ONR BAA Announcement # ONRBAA13-009
Date: 21 February 2013

Hybrid Energy Storage Module (HESM) Proof of Concept Demonstrations

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The following information presents the basic organization of this document as well as the location of significant information:

INTRODUCTION:

This publication constitutes a Broad Agency Announcement (BAA) as contemplated in Federal Acquisition Regulation (FAR) 6.102(d)(2) and 35.016. A formal Request for Proposals (RFP), other solicitation, or additional information regarding this announcement will not be issued.

The Office of Naval Research (ONR) will not issue paper copies of this announcement. The ONR reserves the right to fund all, some or none of the proposals received under this BAA. ONR provides no funding for direct reimbursement of proposal development costs. Technical and cost proposals (or any other material) submitted in response to this BAA will not be returned. It is the policy of ONR to treat all proposals as sensitive competitive information and to disclose their contents only for the purposes of evaluation.

I. GENERAL INFORMATION:

1. Agency Name - Office of Naval Research

2. Research Opportunity Title - Hybrid Energy Storage Module (HESM) Proof of Concept Demonstrations

3. Program Name - Hybrid Energy Storage Module Program

4. Research Opportunity Number - ONRBAA13-009

5. Response Date -

White Papers: 3/19/2013
Full Proposals: 6/14/2013

6. Research Opportunity Description -

With an expansion in breadth of capability and mission profiles across DoD, current and future platforms increasingly require integrated energy storage systems to support a diversity of loads resulting from advanced weapons and sensors, all electric platform operation, and fuel efficient plant alignments. Energy storage systems have long been a compromise between high rate, high capacity, and other factors. Hybrid energy storage, which include combinations of power and energy devices such as battery-capacitor, battery-flywheel, or battery-battery (different types), etc, are intended to enhance integration of existing power systems with energy storage. This approach provides maximum safety, reliability, efficiency, and security of operation with minimal installed storage, overhead, and cost.

Hybrid Energy Storage Modules (HESM) with high power and energy densities, high rate capability, scalable to all power levels, will maximize performance, enhance fuel efficiency and enable future high power weapons and sensor systems on legacy and next generation vehicles and platforms. This capability is intended to store electrical energy while having variable charge & discharge rates in high power density modular-reconfigurable configurations.

The HESM program, co-sponsored by Assistant Secretary of Defense (ASD) Research and Engineering (R&E) and ASD Operation Energy Plans and Programs (OEPP), addresses advanced technology development associated with providing the capability to enhance fuel efficiency, maximize performance and reliability, and enable future high power weapons and sensor systems on legacy and next generation Army and USMC battlefield generators and vehicles, Air Force and Navy aircraft, and Navy ships. ONR is presently leading the effort which has established three overarching track areas associated with DoD operations:

- Tactical: Plug and Play configuration for capability and fuel efficiency in a battlefield environment. (*Proposals specifically for this area are <u>not</u> being requested under this BAA.*)

- Aircraft: Improve generator and power system reliability. (*Proposals for this area are being requested under this BAA.*)
- Large Power: Continuous transient support and fuel efficient operation. (*Proposals for this area are being requested under this BAA.*)

Each development track is presently establishing a basis of understanding and benefit of HESM operation in a military environment with planned subscale development and demonstrations.

The Office of Naval Research (ONR) is interested in receiving proposals for the development and demonstration of the concept of hybridized energy storage for the purpose of supporting highly transient loads via a coordinated, multiple-device approach in two of the HESM development tracks, specifically Aircraft and Large Power. The objectives for each of the development track areas are described further below. Full technical proposals for the development of hybrid energy storage technologies capable of superior volumetric, gravimetric, safety, life, and overall performance characteristics under transient conditions should suitably describe the system approach and intended benefits from the methodologies chosen. A multiple-device hybrid storage approach should provide a combination of the benefits of each device, such that there is an inherent rate capability from one or more component(s) and an inherent energy capability from one or more component(s).

Although the BAA is not requesting proposals specifically for the Tactical track, proposals are being requested in a third development area for which the applicability of the concepts will impact all tracks including Tactical, Aircraft, and Large Power. The Office of Naval Research (ONR) is also interested in receiving proposals to develop and demonstrate a safe energy storage structure (HESM Development Area #3 below), which is capable of not only buffering against life-reducing high operating temperatures in devices due to aggressive cycling operations, but will also prevent/limit thermal runaway conditions. Integrating novel thermal management methodologies into high density storage modules is key to achieving this package.

Proposers may submit to one or more of the HESM development area tracks. However, a separate standalone proposal is required for each area.

In partnership, the Advanced Research Projects Agency for Energy (ARPA-E) released a solicitation entitled "Advanced Management and Protection of Energy storage Devices (AMPED)." This effort aims to unlock enormous untapped potential in the performance, safety, and lifetime of today's commercial battery chemistries exclusively through system-level innovations, distinct from efforts to enhance underlying battery materials and architectures. ARPA-E's AMPED program focuses on novel S&T advances in sensing, control, and power management technologies to enable entirely new capabilities for battery management. The AMPED program provides a foundational toolset of approaches that can readily be leveraged to more effectively integrate high-energy battery systems and enable aggressive usage profiles in hybridized energy storage systems.

ONR highly encourages integration of concepts/approaches outlined in ARPA-E's AMPED program solicitation. ONR also encourages partnering with organizations receiving awards under AMPED, where appropriate, with a view toward speeding the incorporation of new science and technology into fielded systems. Proposals that utilize industry-ARPA-E AMPED concepts to enhance the development of novel Science and Technology (S&T) advances will be given favorable consideration.

Briefs that describe the need, current state-of-the-art, and program goals from ONR Industry Day for this BAA, held on 12/12/ 2012, are available on the FedBizOpps, reference Section VII.14 of this solicitation for the direct link.

Information in this BAA regarding desired capabilities, metrics, and any other technical or contracting information supersedes any previously published information (including that briefed at the industry day described above).

6.1 HESM Development Area #1: Aircraft

The military's emphasis on More Electric Aircraft (MEA) has created opportunities for new subsystem designs and an increase in dynamic, electric loads. As a result, more capabilities have been required of the Electrical Power System (EPS). This includes the ability to source more power and the ability to react to regenerative energy. As

more electrically demanding loads are added to emerging and legacy aircraft, the EPS will be required to source higher peaks of power at faster rates.

The intent of this developmental program is to seek to improve three key characteristics of the MEA: electrical power quality, component lifespan, and overall system performance for all flight conditions, including possible weight and volume savings. A successful program will result in the construction and demonstration of a HESM unit, consisting of an electrical accumulator unit utilizing at least two different types of energy storage devices (battery-battery [different types], battery-capacitor, battery-flywheel) operating in a coordinated manner to support this aim in an optimized way. It should be noted that the existing main backup battery(ies) on the aircraft can be considered to be one of the coordinated energy storage device sources.

The program will develop the HESM to a Technology Readiness Level (TRL-6) demonstration; the module will be validated in a relevant environment that is described in Section 6.1.2 under Aircraft Phase II and Table A2. The demonstrator should be able to be taken to a flight test condition with limited modifications. The delivered HESM hardware will be modular so that key components, including semiconductors and energy storage elements, may be replaced or upgraded in the future.

The Air Force Research Laboratory (AFRL), working with ONR, will be the technical lead of this development area.

6.1.1 Background:
Upgraded MEA systems are being designed possessing more dynamic electrical load profiles which require more power at faster rates than past systems. The introduction of Electro-Hydrostatic Actuators (EHAs) and Electro-Mechanical Actuators (EMAs), for example, has resulted in significant peak to average power ratios often exceeding 5:1. For example, a 10kW rated actuator may draw 50 kW at startup (20 ms averaging time window) and 75 to 100 kW as an instantaneous peak. Legacy systems allow current to flow only from sources to loads, which forces the use of regenerated energy resistors. This dynamic, bidirectional load profile in a conventional distribution configuration places great stress on the EPS components and contributes to a reduction in both power quality and overall system reliability. As a result, Electrical Accumulator Units (EAUs) are being investigated as a supplement to the main generator. These initial efforts have targeted the development of Line Replaceable Units (LRUs), and consist of a combination of energy storage elements and power electronics. Some recent concepts have sought to utilize the existing main battery as the energy storage and a DC/DC converter interfacing the 270 VDC bus.

The use of the main battery as the sole energy source presents performance limitations for the EAU system. These limitations involve the maximum current of the battery cells in question as well as charge and discharge rates. A more volume and mass efficient solution may involve a hybrid synthesis of different energy storage devices, with each device being operated in a more appropriate performance environment.

6.1.2 Program Plan:

This Science and Technology (S&T) program consists of two planned phases, Aircraft Phase I and Aircraft Phase II, which are covered by this BAA, and the objectives for each are described below. All awards will include the work in both phases, with Phase II being a full scale demonstration optional effort. Decisions for selection will be based on the degree to which the proposed effort can technically meet key metrics as described in the following section below and the proposed path to achieve objective metrics. The overall objectives of the Aircraft development of this Hybrid Energy Storage Module will be operated within this two-phased approach:

Aircraft Phase I: The Phase I contract period, i.e., base effort, is notionally a 12 month effort. Design and proof of concept of hybridized multi-component energy storage system to support technical modes of operation as defined within this BAA § I.6.1.1. Approaches should baseline current technology and report possible benefits, advantages, challenges and disadvantages of multicomponent hybrid energy storage supporting transient load operations coordinated with supplied power. An emphasis will be made on power and energy dense components operating in ways that prevent abusive or life-compromising modes of operation.

The HESM unit must:

- Utilize a battery and at least one other form of Energy Storage Device (ESD). (Potential energy storage devices include different battery chemistries, capacitors, and flywheels.). The main aircraft battery can be considered as a candidate for one of the ESDs.
- Operate the HESM in parallel with the main EPS generator and perform the normal duties of the battery(ies) in a 270 VDC system.
- Utilize HESM controls such that there is no adverse interaction with the common controls for MEA generating and distribution systems.
- Operate with a capability of sourcing emergency power in the event of generator failure.
- Operate with sufficient current for the engine starting system, which is also known as the Integrated Power Package (IPP).
- Incorporate bidirectional power electronic topologies and controls in order to actively manage energy for ESDs and offer automatically resetting short circuit protection.
- Operate with the ability to sink regenerated energy that aligns with the requirements provided in Table A1.
- Operate with sufficient current sensing to allow for differential current protection. The nominal operating bus voltage will be MIL-STD-704(f) compliant 270 VDC, with an important goal of complying with a modified envelope that restricts transient voltage limits to between +250V and +280V.

Phase I Deliverables:

• Quarterly Technical Reports
• Monthly Status and Financial Reports
• Preliminary Hazard/Safety Analysis for the energy subsection using MIL-STD-882D as guidance. Format shall be in accordance with DI-SAFT 80101B.
• Preliminary System Design
• Preliminary Design Review
• Final Report that includes a table of all system components with weights/volumes, TRLs, etc.
• Phase II Plan of Action (including a prioritized list of risks associated with the Phase II final system); due 30 days prior to the end of the contract.
• A 3D solid model of a full scale energy system in one of the following Computer Aided Design (CAD) universal exchange formats: STEP (214), or Initial Graphics Exchange Specification (IGES).
• Energy System layout drawings of critical components, interfaces and subsystems integrated into the aircraft hull; this would be 2-D Level I drawings at a minimum. Use both .dxf and .pdf formats
• A validated HESM model that predicts transient dynamic performance with a confidence of 0.90 or better compared to the actual hardware.

Aircraft Phase II: The contract Phase II period, i.e. the option effort, consists of a notional 18-month period. Final development and demonstration of hybrid energy storage system capable of full-scale transient loads and capability as defined in Table A1. The demonstration's operating electrical environment will be, as a minimum, a single-channel electrical distribution system in a relevant environment laboratory, including representative sources and loads of types and ratings similar to those of emerging MEA. Demonstration of required capabilities including that a loss of generator power or component failure will not result in loss of emergency power. The minimum size of the generator will be 80 kW continuous, with systems of larger size preferred.

A Phase II system will be fully validated under operational modes and temperatures by vendor under (Factory Acceptance Test) FAT and then provided as a functional unit for further follow-on evaluation by the Government. A final delivery will include an HESM as described above, connectors and interconnect wiring, an operating manual, controls, and specialty hardware necessary to make the device function in a laboratory environment. Hardware data will be used to report advantages and disadvantages of using a battery-based EAU versus a HESM. This comparison will be included in the final report. Dynamic models, including time and frequency domain performance, will be deliverables for this program. Model interfaces must be Model Requirements and Implementation Plan (MRIP) compliant. Model validation with the actual hardware is required. The validation process will be defined using proper physics-based models and stochastic principles. Confidence in the model's predictive performance within a

given uncertainty will be mathematically derived as part of the overall validation process.

The Phase II effort must also strive to integrate technologies developed under the ARPA-E AMPED program into the safety, monitoring, control and/or analysis aspects of the system operation. Greater consideration will be given to efforts which align and attempt to provide designs which utilize technologies developed under the ARPA-E program as described in Section V.

Both Phases:

The proposal must define the approach by which a proof of concept and HESM unit will be tested, the simulation method(s) used for developing and evaluating the system, the process by which validation will be performed, definition of sensors and safety equipment to be used, definition of the hardware that the system will be composed of or will be evaluated to optimize the system design, performance of the proposed hybrid energy storage, and all interfaces to and from the storage system and controls/sensors. All proposals must provide a detailed scope of work for the development of the core technologies, including a description of the algorithms, development approaches, safety evaluations, laboratory implementation, embedded implementation using hardware in the loop or other experimentation approaches, and power, volume, and weight estimates.

Phase II Deliverables:
• Quarterly Technical Reports
• Monthly Status and Financial Reports
• Final Report (along with the summary of all the test results, this report should also include recommendations necessary to further mature the technology, such as component risks that need further development/testing, component system reliability, component system manufacturing improvements, etc.)
• 3-D Solid model of a full scale energy system in one of the following CAD universal exchange formats: STEP (214), IGES
• Detailed Design Package, containing Level II 2-D drawings and an accompanying parts list. Use both .dxf and .pdf formats.
• Energy System layout drawings of critical components, interfaces and subsystems as integrated into the test site; this would be 2-D Level I drawings at a minimum. Use both .dxf and .pdf formats
• Standard Operating Procedures (SOPs), operating manuals, maintenance schedules.
• Piping and Instrumentation Diagram (P&ID) schematic illustrating the functional relationship of piping, instrumentation and system equipment for cooling system
• Electrical one-line schematics and associated detailed schematics for hardware
• Detailed design approach and quantification of benefit which provides application of ARPA-E AMPED program technologies (Section V) for energy storage systems.
• Hazards Assessment using MIL-STD-882D as guidance. Format shall be in accordance with DI-SAFT 80101B (links available in Section VII.10).
• Prototype demonstration system integrated into a suitable packaged container and tested, including connectors and interconnect wiring, controls, and specialty hardware necessary to make the device function in a laboratory environment

The Energy System shall be designed for safety of all personnel involved in shipping, loading and handling, operation, and maintenance of the system. No single point of failure or human error shall lead to initiation of a Category I hazard (Catastrophic - defined as death, system loss, or severe damage) or Category II hazard (Critical - defined as severe injury, severe occupational illness, major system or environmental damage). Two or more independent faults, which may result in a Category I or II hazard, shall not be permitted unless their total probability of occurrence is less than or equal to 1×10^{-6}.

TABLE A1: Program Criteria (Note: C-rate defined as a multiplier of the Ampere-hour capacity of the high-	Metric

energy component of the demonstrator system)	
Design discharge rate	The minimum size of the demonstrated parallel generator will be 80 kW continuous. Instantaneous load conditions supported will be 200 kW (thr), 240kW (obj) at that generator rating and scale with increased generator output.
Available energy content under discharge	The system should be capable of storing a minimum of 2MJ of total energy.
System response time	The system should be able to support bidirectional slew rates of at least 20kW/ms
Load support	The unit must source peak current and a portion of the rising edge for dynamic, high power loads. The system should be able to source 50% or more of the load current for 60 Hz and higher frequency content of dynamic loads, as viewed from the onset of increased power demand to the reduction of power demand. The HESM's share of higher frequency load content will increase until frequency content of 120 Hz and higher will be 90% or more sourced by the HESM.
Operating time	System should be capable of operating continuously under EAU mode, with capability of sourcing emergency power in the event of generator failure (45 kW, 2MJ) and must also source necessary current for the engine starting system (45 kW, 2MJ).
Charge capability	System must be capable of accepting 20kW/ms for a minimum quantity of 3kJ.
Thermal management	System should minimize reliance on forced air, and maintain operation in ambient conditions provided in Table A2. The external volume and shape will be appropriate for MEA applications.
Monitoring and management	System under Phase I and II should include a full management system which has the capability to isolate storage components to prevent abusive conditions, as well as report component voltage, temperature, operating current and other details to a DAQ for operational analysis. System under Phase II should account for advanced sense and control technologies IAW Section V. Connectivity and control with external controller/recorder are highly desirable. Standard, easily procured connector types are required.
Efficiency	System should be capable of supporting >85% efficiency at full rate.

Table A2: Specifications and Relevant Operational Information	Metric
OPERATING CONDITIONS	

Cooling	Convection and conduction cooling only
Air Temperature (ambient)	0°C to 71°C; goal of -40°C operation
Environmental Conditions	MIL-STD-810G
Batteries, Storage, Aircraft General Specification	MIL-PRF-8565K
INTERFACE REQUIREMENTS	
System Interface Voltage	270VDC
AC Power Interface	MIL-STD-704(f)
DC Protection	Contactor and fuse or fast-acting circuit breaker
SAFETY REQUIREMENTS	
Navy Lithium Battery Safety Program Responsibilities and Procedures	NAVSEA S9310-AQ-SAF-010 15 July 2010
High-Energy Storage System Safety Manual	NAVSEA SG270-BV-SAF-010 28 Oct. 2011
Hazards Assessment	MIL-STD-882D
Management System	All storage components will have tested and proven active management systems monitoring and protecting them under use

6.2: HESM Development Area #2: Large Power

The goal of this program is to develop and demonstrate energy storage system technologies capable of supporting continuous transient loads with integrated power sources, with the purpose of demonstrating potential concepts to the Navy. Proposals shall describe a complete system concept, provide a detailed scope of work for the development of the core technologies and conduct integrated bench-top system testing to achieve a Technology Readiness Level (TRL) of no less than 4 (Phase I), with a target of TRL 5 at the end of the Phase II demonstration. In addition to the specific S&T performance capabilities, proposers are expected to conduct a safety analysis of the system energy technology concept with associated testing as required. Any proposal that does not provide a specific full system solution, as well as a safety analysis, will not be considered.

6.2.1 Background

A hybridized energy storage system consists of two or more energy storage devices, (e.g. battery-capacitor, battery-flywheel, flywheel-capacitor or other storage component types) which can work in concert to provide support of a transient load and rapid power flow from a continuous or transient source, while also having high energy content. The system should provide the capability to support rapid discharge and charge on a continuous basis in conjunction with a power source, without operating components in a scenario which has the potential to be abusive or adversely affect lifetime as defined by the storage component vendor or other metrics. As such, the system should be designed so that both devices can operate together in a coordinated manner, but also provide the flexibility to operate under different modes, to capitalize upon the fact that certain energy storage devices have a vast difference in discharge and charge rates. The system should provide the capability to operate in multiple manners to optimally support transient load conditions which energy storage is required to support. These capabilities include but are not limited to the following three different modes. Each mode utilizes a high energy storage device and high power storage device as a minimum:

Mode 1 - Charge Optimization: System supports reduction in effective rate operation of the high energy storage device (e.g. battery or equivalent) servicing a transient load by utilizing a high power "high charge rate-capable" device (e.g. capacitor or equivalent) to load level and/or peak shave the high energy device which is otherwise cycling on and off. This thereby allows the high energy device to discharge at a lower rate over longer duration, minimizing stress and losses.

Mode 2 - Charge Sustainment: System supports operational extension of a storage device under discharge to a

transient load by utilizing externally sourced power to charge the energy device when the transient load is not operating and the storage is idle, and absorbing energy into a temporary buffer when the energy storage device is under discharge, thereby load leveling the source and providing near-constant draw from the power system. Each component may charge and discharge as necessary to operate and maintain suitable state of charge.

Mode 3 - Charge Augmentation: System supports a transient load by allowing a source and storage device(s) to collectively service the load when it is operating, and then load-level the source when the transient load is not drawing power. The energy device could accept a non-strenuous amount of charge and the rate-capable device would accept the remainder when the load is not operating, and then power flow would be controlled to enable repeated cycling of this sort.

Unexpected challenges may arise during varying load conditions, and new applications and benefits of hybridized storage may be found, so the approach should be flexible to account for unknowns.

6.2.2 Program Plan

This Science and Technology (S&T) program consists of two planned phases, Large Power Phase I and Large Power Phase II, which are covered by this BAA, and the objectives for each are described below. Decisions for selection will be based on the degree to which the proposed effort can technically meet key metrics as described in the following section below and the proposed path to achieve objective metrics. The overall objectives of the large Power Systems development of this Hybrid Energy Storage Module will be operated within this two-phased approach:

Large Power Phase I: The Phase I contract period, i.e., base effort, is notionally a 12 month effort. During this effort, performers will work to develop the proof of concept hybrid storage approach, including algorithms and hardware to meet or exceed the thresholds defined below and in Tables L1 and L2. In addition, the performers will develop a detailed design to support Phase II efforts.

Phase I will involve the development and demonstration of scaled proof of concept of hybridized multi-component energy storage system to support technical modes of operation as defined within this BAA § I.6.2.1 and others as the technology and innovation process enables. Approaches should baseline current technology and demonstrate possible benefits, advantages, challenges and disadvantages of multi-component hybrid energy storage supporting transient load operations coordinated with supplied power, operating in the defined modes as well as potential additional beneficial ways, and supporting the requirements given in Table L1. An emphasis will be made on power and energy dense components operating in ways that prevent abusive or life-compromising modes of operation, but electrical interfaces do not need to be operated at the voltage levels specified in Table L2. Development of proof of concept hardware and software for significantly scaled down power transients of less than 50kW is acceptable with known profile behaviors in benign environments, though thermal management should be completely considered for the requirements established under this BAA as shown in Table L2. It will be assumed that support and/or balance of plant equipment such as converters, breakers, contactors and related equipment will be optimized volumetrically under other efforts and therefore does not constitute a volumetric penalty in terms of system design for the Phase I demonstration. Additionally, a detailed notional design of a ≥200kW integrated high-density hybrid energy storage solution will also be produced with the intent of scaling proof of concept system architectures to be applicable under Phase II.

Models will be essential to the validation of claims and determination of suitable hybrid approaches for applicability to shipboard electric plant operation and architectures. To support related studies, a time domain simulation of the proof of concept and ultimate deliverable (under Phase II) is required. The Phase I effort will deliver a PSCAD or Simulink model of the proof of concept system, and a model of the scaled system that the detailed design depicts. To meet these intents, the computer model shall be delivered in an unencrypted form to the Government using Power Systems Computer Aided Design (PSCAD or Simulink). The contractor shall develop and deliver a Model Description Document (MDD) using the format required in the contract. An MDD will be required for all distribution versions of model (s). The model shall be delivered with a three-phase electrical node interface and/or DC electrical node interface for use in either AC or DC electric plant simulations. The resulting HESM model will predict time domain transients of HESM response for various electrical load scenarios. Predicted electrical

parameters include frequency, current, voltage, energy, and power supplied/demanded. The model will be designed to support time domain transient analysis studies related to frequency and voltage regulation and stability.

Phase I Deliverables:
• Quarterly Technical Reports
• Monthly Status and Financial Reports
• Preliminary Hazard/Safety Analysis for the energy subsection using MIL-STD-882D as guidance. Format shall be in accordance with DI-SAFT 80101B.
• Preliminary System Design
• Preliminary Design Review
• Final Report that includes a table of all system components with weights/volumes, TRLs, etc.
• Phase II Plan of Action (including a prioritized list of risks associated with the Phase II final system); due 30 days prior to the end of the contract
• A 3D solid model of a full scale energy system in one of the following CAD universal exchange formats: STEP (214), IGES
• Unencrypted PSCAD or Simulink model with complete MDD for proof of concept system
• Energy System layout drawings of critical components, interfaces and subsystems integrated into the hull; this would be 2-D Level I drawings at a minimum. Use both .dxf and .pdf formats
• Subscale Prototype Hybrid Energy Storage System, rigorously proven at vendor facility.
• Detailed design of scaled-up prototype system
• Unencrypted, scaled PSCAD or Simulink model of detailed design system with complete MDD for proof of concept system. The computer model shall be delivered to the Government with the ability to be converted to RSCAD for use with Real Time Digital Power Software (RTDS).

Large Power Phase II: The contract Phase II period, i.e. the option effort, consists of a notional 18-month period which terminates in FY16 with a series of demonstrations and delivery of the hybrid system demonstrator to the Navy. During the Phase II Period, performers will work to develop and build the hybrid system at scale, including software, hardware and requisite data acquisition to prove the system's capability to meet or exceed the thresholds defined below and in Tables L1 and L2.

The Phase II effort will involve final development and build of a hybrid energy storage system capable of a threshold level of 200kW transient loads (Objective 600kW) with greater intermittent peaks (400kW or double the maximum transient load, whichever is greater). The mission profile will include operation in the modes as defined within this BAA but with transient loads that can vary stochastically with power levels changing by -50%/+100% each occurrence. The system will be fully validated under operational modes by vendor under FAT vendor test and evaluation, and then provided delivered as a functional unit to the Navy for further follow-on evaluation. Consideration will be made for ability to support a broader diversity of load slew rates, slope and magnitude of load changes, time frames for change in conditions, etc. Consideration will also be made for approaches which intend to reduce the size and thermal load of the entire system by making use of advanced high bandwidth converter approaches, advanced materials, improved controls scenarios, and superior safety approaches that both prevent and protect in case of faults and releases from the components within the system. Detailed evaluation of performance, life, thermal and other operational characteristics will be performed in this phase.

Models will be essential to the validation of claims and determination of suitable hybrid approaches for applicability to shipboard electric plant operation and architectures. To support related studies, a time domain simulation of the deliverable system is required. During development, the offeror will deliver a PSCAD or Simulink model of the deliverable system, with the ability to be converted for use to RSCAD for use with a Real Time Digital Simulator (RTDS) for further operational analysis by the government upon final delivery. To meet these intents, the computer model shall be delivered in an unencrypted form to the Government using PSCAD or Simulink. The contractor shall develop and deliver a Model Description Document (MDD) using the format provided during the contract action. The MDD will be delivered together with the PSCAD or Simulink model to support the government operating the model in Simulation (SIM) and Simulation/Stimulation (SIM/STIM) environments at their facility, but will be delivered during the execution of this effort for verification. An MDD will be required for all distribution versions of model(s). The model shall be delivered with a three-phase electrical node interface and/or DC electrical node

interface for use in either AC or DC electric plant simulations. The resulting HESM model will predict time domain transients of HESM response for various electrical load scenarios. Parameters to be predicted include electrical parameters such as frequency, current, voltage, energy, and power supplied/demanded. The model will be designed to support time domain transient analysis studies related to frequency and voltage regulation and stability.

The Phase II effort must also strive to integrate technologies developed under the ARPA-E AMPED program into the safety, monitoring, control and/or analysis aspects of the system operation. Greater consideration will be given to Phase II efforts which align and attempt to provide designs which utilize technologies developed under the ARPA-E program as described in Section V. The effort will provide a rigorous analysis deliverable which analyzes and indicates the optimal integration approaches and potential benefits from utilization of the technologies associated with this effort. This will be reviewed in detail as part of the design review process, and will be a contractual deliverable of this effort. Any updated models should be reflected in a final deliverable PSCAD or Simulink model as defined above.

After simulated load testing of the Phase II system at the Vendor site under FAT, the unit will be delivered to a Navy site for further test and evaluation as required. The proposal must define the approach of which a proof of concept and scaled demonstration will be tested, the simulation method(s) used for developing and evaluating the system, definition of sensors and safety equipment to be used, definition of the hardware that the system will be composed of or will be evaluated to optimize the system design, performance of the proposed hybrid energy store, and all interfaces to and from the storage system and controls/sensors. All proposals must provide a detailed scope of work for the development of the core technologies, including a description of the algorithms, development approaches, safety evaluations, laboratory implementation, embedded implementation using hardware in the loop or other experimentation approaches, and power, volume, and weight estimates.

Phase II Deliverables:
• Quarterly Technical Reports
• Monthly Status and Financial Reports
• Final Report (along with the summary of all the test results, this report should also include recommendations necessary to further mature the technology, such as component risks that need further development/testing, component system reliability, component system manufacturing improvements, etc.)
• 3-D Solid model of a full scale energy system in one of the following CAD universal exchange formats: STEP (214), IGES
• Detailed Design Package, containing Level II 2-D drawings and an accompanying parts list. Use both .dxf and .pdf formats.
• Energy System layout drawings of critical components, interfaces and subsystems as integrated into the test site; this would be 2-D Level I drawings at a minimum. Use both .dxf and .pdf formats
• Standard Operating Procedures (SOPs), operating manuals, maintenance schedules.
• Piping and Instrumentation Diagram (P&ID) schematic illustrating the functional relationship of piping, instrumentation and system equipment for cooling system
• Electrical one-line schematics and associated detailed schematics for hardware
• Hazards Assessment using MIL-STD-882D as guidance. Format shall be in accordance with DI-SAFT 80101B (links available in Section VII.10).
• Detailed design and quantification of benefit which provides application of ARPA-E AMPED program technologies (Section V) for energy storage systems.
• Report and detailed design of integration approaches of technology for enhanced performance, safety, and situational awareness. Integration of actual technology into delivered system as applicable.
• Unencrypted, scaled PSCAD or Simulink model of detailed design system with complete MDD. The computer model shall be delivered to the Government with the ability to be converted to RSCAD for use with RTDS.
• Prototype demonstration system integrated into a suitable packaged container and tested; delivered after factory testing
• Any required support equipment necessary to complete a demonstrator (e.g. small generator/power supply, test load system, DAQ, cooling system, spares, etc.)

The Energy System shall be designed for safety of all personnel involved in shipping, loading and handling, operation, and maintenance of the system. No single point of failure or human error shall lead to initiation of a

Category I hazard (Catastrophic - defined as death, system loss, or severe damage) or Category II hazard (Critical - defined as severe injury, severe occupational illness, major system or environmental damage). Two or more independent faults, which may result in a Category I or II hazard, shall not be permitted unless their total probability of occurrence is less than or equal to 1×10^{-6}.

Large Power Demonstration Metrics/Objectives, Indicative Profiles and Other Information

TABLE L1: Program Criteria (Note: C-rate defined as a multiplier of the Ampere-hour capacity of the high-energy component of the demonstrator system)	Metric
Power output characteristics	The system will be capable of a threshold level of 200kW transient loads (Objective 600kW) with greater intermittent peaks (400kW or double the maximum transient load, whichever is greater).
Modularity	The system should be modular in overall design with common interfaces to the maximum extent practicable. Architecture should be suitable for combination with like systems to achieve higher power levels.
Energy component design discharge rate	High energy (e.g. battery, flywheel, etc.) components to be utilized in a demonstrator proof of concept must be capable of discharge continuously at a rate of 12C (threshold) and 30C (objective). The continuous discharge rate should be capable of supporting the base (non-intermittent peak) transient loads defined above.
Discharge duration of interest	System must operate to provide benefit under operations as short as two minutes (full discharge of storage system), and as long as ten minutes, operating solely off of energy storage devices. Loading profiles should be drawn out to support continuous operations
System response time	The system should be able to transition from no load to full load in 0.001s or faster. The system should be able to transition from responding as a load (charge) at full input to a source (discharge) at full output within 0.004s (threshold) and 0.002s (objective).
Load support	Detect and support full stochastic loading at various rates (objective); various known load profiles in a randomized application (threshold).
Operating time	System should be capable of operating continuously as a buffer of a prime mover in manners consistent with the modes defined above. System will also function with reduced output as a storage system for 5-10 minutes under a constant power output.
Charge capability	System must be capable of full optimized charge (0-100% SOC) in 1 hr (threshold), 15 min (objective). System must also be capable of buffering input power from an external source at a rate of 15C (threshold), 30C (objective), at a 20% duty cycle (threshold), 50% (objective) with a cyclic period of 10 seconds.
Thermal management	System should include an integrated thermal management approaches for the storage and

	conversion equipment to enable high-rate operation, safety and life.
Monitoring and management	System under Phase I and II should include a full management system which has the capability to isolate storage components to prevent abusive conditions, as well as report component voltage, temperature, operating current and other details to a DAQ for operational analysis. System under Phase II should account for sense and control technologies IAW Section V.
Efficiency	System should be capable of supporting >85% full round-trip efficiency at full rate.
Volume and Mass	The energy storage components should support a reasonable expectation of advanced-technology components that offer superior volumetric and gravimetric density as compared to current common technology options such as Lead-acid batteries and film/electrolytic capacitors. A baseline design should be provided under Phase I to identify notional improvements with estimates to support ultimate overall volumetric and gravimetric density.
Structural	System should be rack-mounted in a suitable enclosure and be able to be broken down and transported for delivery.

Table L2: Specifications and Relevant Operational Information	Metric
OPERATING CONDITIONS	
Water Temperature (available seawater cooling)	5°C to 35°C
Air Temperature (ambient)	5°C to 65°C
Shipboard Shock*	MIL-S-901D: Grade B for components, Grade A for any safety controls, management and isolation systems
Shipboard Vibration*	MIL-STD-167-1
Humidity	0-100 % relative humidity
Salt Fog*	Marine Environment
INTERFACE REQUIREMENTS	
Electrical Source Interface Voltage	450 or 4160VAC 3Ph.
Energy Storage Interface Voltage	680-1000VDC
Support Power Interface Voltage	120VAC 1Ph.
High Voltage DC Load Interface	680-1000VDC
Low Voltage DC Load Interface	140VDC ±2% (steady state), ±10% transient
AC Power Interface	MIL-STD-1399
AC Protection	Breaker
DC Protection	Contactor and Fuse IAW S9310 ESD

SAFETY REQUIREMENTS	
High-Energy Storage System Safety Manual	NAVSEA SG270-BV-SAF-010 28 Oct. 2011
Navy Lithium Battery Safety Program Responsibilities and Procedures	NAVSEA S9310-AQ-SAF-010 15 July 2010
Hazards Assessment	MIL-STD-882D
Management System	All storage components will have tested and proven active management systems monitoring and protecting them under use

*** Design Consideration Only**

6.3: HESM Development Area #3: HESM Militarized Energy Storage Device Structure

The goal of this effort is to develop and demonstrate a safe energy storage structure which is capable of not only buffering against life-reducing high operating temperatures due to aggressive cycling operations but will also prevent/limit thermal runaway conditions , release and propagation between cells or groups of cells. Integrating novel thermal management methodologies into high density storage modules is key to achieving this package. These thermal management methodologies can be Passive techniques (Phase Change Materials, Advanced Insulation, etc), Active techniques (Heat Pipes, Cold Plates, Advanced Working Fluids, etc), and lightweight structural materials. The core energy source of this integrated structure demonstration effort is anticipated to be lithium-ion battery packs. Physical interchangeability between a high energy and a high power cell is highly desirable, to obtain a common approach to containing variants on cell type and chemistry. Proposals shall describe a complete battery pack system concept including a well-defined cell technology, provide a detailed scope of work for the development of the core thermal management technologies and define that integrated bench-top system testing to be conducted in order to achieve a Technology Readiness Level (TRL) of no less than 4 with a target of TRL 5 at the end of the demonstration. In addition to the specific S&T performance capabilities, proposers are expected to conduct a safety analysis of the system energy technology concept. Any proposal that does not provide a specific full battery pack system concept (accounting for layers of nearest neighbors) solution, a safety analysis, and comparative analysis to present SOA solutions will not be considered.

6.3.1 Background

HESM units across all DoD applications including Tactical, Aircraft, and Large Power, will be operated in a manner to support rapid power flow from a continuous or transient source in extreme environmental conditions, and installed in close proximity to military personnel. These abusive operating conditions have the potential to severely limit life expectancy of electrochemical storage devices such as batteries and capacitors and have the potential to incur a thermal runaway condition due to failed cells. Due to the need for high power density, advanced storage device technologies such as lithium-ion batteries are sought. However, potential safety and life impacts may limit their implementation. Additionally, conventional thermal management methods for dealing with safety and life impacts may increase overall size of the total enclosure system to the point of eliminating the high density benefits derived from the use of these advanced energy storage device technologies. Furthermore, the potential for advanced energy storage device incidents, such as battery fires, have led to increased regulations and qualification requirements which incur additional implementation cost.

As mentioned above, the energy storage technology used in this demonstration will be a lithium-ion battery pack. As such, the system should be designed so that the integrated battery pack with advanced thermal management technologies can support cell temperature regulation, help prevent single cell thermal runaway, and limit neighboring cells from being triggered. The design shall be capable of either insulating cell-level thermal events to prevent thermal failure propagation to adjacent cells, or conducting heat away from adjacent cells and modules with sufficient speed and efficiency to prevent sympathetic cell and module failure and propagation. Propagation occurs when failure of a cell or module leads to the failure of neighboring cells or modules, most commonly because of thermal or electrical energy transfer, known as cascading. Single cells, as defined in the requirements section below, may undergo energetic release; however, the thermal management system must be able to remove heat faster than it is being generated, keeping the cell temperature below the critical point where the reaction becomes uncontrollable, or a condition where excessive energy is transferred to a neighboring cell causing it to undergo the same energetic

release.

6.3.2 Program Plan

This Science and Technology (S&T) program consists of two phases, Structure Phase I and Structure Phase II. These two phases are covered by this BAA, and the objectives for each are described below. Selection will be based on the ability of the proposed design to meet the technical metrics as described in the following section, and the proposed path to achieving the metrics. The Energy Storage Device Structure development effort is defined in this two-phased approach:

Structure Phase I: The Phase I contract period, i.e., base effort, is notionally a 12 month effort. During this effort, performers will develop the proof of concept for a safe battery packaging structure that will support high rate operation of the hybrid energy storage module system, while ensuring maximum safety and resistance to propagation between cells in the case of a thermal event. This phase allows development and demonstration of proof of concept level technology to meet or exceed the thresholds defined below and in Tables S1 and S2. In addition, the performers will develop a detailed design of the packaging structure for a battery module as defined in Table S1.

Planar cells and cylindrical cells will be considered to provide maximum utility to various geometries and designs suitable for various applications. If an overall approach can utilize the same packaging structure, including thermal management and other components for both cell types, additional consideration may be given. It is also important that the approaches provided can support operationally-created heat rejection to air and liquid cooling with minimal modifications, under the rate characteristics and conditions given in Table S1.

Phase I will involve the development and demonstration of integrated proof of concept energy storage packaging structures implementing technologies including but not limited to thermal, safety and data acquisition, to support use of energy storage as defined within this BAA § I.6.1, I.6.2 and others as the technology and innovation process enables. Approaches should demonstrate possible benefits, advantages, and challenges for creating common packaging structures to hold power or energy cells under transient discharge-charge operations. An emphasis will be made on commonality of the approaches so that the technology can be applied/scaled to various chemistry and cell design variants (power bias to energy bias in cell design). Development of proof of concept designs are acceptable for demonstration at the sub-pack level (low voltage, smaller cell groups), though thermal management and safety should be completely considered for the requirements established under this BAA as shown in Table S2. The connectivity and alignment into larger groupings as required per the tables below should be considered and approaches provided in a detailed notional design which will be produced and characterized under Phase II.

When a design has been solidified, a detailed thermal analysis will be required to ensure that in the event of cell thermal runaway, propagation from one cell or module to another is mitigated for all possible modes of operation and that this performance will scale up in larger energy storage systems. This analysis should also be capable of determining the fidelity of temperature sensors placed at various locations for the early detection of thermal runaway. The proof of concept approaches should be thoroughly evaluated at the rates and conditions presented under Tables S1 and S2. For safety evaluation, multiple methods can be used to initiate the failure mode; including but not limited to internal shorting, localized thermal abuse, overcharge, or external short/puncture.

Approaches which prove the concepts under Phase I may include models, however any modeling should be backed with clear and traceable validation base, and the final deliverables under Phase I should be again verified by actual demonstration, not just modeling and simulation. Any model related to analysis of the approach should be provided as part of the deliverable package in a form which can be utilized to support further studies of platform effects for installations where a final product may be implemented.

The Phase II effort must also strive to integrate technologies developed under the ARPA-E AMPED program into the safety, monitoring, control and/or analysis aspects of the system operation. Greater consideration will be given to Phase II efforts which align and attempt to provide designs which utilize technologies developed under the ARPA-E program as described in Section V.

Phase I Deliverables:

• Quarterly Technical Reports
• Monthly Status and Financial Reports
• Test Plan
• Preliminary System Design
• Preliminary Design Review
• Thermal Analysis Results
• Final Report that includes a table of all system materials with weights/volumes/Material Safety Data Sheet (MSDS) for any potentially hazardous materials, TRLs, etc.
• Phase II Plan of Action (including a prioritized list of risks associated with the Phase II final system); due 30 days prior to the end of the contract
• A 3D solid model of the packaging structure design in one of the following CAD universal exchange formats: STEP (214), IGES
• Layout drawings of critical components, interfaces and subsystems integrated into the design; this would be 2-D Level I drawings at a minimum. Use both .dxf and .pdf formats
• Subscale Proof of Concept package populated with a high power battery, rigorously proven at vendor facility
• Detailed design of scaled-up prototype system

Structure Phase II: The contract Phase II period, i.e., the option effort, consists of a notional 18-month period which terminates in FY16 with a series of thermal and safety demonstrations and delivery of a group of packs combined to meet subcomponent voltage and racked in a nearest-neighbor configuration. During the Phase II period, performers will work to build and evaluate the packaging structure as built into 48V battery modules, and will include simulation, validation and tests on hardware with detailed data acquisition to prove the capability and behaviors. The results must meet or exceed the thresholds defined below and in Tables S1 and S2.

The Phase II effort will involve final development and build of battery packs, integrated into 48V battery modules. The system will be fully validated under performance conditions as defined in Table S1, and abusive conditions as defined by the references in Table S2. Favorable consideration will be given for ability to support a broader diversity of storage components with a given design (adaptability to multiple cell types biased towards power or energy output, commonality and scalability without change in performance). Favorable consideration will also be given for approaches which reduce the size and thermal load of the entire system by making use of advanced high bandwidth converter approaches, advanced materials, improved controls scenarios, and superior safety approaches that both prevent and protect in case of faults and releases from the energy storage components within the system. Detailed evaluation of performance, life, thermal characteristics and other operational capabilities will be performed in this phase.

Models will be essential to the validation of claims and determination of suitability of the thermal and packaging approaches to overcome scenarios in which they are arrayed in substantial packages up to the MWh level. Approaches built under this effort will have any design models delivered in a usable form to support analysis and transition of this technology to host platforms.

The Phase II body of work should also include engineering design efforts to integrate technologies as specified under ARPA-E AMPED technology IAW Section V into the system design. The effort will provide a rigorous analysis deliverable which analyzes and indicates the optimal integration approaches and potential benefits from utilization of the technologies. This will be reviewed in detail as part of the design review process, and will be a contractual deliverable of this effort. Favorable consideration will be made for approaches which integrate AMPED hardware into the deliverable system under Phase II either for the factory demonstration or as an additional capability to the delivered system. Any updated models should be reflected in a final deliverable PSCAD or Simulink model as defined above.

The program will conduct cyclic load testing and safety evaluation of the Phase II components in a racked with nearest-neighbors configuration at the Vendor site (or elsewhere for safety testing) under FAT, and then deliver new modules to a DoD facility for further test and evaluation as required. The proposal must define the approach in which a proof of concept and scaled demonstration will be tested, the definition of sensors and safety equipment to be used, the definition of the hardware that the system will be composed of or will be, the performance of the

proposed approach, and all interfaces to and from the module and controls/sensors. All proposals must provide a detailed scope of work for the development of the core technologies, including a description of the development approaches, safety evaluations, instrumentation development, other experimentation approaches, and power, volume, and weight estimates.

Deliverables:
• Quarterly Technical Reports
• Monthly Status and Financial Reports
• Modeling and Analytical Approaches Report and Model Instruction
• Developmental Testing Evaluation Reports
• Final Report (along with the summary of all the test results, this report should also include recommendations necessary to further mature the technology, such as component risks that need further development/testing, component system reliability, component system manufacturing improvements, etc.)
• 3-D Solid model of a full scale energy system in one of the following CAD universal exchange formats: STEP (214), IGES
• Detailed Design Package, containing Level II 2-D drawings and an accompanying parts list. Use both .dxf and .pdf formats.
• Energy System layout drawings of critical components, interfaces and subsystems as integrated into the test site; this would be 2-D Level I drawings at a minimum. Use both .dxf and .pdf formats
• Piping and Instrumentation Diagram (P&ID) schematic illustrating the functional relationship of piping, instrumentation and system equipment for cooling system
• Electrical one-line schematics and associated detailed schematics for hardware
• Hazards Assessment using MIL-STD-882D as guidance. Format shall be in accordance with DI-SAFT 80101B (links available in Appendix.).
• Detailed design and quantification of benefit which provides application of ARPA-E AMPED program technologies (Section V) for energy storage systems.
• Report and detailed design of integration approaches of technology identified in Section V for enhanced performance, safety, and situational awareness. Integration of actual technology into delivered system as applicable.
• Prototype components that have not been damaged during test and evaluation.
• Any required support equipment necessary to complete a demonstrator (e.g. DAQ, cooling system, etc.)

Militarized Energy Storage Device Structure Demonstration Metrics/Objectives, Indicative Profiles and Other Information

TABLE S1: Program Criteria (Note: C-rate defined as a multiplier of the Ampere-hour capacity of the high-energy component of the demonstrator system)	Metric
Design approach	One parallel (1P) cell with a minimum capacity of 10Ah will be connected in series to a higher voltage level on a Li-ion battery pack. These packs will be the smallest grouping of cells that utilize the common structure for safety, monitoring and thermal management. (Note: 10Ah minimum is defined to emphasize the desirability of “large format” solutions. However, 26650 format cells *only* are allowed if a strong justification can be made. If 26650 cells are to be used, they will be applied in a 4-6P configuration within the pack to yield roughly 10-15Ah. No cell smaller than 26650 will be permitted.)

Scalability	Approach should be scalable to cells with capacity of 50Ah or higher.
Design discharge rate	Components to be utilized in a demonstrator proof of concept must be capable of discharge continuously at a rate of 12C (threshold) and 30C (objective).
Load support	Continuous discharge-charge capability with no stop period in-between, and with continuous operations over at least 80% SOC swing.
Design charge rate	System must be capable of full optimized charge (0-100% SOC) in 1 hr (threshold), 15 min (objective). System must also be capable of buffering input power from an external source at a rate of 15C (threshold), 30C (objective), at a 20% duty cycle (threshold), 50% (objective) with a cyclic period of 10 seconds. Note: while C rate is provided, ultimately loads will be roughly constant power.
Safety	Design will support prevention and isolation of energetic cell failure for any rate of thermal and chemical release, assuming a fault of any type occurs in one cell (e.g. internal short). The prevention of propagation is paramount. Propagation will be limited to the cell pack (threshold) or single cell (objective).
Thermal management	System should include an integrated thermal management approach for the storage and conversion equipment to enable high-rate operation, safety and life.
Monitoring and management	System under Phase I and II should include a full management system which has the capability to isolate storage components to prevent abusive conditions, as well as report component voltage, temperature, operating current and other details to a DAQ for operational analysis.
Isolation	Controls via Battery Management System (BMS) should be able to operate a contactor to protect, and a passive fuse should also be present at terminals (threshold), a bypass capability should *also* be provided to isolate failed packs in an automatic manner (objective)
Volume and Mass	The packaging approach should enable reasonable but limited volume and mass expansion to support integrated technologies inherent to the structure requirements. Packaging weight and volume of the pack structure should not exceed an increase of 80% (threshold), 20% (objective), as compared to the individual cell volume and mass.

Table S2: Specifications and Relevant Operational Information	Metric

OPERATING CONDITIONS	
Water Temperature (available seawater cooling)	5°C to 35°C
Air Temperature (ambient)	-40°C to 70°C
Shock*	MIL-S-901D: Grade B for components, Grade A for any safety controls, management and isolation systems
Vibration*	MIL-STD-167-1
Environmental Protection*	MIL-STD-810G
Humidity	0-100 % relative humidity
INTERFACE REQUIREMENTS	
Battery Pack and Battery Module Interface Voltage	Battery modules (smallest replaceable unit) will be constructed of battery packs. The battery module will have a terminal voltage of nominal 48VDC, with the battery packs being any level up to 48VDC.
Energy Storage Interface Voltage*	Up to1000VDC Strings of Battery Modules
DC Protection	BMS Controlled Contactor; and fuse or fast-acting circuit breaker
SAFETY REQUIREMENTS	
High-Energy Storage System Safety Manual	NAVSEA SG270-BV-SAF-010 28 Oct. 2011
Navy Lithium Battery Safety Program Responsibilities and Procedures	NAVSEA S9310-AQ-SAF-010 15 July 2010
Hazards Assessment	MIL-STD-882D
Management System	All storage components will have tested and proven active management systems monitoring and protecting them under use

*** Design Consideration Only**

7. Point(s) of Contact -

Questions of a technical nature should be submitted to:

Point of Contact Name: Donald Hoffman
Point of Contact Occupation Title: Program Officer
Division Title: Ship Systems and Engineering Division
Division Code:331
Address:
Office of Naval Research
One Liberty Center
875 North Randolph Street
Arlington, VA 22203-1995
Email Address: donald.hoffman@navy.mil

Questions of a business nature should be submitted to:

Darnell Griffin, Contract Specialist - darnell.griffin@navy.mil

Any questions regarding this solicitation must be provided to the Technical Point of Contact and Business Point of

Contact listed in this solicitation. All questions shall be submitted in writing by electronic mail.

Questions submitted within 2 weeks prior to a deadline may not be answered, and the due date for submission of the white paper and/or full proposal will not be extended.

Amendments will be posted to one or more of the following webpages:

- Federal Business Opportunities (FEDBIZOPPS) Webpage - https://www.fbo.gov/
- ONR Broad Agency Announcement (BAA) Webpage - http://www.onr.navy.mil/en/Contracts-Grants/Funding-Opportunities/Broad-Agency-Announcements.aspx

Questions of a security nature should be submitted to:

Diana Pacheco
Industrial Security Specialist
Office of Naval Research
Security Department, Code 43
One Liberty Center
875 N. Randolph Street
Arlington, VA 22203-1995
Email Address: diana.pacheco@navy.mil

Any CLASSIFIED questions shall be handled through the ONR Security POC. Specifically, any entity wanting to ask a CLASSIFIED question shall send an email to the ONR Security POC with copy to both the Technical POC and the Business POC stating that the entity would like to ask a CLASSIFIED question. DO NOT EMAIL ANY CLASSIFIED QUESTIONS. The Security POC will contact the entity and arrange for the CLASSIFED question to be asked through a secure method of communication.

8. Instrument Type(s) - Contracts

Awards will be issued as cost-type Contracts. ONR reserves the right to award a different instrument type if deemed to be in the best interest of the Government.

Any contract awards resulting from this BAA will incorporate the most current FAR, DFARs, NMCARS and ONR clauses. Examples of model contracts can be found on the ONR website at the following link: http://www.onr.navy.mil/Contracts-Grants/submit-proposal/contracts-proposal/contract-model-awards.aspx.

9. Catalog of Federal Domestic Assistance (CFDA) Numbers -

N.A.

10. Catalog of Federal Domestic Assistance (CFDA) Titles -

N.A.

11. Other Information -

Work funded under a BAA may include basic research, applied research and some advanced technology development (ATD). With regard to any restrictions on the conduct or outcome of work funded under this BAA, ONR will follow the guidance on and definition of "contracted fundamental research" as provided in the Under Secretary of Defense (Acquisition, Technology and Logistics) Memorandum of 24 May 2010. As defined therein, the definition of "contracted fundamental research", in a DoD contractual context, includes [research performed

under] grants and contracts that are (a) funded by Research, Development, Test, and Evaluation Budget Activity 1 (Basic Research), whether performed by universities or industry or (b) funded by Budget Activity 2 (Applied Research) and performed on campus at a university. The research shall not be considered fundamental in those rare and exceptional circumstances where the applied research effort presents a high likelihood of disclosing performance characteristics of military systems or manufacturing technologies that are unique and critical to defense, and where agreement on restrictions have been recorded in the contract or grant.

Pursuant to DoD policy, research performed under grants and contracts that are a) funded by Budget Category 6.2 (Applied Research) and NOT performed on-campus at a university or b) funded by Budget Category 6.3 (Advanced Research) does not meet the definition of "contracted fundamental research." In conformance with the USD (AT&L) guidance and National Security Decision Direction 189, ONR will place no restriction on the conduct or reporting of unclassified "contracted fundamental research," except as otherwise required by statute, regulation or Executive Order. For certain research projects, it may be possible that although the research being performed by the prime contractor is restricted research, a subcontractor may be conducting "contracted fundamental research." In those cases, it is the ***prime contractor's responsibility*** in the proposal to identify and describe the subcontracted unclassified research and include a statement confirming that the work has been scoped, negotiated, and determined to be fundamental research according to the prime contractor and research performer.

Normally, fundamental research is awarded under grants with universities and under contracts with industry. ATD is normally awarded under contracts and may require restrictions during the conduct of the research and DoD pre-publication review of research results due to subject matter sensitivity.

As regards to the present BAA, the Research and Development efforts to be funded will consist of advanced technology development. The funds available to support awards are Budget Activity 3.

FAR Part 35 restricts the use of Broad Agency Announcements (BAAs), such as this, to the acquisition of basic and applied research and that portion of advanced technology development not related to the development of a specific system or hardware procurement. Contracts and grants and other assistance agreements made under BAAs are for scientific study and experimentation directed towards advancing the state of the art and increasing knowledge or understanding.

THIS ANNOUNCEMENT IS NOT FOR THE ACQUISITION OF TECHNICAL, ENGINEERING AND OTHER TYPES OF SUPPORT SERVICES.

II. AWARD INFORMATION

1. Amount and Period of Performance-

HESM Development Area #1: Aircraft
Total Amount of Funding Available: $5300K
Anticipated Number of Awards: 1 to 2
Anticipated Range of Individual Award Amounts: Up to $5300K
Anticipated Period of Performance: 30 months

HESM Development Area #2: Large Power
Total Amount of Funding Available: Up to $7000K
Anticipated Number of Awards: 1 to 2
Anticipated Range of Individual Award Amounts: Phase I up to $1500K, total award not to exceed $5500K
Anticipated Period of Performance: 30 months

HESM Development Area #3: HESM Militarized Energy Storage Device Structure
Total Amount of Funding Available: Up to $2000K
Anticipated Number of Awards: 1 to 2
Anticipated Range of Individual Award Amounts: Up to $2000K

Anticipated Period of Performance: 30 months

2. Production and Testing of Prototypes-

In the case of funded proposals for the production and testing of prototypes, ONR may during the contract period add a contract line item or contract option for the provision of advanced component development or for the delivery of additional prototype units. However, such a contract addition shall be subject to the limitations contained in Section 819 of the National Defense Authorization Act for Fiscal Year 2010.

III. ELIGIBILITY INFORMATION

All responsible sources from industry may submit proposals under this BAA. Historically Black Colleges and Universities (HBCUs) and Minority Institutions (MIs) are encouraged to submit proposals and join others in submitting proposals. However, no portion of this BAA will be set aside for HBCU and MI participation, due to the impracticality of reserving discrete or severable items of this research for exclusive competition among the entities.

Federally Funded Research & Development Centers (FFRDCs), including Department of Energy National Laboratories, are not eligible to receive awards under this BAA. However, teaming arrangements between FFRDCs and eligible principal bidders are allowed so long as they are permitted under the sponsoring agreement between the Government and the specific FFRDC.

Navy laboratories and warfare centers as well as other Department of Defense and civilian agency laboratories are also not eligible to receive awards under this BAA and should not directly submit either white papers or full proposals in response to this BAA. If any such organization is interested in one or more of the programs described herein, the organization should contact an appropriate ONR POC to discuss its area of interest. The various scientific divisions of ONR are identified at http://www.onr.navy.mil/. As with FFRDCs, these types of federal organizations may team with other responsible sources from academia and industry that are submitting proposals under this BAA.

University Affiliated Research Centers (UARC) are eligible to submit proposals under this BAA unless precluded from doing so by their Department of Defense UARC contract.

Teams are also encouraged and may submit proposals in any and all areas. However, Offerors must be willing to cooperate and exchange software, data and other information in an integrated program with other contractors, as well as with system integrators, selected by ONR.

Some topics cover export controlled technologies. Research in these areas is limited to "U.S. persons" as defined in the International Traffic in Arms Regulation (ITAR) - 22 CFR § 1201.1 et seq.

IV. APPLICATION AND SUBMISSION INFORMATION

1. Application and Submission Process - White Paper, Oral Presentation, Full Proposals

White Papers: The due date for white papers is no later than 2:00 PM (EST) on Tuesday, 19 March 2013. Unclassified white papers are to be submitted as a pdf file via electronic mail (email) only to the Primary Technical Point of Contact, Mr. Donald Hoffman, at donald.hoffman@navy.mil. NOTE: White Papers sent by FAX or Hard Copy delivery will not be accepted.

If an Offeror does not submit a white paper before the specified due date and time, it is not eligible to participate in the remaining Full Proposal submission process and is not eligible for funding. Each white paper should state that it is submitted in response to this BAA and cite the particular HESM Development Track area of the Research Opportunity Descriptions that the white paper is addressing.

Proposers may submit to one or more of the development track area announcements. A separate standalone white paper is required for each track area.

White Paper Evaluation/Notification: Evaluations of the white papers will be issued via email notification on or about Tuesday, 30 April 2013. A full proposal will be subsequently requested from those Offerors whose proposed technologies have been identified as being of “particular value” to the program. However, any such request does not assure a subsequent award. Any Offeror whose white paper technology was not identified as being of "particular value" is ineligible to submit a full proposal under this BAA.

Full Proposals: The due date for receipt of Full Proposals is 2:00 PM (EDT) on Friday, 14 June 2013. It is anticipated that final selections will be made within 8 weeks after full proposal submission. As soon as the final full proposal evaluation process is completed, PI's will be notified via email of their project's selection or non-selection. Full proposals received after the published due date and time will not be considered for funding under this BAA.

Oral Presentations: ONR intends to make awards based on the initial full proposal submissions but reserves the right to request revised proposals for the most highly rated proposals in one or more of the tracks if in the best interests of the Government. If revised full proposals are requested in certain tracks, it is expected that any proposal revisions would be initially provided as an oral presentation to the government and include a question and answer session. More specific instructions on the format and time limits for the oral presentations and question and answer session will be provided to all offerors determined to be amongst the most highly rated proposal if and when the Government requests revised proposals

2. Content and Format of White Papers/Full Proposals -

White Papers and Full Proposals submitted under the BAA are expected to be unclassified ; however, confidential/classified responses are permitted. Contracts or other instruments resulting from a classified proposal will be unclassified.

Proposal Instructions:

a. WHITE PAPERS

White Paper Format

- Paper Size - 8.5 x 11 inch paper
- Margins - 1 inch
- Spacing - single spaced
- Font - Times New Roman, 12 point
- Max. Number of Pages permitted: 12 pages (excluding cover page, resumes, bibliographies, table of contents, and ARPA AMPED Technology Insertion section)
- Copies - One (1) electronic copy in Adobe PDF or Word 2007

White Paper Content

- **Cover Page:** The Cover Page shall be labeled "WHITE PAPER", and shall include the BAA number, proposed title, Offeror's administrative and technical points of contact, with telephone numbers, facsimile numbers, and Internet addresses, and shall be signed by an authorized officer.

- **Technical Concept:** A description of the technology innovation and technical risk areas. Any detailed modeling and simulation or other concept basis must be clearly explained when presented within charts, graphs, and tables.

- **Operational Naval Concept:** A description of the project objectives, the concept of operation for

the new capabilities to be delivered, and the expected operational performance improvements.

- **Operational Utility Assessment Plan:** A plan for demonstrating and evaluating the operational effectiveness of the Offeror's proposed products or processes in field experiments and/or tests in a simulated environment.

Other Requirements:

- Past History - Identify any previous work conducted in specific or related areas, including related major contract actions.

- Costs - A Rough Order of Magnitude (ROM) projection for the Phase I and II efforts with associated assumptions.

- Management Plan - Identification of the principal investigators and descriptions of partnering arrangements.

- ARPA-E AMPED Technology Insertion (Not included in overall 12-page limit for the white paper, however this section shall not exceed 5-pages and be a severable section of the white paper) - Applicants should include a brief description of any plans to incorporate AMPED concepts, or any relevant partnerships with ARPA-E funded projects. Incorporation of AMPED concepts will be considered under the BAA technical evaluation criteria based on the following factors:

  • Consistency of the advanced concept with one or more AMPED Program Objectives and Technical Areas of Interest.
  • Degree to which the AMPED concept will be incorporated into the HESM demonstration system. At a minimum, AMPED approaches should form the basis of an advanced conceptual design that can be validated for future implantation in the HESM system.
  • Expected benefit of the AMPED concept integration relative to some clear baseline system capabilities and performance.
  • Degree to which the AMPED concept complements and is cohesive with the baseline HESM system approach.

b. FULL PROPOSALS

i. INSTRUCTIONS FOR CONTRACTS

Proposal Package: The following three documents with attachments comprise a complete proposal package:

(1) Technical Proposal Template (pdf)
(2) Technical Content (word)*
(3) Cost Proposal Spreadsheet (excel)

These documents can be found at: http://www.onr.navy.mil/Contracts-Grants/submit-proposal/contracts-proposal/cost-proposal.aspx

**When completing this template, Offerors should cross-reference both Section I.6 (Research Opportunity Description) and Section V (Evaluation Information) to assure all information required by the BAA is provided in the proposal.*

All have instructions imbedded into them that will assist in completing the documents. Also, both the Technical Proposal Template and the Cost Proposal Spreadsheet require completion of cost-related information. Please note

that attachments can be incorporated into the Technical Proposal Template for submission.

The format requirements for any attachments are as follows:

- Paper Size- 8.5 x 11 inch paper
- Margins – 1 inch
- Spacing- single or double spaced
- Font- Times New Roman, 12 point

The Cost Proposal Spreadsheet can be found by following this link: http://www.onr.navy.mil/Contracts-Grants/submit-proposal/contracts-proposal/cost-proposal.aspx. Click on the "proposal spreadsheet" link and save a copy of the spreadsheet. Instructions for completion have been embedded into the spreadsheet. Any proposed options that are identified in the Technical Proposal Template or Technical Content documents, but are not fully priced out in the Cost Proposal Spreadsheet, will not be included in any resulting contract. If proposing options, they must be separately priced and separate spreadsheets should be provided for the base period and each option period. In addition to providing summary by period of performance (base and any options), the Contractor is also responsible for providing a breakdown of cost for each task identified in the Statement of Work. The sum of all costs by task worksheets MUST equal the total cost summary.

For proposed subcontracts or interorganizational transfers over $150,000, Offerors must provide a separate fully completed Cost Proposal Spreadsheet in support of the proposed costs. This spreadsheet, along with supporting documentation, must be provided either in a sealed envelope with the prime's proposal or via e-mail directly to both the Program Officer and the Business Point of Contact at the same time the prime proposal is submitted. The e-mail should identify the proposal title, the prime Offeror and that the attached proposal is a subcontract, and should include a description of the effort to be performed by the subcontractor. Offerors should also familiarize themselves with the new subcontract reporting requirements set forth in Federal Acquisition Regulation (FAR) clause 52.204-10, Reporting Executive Compensation and First-Tier Subcontract Awards. The pertinent requirements can be found in Section VII, Other Information, of this document.

Offerors should submit one (1) electronic copy on CD-ROM of their proposal package. The electronic copy should be submitted in a secure, pdf-compatible format, except for the electronic file for the Cost Proposal Spreadsheet which should be submitted in a Microsoft Excel 2007 compatible format. All attachments should be submitted in a secure, pdf-compatible format.

The secure pdf-compatible format is intended to prevent unauthorized editing of the proposal prior to any award. A password should not be required for opening the proposal document, but the Government must have the ability to print and copy text, images, and other content. Offerors may also submit their Technical Proposal Template and Technical Content in an electronic file that allows for revision (preferably in Microsoft Word) to facilitate the communication of potential revisions. Should an Offeror amend its proposal, the amended proposal should be submitted following the same hard and electronic copy guidance applicable to the original proposal.

The electronic submission of the Excel spreadsheet should be in a "useable condition" to aid the Government with its evaluation. The term "useable condition" indicates that the spreadsheet should visibly include and separately identify within each appropriate cell any and all inputs, formulas, calculations, etc. The Offeror should not provide "value only spreadsheets" similar to a hard copy.

3. Significant Dates and Times -

Event	Date	Time
White Paper Due Date	3/19/2013	2:00 PM Eastern Daylight Time
Notification of White Paper Evaluation*	4/30/2013	

Full Proposal Due Date	6/14/2013	2:00 PM Eastern DaylightTime
Notification of Selection: Full Proposals*	8/20/2013	
Awards*	1/15/2014	

**These dates are estimates as of the date of this announcement.*

NOTE: Due to changes in security procedures since September 11, 2001, the time required for hard-copy written materials to be received at the Office of Naval Research has increased. Materials submitted through the U.S. Postal Service, for example, may take seven days or more to be received, even when sent by Express Mail. Thus any hard-copy proposal should be submitted long enough before the deadline established in the solicitation so that it will not be received late and thus be ineligible for award consideration.

4. Submission of Late Proposals -

Any proposal, modification, or revision that is received at the designated Government office after the exact time specified for receipt of proposals is "late" and will not be considered unless it is received before award is made, the contracting officer determines that accepting the late proposal would not unduly delay the acquisition and:

a. If it was transmitted through an electronic commerce method authorized by the announcement, it was received at the initial point of entry to the Government infrastructure not later than 5:00 P.M. one working day prior to the date specified for receipt of proposals; or
b. There is acceptable evidence to establish that it was received at the Government installation designated for receipt of proposals and was under the Government's control prior to the time set for receipt of proposals; or
c. It was the only proposal received.

However, a late modification of an otherwise timely and successful proposal that makes its terms more favorable to the Government will be considered at any time it is received and may be accepted.

Acceptable evidence to establish the time or receipt at the Government installation includes the time/date stamp of that installation on the proposal wrapper, other documentary evidence of receipt maintained by the installation, or oral testimony or statements of Government personnel.

If an emergency or unanticipated event interrupts normal Government processes so that proposals cannot be received at the Government office designated for receipt of proposals by the exact time specified in the announcement, and urgent Government requirements preclude amendment of the announcement closing date, the time specified for receipt of proposals will be deemed to be extended to the same time of day specified in the announcement on the first work day on which normal Government processes resume.

The contracting officer must promptly notify any offeror if its proposal, modifications, or revision was received late and must inform the offeror whether its proposal will be considered.

5. Address for the Submission of White Papers and Full Proposals for Contracts.

Unclassified White Papers must be emailed to Donald Hoffman at the following email address: donald.hoffman@navy.mil. The subject line of the email shall read "ONR BAA13-009 White Paper Submission."

NOTE: 1) Do not send .ZIP files; 2) Do not send password protected files; 3) In order to provide traceability and evidence of submission, Offerors may wish to use the "Delivery Receipt" option available from Microsoft Outlook and other email programs that will automatically generate a response when the subject email is delivered to the recipient's email system. Consult the User's Manual for your email software for further

details on this feature.

The DVD or CD-ROM of Unclassified Full Proposal including all supporting documentation should be sent to the Office of Naval Research at the following address:

Office of Naval Research
Attn: Donald Hoffman
ONR Department Code: 331
875 North Randolph Street
Arlington, VA 22203-1995

If hand delivering a full proposal, the following person can be used as a secondary point of contact to be used if the primary cannot be reached:

Office of Naval Research
Attn: Nathan Desloover
Email: Nathan.desloover.ctr@navy.mil
ONR Department Code: 332
875 North Randolph Street
Arlington, VA 22203-1995

Classified White Papers or Full Proposals shall be submitted directly to the attention of ONR's Document Control Unit at the following address and marked in the following manner:

OUTSIDE ENVELOPE (no classification marking):

"Office of Naval Research
Attn: Document Control Unit
ONR Code 43
875 North Randolph Street
Arlington, VA 22203-1995"

The inner wrapper of the classified White Paper and/or Full Proposal should be addressed to the attention of the TPOC, ONR Code 331 and marked in the following manner:

INNER ENVELOPE (stamped with the overall classification of the material)

"Program: Hybrid Energy Storage Module (HESM)"
Office of Naval Research
ATTN: Donald Hoffman
ONR Code: ONR Code 331
875 North Randolph Street
Arlington, VA 22203-1995"

An 'unclassified' Statement of Work (SOW) must accompany any classified full proposal.

V. EVALUATION INFORMATION

1. Evaluation Criteria -

Award decisions will be based on a competitive selection of proposals resulting from a scientific and cost review. Evaluations will be conducted using the following evaluation criteria:

Criteria #1: Ability to Meet Program Technical Objectives and Metrics & Overall Scientific and Technical Merit:

Ability to Meet Program Technical Objectives and Merits: The feasibility and likelihood of the proposed approach to meet the program technical objectives/metrics. The extent to which the proposal reflects a mature, substantiated, and quantitative understanding of the program technical objectives/metrics, the statistical confidence with which they may measure, and their relationship to the concept of operations that will result from successful performance in the program. A proposal that fails to adequately address how it will meet Program Technical Objectives/Metrics shall not be reviewed further. If the proposal is rated unacceptable in this category, it shall not be reviewed any further.

Technical Merit: The extent to which the proposed technical approach is feasible, achievable, and complete. Task descriptions and associated technical elements provided are complete and in a logical sequence with all proposed deliverables clearly defined such that a final product that achieves the goal can be expected as a result of award. The proposal identifies major technical risks, and planned mitigation efforts are clearly defined and feasible.

Scientific Merit: Proposer must demonstrate that its proposal is innovative, that the technical approach is comprehensive, systematic and sound, that it has an understanding of critical technical issues and risks, that it has a plan for mitigation of those risks, and that the technical elements are well integrated into a cohesive program. Task descriptions and associated technical elements provided are complete and in a logical sequence with all proposed deliverables clearly defined such that the final product can be expected to achieve the program goals.

Criteria #2: Potential for the Technology to Transition:
This factor assesses a technology's potential and likelihood of implementation on DoD platforms.

A concern for the government is the ability to transition the Hybrid Energy Storage Module program to production once the technology is proven. Key to a successful transition is upfront planning, acknowledging and resolving all aspects of Intellectual Property (IP) rights. The following criteria will be considered to evaluate best value and best fit to any future transition: The IP assertions are realistic and clearly delineated.
• IP assertions are well substantiated.
• Licensing terms are clear and enforceable.
• Mitigating Technology Risk
• Open Architecture

In addition, the least restrictive IP rights provided to the Government in the resulting technology will be considered as favorable.

For any critical technical data and/or computer software to be delivered to the Government under a proposed effort has been developed exclusively at private expense and the Government has not already received Unlimited or Government Purpose Rights or would not otherwise receive Government Purpose Rights under the effort in that technical data or computer software, resulting proposals that provide the Government an opportunity to purchase Government Purpose Rights under any resulting contract will be favorably considered.

Criteria#3: The Offeror’s capabilities, related experience, past performance, facilities, techniques, management plan, or unique combinations of these which are integral factors for achieving the proposal objectives and bringing product under development to mature technology.

Criteria #4: The qualifications, capabilities and experience of the proposed Principal Investigator (PI), team leader and key personnel who are critical in achieving the proposal objectives

The qualifications, capabilities and experience of the proposed principal investigator, team leader and other key personnel who are critical in achieving the proposal objectives. Specify availability qualified technical personnel with appropriate experience and applicable.

Criteria #5: The realism of the proposed costs and availability of funds.

Proposers may add a third option to the proposal to allow the Government an option to buy Government Purpose Rights in any critical technical data and/or computer software to be delivered to the Government under this effort that has been developed exclusively at private expense and for which the Government has not already received Unlimited or Government Purpose Rights or would not otherwise receive Government Purpose Rights under the effort in that technical data and/or computer software.

Industry-ARPA-E AMPED Program Performer Partnering - ARPA-E's AMPED program focuses on novel S&T advances in sensing, control, and power management technologies to enable entirely new capabilities for battery management. The AMPED program provides a foundational toolset of approaches that can readily be leveraged to more effectively integrate high-energy battery systems and enable aggressive usage profiles in hybridized energy storage systems.

ONR highly encourages integration of concepts/approaches outlined in ARPA-E's AMPED program solicitation. Links to the AMPED solicitation and description of funded AMPED projects are included in Section VII.14 below. Concepts and approaches that address any objectives of the AMPED program and fall within the following Technical Areas of Interest described in the AMPED solicitation are seen as important complementary capabilities for HESM:

Area 1: Online Sensing
Area 2: Offline or Online Characterization for Fast Monitoring and Prediction
Area 5: Technologies that Offer New Control Capabilities via Advanced Models, Mechanisms, or Actuators

Proposals that incorporate ARPA-E AMPED concepts, as a means to enhancing the performance potential of their HESM systems, will be given favorable consideration. ONR also encourages partnering with organizations that are receiving funding from ARPA-E, where appropriate, with a view toward speeding the incorporation of new science and technology into fielded systems.

Overall, the technical criteria 1 - 4 above are significantly more important than the cost factor, with the technical factors all being of equal value. The degree of importance of cost will increase with the degree of equality of the proposals in relation to the other factors on which selection is to be based, or when the cost is so significantly high as to diminish the value of the proposal's technical superiority to the Government.

Award(s) will be made to the proposers whose proposals are determined to be the most advantageous and of best value to the Government, all factors considered, including the potential contributions of the proposed work to the overall research program and the availability of funding for the effort.

The ultimate recommendation for award of proposals is made by ONR's scientific/technical community. Recommended proposals will be forwarded to the contracts department will perform costs analysis prior to any ensuing negotiations. Any notification received from ONR that indicates that the Offeror's full proposal has been recommended, does not ultimately guarantee an award will be made. This notice indicates that the proposal has been selected in accordance with the evaluation criteria above and has been sent to the contracting department to conduct cost analysis, determine the offeror's responsibility, and any take any other relevant steps necessary prior to commencing negotiations with the offeror

Industry-Academia Partnering - ONR highly encourages partnering among industry and academia with a view toward speeding the incorporation of new science and technology into fielded systems. Proposals that utilize industry-academic partnering which enhances the development of novel S&T advances will be given favorable consideration.

2. Commitment to Small Business

The Office of Naval Research is strongly committed to providing meaningful subcontracting opportunities for small

businesses, small disadvantaged businesses (SDBs), woman-owned small businesses (WOSBs), historically underutilized business zone (HUBZone) small businesses, veteran-owned small business (VOSBs), service disabled veteran-owned small businesses (SDVOSBs), historically black colleges and universities, and minority institutions, and other concerns subject to socioeconomic considerations through its awards.

a.) Subcontracting Plan - For proposed awards to be made as contracts that exceed $650,000, large businesses and non-profits (including educational institutions) shall provide a Subcontracting Plan that contains all elements required by FAR 52.219-9, as supplemented by DFARS 252.219-7003. Small businesses are exempt from this requirement.

The Subcontracting Plan should be submitted as an attachment to the "Technical Proposal Template"and will not be included in the page count. If a company has a Master Subcontracting Plan, as described in FAR 19.701 or a Comprehensive Subcontracting Plan, as described in DFARS 219.702, a copy of the plan shall also be submitted as an attachment to the "Technical Proposal Template."

Plans will be reviewed for adequacy, ensuring that the required information, goals, and assurances are included. Zero Percent (0%) for goals, or Zero Dollars ($0), or Not Applicable (N/A), are unacceptable. If a subcontracting plan is not submitted with the proposal package or the negotiation of an acceptable subcontracting plan is required, there could be a delay in the issuance of an award. In addition, in accordance with FAR 52.219-9, failure to submit and negotiate a subcontracting plan may make an offeror ineligible for contract award.

Offerors shall propose a plan that ensures small businesses (inclusive of SDBs, WOSBs, HUBZone, VOSBs and SDVOSBs, etc.) will have the maximum practicable opportunity to participate in contract performance consistent with its efficient performance**.**

As a baseline, offerors shall to the best extent possible propose realistic goals to ensure small business participation in accordance with the current fiscal year subcontracting goals found on the Department of Defense Office of Small Business Program website at: http://www.acq.osd.mil/osbp/. If proposed goals are below the statutory requirements, then the offeror should provide a viable written explanation as to why small businesses are unable to be utilized and what attempts have been taken to ensure that small business were given the opportunity to participate in the effort to the maximum extent practicable. 33

b.) Small Business Participation Statement – If subcontracting opportunities exist, all prime offerors shall submit a Small Business Participation Statement regardless of size in accordance with DFARS 215.304 when receiving a contract for more than the simplified acquisition threshold (i.e.$150,000). All offerors shall provide a statement of the extent of the offeror's commitment in providing meaningful subcontracting opportunities for small businesses and other concerns subject to socioeconomic considerations through its awards and must agree that small businesses, VOSBs, SDVOSBs, HUBZones, SDBs, and WOSBs concerns will have to the maximum practicable opportunity to participate in contract performance consistent with its efficient performance.

NOTE: Small Business Offerors may meet the requirement using work they perform themselves.

This assertion will be reviewed to ensure that it supports this policy by providing meaningful subcontracting opportunities. The statement should be submitted as a part of the proposal package and will not be included in the page count.

3. Options -

The Government will evaluate options for award purposes by adding the total cost for all options to the total cost for the basic requirement. Evaluation of options will not obligate the Government to exercise the options during the period of performance.

4. Evaluation Panel -

Technical and cost proposals submitted under this BAA will be protected from unauthorized disclosure in accordance with FAR 3.104-4 and 15.207. The cognizant Program Officer and other Government scientific experts will perform the evaluation of technical proposals. Restrictive notices notwithstanding, one or more support contractors may be utilized as subject-matter-expert technical consultants. However, proposal selection and award decisions are solely the responsibility of Government personnel. Each support contractor's employee having access to technical and cost proposals submitted in response to this BAA will be required to sign a non-disclosure statement prior to receipt of any proposal submissions.

VI. AWARD ADMINISTRATION INFORMATION

1. Administrative Requirements -

- The North American Industry Classification System (NAICS) code - The NAICS code for this announcement is "541712" with a small business size standard of "500 employees".

- System for Award Management (SAM): All Offerors submitting proposals or applications must:

  1) be registered in the SAM prior to submission;

  2) maintain an active SAM registration with current information at all times during which it has an active Federal award or an application under consideration by any agency; and

  3) provide its DUNS number in each application or proposal it submits to the agency.

  The System for Award Management (SAM) is a free web site that consolidates the capabilities you used to find in CCR/FedReg, ORCA, and EPLS. Future phases of SAM will add the capabilities of other systems used in Federal procurement and awards processes. SAM may be accessed at https://www.sam.gov/portal/public/SAM/

- Access to your Grant, Cooperative Agreement, Other Transaction and Contract Award

  Effective 01 October 2011, hard copies of award/modification documents will no longer be mailed to Offerors. All Office of Naval Research (ONR) award/modification documents will be available via the Department of Defense (DoD) Electronic Document Access System (EDA).

  EDA is a web-based system that provides secure online access, storage, and retrieval of awards and modifications to DoD employees and vendors.

  If you do not currently have access to EDA, you may complete a self-registration request as a "Vendor" via http://eda.ogden.disa.mil following the steps below:

  Click "New User Registration" (from the left Menu)
  Click "Begin VENDOR User Registration Process"
  Click "EDA Registration Form" under Username/Password (enter the appropriate data)
  Complete & Submit Registration form

  Allow five (5) business days for your registration to be processed. EDA will notify you by email when your account is approved.

  Registration questions may be directed to the EDA help desk toll free at 1-866-618-5988, Commercial at 801-605-7095, or via email at cscassig@csd.disa.mil (Subject: EDA Assistance)

VII. OTHER INFORMATION

1. Government Property/Government Furnished Equipment (GFE) and Facilities

Government research facilities and operational military units are available and should be considered as potential government-furnished equipment/facilities. These facilities and resources are of high value and some are in constant demand by multiple programs. It is unlikely that all facilities would be used for any one specific program. The use of these facilities and resources will be negotiated as the program unfolds. Offerors submitting proposals for contracts, cooperative agreements and Other Transaction Agreements should indicate in the Technical Proposal Template, Section II, Blocks 8 and 9, which of these facilities are critical for the project's success. Offerors submitting proposals for grants should address the need for government-furnished facilities in their technical proposal.

2. Security Classification

In order to facilitate intra-program collaboration and technology transfer, the Government will attempt to enable technology developers to work at the unclassified level to the maximum extent possible. Normally, work done under a grant does not require access to classified material. If it is determined that access to classified information will be required during the performance of an award, a Department of Defense (DD) Form 254 (Contract Security Classification Specification) will be attached to the contract; and FAR 52.204-2 - Security Requirements will be incorporated into the contract. The Offeror must clearly identify such need by completing Section II, Block 11, DD 254 – Security Classification Specification, of the Technical Proposal Template.

If it is determined that access to classified information will be required during the performance of an award, a Department of Defense (DD) Form 254 will be attached to the contract; and FAR 52.204-2 – Security Requirements will be incorporated into the contract.

3. Use of Animals and Human Subjects in Research

RESERVED

4. Recombinant DNA

RESERVED

5. Use of Arms, Ammunition and Explosives

RESERVED

6. Department of Defense High Performance Computing Program

The DoD High Performance Computing Program (HPCMP) furnishes the DoD S&T and RDT&E communities with use-access to very powerful high performance computing systems. Awardees of ONR contracts, grants, and assistance instruments may be eligible to use HPCMP assets in support of their funded activities if ONR Program Officer approval is obtained and if security/screening requirements are favorably completed. Additional information and an application may be found at http://www.hpcmo.hpc.mil/.

7. Organizational Conflicts of Interest

All Offerors and proposed subcontractors must affirm whether they are providing scientific, engineering, and technical assistance (SETA) or similar support to any ONR technical office(s) through an active contract or subcontract. All affirmations must state which office(s) the offeror supports and identify the prime contract numbers.

Affirmations shall be furnished at the time of proposal submission. All facts relevant to the existence or potential existence of organizational conflicts of interest (FAR 9.5) must be disclosed. The disclosure shall include a description of the action the offeror has taken or proposes to take to avoid, neutralize, or mitigate such conflict. In accordance with FAR 9.503 and without prior approval, a contractor cannot simultaneously be a SETA and a research and development performer. Proposals that fail to fully disclose potential conflicts of interests or do not have acceptable plans to mitigate identified conflicts will be rejected without technical evaluation and withdrawn from further consideration for award. Additional ONR OCI guidance can be found at http://www.onr.navy.mil/About-ONR/compliance-protections/Organizational-Conflicts-Interest.aspx. If a prospective offeror believes that any conflict of interest exists or may exist (whether organizational or otherwise), the offeror should promptly raise the issue with ONR by sending his/her contact information and a summary of the potential conflict by e-mail to the Business Point of Contact in Section I, item 7 above, before time and effort are expended in preparing a proposal and mitigation plan. If, in the sole opinion of the Government after full consideration of the circumstances, any conflict situation cannot be effectively avoided, the proposal may be rejected without technical evaluation and withdrawn from further consideration for award under this BAA.

8. Project Meetings and Reviews

HESM Development Area #1: Individual program reviews between the ONR/AFRL sponsors and the performer may be held as necessary. Program status reviews may also be held to provide a forum for reviews of the latest results from experiments and any other incremental progress towards the major demonstrations. These meetings will be held at various sites throughout the country. For costing purposes, offerors should assume that 40% of these meetings will be at or near AFRL, Wright Patterson AFB, Dayton, OH and 60% at other contractor or government facilities. Interim meetings are likely, but these will be accomplished via video telephone conferences, telephone conferences, or via web-based collaboration tools.

HESM Development Area #2: Individual program reviews between the ONR sponsor and the performer may be held as necessary. Program status reviews may also be held to provide a forum for reviews of the latest results from experiments and any other incremental progress towards the major demonstrations. These meetings will be held at various sites throughout the country. For costing purposes, offerors should assume that 40% of these meetings will be at or near ONR, Arlington, VA and 60% at other contractor or government facilities. Interim meetings are likely, but these will be accomplished via video telephone conferences, telephone conferences, or via web-based collaboration tools.

HESM Development Area #3: Individual program reviews between the ONR sponsor and the performer may be held as necessary. Program status reviews may also be held to provide a forum for reviews of the latest results from experiments and any other incremental progress towards the major demonstrations. These meetings will be held at various sites throughout the country. For costing purposes, offerors should assume that 40% of these meetings will be at or near ONR, Arlington, VA and 60% at other contractor or government facilities. Interim meetings are likely, but these will be accomplished via video telephone conferences, telephone conferences, or via web-based collaboration tools.

9. Executive Compensation and First-Tier Subcontract Reporting

The FAR clause 52.204-10, “Reporting Executive Compensation and First-Tier Subcontract Awards,” will be used in all procurement contracts valued at $25,000 or more. A similar award term will be used in all grants and cooperative agreements.

10. Combating Trafficking in Persons

Appropriate language from FAR Clause 52.222-50 will be incorporated in all awards.

11. Updates of Information regarding Responsibility Matters

FAR clause 52.209-9, Updates of Publicly Available Information Regarding Responsibility Matter, will be included in all contracts valued at $500,000 where the contractor has current active Federal contracts and grants with total

value greater than $10,000,000.

12. Employment Eligibility Verification

As per FAR 22.1802, recipients of FAR-based procurement contracts must enroll as Federal Contractors in E-verify and use E-verify to verify employment eligibility of all employees assigned to the award. All resultant contracts from this solicitation will include FAR 52.222-54, "Employment Eligibility Verification." This clause will not be included in grants, cooperative agreements, or Other Transactions.

13. Intellectual Property

Offerors responding to this BAA must submit a separate list of all technical data or computer software that will be furnished to the Government with other than unlimited rights. The Government will assume unlimited rights if offerors fail to identify any intellectual property restrictions in their proposals. Include in this section all proprietary claims to results, prototypes, and/or deliverables. If no restrictions are intended, then the offeror should state "NONE."

14. Other Guidance, Instructions, and Information

Appendix

ONR Industry Day Briefs	https://www.fbo.gov/?s=opportunity&mode=form&id=83d678615b29536274fc24a83c893120&tab=core&_cview=0
ARPA-e AMPED Program	https://arpa-e-foa.energy.gov/Default.aspx?Archive=1#FoaId088db619-ab1f-4ebc-ac69-ea1be9e58eec
MIL-STDs-882D	www.system-safety.org/Documents/MIL-STD-882D.pdf
MIL-STD-901D (Grade B)	http://www.assistdocs.com/search/document_details.cfm?ident_number=2640&StartRow=1&PaginatorPageNumber=1&doc%5Fid=MIL%2DS%2D901D&status%5Fall=ON&search%5Fmethod=BASIC
DI-SAFT 80101B	https://assist.daps.dla.mil/quicksearch/basic_profile.cfm?ident_number=209470
MIL-PRF-8565K	http://www.everyspec.com/MIL-PRF/MIL-PRF-000100-09999/MIL-PRF-8565K_6893/
MIL-STD-461 (RE101,RE102,RS101,RS103)	http://www.assistdocs.com/search/document_details.cfm?ident_number=35789&StartRow=1&PaginatorPageNumber=1&doc%5Fid=MIL%2DSTD%2D461&status%5Fall=ON&search%5Fmethod=BASIC
Mil-Std 704(f)	http://www.wbdg.org/ccb/FEDMIL/std704f.pdf
S9310-AQ-SAF-010	www.navsea.navy.mil/NAVINST/09310-001B.pdf
MIL-STD-1399	http://www.assistdocs.com/search/document_details.cfm?ident_number=36820&StartRow=1

	&PaginatorPageNumber=1&doc_id=MILSTD-%201399-300&search_method=BASIC
NAVSEA SG270-BV-SAF-010 28 Oct. 2011	https://www.fbo.gov/index?s=opportunity&mode=form&id=4a4ef5f3e26e78711f743e2ec348d2ea&tab=core&_cview=0