REQUEST FOR INFORMATION (RFI)
United States Marine Corps (USMC)
Expeditionary Energy Concepts (E2C) 2016
(Formerly known as the Experimental Forward Operating Base (ExFOB) demonstration)

OVERVIEW:

This announcement constitutes a Request for Information (RFI) notice for planning purposes.

This year's Expeditionary Energy Concepts demonstration (E2C 2016) will be held at Marine Corps Base Camp Pendleton, California, from 2 - 6 May 2016.

E2C 2016 will focus on four technology areas:

1. Squad-sized Small Unit Water Purification
2. Energy storage technology for Mobile Electric Micro-grid application
3. Energy Scavenging to support Distributed Operations
4. Optimization of Shock Trauma Platoon/Forward Resuscitative Surgical System

Responses are requested no later than 15 January 2016. Responses received after that time may be reviewed, but are unlikely to be considered for participation.

Ensure the email subject line in your response identifies the technology focus area you are responding under.

ABOUT EXPEDITIONARY ENERGY CONCEPTS (E2C):

Created by the Commandant in 2009, E2C (formerly ExFOB) brings together stakeholders from across Marine Corps requirements, acquisition, and technology development communities in a dynamic process to quickly evaluate technologies that reduce battlefield energy, water requirements, and extend the operational reach of the Corps.

Once per year, the Marine Corps invites select industry participants to E2C to demonstrate commercial off-the-shelf technologies with potential to address current Marine Corps expeditionary energy, water, and waste capability gaps. *E2C is not a tradeshow*. During the week-long demonstration, a team of engineers will collect data on system performance and Marine operators will provide qualitative feedback on what they observe. Following the demonstration, promising technologies may be evaluated in a controlled lab environment and then put into the hands of Marines for field testing in combat conditions. Lab and field evaluation results will inform Marine Corps requirements development.

E2C 2016 TECHNOLOGY FOCUS AREAS

E2C 2016 will focus on technologies that enable small unit distributed operations (e.g. distributed Company Landing Team operations). Small unit distributed operations require small, highly mobile, tactical units that can easily maneuver for extended range without fuel, battery, or water resupply. The Marine Corps is interested in the following four technology areas and their associated specifications:

1. Squad-sized Small Unit Water Purification (SUWP)

The Marine Corps is interested in a squad sized water purification system in order to provide a capability to sustain dismounted Marines in austere environments. The Marine Corps is interested in water purification units that meet the following specifications:

- Man-packable
- Weigh 10 lbs. or less
- Filters water with a minimum of 5,000 mg/L salinity to potable water
- Prefer mechanical filtration; no power required, but power requirements satisfied by small man-packable solar blankets will be considered.
- Flow rate- 5 gal/hr

2. Energy Storage Technology for Mobile Electric Micro-grid (MEM)

The Marine Corps is interested in Intelligent Power Management (IPM) that is a key piece of MEM. The IPM capability focuses on providing stable, flexible, reliable and renewable, tactical power. The overall IPM system consists of three major subsystems: The Mobile Electric Power (Advanced Medium Mobile Power Sources (AMMPS)) with an intelligent Digital Control Systems (DCS); Power Distribution with the Marine Corps Mobile Electric Power Distribution System-Replacement (MEPDIS-R); and an Energy Storage Unit (ESU). The AMMPS with intelligent DCS allows multiple generators to form a local grid, synchronizing generators and turning them on and off as needed to automatically adjust to changing load demand. The MEPDIS-R is the current distribution system within Marine Corps and will be the back bone which all other IPM systems must be able to interface with. It is understood that commercial off-the-shelf technologies are not likely to address these traits exactly, but the need is for uninterruptable power sources that allow for the reduction of spinning reserves (where spinning reserves are extra generators on-line for power assurance). Key objective traits the Government is interested in for the ESU include the following:

- Capable of providing standalone uninterruptable power when generators are shut off unexpectedly to allow for an alternate generator to start up.
- Capable of interfacing with the Marine Corps MEPDIS-R system.
- Power Capability: 60kW continuous for a minimum of 5 minutes and up to 30 minutes.
- Power Type and Quality: 120/208 VAC 3 Phase, 60 Hz that meets MIL-STD-1332B.
- Able to detect load transients and exhibit uninterrupted operation while switching between charging and providing power to the load.
- Size: No larger than the AMMPS 60 kW generator footprint (no larger than 82 inches in length, no larger than 36 inches in width and no larger than 52.8 inches in height). Smaller sizes are desirable.
- It is preferred that the ESU be a modular system with expandable energy storage capability.
- Autonomous operations that automatically adjust with changing load demand and generation capacity available.
- Capable of cycling while under light load and where generator operating efficiency is high, and be capable of switching off.
- Require no changes to the generator set or power distribution system to function.

3. Energy Scavenging to support Distributed Operations

A single Marine man-packable system(s), useable by an non-utilities Military Occupational Specialty Marine at the infantry squad, platoon or Company Landing Team, that leverages and converts foreign, or unidentifiable power sources, (multiple voltages, frequencies, AC or DC) for use with United States military electronic equipment and for battery recharging. The Marine Corps is interested in technologies that meet the following specifications and capabilities (respondents can respond to one or both):

For smaller applications:

- The power manager, minus the cables, connectors and carrier, should be less than 2 lbs.
- The system should have an intelligent connector and cable manager so as to minimize the number of connector's and cables to be carried while maximizing the number of supported systems and loads.
- Able to determine the availability, suitability and compatibility of the existing source for use to scavenge from it (battery, generator, power line, etc.) to a specific USMC piece of equipment, (battery, laptop, sensor, radio, etc.) and provide feedback to the user as to appropriateness of the compatibility, the power throughput and when (if) the recharging is either complete or no longer useful.
- The system should be either operator selectable for output, or automatically determine the appropriate output for the connected systems.
- Input: AC or DC; in as wide a range as practical.
- Output; DC output, 9-32 VDC. (AC 120VDC 60Hz optional)

A similar capability for larger applications would be used with a higher capacity to scavenge power for vehicles, combat operation centers, weapon systems, radars etc.… and would be capable of the following:

- Determining the availability, suitability and compatibility of the existing source for use to scavenge from it to a specific USMC piece of equipment and provides feedback to the user as to appropriateness of the compatibility, the power throughput and when (if) the recharging is either complete, or no longer useful.
- Carried by a vehicle (mountable or packaged inside the vehicle)
- Employed either on the vehicle or temporarily placed on the ground/another platform within a short distance (30 feet).
- Connects to the Vehicle's bus.
- Can be used either when stopped, (using scavenged shore power to power the vehicle's onboard systems) or when the vehicle is on the move, (using the vehicle to either recharge DC batteries (which we generally cannot do now) or use it to power AC systems that do not now mount and connect directly to the vehicle's internal bus)
- Input: AC, worldwide range
- Output: 120 VAC, 60 Hz and MIL-STD 1275 DC 24V nominal, connected to vehicle bus.

4. Optimization of Forward Resuscitative Surgical System/Shock Trauma Platoon (FRSS/STP)

E2C 2016 will demonstrate improvements to the FRSS and STP in order to meet the Commandant's 2025 goal of "sustaining C4I and life support systems in place" with zero non-mobility fuel, and to enable future sea-based operations in austere and lethal environments. These technologies will need to be compatible with the V-22 Osprey and extend time supporting combat without resupply. The following capabilities are desired:

- Oxygen Generation:
  - Bulk Oxygen (O2) Generation: Medical grade (>93%) with a flow rate of 5- 10 liters per minute. Desired size; less than 20 cubic feet. Desired weight; less than 250lbs. Desired average power consumption; 1200W or less. Desired peak power consumption; 1,250W or less. Solar power compatible. Inaudible with the ability to refill oxygen cylinders.
  - Individual Patient Oxygen (O2) Generation: Medical grade (>93%) with a flow rate of 5-15 liters per minute at altitudes up to 18,000 ft. Desired size: No greater than 368 cu.in. Desired weight: less than 12 lbs. Power: Battery operated, preferably using stock rechargeable or disposable batteries. Chargers should be solar power compatible. Desired to meet ANSI/IEC 60529 (Degrees of protection provided by enclosure) protection level IP65.

- Blood Storage: 7" Touch screen controller giving detailed history of temperature performance, 56L payload, Alarms for set at 2.5°C and 5.5°C. Rugged polyethylene exterior construction and insulated with 2-3 inches of pressure-injected polyurethane in the walls and lid. Desired Power: Less than 40W at room temperature for startup, and less than 20W at 40°C. Redundant battery power and solar power compatible. AC and DC capable. With encapsulated PCM (phase change material) and insulation in the walls and lid that provide for up to 96 hours operations maintaining a safe temperature range of 2° to 4°C unpowered if unopened. External volume 10-11 cubic feet. Empty weight: Less than 100lbs.

- Anesthesia machine. Fully-functional, compact and portable anesthesia system in a lightweight package, three gases machine (O2, N2O and Air). The cube not to exceed 0.5 cu ft. weight not to exceed 10 lbs. Power consumption not to exceed 70W. Advanced ventilation modes and monitoring, low volume breathing circuit (flow through and circle). Electronic control of FGF and vaporization. 4 hour battery reserve. Safety oxygen flow control allows oxygen flow in the absence of electrical power.

- Ultrasound: Point of care ultrasound for high-resolution soft tissue imaging appropriate for: FAST exam, vascular access, and abdominal assessment. Low power, cell-phone, or tablet form factor. The cube not to exceed 0.25 cu ft. Weight not to exceed 2 lbs.

- Instrument Sterilization: portable, non-steam, sterilizer that requires low power or other fuel source to operate. Sterilizes plastics and heat sensitive materials. Power not to exceed 700W.

- Patient Warming System: small, lightweight, low power consumption, inaudible solution with integrated temperature sensors that read and monitor a patient's core temperature. Also provides the capability to raise a patient's core temperature to normal levels and then maintain that desired level before (pre-op), during, and following surgery (post-op) seamlessly. Solar power compatible with redundant battery power, AC and DC capable.

- Lighting:
  - Lighting: General tent lighting using non-incandescent lights capable of providing: Tent ceiling mounted lights providing luminous intensity of at least 1500 lux in all areas of tent (using the HDT Base-X Model 305 tent as baseline). Single set-point systems should have color temperature in the 5000-6500K range. Desire ability to change color temperatures quickly to include pre-set values of 3500K, 4100K, and 4700K, in addition to the aforementioned single set-point color temperature (in the 5000K-6500K range). If ballast is required, an electronic, high-frequency ballast should be used. Lighting solutions should have a MTBF of at least 11,000 hours. Power usage should be at least 75% less than comparable incandescent systems. In case of interruption of the power supply, the light should be restored within 5 seconds with at least 50% of the previous lux intensity.

  - Room disinfection: Medical treatment and surgical room disinfection solutions that minimize water and supply burden. Power should be compatible with solar power systems. Room disinfection should require no more than 1 hour to complete the disinfection cycle. System must be interruptible during the disinfection cycle, and room must be habitable in no more than 5 minutes. Examples of disinfection solutions include Ultraviolet-C shortwave light, antimicrobial surface treatments, and sanitizing vapor.

ADMINISTRATIVE DETAILS

Submission Process: To respond to this RFI, please complete the attached E2C Submission Form and send via e-mail to: energy@usmc.mil. Please ENSURE that the technology focus area you are submitting under is in the subject line of your email. Please do not attach marketing brochures, test reports, or other extraneous materials to your Submission Form as they will not be reviewed. If you have more than one system (or technology) to demonstrate, submit separate Submission Forms for each system (or technology). To ensure your submission passes Marine Corps filters, total size of the emails shall not exceed 5Mb, so it is recommended that pictures be compressed as necessary. If more than one submission email is sent or any large emails approaching 5Mb are sent, a separate text-only coordination email is recommended.

Notification of Decision: If your technology is of interest, the E2C Team will contact you with an invitation to participate in E2C 2016 at Marine Corp Base Camp Pendleton, CA. In addition, a list of selected companies will be posted to www.hqmc.marines.mil/e2o in February. If your company is not on the list, your technology was not selected for further review. The E2C Team will decide which technologies to include in E2C 2016 at its sole discretion, after considering factors such as the technical readiness level (TRL) of the technology, the performance characteristics of the technology, space and resources available at the demonstration site, and the interests of the Marine Corps. Please note that the decision to invite or non-invite a company is not a procurement decision, and disappointed applicants are not entitled to protest or appeal non-invite decisions.

Additional Documentation Requirements: Companies invited to participate in E2C ’16 will be required to provide additional technical documentation to facilitate safety release approval and test plan development. Timely submission of this documentation is essential to ensure a safe and successful event. More information on required documentation will be provided with your invitation to the demo.

Support Contractor Assistance: Companies are advised that the E2C Team is supported by Government support contractors (which may include employees of Leidos, Mantech International, Pacific Rim Defense, SAIC and Vision Point Systems) who will review information submitted in response to this RFI for the purpose of providing technical advice to the E2C Team. Companies which submit Submission Forms in response to this RFI will be deemed to have waived any objection to the Government's use of support contractors to review their Submission Forms.

NOTE: This RFI is issued for the purpose of determining market capability of sources and does not constitute an Invitation for Bid (IFB), a Request for Proposal (RFP), a Request for Quote (RFQ) or an indication that the Government will contract for any of the items or services contained in this notice. No solicitation document exists. Responses shall not include classified or proprietary material. Information with classified, 'Proprietary', 'Confidential', or other markings limiting distribution will not be reviewed. Responses to this notice will not be returned. No reimbursement will be made for any costs to provide information in response to this announcement or any follow-up information requests. Information or statements contained herein are not binding upon the Government.

Expeditionary Energy Concepts (E2C) 2016 Submission Form
(Formerly known as the Experimental Forward Operating Base or ExFOB)

Submission Instructions: Complete the E2C 2016 Submission Form and save as an Adobe Portable Document Format. Send the .pdf and a .jpg photo of your technology to energy@usmc.mil. The completed Submission Form must be received by midnight EST on 15 January 2016.

PART A - Name and Contact Information

1. Technology Name:
2. Company Name:
3. Company Mailing Address:
4. POC Name:
5. POC E-mail:
6. POC Phone:
7. Company Website:
8. Company CAGE code:

PART B - Technology Category (check one)

SUWP	MEM Storage	Energy Scavenging	STP/FRSS Optimization
_____	_____	_____	_____

PART C - Technology Description

9. Describe your technology and how it can reduce resupply requirements, increase self-sustainability and extend the operational reach of units operating in distributed operations.

10. Provide a physical description and summarize the technical specifications of your technology.
--> **For SUWP**, include dimensions (in inches), weight (in pounds), flow rate, output mg/L salinity with a 5,000 mg/L salinity input, annotate if system is P-248 certified.
--> **MEM Storage**, include dimensions (in inches), weight (in pounds), chemistry, number of cells, cell configuration, battery voltage (in Volts), charge rate, energy (in Watt hours), and energy density (in Watt hours per kilogram).
--> **Energy Scavenging**, include technical specifications to include: dimensions (in inches), weight (in pounds), converted output voltage ranges, scavenger input power, input current and input voltage, and charging capabilities.
--> **STP/FRSS Optimization**, include technology dimensions (in inches), weight (in pounds), power consumption (in watts), and projected fuel, Size, Weight and Power savings over program of record STP/FRSS equipment.

11. Indicate the Technology Readiness Level (TRL) of your technology. Department of Defense TRL definitions are included below for reference. Note: You must have a working prototype (typically TRL 6 or above) to participate in E2C 2016.

__6 __7 __8 __9

12. Have you shown or discussed your technology with anyone in federal or state government or the military services? If yes, provide POC name, phone, and e-mail.

13. Has your technology been tested in a military operational environment (training or deployment)? If yes, describe the nature of the test, date, location, military office(s) involved, and military POC name, phone, and e-mail.
14. Do you foresee any issues integrating your technology into military platforms and/or an operational environment (discuss both) (i.e. sensitivity to extreme temperatures, water, sand etc.)?
15. Is your technology currently being used in the private sector? If yes, describe.
16. Summarize relevant test data for your technology, emphasizing projected fuel savings, size, weight, and power reduction and/or efficiency improvement over existing USMC technology. DO NOT ATTACH COPIES OF TEST REPORTS.
17. Describe how you will demonstrate your technology at the E2C 2016 demonstration. A dynamic demonstration is required. Include information regarding space (sq. ft.) and equipment required. NOTE: The E2C location is remote and shore power will not be available. If you require power you will need to bring your own generator.

18. Attach a Material Safety Data Sheet (MSDS) for your technology if available. NOTE: Companies invited to participate in E2C 2016 will be required to provide additional documentation to facilitate safety release approval.
19. Attach a .jpg photo of your technology. (CAD drawings and computer simulations are not sufficient).
20. How did you hear about Expeditionary Energy Concepts? FBO, E2O website, word of mouth, Press Release, Article, etc.

Department of Defense Technology Readiness Levels, Defined*

Technology Readiness Level	**Description**
1. Basic principles observed and reported.	Lowest level of technology readiness. Scientific research begins to be translated into applied research and development. Examples might include paper studies of a technology's basic properties.
2. Technology concept and/or application formulated.	Invention begins. Once basic principles are observed, practical applications can be invented. Applications are speculative and there may be no proof or detailed analysis to support the assumptions. Examples are limited to analytic studies.
3. Analytical and experimental critical function and/or characteristic proof of concept.	Active research and development is initiated. This includes analytical studies and laboratory studies to physically validate analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative.
4. Component and/or breadboard validation in laboratory environment.	Basic technological components are integrated to establish that they will work together. This is relatively "low fidelity" compared to the eventual system. Examples include integration of "ad hoc" hardware in the laboratory.
5. Component and/or breadboard validation in relevant environment.	Fidelity of breadboard technology increases significantly. The basic technological components are integrated with reasonably realistic supporting elements so it can be tested in a simulated environment. Examples include "high fidelity" laboratory integration of components.
6. System/subsystem model or prototype demonstration in a relevant environment.	Representative model or prototype system, which is well beyond that of TRL 5, is tested in a relevant environment. Represents a major step up in a technology's demonstrated readiness. Examples include testing a prototype in a high-fidelity laboratory environment or in simulated operational environment.
7. System prototype demonstration in an operational environment.	Prototype near, or at, planned operational system. Represents a major step up from TRL 6, requiring demonstration of an actual system prototype in an operational environment such as an aircraft, vehicle, or space. Examples include testing the prototype in a test bed aircraft.

8. Actual system completed and qualified through test and demonstration.	Technology has been proven to work in its final form and under expected conditions. In almost all cases, this TRL represents the end of true system development. Examples include developmental test and evaluation of the system in its intended weapon system to determine if it meets design specifications.
9. Actual system proven through successful mission operations.	Actual application of the technology in its final form and under mission conditions, such as those encountered in operational test and evaluation. Examples include using the system under operational mission conditions.

DEFINITIONS:

BREADBOARD: Integrated components that provide a representation of a system/subsystem and which can be used to determine concept feasibility and to develop technical data. Typically configured for laboratory use to demonstrate the technical principles of immediate interest. May resemble final system/subsystem in function only.

"HIGH FIDELITY": Addresses form, fit and function. High-fidelity laboratory environment would involve testing with equipment that can simulate and validate all system specifications within a laboratory setting.

"LOW FIDELITY": A representative of the component or system that has limited ability to provide anything but first order information about the end product. Low-fidelity assessments are used to provide trend analysis.

MODEL: A functional form of a system, generally reduced in scale, near or at operational specification. Models will be sufficiently hardened to allow demonstration of the technical and operational capabilities required of the final system.

OPERATIONAL ENVIRONMENT: Environment that addresses all of the operational requirements and specifications required of the final system to include platform/packaging.

PROTOTYPE: A physical or virtual model used to evaluate the technical or manufacturing feasibility or military utility of a particular technology or process, concept, end item or system.

RELEVANT ENVIRONMENT: Testing environment that simulates the key aspects of the operational environment.

SIMULATED OPERATIONAL ENVIRONMENTAL: Either 1) a real environment that can simulate all of the operational requirements and specifications required of the final system, or 2) a simulated environment that allows for testing of a virtual prototype; used in either case to determine whether a developmental system meets the operational requirements and specifications of the final system.

**Source: DoD Deskbook 5000.2-R, Appendix 6, Technology Readiness Levels and Their Definitions.*