BAA Call N00014-23-S-BC10
Special Program Announcement for Office of Naval Research
Research Opportunity:
"Carbon Dioxide as a Source of Naval Energy and Materials"

I. INTRODUCTION

This announcement describes a technology area entitled "Operational Endurance from Environmental Carbon," under the N00014-23-S-B001, Long Range Broad Agency Announcement for Navy and Marine Corps Science and Technology which can be found at https://www.nre.navy.mil/work-with-us/funding-opportunities/announcements. The submission of proposals, their evaluation and the placement of research grants and contracts will be carried out as described in the above Long Range Broad Agency Announcement.

The purpose of this announcement is to focus attention of the scientific community on (1) the area to be studied, (2) facilitate dialogue amongst those interested in this arena, and (3) the planned timetable for the submission of white papers and full proposals.

II. TOPIC DESCRIPTION

The proposed topic will explore and exploit the advancement of carbon dioxide (CO_2) capture and utilization technologies for future Navy applications. The program will pursue white papers and proposals in support of the applied research effort at Technology Readiness levels (TRL) 2-6.

Background:

ONR is examining future low carbon energy and material producing processes that consist of combining environmental carbon removal technologies with fuel and material synthesis technologies. Enhancing direct ocean and direct air capture capabilities to fieldable technologies is becoming increasingly important for future operational implementation on land and at sea. Next-generation carbon conversion technologies offer a unique solution to operational endurance and sustainability. These efforts are essential to meet Navy Climate Action 2030, "net zero" carbon emission goals. However current carbon capture and utilization processes do not have the modularity, scalability, size, weight, footprint, field ability, and energy or mechanical efficiencies to be deployed for energy and material production near the point of use for the Navy. In addition, current technological applications are not focused on producing hydrocarbons and materials that meet or exceed Navy specifications such as MIL-DTL-5624W. Proposals seek to identify and develop simple, low capital cost, scalable technologies to efficiently utilize all the carbon in a synthesis approach to produce finished synthetic jet fuel that meets or exceeds MIL-DTL-5624W without the need to blend with petroleum jet fuel.

Objective:

The Office of Naval Research (ONR) is interested in receiving proposals for potential FY23 Applied Research (Budget Category 6.2) projects under the following four focus areas:

Environmental carbon capture based sustainable aviation fuel processes:

- **Objective:** Develop novel approaches to producing sustainable aviation fuel from environmental carbon.

- **Background:** DoD sustainable aviation fuel processes will be driven by footprint and the amount of environmental carbon that can be efficiently converted to a jet fuel fraction. Specifically, the US Navy's jet fuel, JP5, has flashpoint and aromatic content minimum requirements along with other requirements found in MIL-DTL-5624W. Typically, synthetic fuel production yields a distribution of hydrocarbons chain lengths where the synthetically produced C9 to C16 iso-paraffin compounds are isolated and upgrade to jet fuel. The remaining light ends (C1 to C8) are discarded or utilized for other applications while the heavy ends are used as waxes, lubricants, or hydrocracked to produce more finished jet fuel. Currently synthetic fuels from environmental carbon sources lack sufficient aromatic content and appropriate processes at scale to efficiently utilize all the light and heavy end hydrocarbons produced during the synthesis process. Proposals seek to identify and develop simple, low capital cost, scalable technologies to efficiently utilize all the carbon in a synthesis approach to produce finished synthetic jet fuel that meets or exceeds MIL-DTL-5624W without the need to blend with petroleum jet fuel.

Sustainable Processes to Convert Environmental Carbon to Intermediates:

- **Objective:** Develop novel approaches such as solid oxide fuel cells (SOEC) to produce synthesis gas (carbon monoxide (CO) and hydrogen (H_2)) as the intermediate for the production of sustainable aviation fuel.

- **Background:** DoD sustainable aviation fuel processes will be driven by footprint along with the carbon and H_2 utilization. Two-step thermochemical approaches are commonly used to convert CO_2 to higher hydrocarbons for fuel production. The first step involves the synthesis of an intermediate such as carbon monoxide (CO), methanol, or olefins. These intermediates are synthesized in a second step to fuels, lubricants, and chemicals. Additional electrolysis equipment is required to produce the H_2 utilized for the synthesis reactions. SOECs as a low-cost green hydrogen producing technology is gaining attention. In addition to H_2 production at lower power requirements, this technology has the ability to perform Co-Electrolysis of carbon dioxide (CO_2) and water to produce syngas. Proposals seek to evaluate and understand the effects of the environment, different CO_2/water mixtures, SOEC materials, size, weight, and scalabilty on the efficiencies of the proposed approach to producing synthesis gas for sustainable aviation fuel production.

Sustainable Processes to Convert Environmental CO_2 to Materials and Products:

- **Objective:** Develop novel low-cost, energy efficient synthetic approaches to producing materials and products from CO_2 that can be used to enhance additive manufacturing processes.

Background: Synthesis of carbon-based materials and products from CO_2 offers the Navy unique climate action solutions along with the potential to produce materials and products at the point of

use. Carbon-based composites from CO_2 is just one example of innovative solutions for developing resilient, durable, light-weight materials for DoD applications. The challenge to producing materials and products from CO_2 is the ability to target goods and materials that will offset costs associated with manufacturing and CO_2 recovery. Proposals seek to develop novel approaches to convert CO_2 to value added composites and construction materials and or to utilize it to enhance material performance in additive manufacturing processes.

Electrode Catalyst Alternatives for the Hydrogen and Oxygen Evolution Reactions:

- **Objective:** Develop low-cost, energy efficient, novel electrocatalyst materials that perform both the hydrogen evolution reaction (HER) and oxygen evolution reaction (OER) under different environmental conditions.

Background: Hydrogen production, carbon dioxide reduction, carbon dioxide capture, and fuel cells are all examples where electrochemical approaches have been applied. Each approach utilizes electrocatalyst to perform the desired chemical process. Many times, the electrocatalyst in these approaches operate in ideal electrolyte and pH conditions to optimize catalyst performance and efficiencies. Platinum electrocatalyst have proven to be the most efficient and compatible materials for electrochemical applications. However, platinum's cost and availability elicit the need to develop new electrocatalysts to achieve similar efficiencies, selectivities, and performance. Proposals seek the development of low cost, energy efficient, selective electrocatalysts that target the HER and OER under non-ideal and pH conditions. These materials should be able to perform both reactions over a range of pH conditions from 2 to 14 in nonideal solutions.

III. NO EVENTS ARE PLANNED

IV. WHITE PAPER SUBMISSION

Although not required, white papers are strongly encouraged for all offerors seeking funding. Each white paper will be evaluated by the Government to determine whether the technology advancement proposed appears to be of particular value to the Department of the Navy. Initial Government evaluations and feedback will be issued via e-mail notification from the Technical Point of Contact. The initial white paper appraisal is intended to give entities a sense of whether their concepts are likely to be funded.

Detailed Full Proposal (Technical and Cost volumes) will be subsequently encouraged from those Offerors whose proposed technologies have been identified through the above referenced e-mail as being of "particular value" to the Government. However, any such encouragement does not assure a subsequent award. Full Proposals may also be submitted by any offeror whose white paper was not identified as being of particular value to the Government or any offeror who did not submit a white paper.

For white papers that propose efforts that are considered of particular value to the Navy but either exceed available budgets or contain certain tasks or applications that are not desired by the Navy, ONR may suggest a full proposal with reduced effort to fit within expected available budgets or an effort that refocuses the tasks or application of the technology to maximize the benefit to the Navy.

White papers should not exceed 5 single-sided pages, exclusive of cover page, references, and resume of principal investigator, and should be in 12-point Times New Roman font with margins not less than one inch. White papers shall be in Adobe PDF format (preferred) or in Microsoft Word format compatible with at least Microsoft Word 2016.

The Cover Page can be found at https://www.nre.navy.mil/work-with-us/how-to-apply/submit-contract-proposal for contract submissions and at https://www.nre.navy.mil/work-with-us/how-to-apply/submit-grant-application for grant submissions.

The 5-page body of the white paper should include the following information:

- Technical Concept: A description of the technology innovation and technical risk areas.

- Future Naval Relevance (where applicable) – A description of potential Naval relevance and contributions of the effort to the agency's specific mission.

- Operational Naval Concept (where applicable) – 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 (where applicable) – 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.

- Rough Order of Magnitude (ROM) cost estimate

A resume of the principal investigator, not to exceed 1 page, should also be included after the 5-page body of the white paper.

White papers must be submitted through Fedconnect at www.fedconnect.net in accordance with Section D. Application and Submission Information, Section 2. Content and Form of Application Submission, paragraph d. White Paper Requirements, ii. White Paper Submission in N00014-23-S-B001.

To ensure full, timely consideration for funding, white papers should be submitted **no later than 5 JUNE 2023**. White papers received after that date will be considered as time and availability of funding permit.

The planned date for completing the review of white papers is **7 JULY 2023**.

V. FULL PROPOSAL SUBMISSION AND AWARD INFORMATION

Full proposals should be submitted under N00014-23-S-B001 by **11 August 2023**. Full Proposals received after that date will be considered as time and availability of funding permit.

ONR anticipates that both grants and contracts will be issued for this effort.

Full proposals for contracts should be submitted in accordance with the Appendix 2 of the N00014-23-S-B001. Full proposals for grants should be submitted via Grants.gov in accordance with Appendix 1 of N00014-23-S-B0001.

ONR plans to fund up to 5 individual grants and contracts with a total value of $425,000 each, using research funds. However, lower, and higher cost proposals will be considered.

The period of performance for projects may be from 2 to 3 years.

Although ONR expects the above described program plan to be executed, ONR reserves the right to make changes.

Funding decisions should be made by 16 October 2023. Selected projects will have an estimated award date of 12 January 2024 for Grants 30 April 2024 for Contracts.

VI. SIGNIFICANT DATES AND TIMES

Event	Date	Time
Recommended White Paper Submission Date*	5 June 2023	1400 Eastern Daylight Time
Notification of White Paper Valuation*	7 July 2023	
Recommended Full Proposal Submission	11 August 2023	1500 Eastern Daylight Time
Notification of Selection: Full Proposals *	16 October 2023	
Awards *	Grants 12 January 2024 Contracts 30 April 2024	

Note: * These are approximate dates**.**

VII. Small Business Subcontracting

As indicated in ONR Broad Agency Announcements large businesses and non-profit organizations must submit a subcontracting plan along with their research proposal. While large businesses and non-profits are responsible for making these subcontracting arrangements, ONR will help facilitate prime contractor/small business contracting connections by posting to the ONR external website contact information of small businesses that have indicated their subcontracting interests and technological niche for prime contractor consideration for this program. This is not an endorsement, but an effort by ONR to help bring these parties together to provide superior solutions.

If you are a small business, and your company is interested in subcontracting activities with large businesses and/or non-profits considering your technology for this program, please provide the following information by email, to the ONR Small Business Director at ellen.simonoff.civ@us.navy.mil with the subject line, "BC N00014-23-S-BC10". Provide this information:

1) Company Name and Website
2) Individual (POC) name and POC email address
3) Business Size and socio-economic category
4) Brief Technology Description (no more than 3 sentences)
5) Technology Key Words (no more than 10 words)

Note: Do not include ANY proprietary information. This information will be posted on the ONR website under this BAA call and will available to the public.

VIII. POINTS OF CONTACT

In addition to the points of contact listed in N0014-23-S-B0001 the specific points of contact for this announcement are listed below:

Technical Points of Contact:
Heather D. Willauer
Advanced Naval Platforms Division, Code 331
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H. Scott Coombe
Advanced Naval Platforms Division, Code 331
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Business Point of Contact/Contracting Officer:
Leila Hemenway
Contraction Office, Code 251
leila.k.hemenway.civ@us.navy.mil

VIII. SUBMISSION OF QUESTIONS

Any questions regarding this announcement must be provided to the Technical Points of Contact and/or the Business Point of Contact listed above. All questions shall be submitted in writing by electronic mail.

Answers to questions submitted in response to this BAA Call will be addressed in the form of an Amendment and will be posted to the following web pages:

- sam.gov Webpage –Contract Opportunities – https://sam.gov/
- Grants.gov Webpage – http://www.grants.gov/
- ONR BAAs, FOAs and Special Program Announcements Webpage - https://www.nre.navy.mil/work-with-us/funding-opportunities/announcements

Questions regarding **White Papers or Full Proposals** should be submitted NLT two weeks before the dates recommended for receipt of White Papers and/or Full Proposals. Questions after this date may not be answered.