Carbon Removal Application

General Application

The General Application applies to everyone, all applicants should complete this.

Company or organization name

Company or organization location (we welcome applicants from anywhere in the world)

Name of person filling out this application

Email address of person filling out this application

Brief company or organization description

<10 words

1) Overall CDR solution

a) Provide a technical explanation of the proposed project, including as much specificity regarding location(s), scale, timeline, and participants as possible. Feel free to include figures.

<1500 words

b) What is your role in this project, and who are the other actors that make this a full carbon removal solution? (E.g. I am a broker. I sell carbon removal that is generated from a partnership between DAC Company and

Injection Company. DAC Company owns the plant and produces compressed CO_2. DAC Company pays Injection Company for storage and long-term monitoring.)

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<50 words
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c) What are the three most important risks your project faces?

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<300 words
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2) Timeline and Permanence

a) Please fill out the table below.

Timeline for offer

Project duration
Over what duration will you be actively running your DAC plant, spreading olivine, growing and sinking kelp, etc. to deliver on your offer? E.g. Jun 2021 - Jun 2022. The end of this duration determines when the purchaser may consider renewing our contract with you based on performance.

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<10 words
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When does carbon removal occur?
We recognize that some solutions deliver carbon removal during the project duration (e.g. DAC + injection), while others deliver carbon removal gradually after the project duration (e.g. spreading olivine for long-term mineralization). Over what timeframe will carbon removal occur? E.g. Jun 2021 - Jun 2022 OR 500 years.

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<10 words
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Distribution of that carbon removal over time
For the time frame described above, please detail how you anticipate your carbon removal capacity will be distributed. E.g. "50% in year one, 25% each year thereafter" or "Evenly distributed over the whole time frame". We're asking here specifically about the physical carbon removal process here, NOT the "Project duration". Indicate any uncertainties, eg "We anticipate a steady decline in annualized carbon removal from year one into the out-years, but this depends on unknowns re our mineralization kinetics"

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<10 words
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Permanence

Over what duration you can assure durable carbon storage for this offer (e.g. this batch of biochar, these rocks, this kelp, this injection site)? E.g. 1000 years.

> <10 words

b) What are the upper and lower bounds on your permanence claimed above in 2(a)? Number/range

> Number / range

c) Have you measured this permanence directly, if so, how? Otherwise, if you're relying on the literature, please cite data that justifies your claim. *(E.g. We rely on findings from Paper_1 and Paper_2 to estimate permanence of mineralization, and here are the reasons why these findings apply to our system. OR We have evidence from this pilot project we ran that biomass sinks to D ocean depth. If biomass reaches these depths, here's what we assume happens based on Paper_1 and Paper_2.)*

> <200 words

d) What permanence risks does your project face? Are there physical risks (e.g. leakage, decomposition and decay, damage, etc.)? *Are there socioeconomic risks (e.g. mismanagement of storage, decision to consume or combust derived products, etc.)? What fundamental uncertainties exist about the underlying technological or biological process?*

> <200 words

e) How will you quantify the actual permanence/durability of the carbon sequestered by your project? If direct measurement is difficult or impossible, how will you rely on models or assumptions, and how will you validate those assumptions? *(E.g. monitoring of injection sites, tracking biomass state and location, estimating decay rates, etc.)*

> <200 words

3) Gross Capacity

a) Please fill out the table below. *All tonnage should be described in metric tonnes here and throughout the application.*

Offer (metric tonnes CO₂) over the timeline detailed in the table in 2(a)

Gross carbon removal

Do not subtract for embodied/lifecycle emissions or permanence, we will ask you to subtract this later.

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E.g. XXX tCO₂
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If applicable, additional avoided emissions

e.g. for carbon mineralization in concrete production, removal would be the CO_2 utilized in concrete production and avoided emissions would be the emissions reductions associated with traditional concrete production.

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E.g. XXX tCO₂
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b) Show your work for 3(a). How did you calculate these numbers? If you have significant uncertainties in your capacity, what drives those? *(E.g. This specific species sequesters X tCO_2/t biomass. Each deployment of our solution grows on average Y t biomass. We assume Z% of the biomass is sequestered permanently. We are offering two deployments. XYZ*2 = 350 tCO_2 = Gross removal. OR Each tower of our mineralization reactor captures between X and Y tons CO_2/yr, all of which we have the capacity to inject. However, the range between X and Y is large, because we have significant uncertainty in how our reactors will perform under various environmental conditions)*

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<150 words
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c) What is your total overall capacity to sequester carbon at this time, e.g. gross tonnes / year / (deployment / plant / acre / etc.)? Here we are talking about your project / technology as a whole, so this number may be larger than the specific capacity offered and described above in 3(b). We ask this to understand where your technology currently stands, and to give context for the values you provided in 3(b).

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metric tonnes tCO₂/yr
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d) We are curious about the foundational assumptions or models you use to make projections about your solution's capacity. Please explain how you make these estimates, and whether you have ground-truthed your methods with direct measurement of a real system (e.g. a proof of concept experiment, pilot project, prior deployment, etc.). We welcome citations, numbers, and links to real data! *(E.g. We assume our sorbent has X absorption rate and Y desorption rate. This aligns with [Sorbent_Paper_Citation]. Our pilot plant performance over [Time_Range] confirmed this assumption achieving Z tCO_2 capture with T tons of sorbent.)*

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<200 words
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e) Documentation: If you have them, please provide links to any other information that may help us understand your project in detail. This could include a project website, third-party documentation, project specific research, data sets, etc.

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up to 5 links
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4) Net Capacity / Life Cycle Analysis

a) Please fill out the table below to help us understand your system's efficiency, and how much your lifecycle deducts from your gross carbon removal capacity.

	Offer (metric tonnes CO_2)
Gross carbon removal	Should equal the first row in table 3(a)
Gross project emissions	Should correspond to the boundary conditions described below in 4(b) and 4(c)
Emissions / removal ratio	Gross project emissions / gross carbon removal: should be less than one for net-negative carbon removal systems, e.g. the amount emitted is less than the amount removed
Net carbon removal	Gross carbon removal – Gross project emissions

b) Provide a carbon balance or "process flow" diagram for your carbon removal solution, visualizing the numbers above in table 4(a). Please include all carbon flows and sources of energy, feedstocks, and emissions, with numbers wherever possible *(E.g. see the generic diagram below from the CDR Primer, Charm's Stripe 2020 application for a simple example, or CarbonCure's 2020 application for a more complex example)*. If you've had a third-party LCA performed, please link to it.

c) Please articulate and justify the boundary conditions you assumed above: why do your calculations and diagram include or exclude different components of your system?

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<100 words
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d) Please justify all numbers used in your diagram above. Are they solely modeled or have you measured them directly? Have they been independently measured? Your answers can include references to peer-reviewed publications, e.g. Climeworks LCA paper.

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<200 words
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e) If you can't provide sufficient detail above in 4(d), please point us to a third-party independent verification, or tell us what an independent verifier would measure about your process to validate the numbers you've provided. (We may request such an audit be performed.)

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<100 words
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5) Learning Curve and Costs (Backward-looking)

We are interested in understanding the learning curve of different carbon removal technologies (i.e. the relationship between accumulated experience producing or deploying a technology, and technology costs). To this end, we are curious to know how much additional deployment this procurement of your solution would result in. (There are no right or wrong answers here. If your project is selected we may ask for more information related to this topic so we can better evaluate your progress.)

a) Please define and explain your unit of deployment. *(E.g. # of plants, # of modules)*

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<50 words
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b) How many units have you deployed from the origin of your project up until today? Please fill out the table below, adding rows as needed. Ranges are acceptable if necessary.

Year	Units deployed (#)	Unit cost ($/unit)	Unit gross capacity (tCO$_2$/unit)	Notes

2021				<50 words
2020				<50 words
2019				<50 words
...				<50 words

c) Qualitatively, how and why have your deployment costs changed thus far? *(E.g. Our costs have been stable because we're still in the first cycle of deployment, our costs have increased due to an unexpected engineering challenge, our costs are falling because we're innovating next stage designs, or our costs are falling because with larger scale deployment the procurement cost of third party equipment is declining.)*

<50 words

d) How many additional units would be deployed if we bought your offer? The two numbers below should multiply to equal the first row in table 3(a).

# of units	Unit gross capacity (tCO$_2$/unit)
Number	# tCO$_2$/unit

6) Cost and Milestones (Forward-looking)

We ask these questions to get a better understanding of your growth trajectory and inflection points, there are no right or wrong answers. If we select you for purchase, we'll expect to work with you to understand your milestones and their verification in more depth.

a) What is your cost per ton CO$_2$ today?

$/tCO$_2$

b) Help us understand, in broad strokes, what's included vs excluded in the cost in 6(a) above. We don't need a breakdown of each, but rather an understanding of what's "in" versus "out."

<100 words

c) List and describe **up to three** key upcoming milestones, with the latest no further than Q2 2023, that you'll need to achieve in order to scale up the capacity of your approach.

Milestone #	Milestone description	Why is this milestone important to your ability to scale?	Target for achievement (eg Q4 2021)	How could we verify that you've achieved this milestone?
1	<100 words	<200 words		<100 words
2	<100 words	<200 words		<100 words
3	<100 words	<200 words		<100 words

d) How do these milestones impact the total gross capacity of your system, if at all?

Milestone #	Anticipated total gross capacity prior to achieving milestone (ranges are acceptable)	Anticipated total gross capacity after achieving milestone (ranges are acceptable)	If those numbers are different, why?
1	Should match 3(c)		<100 words
2			<100 words
3			<100 words

e) How do these milestones impact your costs, if at all?

Milestone #	Anticipated cost/ton prior to achieving milestone (ranges are acceptable)	Anticipated cost/ton after achieving milestone (ranges are acceptable)	If those numbers are different, why? (100 words)
1	Should match 6(a)		<100 words
2			<100 words
3			<100 words

f) If you could ask one person in the world to do one thing to most enable your project to achieve its ultimate potential, who would you ask and what would you ask them to do?

<50 words

g) Other than purchasing, what could we do to help your project?

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<50 words
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7) Public Engagement and Environmental Justice

We require projects to consider and address potential social, political, and ecosystem risks associated with their deployments. Projects with effective public engagement tend to do the following:

- Identify key stakeholders in the area they'll be deploying
- Have some mechanism to engage and gather opinions from those stakeholders and take those opinions seriously, iterating the project as necessary.

The following questions are for us to help us gain an understanding of your public engagement strategy. There are no right or wrong answers, and we recognize that, for early projects, this work may not yet exist or may be quite nascent.
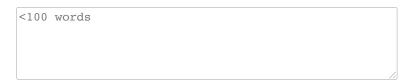
a) Who are your external stakeholders, where are they, and how did you identify them?

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<100 words
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b) If applicable, how have you engaged with these stakeholders? Has this work been performed in-house, with external consultants, or with independent advisors?

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<100 words
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c) If applicable, what have you learned from these engagements? What modifications have you already made to your project based on this feedback, if any?

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<100 words
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d) Going forward, do you have changes planned that you have not yet implemented? How do you anticipate that your processes for (a) and (b) will change as you execute on the work described in this application?

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<100 words



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e) What environmental justice concerns apply to your project, if any? How do you intend to consider or address them?

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<100 words



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11) Legal and Regulatory Compliance

a) What legal opinions, if any, have you received regarding deployment of your solution?

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<100 words



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b) What permits or other forms of formal permission do you require, if any? Please clearly differentiate between what you have already obtained, what you are currently in the process of obtaining, and what you know you'll need to obtain in the future but have not yet begun the process to do so.

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<100 words



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c) In what areas are you uncertain about the legal or regulatory frameworks you'll need to comply with? This could include anything from local governance to international treaties. For some types of projects, we recognize that clear regulatory guidance may not yet exist.

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<100 words



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12) Offer

This table constitutes your offer, and will form the basis for contract discussions if you are selected for purchase.

	Offer
Net carbon removal (metric tonnes CO$_2$)	Should match the last row in table 4(a), "Net carbon removal"

Delivery window (at what point should we consider your contract complete?)

Should match the first row in table 2(a), "Project duration"

Price ($/metric tonne CO₂)

Note on currencies: while we welcome applicants from anywhere in the world, our purchases will be executed exclusively in USD ($). If your prices are typically denominated in another currency, please convert that to USD and let us know here.

This is the price per ton of your offer to us for the tonnage described above. Please quote us a price