## Request for Proposals

## On Direct Air Capture to Fuel

## September 2020

A 1-year contract up to $150,000 USD will be awarded to undertake techno-economic analysis and modeling of direct air capture to kerosene-based fuels. The submission deadline is 5:00 pm PST on September 23, 2020.

The expertise required for this project includes a deep understanding of transportation modeling, direct air capture and energy modeling, and techno-economic analysis. We therefore strongly encourage collaborations between expert groups.

## Context

Global jet fuel demand continues to increase and is forecasted to reach 406 million tons per year by 2035 (Royal Society, 2019). For the world to achieve net-zero emissions by 2050 and maintain a safe level of atmospheric CO2 thereafter, aviation — like all other sectors —  must find a way to decarbonize.

Eighty percent of the global jet fuel demand is expected to come from sustainable fuel sources (ATAG). With the maturation and expansion of direct air capture (DAC) technologies in recent years, synthetic fuels produced from carbon dioxide removed from the atmosphere are now emerging as a viable alternative to fossil fuels. The primary benefit of this production method is its drop-in capability and lower land-use demands compared to synthetic fuels from biological origin. However, more techno-economic research of direct air capture-to-fuel (DAC-fuel) is needed to better understand the pathways and conditions under which it would be a meaningful method to decarbonize long-haul aviation.

This project aims to address the research gap by adding to the currently limited literature on the full cost analysis of DAC to kerosene-based fuels.

## Scope of Work

ClimateWorks is issuing a call for proposals to better understand the role of DAC-fuel in aviation:

1. Identify the full technical potential of DAC-fuel by creating new demand modeling for the amount needed to meet forecasted global and regional (EU and US) long-haul aviation fuel demand. Provide an updated forecast of DAC-fuel costs given the most recent estimates of CO2 from direct air capture.
2. Comparison of DAC-fuel cost to alternatives such as fuels from concentrated CO2 sources, as well as algae, alcohol to jet, HEFA, and fossil kerosene. Provide cost comparison forecasts to 2030 and 2050.
3. Estimate the potential saving around land use based on forecasted demand of DAC-fuel in the aviation sector, in the U.S. and the EU, vis-à-vis estimated land demand from aviation biofuels as the sole alternatives to fossil kerosene.
4. Identify the main variables in determining DAC-fuel costs against past literature.
5. A realistic assessment of competition with renewable energy demand in the U.S. and the EU, as a stress test of existing DAC analysis.

### Recommended Parameters

* DAC Technology: assess DAC-fuel viability using both solid and liquid sorbent technologies, and respective capital costs.
* Fuel production technology: consider variations of calciners (e.g. oxy-fire vs. electric), electrolyzers.
* Hydrogen: consider sources from green hydrogen only.
* Electricity/heat inputs: should adhere to energy systems of respective geographies (US, EU), maximize renewable electricity production in forecasts. Consider variations in capacity factor and energy storage. However, if possible, can consider optimal siting such as deserts outside of those regions or areas closer to renewable energy resources.
* Deployment scenarios: will leave to PI judgment but consider factors such as electrification, the potential of other technological innovation in aviation, and renewable energy availability.

## Deliverables

1. A report detailing the findings on whether and under what scenarios will DAC-fuel be a viable alternative to displacing other emission-intensive or land-intensive fuels, and address the key questions identified in this request for proposals. This must include a clear methodological section.
2. A short summary of the report to act as a scientific primer for policymakers.

The authors may use this work as a basis for other academic publications.

## Application Process

We strongly encourage joint submissions from groups with different expertise, such as transport modeling with direct air capture. We also welcome groups to submit proposals that clarify their role within the partnership for matchmaking.

Please download and complete the application package and submit to dacfuel.rfp@climateworks.org.

For other inquiries, please email dacfuel.rfp@climateworks.org.

### Total Budget

Up to $150,000 USD

### Timeline

Submission Open: September 1, 2020

Submission Closed: September 23, 2020, 5:00 pm PST

Submission Review: September 24 - October 2, 2020

Award Announced: October 5, 2020

## About the Funders

The ClimateWorks Foundation created its Carbon Dioxide Removal (CDR) Program in 2018 to help catalyze and promote the carbon dioxide removal field. The Initiative focuses on CDR approaches across the natural and technological spectrum, as well as the global oceans.

## Direct Air Capture to Fuel

## Research Proposal Submission Form

### Instructions

Please submit a brief proposal via email to dacfuel.rfp@climateworks.org

The submission deadline is 5:00pm PST on September 23, 2020.

### Contact Details

Institution(s)

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Is this a co-submission? Y/N

*If Yes, please clearly indicate the affiliations of each researcher.*

Name(s) of Researcher(s)

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**Project Lead Contact Information**

First and Last Name:

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E-mail:

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### SUBMISSION CONTENT

Please provide:

1. a high-level overview of planned approaches/methodologies and a brief description of the expert team, highlighting the team’s competitive advantage to deliver on the desired outputs. **This content should be no more than 2 pages. If co-submitting with another group, please clearly indicate each group’s responsibilities.**
2. a brief budget description.
3. Curriculum Vitae of key team members.