

## APPLICATION FORM CTA @ France (Cleantech)

<b>COMPANY INFORMATION</b>
Legal Name: Carbon Upcycling Technologies Inc.
Address: Suite 3001, 505 4 <sup>th</sup> Ave SW Calgary (AB) T2P 0J8
Website: <a href="http://ninesigma.com/ninesights-community/solution-provider-spotlight/carbon-upcycling-technologies">ninesigma.com/ninesights-community/solution-provider-spotlight/carbon-upcycling-technologies</a>
Number of employees: 2
Year Established : September 2012
Annual Sales Revenue (CAN\$): N/A
Locations (in Canada / overseas): 1
<b>Primary Contact: Apoorv Sinha</b>
Title: President
Direct Dial:
Cell:
E-mail:
<b>PRODUCTS AND SERVICES</b>
<p><b>Please describe your company’s structure, products and business model (up to 250 words maximum):</b></p> <p>Carbon Upcycling Technologies (CUT) was formed to sequester CO2 emissions in a stable, solid form that could be sold to the market at profit. The company uses an IP-protected process to create a portfolio of graphitic nano-platelets (GNPs) and graphene derivatives using waste CO2 and cheap carbon feedstock. Through this mechanism, the CO2 is captured by embedding itself into mesopores within a solid framework where it remains stable up to 200°C. The product has shown functional benefits such as CO2 uptake of up to 30% (on a mass basis) per gram of GNP, a 15-30% increase in Yield &amp; Tensile Strength in HDPE composites, promoting nucleation in TPU, HDPE, PP, and other polymer resins, built-in UV blocking functionality, 10-20% more thermally conductive polymer composites for shorter cycle times, controllable nano-sized pores (10-200 nm) membranes for water filtration, 10-15% increase in capacity retention in LMO battery &amp; energy storage systems, as well as significant compressive strength improvements in ready-mix and self-consolidating concrete (SCC) blends.</p> <p>CUT uses a lean research and product development strategy to create commercial opportunities by engaging with application specific end-users and suppliers to refine a value proposition. CUT’s business model is to establish client-vendor relationships with companies in material industries such as polymer, concrete, and coatings and scale up production to meet client demands.</p>
<p><b>Describe your competitive advantage(s). Please specify what is your key value proposition for a prospective French business partner:</b></p> <p>Conventional technologies for carbon capture and utilization use chemical adsorption and highly-energy intensive chemical pathways to create biofuels, carbonates, or organic acids with limited global demand and niche market applications.</p>

Contemporary production technologies for similar materials utilize sulfuric and nitric acid for size reduction, leading to multiple adverse effects such as particle contamination & environmentally harmful waste. These processes also don't combine production with direct CO2 capture, and are not as cost-effective as CUT's novel process for size reduction. By not contaminating its feedstock with exposure to acids, CUT's process also allows a wide array of functionalization to be achieved without requiring extensive pre-processing.

CUT is interested in establishing relationships with strategic partners in France that are interested in the development and commercialization of sustainable materials for use in material-intensive industries. French partners with either extensive R&D capabilities pertinent to material science, or extensive distribution channels in the polymer, concrete, coatings, or energy storage industries. CUT is particularly interested in developing connections with French plastic compounding and injection molding companies.

**What is your sales/marketing strategy?**

CUT's vision is to create a product that can provide a healthier world by diminishing waste treatment inefficiencies in various industries through the application of its carbon-based nanoparticle using a CO2-negative process. As new potential applications of the nanoparticle product emerge, CUT goes through a dynamic evaluation to establish whether or not the technology will be a beneficial pursuit and in line with the company's vision. The diversity and the willingness to foster & research new applications for graphene allows CUT the capability of turning into a sustainable long term business.

1/Currently the graphene product is being tested as a cement additive, and the desired results have been reached bringing this the closest application to commercialization. The process of determining the market value of the nano-material in this industry has gone through multiple stages with specific results required in order to move to the next stage. The involvement and feedback of both customer and experts in the industry has been an invaluable asset to CUT as it has provided a confidence in the ability to make this a price-competitive market ready product. In this effort, Carbon Upcycling's efforts in concrete have been championed by Kerridge Concrete, a Calgary-based ready-mix concrete company with over 30 years of operational history.

2/To explore the applications of its nanoparticles in plastics, CUT has aligned itself with Entropex, a plastics production company using waste plastics residues as feedstock as its market partner,

3/while in the energy storage industry, CUT is working with the Lawrence Berkeley National Labs and the University of Toronto as well as a large-scale battery manufacturing company.

4/In the field of coatings, Carbon Upcycling has partnered with zEroCor Tubulars, a small, Calgary-based, downhole coated tubulars' company for market direction, while working with SRI International, the University of Toronto, the University of Calgary, and an expert formerly with Argonne National Labs in Chicago to ensure that its nanoparticles are optimized to provide cost-effective performance required by the market. This voucher will be highly beneficial to the commercialization of the carbon nano-material product, as it will allow the start-up company to be ready for scale-up when these target markets show viable, short-term interest in purchasing our product.

**FUNDING**

**How is your company financed, sources and total funds raised to date. Year-over-year revenue growth?**

So far, CUT has relied on a combination of internal funding from its parent company, Zerocor Technologies, an oilfield service and technology development company in Calgary, as well as funding from various provincial and federal funding mechanisms in Alberta. These funding grants include winning CAD 500K in 2014 from the CCEMC Grand Challenge, as

well as various grants from the National Research Council, Alberta Innovates, and the Scientific Research and Development (SRED) grant mechanisms.

CUT has raised CAD 850K so far and is currently an applicant in the 2<sup>nd</sup> Round of the CCEMC Grand Challenge (innovative carbon uses) as well as the Carbon X-Prize (NRG Foundation, COSIA).

## TEAM

### Please provide background on your management team

**Apoorv Sinha Project Lead- President, CUT:** Apoorv has served as the president of CUT since the commencement of the CCEMC GC in April 2014. He holds a B.Sc. in Chemical Engineering from Georgia Institute of Technology (2010) and manages technical progress, business development, and academic/ industrial partners to assist in the validation, development, scale up, and subsequent commercialization of the firm's technology. Apoorv is also a member of the Energy Futures Lab, a cohort of Albertans pulled together as a think-tank for policy trajectories which help Alberta make a transition to a low-carbon, sustainable energy future. Most recently, Apoorv was included in Alberta Oil's "35 Under 35 list" in July 2016, as well as the Clean50 2017 Cohort. He has represented CUT at various events including Watervent 2014, Rice Alliance CleanTech Forum 2015, Americana 2015, Globe 2016, DSN Network (Warsaw, Poland) 2015, amongst others.

**Greg Boser Chief Strategic Officer, CUT:** Greg started his career in the service sector of the Alberta oil and gas industry in 1977. His business experience includes 10 years with Core Lab as well as the start-up, and eventual sale, of Analog Tracer Services. Greg's career has taken him throughout North America and helped him understand the benefits of quality products and their integral role in producing long-term economic growth. As an active team member in CUT since April 2014, he has brought substantial value and will continue to provide his support in the firm's dealings with various academic and industrial partners.

**Randy Cusson Business Development Lead, CUT:** Randy's career also began in the Alberta oil patch service sector where he has been a successful entrepreneur since 1976. After gaining years of field experience, Randy created the start-up safety company, KEY Safety Services, which he sold in 2006. He also serves as a Managing partner in Reform Energy Services Corporation, a firm that specializes in high pressure drilling operations in Canada, the United States, and the Middle East. Randy's contributions to CUT involve the use of his skills in sales and marketing along with his ability to shape the firm's strategy towards approaching new markets for the sale of its products. With his experience in over 6 materialintensive start-ups, Randy is a valuable cog in steering CUT's corporate vision and long-term growth.

**Luke Carson Business & Technical Development, CUT:** Luke Carson, the most recent addition to CUT, holds a B.Sc. in Geology and carries a strong passion for entrepreneurialism, business, and the sciences. In a short time, he has proven a valuable team member by facilitating key engagements with potential clients like Kelinruier Pipeline, Alta Injection Molding, and others. Apart from adept networking, a broad and capable skill set has allowed him to ensure the progress of multiple aspects of CUT's business development such as; drafting vital marketing and technical documents, building funding applications, and procuring materials.

Supplementary to this lean management team, CUT has engaged a myriad of consultants and associated organizations to fill gaps in essential specialized knowledge. Many of these project partners have been involved since 2014 while others have been engaged for further development of CUT's technology.

## KEY MILESTONES

### Please describe your company's current stage of development stage (prototype or product), and sales forecast

CUT has scaled its production by over 1000 times since starting proof of concept studies in July 2014, and is currently working on its fourth prototype scale, Zeta, tentatively for operation in April 2018. Additionally, CUT is a finalist in the CCEMC Grand Challenge where it won 500K in 2014, is a participant in the COSIA X-Prize, and has also received

support from NSERC, Canadian National Research Council, as well as Alberta Innovates.

CUT has presented its technology as an exhibitor as well as a panelist at the Americana and Globe Conferences, is a member of the SDTC Virtual Incubator, has presented twice at the Watervent in Philadelphia (2014, 2016), and is also a Rice Alliance CleanTech Forum Alum. CUT has alpha-trialed its product in over 12 different market applications including high-end solid lubricants, concrete, polymer, coating additives, as well as fillers in Solar PV and pharmaceutical drug delivery applications. CUT is beta-trialing its carbon additives in the polymer and concrete industries with a total of 6 market partners and intends on initial sales in these markets by Q2 2017.

**CTA Fit**

**Please describe why you want to participate in the CTA? How does this fit in with your business strategy? (Market traction, any business experience/interest in France or Europe)?**

CUT is currently engaged with various organization from Europe such as WIPO Green, Innovation Insights, as well as incubators from TU Delft and KU Leuven. CUT's management has identified Europe as a strategic short-term target for growth as the European Union has created world-leading standards and directive around carbon capture and utilization with the intent of GHG footprint reduction. CUT has already presented its suite of nanoparticles to the Demand Side Network (DSN) in Poland in November 2015 and believes that aligning with a French partner would facilitate the company's aggressive marketing in Europe. CUT has also been in touch with some material science professors at Ecole Polytechnique in France that could supplement the work the company has done in the field of carbon nanomaterials.

**What are your main objectives for participating in the CTA?**

- Demo project
- Raise capital
- Strategic partnership
- Identify/establish new clients
- Soft landing to build / revise market entry strategy for France/Europe
- Other

**Please include any additional information in support of your application: e.g., in Canada references, alumni to the CTA program in the USA?**

- CTA New York /San Francisco Alumni (2014)**
- CTA Denver Alumni (2015)**
- Sustainable Development Technology Canada Virtual Incubator (2015)**
- CCEMC Grand Challenge Recipient (2014)**

**CTA Selection:** If your company is accepted into this CTA, at least one person from the management team would be expected to be in France on Nov 7- Nov 10 for the Boot Camp , and then for two periods of one week TBD between December 1, 2016 and March 31 2017.