

PHYTOPLANKTON CARBON SOLUTIONS PROGRAM

REQUEST FOR PROPOSALS

RFP #1: Characterization of Critical Uncertainties for Ocean Iron Fertilization

REQUEST FOR PROPOSAL OVERVIEW

- **RFP #:** 1
- **RFP Title:** Characterization of Critical Uncertainties for Ocean Iron Fertilization
- **Award Period:** up to 24 months
- **Award Amount:** \$800,000 to \$1.3 million,
- **Letters of Intent (LOI) Due:** Monday, October 12, 2026, at 23:59 Eastern Time (ET)
- **Full Proposal Due:** EDF will communicate the full proposal due date to LOI applicants invited to submit a full proposal.
- **EDF Contact Email:** oceanspcs@edf.org

EDF's Phytoplankton Carbon Solutions (PCS) Program is soliciting proposals to develop an uncertainty framework that characterizes decision-relevant scientific uncertainties associated with PCS effectiveness and risks, focusing specifically on Ocean Iron Fertilization (OIF) strategies. The framework will establish a quantitative state of knowledge on key uncertainties and serve as a primary decision-support tool for the PCS Consortium. The successful team will design deployment scenarios and use the framework to conduct sensitivity analyses to set targets for uncertainty reduction and inform near-term research priorities for the PCS Consortium and beyond.

This award is the first of several PCS focus areas, and successful applicants will join a broader consortium to collaboratively advance decision-relevant PCS research priorities, working closely with other funded teams.

EDF intends to fund one award for up to 24 months and up to USD \$1.3 million.

I. BACKGROUND

Previous PCS modeling studies have explored scenarios under which OIF and potentially other PCS pathways could potentially contribute to climate-relevant carbon dioxide removal (CDR). PCS CDR and social-environmental impact estimates remain highly model-, assumption-, and boundary-condition-dependent. The field lacks consensus on what the magnitude and uncertainty of CDR potential is under realistic deployment scenarios, which CDR measurement uncertainties matter most, which are reducible with near-term research, and which will likely remain unresolved. Without that clarity, research investments cannot be prioritized, and decision-makers cannot judge whether PCS approaches warrant the further scientific advancement needed to establish whether PCS could deliver safe, climate-relevant, durable, measurable, socially acceptable, and governable CDR at scale. Focusing on OIF as the most advanced and promising of PCS pathways, this RFP and the associated research plan are also guided by a comprehensive research framework published by Ocean Visions (further described in Section 9).

This is the first of four RFPs. Subsequent RFPs will focus on 1) advancing biogeochemical modeling for PCS evaluation, 2) targeting biological carbon pump (BCP) research for PCS application, and 3) evaluating social-ecological desirability.

II. OBJECTIVES

The objectives of this call for proposal are three-fold:

Objective 1: Develop an uncertainty framework for OIF (but adaptable to other PCS pathways in the future) that is inclusive of key processes affecting estimates of CDR (scalability, additionality, and durability), costs, and social-ecological boundary conditions, and that allows characterization of the range of potential impacts, to enable comparison of OIF pathway potential and risks to that of other PCS and CDR pathways. The framework should be based on foundational approaches for life cycle assessment (LCA) and technoeconomic analysis (TEA) and PCS stage gating decisions that set conditions for continuation of PCS pathway investigation.

- Ensure adaptability of the core framework components to priority OIF pathways (e.g., iron fertilization in the Southern Ocean and subtropical regions).
- Quantify the (i) effect size and (ii) magnitude of uncertainty for key processes, including the uncertainty in predicting optimal deployment locations and seasons.
- Include inputs from diverse disciplines, inclusive of perspectives across the social-ecological spectrum.

Objective 2: Design realistically ambitious OIF deployment scenarios and conduct sensitivity analyses to identify the uncertainties that must be reduced. Develop quantitative targets for reducing uncertainties that are critical to the viability of OIF and other PCS pathways.

- Realistic scenarios should allow for standardized evaluation of OIF scalability, durability, costs, and social-ecological impacts.

Objective 3: Guide PCS Consortium discussions to collaboratively develop the framework, design scenarios, and identify research priorities.

III. VISION OF SUCCESS

The uncertainty framework is expected to function as a tool that can guide discussions of research priorities and funding decisions.

A successful outcome of this work is the establishment of a comprehensive and structured scientific approach to standardize evaluation of OIF scalability, durability, costs, and social-ecological impacts. Broad engagement in this effort will strengthen and build trust in the framework and scenarios, enabling robust mCDR assessments within the scope of this RFP and work across the Consortium.

The framework advances the PCS field by characterizing and separating the variation in *effect size* of processes influencing PCS viability from *remaining uncertainty* in process understanding, measurements, models, and deployment prediction capabilities. Sensitivity analyses based on the

framework will shed light on which processes must be better understood for the evaluations of PCS. The outputs of the uncertainty framework and analyses will inform prioritization of further research on uncertainties that can be reduced in a reasonable timeframe and/or funding scenario. Further, definition of uncertainties that cannot be reasonably reduced will better inform future PCS decision-making,

By developing realistic deployment scenarios, the potential CDR benefit and extent of environmental and social risks will become more relevant to real-world decision-making, enabling constructive comparisons of PCS scalability scenarios to 'business as usual' scenarios and other CDR approaches.

IV. SCOPE OF WORK

Overview

The project should develop an adaptable uncertainty framework, deployment scenarios, and sensitivity analyses that collectively provide insight into the CDR potential and sustainability of OIF, with sustainability defined as achieving combined economic, environmental, and social benefits. The project should generate outputs of OIF risks and benefits that enable comparison to “business as usual¹” risks and other CDR pathways (e.g., CDR potential, financial cost, social and environmental impacts) and are directly useful for [PCS stage-gate assessment](#) and funding decisions.

The bulk of uncertainty framework development, scenario development, and sensitivity analyses must be completed within the first 12 months of the grant period for the purpose of informing discussions on Consortium priorities. The remaining grant period is dedicated to framework refinement, scenario advancement, uncertainty re-analysis as new knowledge emerges, research publication, and Consortium engagement to develop field-wide recommendations.

Research Questions

Guiding research questions include, but are not limited to:

1. Which uncertainties have the greatest impacts on estimates of OIF potential and why?
2. Which uncertainties can be reduced with either PCS Consortium research or additional research, and which uncertainties must simply be characterized and quantified for future risk-based decisions, and why?
3. What social, economic, political, and regulatory factors should inform the design of realistically ambitious deployment scenarios and assessment of PCS, considering Southern Ocean and subtropical regions as primary deployment regions for OIF?
4. What spatial and temporal bounds should be applied to scenarios to account for the fact that effects may propagate across space and time, including delayed responses and impacts beyond the immediate intervention area?

¹ A BAU scenario assumes that historical and current trends continue without new or aggressive climate policies, rather than assuming zero emissions or completely constant reductions.

5. What assumptions should be tested in sensitivity analyses to inform discussions on priority uncertainties and the feasibility to reduce those?

Workstreams

Proposed projects must, at minimum, encompass the following workstreams:

- 1. PCS Uncertainty Framework.** Design and develop an uncertainty framework for OIF, representing key processes that comprehensively inform the evaluation and uncertainty of PCS climate benefits and impacts on social-ecological systems.

The uncertainty frameworks should encompass foundational aspects of life cycle assessments (LCA), monitoring, reporting and verification (MRV) needs, and techno-economic analysis (TEA) [in the technology development space, a TEA is a method used for the evaluation of cost, while an LCA is a widely used method to account for environmental and more recently social impacts of a technology], and [Ocean Visions' PCS Stage Gate criteria](#). Full cost analyses of OIF scenarios are not required, but the framework should establish the structure and key cost variables needed to evaluate CDR cost-competitiveness as pathway research matures.

The framework should be designed for OIF (keeping adaptability to other PCS pathways in mind), and accommodate:

- Near- and far-field processes (e.g., air-sea gas exchange, export, remineralization, ventilation; see [Ocean Visions' PCS Report Table 1](#)) and biological impacts that could have impacts on ecosystem health and services (e.g., fisheries)
 - Durability time horizons of 100 to 1,000+ years
 - Realistic deployment and cessation scenarios
 - Termination effects
 - Key social-ecological boundary conditions (e.g., ecosystem integrity, biogeochemical linkages, biophysical limits, [resource caps](#), legal jurisdictions), structured so that future research teams can extend and apply the framework to deeper social-ecological assessment
 - Sensitivity analyses and propagation of uncertainty
 - Outputs that are interoperable with ocean biogeochemical model outputs and comparable to other PCS and CDR pathways
- 2. Uncertainty identification and quantification.** Systematically identify and quantify sources of uncertainty affecting CDR additionality, scalability, durability, and measurability, as well as significant social-ecological consequences of PCS interventions. This includes parameter uncertainty, missing observational constraints, and absent or poorly represented processes in ocean models. Uncertainty identification may require literature review, synthesis of unpublished data, expert solicitations, and targeted oceanographic model investigations *as feasible through collaboration with the broader PCS Consortium*.
 - 3. Deployment scenario development.** Develop realistically ambitious OIF deployment scenarios against which a greater than 1 Gt CO₂ per year scalability threshold and social-ecological risk thresholds can be iteratively evaluated. Scenarios must reflect operational

constraints (including regulatory and spatial management constraints), minimum commitment periods, termination effects, and the reality that OIF operations cannot be assumed to continue in perpetuity or scale across entire ocean basins. Scenarios should also enable consideration of current and future governance and conservation variables, such as international treaties and global marine protection targets.

Scenario development must draw on external expertise and Consortium input. The development and shared use of scenarios across the PCS Consortium teams will be discussed at the first Consortium Meeting.

- 4. Sensitivity analysis and uncertainty reduction targets.** Use the framework, quantified uncertainties, and deployment scenarios to conduct sensitivity analyses that explore:
- Which uncertainties are most influential on net CDR quantification and must be reduced for an OIF pathway to remain viable.
 - Which uncertainties have high potential to be reduced through additional research or technology development, including the type of activities needed and realistic timescales (providing guidance for the broader PCS Consortium).
 - Quantitative targets for reducing priority uncertainties to levels at which an OIF pathway becomes quantifiable.

Excessive irreducible uncertainty in an OIF pathway's CDR benefit should be treated as a potential viability threshold as per [Ocean Visions' PCS Stage Gate Framework](#). This threshold determination would be subsequently discussed with the broader PCS Consortium, as will recommendations for reducing uncertainties that would most improve stage-gate decisions considering the expected effort, cost, feasibility, and timescale necessary (e.g., new observations, experiments, model improvements, and monitoring capabilities).

- 5. Consortium collaboration.** The successful team will work collaboratively across the PCS Consortium, as project outputs are intended to help guide research priorities for research teams focused on biogeochemical ocean models, biological carbon pump research for PCS application, and social-ecological impacts. Required activities include participation in annual PCS Consortium Meetings and regular cross-project leads meetings, development of shared goals, tracking progress toward uncertainty reduction, and leading iterative scalability and uncertainty analyses in support of stage-gate assessments throughout the program's lifetime. Consortium teams are expected to adapt their research plans as new findings emerge from within and outside the Consortium. Principal Investigators may adjust their team composition to accommodate shifting priorities.

Out of Scope Activities

- Non-OIF scenarios
- Field experiments
- Field data collection (potentially addressable in future RFPs)
- Biogeochemical model advancement (addressed in future RFPs). This project identifies uncertainties and modeling needs, but is not focused on model development or advancement.

- Social and ecological risk assessment (addressed in future RFPs). This project identifies uncertainties within the decision-making architecture but does not conduct the underlying assessment.

V. REQUIRED DELIVERABLES

Within the first 12 months

- First draft of the uncertainty framework (including quantified uncertainties), deployment scenarios, and identification of critical uncertainties, for presentation and discussion at the annual PCS Consortium Meeting.

During month 13- 24

- Refined uncertainty framework, uncertainty quantification, and deployment scenarios.
- A quantified and ranked account of the uncertainties that matter most for CDR scalability, durability, and social and environmental impact assessment, established through sensitivity analysis.
- A research roadmap with quantitative targets for reducing each high-leverage area of uncertainty, or a documented determination that reduction is not achievable within a decision-relevant timeframe.
- Updated estimates of global net CDR potential of OIF, with explicit uncertainty bounds and structured for comparison to other PCS and CDR pathways, as new research emerges.
- Open-access publication of scientific research, within six months of grant completion.

Throughout the grant period

- Active participation in annual PCS Consortium Meetings, regular cross-project leads meetings and EDF check-in meetings, and any additional collaborations emerging from shared goals within the Consortium.
- Iterative updates to the framework for different scenarios, and uncertainty analyses as new findings or priorities emerge from within and outside the Consortium.
- Regular progress reporting to EDF, aligned with project milestones and EDF synthesis activities; format and frequency to be determined jointly by the grantee and EDF.
- Contributions to EDF-led synthesis and public communication of PCS research progress.
- Open-access publication of the framework, the data used to parameterize it, and associated scenarios and outputs.

Final deliverables

- Final report (EDF to provide template)

VI. BUDGET AND GRANT DURATION

EDF intends to fund one award of up to USD \$1.3 million over a period of up to 24 months, inclusive of indirect costs (capped at 15%).

Funds may be used to support personnel, research expenses, workshops and convenings (including participation in PCS Consortium meetings), scenario development activities, and publication and dissemination costs.

Consistent with the principles of the PCS Research Program, funds may not be used to support commercial PCS activities or activities tied to carbon credit transactions.

Budgets should reflect the front-loaded nature of this award, with the majority of uncertainty framework development and initial sensitivity analyses completed within the first 12 months and the remaining period dedicated to refinement, Consortium engagement, collaborations, and iterative updates and analyses as needed to support shared goals across the Consortium.

VII. APPLICANT TEAM

Principal Investigators (PI) Criteria

All PIs must hold a PhD, be affiliated with a research institution, and have a publication record relevant to the scope of work and role on the project. Early Career Researchers (<10 years since obtaining a PhD) may serve as a PI.

At least one PI on the team must demonstrate prior experience leading a research project of comparable scale.

PIs of the successful team may be part of applicant teams to future Consortium funding opportunities but may not serve in a leadership capacity on such proposals.

Teams may consist of multiple Principal Investigators (PIs) and institutions; multi-institution and international teams are encouraged. EDF requires the project team to designate one organization as the **financial lead**, responsible for distributing funds to each partner organization and financial reporting to EDF. Designation of a financial lead does not constitute overall leadership for the project as a whole.

Team Criteria

The project team will be evaluated based on the collective expertise, collaborative approach, and demonstrated ability to execute the proposed work. Team structure will also be considered, including the extent of international collaborations, career stage diversity, early career researchers in substantive rather than nominal roles, and representation of and beyond the established marine CDR research community. Teams will be expected to articulate plans to implement best practices in the conduct of research, including in the application of codes of conduct such as the [AGU Scientific Integrity and Professional Ethics Policy](#) and [Aspen Code of Conduct for Marine Carbon Dioxide Removal](#).

Teams may include members affiliated with non-research institutions (e.g., consulting, marine industry). However, funds may not be used to support commercial PCS activities or activities tied to carbon credit transactions.

Applicant teams are expected to demonstrate expertise across:

- Life cycle assessment and techno-economic analysis

- Sensitivity analysis and probabilistic or uncertainty modeling
- Deployment scenario development
- Ocean biogeochemistry and carbon cycle science
- Social-ecological assessment expertise sufficient to represent these dimensions within the framework

VIII. Application Process

Step 1: Letter of Intent

Prospective applicants must submit Letters of Intent (LOI) by (1) completing the **LOI template** and (2) submitting the template via the **LOI Submission Form**. The template and webform are available on [EDF's PCS Funding Opportunities webpage](#) (under RFP #1). LOIs will undergo an internal review by EDF.

Important notes about the LOI submission:

- The LOI is limited to 1,700 words to describe the proposed approach, outcomes and project team composition for this project.
- The LOI must be uploaded to the webform as a single PDF.

Step 2: Full Proposal

LOIs selected to advance will be invited to submit a full proposal. EDF will provide invited applicants with the full proposal templates and submission deadline. Invited proposals will be evaluated via a scientific peer-review panel, which will provide a funding recommendation to EDF. EDF makes the final funding decision.

RFP#1 Proposal Timeline

LOI submission deadline	12 October 2026
Invitation for full proposal	16 October 2026
Full proposal due	<i>EDF will communicate the full proposal due date to applicants invited to submit a full proposal.</i>
Anticipated award decision	14 January 2027
Expected grant start date	1 March 2027

Please submit any questions related to the LOI and/or Full Proposal for this RFP to oceanspcs@edf.org.

IX. Connection to Ocean Visions Phytoplankton Carbon Solutions Research Framework

In January 2026, Ocean Visions published the [Phytoplankton Carbon Solutions Research Framework](#), which identified reducing uncertainty on net CDR as one of the highest research priorities and recommended development of a harmonized life cycle assessment and techno-

economic analysis (LCA-TEA) framework as a tool by which to evaluate the CDR potential of ambitious, but realistic, PCS scenarios.

EDF's PCS Research Program, supported by the Grantham Environmental Trust through the Ocean Resilience and Climate Alliance (ORCA), responds directly to that recommendation. This RFP expands the carbon accounting framework to also encompass uncertainties associated with social-ecological impacts stemming from changes in system boundary conditions that will influence whether PCS pathways are desirable. This RFP aims to fund the characterization of these uncertainties, but comprehensive evaluation of specific uncertainties identified within the framework would be evaluated in future funding opportunities.

This RFP funds the foundational analysis which will help guide the work of the broader PCS Consortium. The objectives of this RFP build on the following recommendations from the [Ocean Visions' PCS report and PCS stage-gate framework](#):

- **PCS Recommendation 1:** Reduce Uncertainty on Net Carbon Dioxide Removal: “Develop harmonized life-cycle assessment (LCA)-techno-economic analysis (TEA) framework for PCS to iteratively evaluate CDR potential and run scenarios to identify the most important uncertainties that can be reduced with additional research.”
- **PCS Recommendation 5:** Sharpen Understanding of Southern Ocean Iron Fertilization Scalability Potential: “Develop realistic deployment scaling scenarios to better characterize CDR potential, operations, and risks; Fund research to reduce uncertainties and/or better characterize environmental and socio-economic risks.”