

<p>Request for Proposals: Carbontech Development Initiative CARBONTECH LEAP Program (Columbia University Climate School Lenfest Center for Sustainable Energy ONLY) Proposals Due 01/13/2023 (11:59)</p>
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Please complete online application at:

<https://carbontech.columbia.edu/apply-for-funding-overview>

All information included in the application should be non-confidential

1. Program Summary

The Carbontech Development Initiative (CDI) is a large-scale market transformation grant-seeding and commercialization initiative for carbontech science and technology. CDI aims to position New York State as a global carbontech hub by supporting research and development, facilitating technology transfer, and commercializing innovation. CDI will award research and commercialization grants in four out of its five programs. A fifth program, Accelerate Carbontech, gives participants access to the full suite of CDI training programs and networking activities, without a grant award and contracted technical scope of work. This Request for Proposals is for the CARBONTECH LEAP program.

2. Areas of Interest

Technologies CDI funds are organized around three (3) Topic Areas (TAs) representing the carbontech areas of highest relevance to stimulating a nation-leading carbontech innovation and commercialization ecosystem in New York State. See **Appendix A** for details.

3. Technology Readiness Level (TRL):

The Technology Readiness Level (TRL) scale is a measurement system used to assess the maturity level of a particular technology. CDI proposals will be filtered into program areas based on the TRL of the project at the time of application based on the figure in **Appendix B**. Teams will self-identify a TRL in their application to CDI and will provide a justification for the TRL selected, according to TRL descriptions.

4. Eligibility

CDI has five programs, three **Research Programs** and two **Commercialization Programs**:

- Research Programs:
 - Propel Carbontech – TRL 2-3
 - **Carbontech Leap (Columbia University only)** – **TRL 2-3**
 - New Directions (Columbia University only) – TRL 2-3
- Commercialization Programs
 - Bridge Carbontech – TRL 4-9
 - Accelerate Carbontech – TRL 2-9

Applicants should apply to the appropriate CDI program and conform to the eligibility criteria for the program to which they apply. Applicants may apply to only one program per project, except in instances where an applicant to another CDI program elects to be considered for *Accelerate Carbontech* in case of non-

selection for the original program. This application is for the CARBONTECH LEAP program. Successful applicants must meet all eligibility requirements listed below.

CARBONTECH LEAP: CARBONTECH LEAP focuses on accelerating technology from benchtop to commercialization through a competitive research program. CDI will award funding for scientific research that emphasizes the CDI's Program Technology Scope Topic Areas. Funds for the CARBONTECH LEAP program will be awarded to projects led by core faculty members from the Columbia University Lenfest Center for Sustainable Energy. Teams must include at least one co-PI from another discipline or expertise area of Columbia University. Table 1 below defines eligibility criteria.

Table 1: Carbontech Leap Eligibility Criteria

Criteria	Eligibility Requirement
TRL	TRL 2-3
Team Composition	<ul style="list-style-type: none"> • At least one Lenfest Center Principal Investigator (PI) identified, and • Must include at least one more co-PI from a discipline other than the lead PI
Stage	<ul style="list-style-type: none"> • Pre-formation, or • Formed but not incorporated, or • Incorporated
Technology Area	<ul style="list-style-type: none"> • TA 1-3
Funding	<ul style="list-style-type: none"> • No institutional funding raised, or • Seed funding through Series A
Product Stage	<ul style="list-style-type: none"> • Ideation, or • Minimum Viable Product/prototype
Revenue	<ul style="list-style-type: none"> • Pre-revenue, or • Revenue generating
Pre-existing Intellectual Property (IP)	<ul style="list-style-type: none"> • No IP, or • Existing invention disclosure, or • Patent applied for or issued
Location	<ul style="list-style-type: none"> • Located within New York State
University Affiliation	<ul style="list-style-type: none"> • Must be affiliated with Columbia University

Accelerate Carbontech Program

The CDI Accelerate Carbontech Program awardees participate in trainings along with CDI's Commercialization Program cohorts. Non-awarded applicants to other CDI programs deemed qualified by the scoring committee can opt in to participate in the Accelerate Carbontech program and are not required to prepare and submit a separate application to Accelerate Carbontech.

5. Anticipated Cohort Start Date

April 1st 2023

6. Funding & Project Length

The table below outlines the expected funding and project duration for each awardee for this solicitation. Awards in this solicitation round will total at least \$500,000.

Table 2: Expected Funding and Project Length

Program	Expected Individual Award Amount	Project Duration	Expected Number of Awards
Internal Research	\$250,000	36 months	2

7. Proposal Submission

All submissions must be received by **11:59 p.m. on January 13, 2023** via the Submittable portal at <https://cdi.submittable.com/submit>. Late proposals or proposals not submitted on the Submittable portal will not be accepted.

No communication intended to influence this procurement is permitted except by contacting John Cornwell (Designated Contact) at (212) 853-4112, or by e-mail at cdi-applications@columbia.edu or Erik Funkhouser at (212) 853-4112, or by e-mail at cdi-applications@columbia.edu (Secondary Contact). If you have contractual questions concerning this solicitation, contact John Cornwell (Designated Contact) at (212) 853-4112, or by e-mail at cdi-applications@columbia.edu. Contacting anyone other than the Designated Contacts (either directly by the proposer or indirectly through a lobbyist or other person acting on the proposer's behalf) in an attempt to influence the procurement: (1) may result in a proposer being deemed non-responsible under New York State Finance Law, and (2) may result in the proposer not being awarded a contract.

State Finance Law sections 139-j and 139-k: NYSEDA is required to comply with State Finance Law sections 139-j and 139-k. These provisions contain procurement lobbying requirements which can be found at <https://online.ogs.ny.gov/legal/lobbyinglawfaq/default.aspx>. Proposers are required to answer questions during proposal submission, which will include making required certification under the State Finance Law and to disclose any Prior Findings of Non-Responsibility (this includes a disclosure statement regarding whether the proposer has been found non-responsible under section 139-j of the State Finance Law within the previous four years).

Proprietary Information - Careful consideration should be given before confidential information is submitted as part of your proposal. Review should include whether it is critical for evaluating a proposal, and whether general, non-confidential information, may be adequate for review purposes. The NYS Freedom of Information Law, Public Officers law, Article 6, provides for public access to information NYSEDA possesses. Public Officers Law, Section 87(2)(d) provides for exceptions to disclosure for records or portions

thereof that "are trade secrets or are submitted to an agency by a commercial enterprise or derived from information obtained from a commercial enterprise and which if disclosed would cause substantial injury to the competitive position of the subject enterprise." Information submitted as part of this Solicitation that the proposer wishes to have treated as proprietary, and confidential trade secret information, should be identified and labeled "Confidential" or "Proprietary" on each page at the time of disclosure. This information should include a written request to except it from disclosure, including a written statement of the reasons why the information should be excepted. See Public Officers Law, Section 89(5) and the procedures set forth in 21 NYCRR Part 501 <https://www.nyscrda.ny.gov/About/-/media/Files/About/Contact/NYSERDA-Regulations.ashx>. However, Columbia and NYSEDA cannot guarantee the confidentiality of any information submitted.

Please note, this RFP describes the information required in the application, but this RFP is not the program application – all applications must be submitted through the Submittable portal referenced above.

The proposal application will include the following and will have an overall word limit of 5,000 words:

Project Topic Area: (Select technology topic area)

- 1) Carbon Capture Technology
- 2) Carbon-to-Buildings Materials
- 3) Carbon-to-Chemicals/Fuels/Materials

Technology Readiness Level:

Self-reported TRL at start of project:

TRL targeted at project completion:

Project goals (Maximum word count: 300):

(Provide a clear and concise summary of your core technology, process, product, or service? What is the objective(s) of your company or team as it/they relate to advancing the carbontech market? Describe how this project will benefit New York State in reaching its environmental goals, advancing the State's carbontech market, or improving the economic or emissions outlook for the State's existing sectors.)

Background (Maximum word count: 800):

(Provide background information leading to the application.)

- A) *Discuss the current state of the art, including relevant progress or breakthroughs and knowledge gaps, and, if applicable, describe relevant studies, whether conducted by proposal team.*
- B) *Describe relevant prior or ongoing activities undertaken by members of project team.*
- C) *Identify specific research or commercialization barriers to market readiness affecting the proposed technology or its technology class.]*

Project goals (Maximum word count: 300):

(Describe each project goal. How does each goal align with your project's objectives?)

Proposed Project (Maximum word count: 800):

(Provide a detailed description of proposed project activities, how each activity addresses specific technical, business, or market barriers, and why resolution of these barriers will advance the carbontech market. Explain how the proposed research will result in substantial advancement / translational impact of a carbontech technology or overcome research or other barriers that the project goals address. Include the hypotheses to be tested (if any) and the integration of experiments with theoretical and computational research efforts. Discuss technical and business milestones corresponding with proposed project activities. Describe which, if any, activities result in advancing of project TRL.)

Market Impacts (Maximum word count: 800):

(Detail how the proposed project will impact the carbontech market, including market impacts specific to New York State.

- A. Enumerate specific market impacts that will result from the project.*
- B. Explain the linkage between project activities and progress toward specified market impacts.*
- C. Provide a rationale for why the project team feels confident that proposed activities, independently or collectively, are likely to result in the specified market impacts. Include a description of the conditions for success, potential risks or threats to project success, and risk mitigation strategies.)*

Environmental Impacts (Maximum word count: 800):

(Detail how the proposed project will impact GHG mitigation and other environmental goals. To the extent possible, describe how these impacts align with New York State climate and just transition goals.

- A. Enumerate specific potential GHG or environmental impacts that will result from the project.*
- B. Explain the linkage between project activities and progress toward specified GHG or environmental impacts. For example, describe how project outcomes influence GHG reduction pathways.*
- C. Provide a rationale for why the project team feels confident that proposed activities, independently or collectively, are likely to result in the specified GHG or environmental impacts. Include a description of the conditions for success, potential risks or threats to project success, and risk mitigation strategies.)*

Tech-to-Market Plan (Maximum word count: 800):

(Detail the prospective pathways for project outputs to enter the carbontech market.)

- A. Describe where the project's core innovation fits in a carbontech commercial value chain.*
- B. Upon completion of the proposed scope of work, describe the technological or commercial challenges that will remain as barriers to commercial end use of the project's core innovation.*
 - What technical activities, including prototyping or demonstration need to be completed?*
 - What business or market readiness activities need to be completed, such as business model validation, intellectual property development strategies, human capital requirements, and market development needs.*

Management Structure (Maximum word count: 300):

Outline the project team's organizational and management structure. Describe the roles and responsibilities of each team member. Describe the team's capabilities and access to resources, the systems the team will put in place to carry out the proposed scope of work, and how characteristics of team member backgrounds and experiences contribute to robust team competency.

Stage of Financing (if applicable) (Maximum word count: 100):

(Please describe the current stage of fundraising (Seed, Series A, Series B, etc.) and total amount of funding raised to date)

Scope of Work and Gantt Chart of Activities (Maximum word count: 1,500): *(Provide a detailed scope of work for the project. The scope of work should include a timeline of activities and proposed project milestones and deliverables associated with each activity. All project activities must correspond with at least one milestone. Milestones and deliverables will be subject to negotiation after award selection. Specify a timeline for all major activities in Gantt chart format. Use the attached Scope of Work and Gantt chart template in Appendix D. Note the scope of work document does not count to proposal word limit. Note the scope of work document does not count to proposal word limit.)*

Topline Project Needs and Budget

Category	Requested Funding
Staff salary & benefits (indicate # of personnel)	\$
Materials & Supplies	\$
Subcontracts/Consulting/Collaborators/Core Facility Fees (cannot exceed 25% of total budget requested)	\$

Detailed Budget Breakdown. *(A detailed budget breakdown attributing percentages of each cost category proportionally to discrete project activities enumerated in the SOW. Table and description format is acceptable. Columbia University projects should budget direct costs including fringe, but not indirect costs, and use the reduced tuition rate.)*

Budget Impact Statement: *(Applicants must allocate the proposed budget across discrete activities enumerated within the SOW and provide a narrative justification for the corresponding amounts. Note the budget impact statement does not count to proposal word limit.)*

Optional Add-on Activity:

(CDI intends to fund project activities that align with resolution of technical and commercialization barriers. CDI encourages applicants to include up to one “add-on” activity. Add-on activities must advance the business or technical position of the team but need not be thematically linked or essential to the success of the primary strands of work.

Provide an add-on activity description. This should include a brief description of the proposed activity, how it advances the business or technical position of the team, and how the team will integrate add-on activity tasks alongside the activities within their proposed scope of work.

In addition to describing the add-on activity, describe the incremental project costs for the add-on in a range between \$5,000-\$50,000. Proposed add-on costs need not be reflected in proposed project budgets, and do not count toward the maximum project amount. Add-ons will be considered during the contracting process.)

Project Title:	(A non-confidential project name)
Project Lead Contact Information:	(Name, Email, Phone Number, Address)
Project Lead CV/Resume:	(2-page CV / Resume)
Co-Lead Contact Information:	(Name, Email, Phone Number, Address)
Co-Lead CV/Resume:	(2-page CV / Resume)
Additional Team Member Information:	(First Name, Last Name, Title, Consolidated resume of additional team members)
Company/Project Website (if applicable):	(website url)

8. Review Process

CDI will review applications for eligibility and a Scoring Committee will score based on: team qualification, responsiveness to the objectives and requirements of the RFP, appropriateness of proposed activities, potential market impact, likelihood of market impacts, likelihood of translational impacts, potential environmental impacts, and relevancy to New York State. The review process will safeguard against any conflicts of interest on the review panel.

We suggest applicants provide sufficient information to allow for robust review of the project but should not disclose any information they are bound to hold confidential. If you have any questions prior to applying, please reach out to CDI-information@columbia.edu for any questions related to using the Submittable platform, please reach out to CDI-applications@columbia.edu.

Appendix A: CDI Topic Areas (TAs)

Error! Reference source not found. outlines the TAs CDI will fund.

Table 1. CDI Program Technology Scope Topic Areas

Topic Area	Area Scope
TA1: CO2 Capture Technology	<p>Research and commercialization efforts in this topic area aim to further discoveries for carbon capture using novel materials and systems to harvest CO₂ from the environment (i.e., air and ocean). Efforts may also aim to advance CO₂ capture by enabling key New York State industries to decarbonize using feedstocks from current waste streams (e.g., waste-to-energy (WTE) and cement plants). Point source CO₂ capture technologies targeting fossil fuel burning power plants, however, are excluded.</p> <p>TA 1 efforts may fall under any of the following subtopics:</p> <ul style="list-style-type: none">• Direct air capture (DAC)<ul style="list-style-type: none">○ Materials with long-term stability (e.g., enhanced oxidative thermal stability and tolerance to moisture)○ DAC system with a low pressure drop○ The innovative use of renewable energy for sorbent regeneration○ The integration of DAC and CO₂ conversion• Direct ocean capture (DOC).<ul style="list-style-type: none">○ Different reaction pathways (e.g., electrochemical) to harvest CO₂ from ocean and their impacts on the ocean chemistry○ The integration of DOC with carbon mineralization and ocean alkalinity addition• CO₂ capture from waste-to-energy and cement plants.<ul style="list-style-type: none">○ Effects of varied CO₂ concentration and impurities on CO₂ capture materials and systems○ Integration of CO₂ capture with resource recovery and CO₂ utilization• Innovative sorbent regeneration technology<ul style="list-style-type: none">○ The innovative use of renewable energy via non-thermal energy transfer (e.g., targeted heating using microwave, RF heating, etc.) for sorbent regeneration○ Novel reactor design
TA2: CO₂-to-Building Materials	<p>Construction materials represent an important market for CO₂ utilization, since the built environment can store large amounts of carbon at climate relevant scales. This TA will investigate the conversion of different local feedstocks (i.e., WTE ash and construction wastes from New York State) to building materials with reduced carbon intensity and improved performance to drive a scalable and sustainable construction industry in New York State.</p> <p>TA 2 efforts may fall under any of the following subtopics:</p> <ul style="list-style-type: none">• Carbon mineralization of waste. Materials such as WTE plant ash, waste concrete, mine tailings, etc. to produce solid carbonates and other solid by-products as sustainable building materials with lower carbon intensity• CO₂ curing of concretes. Efforts to reduce the overall energy requirement to incorporate CO₂ into building materials

	<ul style="list-style-type: none"> • Mg-based construction materials. Materials R&D and performance evaluations compared to Ca-based materials (e.g., $\text{Mg}(\text{OH})_2$ production from ocean and MgCO_3 production from waste materials and minerals)
TA3: CO₂-to-Chemicals/ Fuels/ Materials	<p>As renewable energy becomes affordable, chemical industries can harness renewable energy and convert CO₂ rather than fossil carbon to produce chemicals, fuels, and materials. CO₂ conversion technologies require focused and sustained R&D in areas such as catalysis, novel materials, and separations as well as their effective integration.</p> <p>TA 3 efforts may fall under any of the following subtopics:</p> <ul style="list-style-type: none"> • Electrochemical conversion of CO₂ <ul style="list-style-type: none"> ○ Catalyst development ○ Novel electrolyte design for combined CO₂ capture and conversion ○ Effects of varied CO₂ concentration and impurities ○ Integration of electrochemical CO₂ conversion with downstream bioconversion reactor • Dual-functional materials. Materials that host both CO₂ capture and conversion via tandem reactions (e.g., thermochemical, electrochemical, carbon mineralization reactions)

Appendix B: Technology Readiness Levels

Figure 1: Technology Readiness Levels (TRLs)



Appendix C: Definitions

- **Carbontech:** Carbontech represents a diverse set of technologies. Carbontech excludes any products or services that increase the emission of greenhouse gases or emit substantial greenhouse gases or other environmental pollutants through operation.
- **Demonstrated Benefit to New York State:** Examples of activities that represent a ‘Demonstrated Benefit to New York State’ include:
 - Having some portion of an organization’s workforce (beyond at least one employee), such as research and development, manufacturing, and/or sales, based in New York State; and/or
 - Benefiting supply chain partners, vendors, investors, and/or service providers in New York State; and/or
 - Having an addressable market of current or future customers within New York State.
- **Direct Expenses:** Expenses that are directly related to delivering the Services Requested. These costs can be identified specifically with a particular service/activity/task or can be directly assigned to a particular service/activity/task relatively easily and with a high degree of accuracy.
- **Indirect Expenses:** Expenses that are indirectly related to delivering the Services Requested. These costs include administrative costs, overhead, other expenses that are not Direct Expenses and/or are costs incurred for a common or joint purpose benefitting more than one service/activity/task and not readily assignable to a specific service/activity/task.

Appendix D: Scope of Work and Gantt Chart Template

SCOPE OF WORK TEMPLATE

Project Title

(Provide a detailed scope of work for the project. The scope of work should include a timeline of activities and proposed project milestones and deliverables associated with each activity. All project activities must correspond with at least one milestone. Milestones and deliverables will be subject to negotiation after award selection.)

DEFINITIONS

(Define any acronyms or uncommon words/phrases/technical terms to be used in the SOW)

The Applicant is defined as:

Company Name

Contact Name

Street Address

City, State Zip code

Email/Phone/Fax

The Project Site(s) (if applicable) is/are defined as:

Site Name

Site Street Address

City, State Zip code

Activity 1-Title

Identify and describe activity and associated sub-tasks. Describe expected deliverables the activity will produce and the milestones associated with the activity. The activities and tasks should:

- *Be worded so it is clear what the applicant would be required to do.*
- *Avoid using phrases like 'etc,' or 'including, but not limited to;' these phrases are ambiguous and hard to enforce.*
- *Tasks should be linear, so later tasks build on earlier tasks, and earlier tasks inform work being completed later on, as much as possible.*
- *When referring to previous or subsequent activities, use the activity number.*

Activity 1 - Proposed Deliverable(s) – *Deliverables should be directly tied to the work completed in the activity. Most, if not all activities, should have a deliverable, except in special circumstances.*

- *Deliverables should be a tangible item, for example, a report, a presentation, a prototype or product.*

Activity 1 - Proposed Milestone(s): *Project milestones should be directly associated with the described activity. All activities should correspond with at least one project milestone. Project milestones are key points in the project that mark the completion of a major phase of work.*

Activity 1 Schedule- *Every activity should have a duration in days from a start date to an end date during which work is expected to be completed. This should be noted here and included in the attached project Gantt chart.*

(Repeat identification and description of activities, tasks and deliverables as often as needed under this proposed project.)

Gantt Chart Template

(Note: This template is available as a Word document in the Submittable portal. Applicants may copy this to a spreadsheet format if needed.)

Gantt Chart Template

ACTIVITY/SUBTASK NUMBER	ACTIVITY/ SUBTASK NAME	START	END	DURATION (IN DAYS)	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10
[ACTIVITY 1]		Month 1	Month 3	90										
[SUBTASK 1]		Month 1	Month 2	60										
[ACTIVITY 1]		Month 4	Month 6	90										
[SUBTASK 1]		Month 4	Month 5	60										
[ACTIVITY 1]		Month 7	Month 9	90										
[SUBTASK 1]		Month 7	Month 8	60										