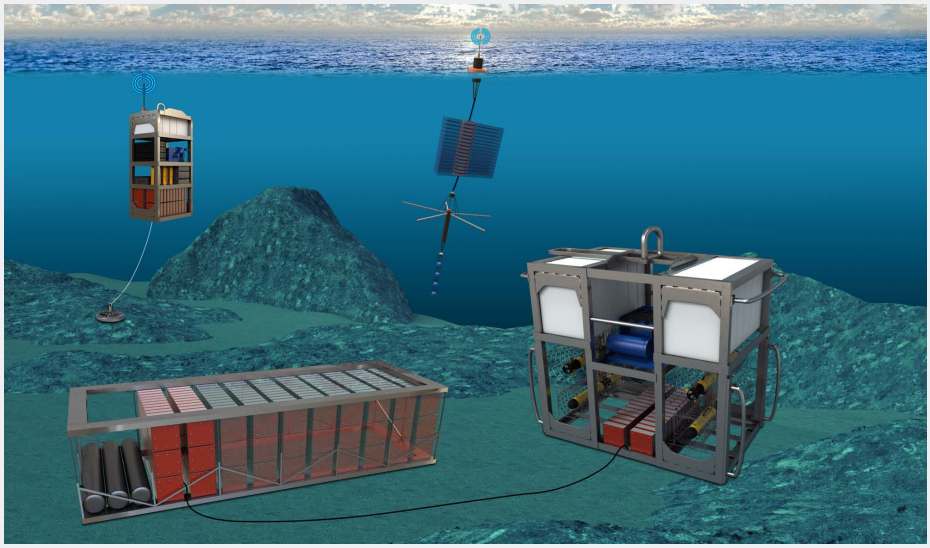
STATIC ENERGY MODULES

- Static systems can be scaled from A-size units (shown at right) to multiple megawatt seabed systems.
- Static systems store compressed at <40% height, with no electrolyte present, to minimize storage and pre-deployment volume, thus maximizing energy density to enable simpler handling and storage aboard submersibles or vessels of opportunity. L3Harris pressure tolerant cells and health monitoring electronics have been demonstrated to 6,000m depth through pressure tank testing.
- L3Harris has demonstrated the ability to put static modules into a deployed but dormant state -"stasis"- with no impact on electrochemistry for 60 days in testing and an objective of >5 years (L3Harris initiated a five-month stasis test in Q2 2020). Seabed power modules can be created and chained in series and parallel combinations and activated on a programmed or as-needed basis to meet mission requirements. These modules can be delivered by UUVs, ROVs, USVs, or vessels of opportunity and mated to existing infrastructure to extend its operational lifespan.



Static Energy Modules

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