

CLIMATE CHANGE INNOVATION AND TECHNOLOGY FRAMEWORK

Awardee Summary

CCITF PROGRAM	Clean Technology Development
PROJECT TITLE	Integrated CO ₂ Emission Capture & Utilization in Advanced Nanoparticle Production at Calgary Natural Gas Plant
SECTOR	Low Carbon Electricity Waste to Value-Added
ORGANIZATION	Carbon Upcycling Technologies Inc.
PROJECT LEAD	Apoorv Sinha
AI PROJECT ADVISOR	Babatunde Olateju
GRANT AMOUNT	\$1,800,000
START DATE	11/1/2018
END DATE	10/1/2020

PROJECT OBJECTIVE: Demonstrate CO₂ capture and utilization technology to produce nanoplatelets at a commercial scale from an active natural gas power plant.

PROJECT PROFILE: Carbon Upcycling Technologies (CUT) proposes a direct CO₂ capture and utilization (CarbonTech) project at the Alberta Carbon Conversion Technology Center (ACCTC) in Calgary, AB to capture CO₂ emissions directly from an active natural gas power plant. Through the proposed project, CUT will design, construct, commission, and commercialize the directly captured CO₂ emissions into end-used nanoparticles for use as additives in the concrete, polymers, and battery industries.

As the only Alberta company in the global Carbon X-Prize competition, CUT has the unique opportunity of demonstrating its technology at a functional natural gas power plant, at the commercial scale of 10 tonnes per month (tpm) of nanoplatelet production. The CO₂ obtained from the natural gas plant's flue gas emissions, will be combined with low-cost primary materials (graphite, coal) and secondary residues (coal power fly ash) sourced from within Canada's natural resource operations to produce the desired products. CUT intends to produce 5 tpm of graphitic nanoplatelets (GNPs) and enhanced fly ash (EFA) each to create additives for the construction, polymers, lithium ion battery additives for the energy storage and renewable energy industries using its proprietary, patent-pending mechano-chemical exfoliation process.

The proponent will initially engage with Alberta vendors; Innovative Concepts & Design, Blue Diamond Design, Addos Technologies, and NRG Pressure Vessel Group to design, build, and commission four parallel reactor units at the ACCTC. Subsequently, CUT will cooperate with academic partners at the Universities of Alberta, Calgary, Waterloo, and Toronto, and NRC-NINT in Edmonton to characterize the quality and performance of its product between 2018 and 2020. From Q2 2019 to Q2 2020, CUT will work with construction material (Lafarge, Burnco, Tanas Concrete), plastics (Switch Energy, Clariant, Qualicase, etc)

battery (Enertec China) companies to validate the performance of its products in the three target industries through commercial-scale trials. CUT will leverage the learnings from its ongoing Energy Innovation Program (EIP) project on Carbon Nanoplatelet (CNP) Production from Exhaust CO₂ Emissions. The project will also implement the technical feedback from the technical committees of the Carbon X-Prize, Southern Research Institute, Creative Destruction Labs, NRC-IRAP, and various NSERC committees. In addition to industry and research community support, CUT has also commenced consultations with ERA in Alberta and SDTC Federally for support of the proposed project.

The project will further scale CUT's ability to generate products for the three target markets in which it has created partners, while building the only industrial-scale facility in the world that produces advanced nanoparticles from GHG emissions. The proposed project will also facilitate CUT's entry into the Carbon X-Prize Finals, a global competition with the world's top 10 CO₂ utilization pathways. CUT is the only Alberta-based company in the competition and is the youngest CO₂ -to-value (& waste-to-value) utilization company to generate commercial revenue (within 2.5 years of commencing operations).

GHG EMISSION REDUCTION SUMMARY: