



**U.S. Department of Energy  
Advanced Research Projects Agency – Energy  
Announcement of Teaming Partner List  
for Upcoming Funding Opportunity Announcement:**

***New Program in Critical Mineral Extraction from Ocean Macroalgal Biomass***

The Advanced Research Projects Agency – Energy (ARPA–E) is considering issuing a new Exploratory Topic under Funding Opportunity Announcements (FOAs) DE-FOA-0002784 and DE-FOA-0002785 to evaluate the feasibility of extracting rare-earth and other high-value trace critical minerals from macroalgae cultivated in the U.S. Exclusive Economic Zone.

Rare Earth Elements (REEs) and Platinum Group Metals (PGMs) are critical to the manufacture of modern energy and national security technologies, such as electric vehicles, high-efficiency lighting, and wind turbines. While demand for these elements and metals continues to increase, economically and environmentally viable deposits are difficult to realize, and especially within the US. Research suggests that macroalgae may be an effective bioaccumulator of critical minerals.<sup>1234</sup> However, the environmental and biological variables influencing the capacity of macroalgae as a bioaccumulator are poorly understood. In addition, while extraction methods exist, the ability to extract minerals efficiently and selectively from macroalgae in an environmentally sustainable manner (e.g., reduced carbon generation and/or water use) alongside the valorization of other macroalgal components is limited.

To quantify the efficacy of macroalgae as a critical mineral source, exploration and innovation are needed to evaluate the influencing factors and ultimate capabilities of macroalgal varieties to

---

<sup>1</sup> Nora Shenouda Gad, Biosorption of rare earth elements using biomass of Sargassum on El-Atshan Trachytic sill, Central Eastern Desert, Egypt, Egyptian Journal of Petroleum, Volume 25, Issue 4, 2016, Pages 445-451, ISSN 1110-0621, <https://doi.org/10.1016/j.ejpe.2015.10.013>.

<sup>2</sup> Jéssica Jacinto, Bruno Henriques, A.C. Duarte, Carlos Vale, E. Pereira, Removal and recovery of Critical Rare Elements from contaminated waters by living Gracilaria gracilis, Journal of Hazardous Materials, Volume 344, 2018, Pages 531-538, ISSN 0304-3894, <https://doi.org/10.1016/j.jhazmat.2017.10.054>.

<sup>3</sup> João Pinto, Bruno Henriques, José Soares, Marcelo Costa, Mariana Dias, Elaine Fabre, Cláudia B. Lopes, Carlos Vale, José Pinheiro-Torres, Eduarda Pereira, A green method based on living macroalgae for the removal of rare earth elements from contaminated waters, Journal of Environmental Management, Volume 263, 2020, 110376, ISSN 0301-4797, <https://doi.org/10.1016/j.jenvman.2020.110376>.

<sup>4</sup> Thainara Viana, Bruno Henriques, Nicole Ferreira, Cláudia Lopes, Daniela Tavares, Elaine Fabre, Lina Carvalho, José Pinheiro-Torres, Eduarda Pereira, Sustainable recovery of neodymium and dysprosium from waters through seaweeds: Influence of operational parameters, Chemosphere, Volume 280, 2021, 130600, ISSN 0045-6535, <https://doi.org/10.1016/j.chemosphere.2021.130600>.



accumulate these minerals and the ability to efficiently extract these minerals in an economically viable form. If issued, this Exploratory Topic will likely consist of two complementary tasks.

- (1) Macroalgal Composition: Focused on identifying mechanisms and maximizing the bioaccumulation of REE/PGM elements in brown or red marine macroalgal species with examination of the influence of environmental inputs, seasonal effect and macroalgal species type, and with expectation to provide 10kg of optimized macroalgal biomass containing the targeted hyperaccumulated REE/PGM for efforts under Task 2.
- (2) Element Extraction: Focused on the development of new processes for the efficient extraction and processing of REE/PGM elements into usable forms for energy applications from macroalgal biomass alongside valorization of other macroalgal components (i.e., carbon content, nitrates, etc.), demonstrated with macroalgal biomass samples developed under Task 1.

As a general matter, ARPA-E strongly encourages outstanding scientists and engineers from different organizations, scientific disciplines, and technology sectors to form new project teams. Multidisciplinary and cross-sector collaboration spanning organizational boundaries enables and accelerates the achievement of scientific and technological outcomes that were previously viewed as extremely difficult, if not impossible. Furthermore, ARPA-E strongly encourages involving industry partners to advise and collaborate with these project teams, with the goal of achieving successful industry adoption and integration of the innovative technologies these projects teams develop.

A Teaming Partner List is being compiled to facilitate the formation of new project teams. ARPA-E intends to make the Teaming Partner List available on ARPA-E Exchange (<https://arpa-e-foa.energy.gov>), ARPA-E's online application portal, in December 2022. Once posted, the Teaming Partner List will be updated periodically, until the close of the Full Application period, to reflect new Teaming Partners who have provided their information.

Any organization that would like to be included on the Teaming Partner List should complete all required fields in the following link: <https://arpa-e-foa.energy.gov/ApplicantProfile.aspx>. Required information includes: Organization Name, Contact Name, Contact Address, Contact Email, Contact Phone, Organization Type, Area of Technical Expertise, and Brief Description of Capabilities.

By submitting a response to this Announcement, respondents consent to the publication of the above-referenced information. **By facilitating and publishing this Teaming Partner List, ARPA-E is not endorsing, sponsoring, or otherwise evaluating the qualifications of the individuals and organizations that are self-identifying themselves for placement on this Teaming Partner List. ARPA-E reserves the right to remove any inappropriate responses to this Announcement (including lack of sufficient relevance to, or experience with, the technical topic of the Announcement).** ARPA-E will not pay for the provision of any information, nor will it compensate any respondents for the development of such information. Responses submitted by any means other than via the link provided above will not be considered.

**This Announcement does not constitute a Funding Opportunity Announcement (FOA). No FOA exists at this time.** Applicants must refer to the final Exploratory Topic, expected to be issued in January 2023



under the FOAs noted at the beginning of this Teaming Partner List, for instructions on submitting an application, the desired technical metrics, and for the terms and conditions of funding.