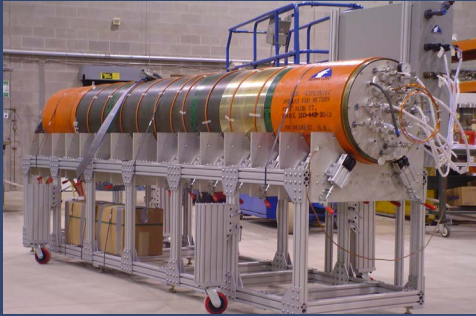




# Navy SBIR/STTR Success



Sierra Lobo's R&D100 Award winning 21-inch diameter UUV Cryo-Force Power-Cell™ Energy System

## Cryo-Force Power-Cell™ Cryogenic Power System for Unmanned Underwater Vehicles

With lifetimes that typically exceed 5,000 hours, fuel cells are efficient, quiet, compact and easy to maintain.

Topic Number: N01-T005

SBIR Investment:  
**\$513,306**

Phase III Revenue:  
**\$5,097,000**

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## About the Technology:

The energy requirements of powering unmanned underwater vehicles (UUVs) are significantly higher today than what can be provided by traditional technologies. For example, the non-rechargeable primary Lithium batteries only last 60 hours, cost more than \$200K each mission to replace, and put a tremendous logistics burden on the host vessel by having to "change-out" and store the hazardous energy section of the UUV after each mission. Sierra Lobo's patented Cryo-Force Power-Cell™ System is a completely integrated, closed-loop liquid oxygen (LOX) and liquid hydrogen (LH2) Proton Exchange Membrane fuel cell system. It is designed to power UUVs, Unmanned Surface Vehicles (USVs), and provide a green energy source for transportation and stationary power systems. Fuel cells typically have lifetimes that exceed 5,000 hours and are efficient, quiet, compact, and easy to maintain since they operate on hydrogen and oxygen.

## Naval Benefit

Sierra Lobo's cryogenic storage technologies, when integrated with fuel cell power systems, have a host of military benefits that include a 2-5x increase in range and endurance for transportation systems, and a 2-3x increase in fuel cell power when using pure oxygen over air. There is also a significant increase in energy storage capacity and a decrease in fuel cell contamination. This results in an increase in fuel cell life. It is a closed system, so it does not bring any fluids in, nor does it eject any fluids that might give away a signature. It is also extremely quiet because of the fuel cell. This green power can be used to reduce and eventually eliminate our military's dependencies on large-battery technology and fossil fuels, in both electrical generation and vehicle propulsion applications.

## Transition

Sierra Lobo was recently awarded a \$3.9 million Phase III contract from the U.S. Navy to develop, fabricate, and test a fuel cell and cryogenic reactants energy system for the Office of Naval Research Innovative Naval Prototype Program for Large Displacement Unmanned Undersea Vehicle (LDUUV) energy and power. The program's objective is to provide high power, high energy density, and missions of up to 70 days, with easy refueling. The system uses liquid hydrogen as the fuel, liquid oxygen as the oxidizer, and a Teledyne Energy Systems PEM fuel cell for power generation. The neutrally buoyant energy system will operate autonomously with no emissions. The 42-inch LDUUV energy system design expands upon Sierra Lobo's R&D100 Award winning, 21-inch diameter UUV Cryo-Force Power-Cell™ Energy System.



# Sierra Lobo, Inc.

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