



# Agenda Item Cover Sheet

Agenda Item N<sup>o</sup>:   A-15  

Meeting Date   4/17/2024  

Consent Section

Regular Section

Public Hearing

<b>Subject:</b> Approve an agreement for Carbon capture demonstration pilot Agreement with LowCarbon America Corporation. (Agreement to follow per Mr. Cassady).			
<b>Department Name:</b> Environmental Services			
<b>Contact Person:</b> Kevin Moran		<b>Contact Phone:</b> 813-209-3073	
<b>Sign-Off Approvals:</b>			
<b>George Cassady</b>	4/5/2024	<b>Kevin Moran</b>	4/5/2024
Assistant County Administrator	Date	Department Director	Date
<b>Kevin Brickey</b>	4/5/2024	<b>Hank Ennis</b>	4/5/2024
Management and Budget – Approved as to Financial Impact Accuracy	Date	County Attorney – Approved as to Legal Sufficiency	Date
<b>Irma Muka</b>	4/5/2024		
Deputy or Chief County Administrator	Date		

**Staff's Recommended Board Motion:**  
 Approve an agreement with LowCarbon America Corporation for a demonstration pilot for carbon capture. The Board directed staff to review a proposal from LowCarbon America Corporation for the installation, operation, and testing of a unit process at the County's Falkenburg Waste to Energy Facility. This Pilot Project is being installed to determine the feasibility and capabilities of a permanent carbon capture and sequestration technology. If proven successful, a full-scale carbon capture project could provide economic and environmental benefits for the citizens of Hillsborough County. There is no financial impact to Hillsborough County from this Agreement.

**Financial Impact Statement:**  
 There is no financial impact to Hillsborough County from this Agreement.

**Background:**  
 LowCarbon America Corporation (LowCarbon) submitted an initial proposal on February 26, 2024, to fabricate, install, and operate a one-ton Carbon Capture, Utilization, and Sequestration (CCUS). This process does not involve injection of water or carbon underground. LowCarbon's technology uses a proprietary catalyst to capture diverted carbon dioxide from the County's Resource Recovery Facility exhaust stack and convert it to calcium carbonate. Based on information provided and reviewed by staff, the pilot system uses very little water for cooling purposes and does not require significant energy to operate. A revised CCUS proposal was submitted by LowCarbon on March 18, 2024, to respond to staff questions and requested clarifications.  
 Staff submitted a Report to the Board on April 3, 2024, summarizing the proposed project. The Board accepted the report and requested that staff bring back this Agreement for the installation of the proposed pilot project.  
 LowCarbon will be fully responsible for all costs required to install, operate, and test this equipment, except for a limited amount of water. The required water necessary for the operation of this system has been described as an amount equal to the amount of water used by one average single-family residence. LowCarbon will submit the results of the testing of the equipment to County Staff. These results will include costs of operations, quantities of carbon dioxide removed from the Waste to Energy exhaust

stream, quantity of calcium carbonate generated and a market study for the calcium carbonate. Using the data from the pilot study, Hillsborough County staff will complete a Cost Benefit Analysis. If the Pilot Project's cost benefit analysis shows that a CCUS system can truly provide an economic and environmental benefit to the citizens of Hillsborough County, then staff may bring back to the Board an open competitive Request for Proposals from qualified contractors and vendors to supply the County with a CCUS.

List Attachments: Carbon Capture Utilization and Sequestration Agreement

## **CARBON CAPTURE UTILIZATION AND SEQUESTRATION AGREEMENT**

This **CARBON CAPTURE UTILIZATION AND SEQUESTRATION AGREEMENT** (the “Agreement”) by and between **LOWCARBON AMERICA CORPORATION** (“Supplier”) and **HILLSBOROUGH COUNTY BOARD OF COUNTY COMMISSIONERS** (the “County”) (all parties collectively the “Parties”) is made and entered into on this \_\_\_\_\_ day of \_\_\_\_\_ 2024 (“Effective Date”).

### **WITNESSETH**

**WHEREAS**, Supplier wishes to supply to the County and County wishes to accept carbon capture utilization and sequestration equipment with the capacity to remove 1 ton of carbon dioxide per day, to be furnished as a pilot project (the “Pilot Project”), in order to determine the feasibility and capabilities of permanent carbon capture utilization and sequestration technology; and

**WHEREAS**, the Pilot Project shall be installed at the Hillsborough County Resource Recovery Facility, 350 N. Falkenburg Road, Tampa, Florida 33619 (the “Site”).

**NOW THEREFORE**, in consideration of the above recitals, all of which are acknowledged as true and correct, and the mutual promises and agreements contained herein and other valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

#### 1. Supplier Obligations.

- a. Supplier shall furnish and cause to be temporarily installed at the Site the equipment for the Pilot Project (the “Equipment”) identified on Exhibit “A” in material compliance with such Plans.
- b. As to not interfere with Resource Recovery Facility operations the Supplier shall install the Equipment at the date and time approved by the County Administrator.
- c. After the Equipment is installed and is operable, Supplier shall operate the Equipment for a period of either 10 or 16 hours per day, for 60 calendar days (Substantiation Period).
- d. Supplier shall supply all manpower, materials, and supplies, necessary to install the Equipment and to operate the Equipment.

#### 2. County Obligations.

- a. County shall permit reasonable access to the Site to allow Supplier to install, operate and test the Equipment during the Substantiation Period.
- b. County shall issue or obtain any applicable licenses, permits, or regulatory approvals required for the Equipment to be installed and operated by Supplier.

- c. County shall furnish water to the Equipment in such amounts necessary for the Equipment to be installed and operated during the Substantiation Period.

3. Performance Testing.

- a. Supplier shall cause the Equipment to be evaluated (the “Performance Testing”) by Korea Testing and Research Institute (the “Tester”), who shall have an inspector present on-site for a period of seven (7) days.
- b. The Tester shall evaluate the Equipment in accordance with the procedures annexed hereto in Exhibit “A”
- c. The Tester shall determine if the performance of the Equipment meets the minimum performance standards annexed hereto in Exhibit “A”. The parties recognize and agree that the amount of CO2 captured by the Equipment will vary, depending on the operating hours of the County’s incinerator and the number of hours testing is conducted.
- d. The Tester shall issue a written report (the “Test Report”) certifying: (1) the Performance Testing conducted, (2) the results of the Performance Testing and all relevant and pertinent test data, (3) what Minimum Performance Standards, if any, were satisfied, and (4) what Minimum Performance Standards, if any, were not satisfied,
- e. Supplier shall bear all costs associated with the Performance Testing.
- f. In the event the Equipment does not meet the Minimum Performance Standards, Supplier may at its sole option and expense, perform any remedial or corrective work to the Equipment which Supplier deems appropriate, and thereafter cause the Tester to re-perform the Performance Testing (in whole or in part) (the “Retest”). The Tester shall issue an additional Test Report as to the Retest (the “Retest Test Report”). The Test Report and the Retest Test Report are hereinafter collectively referred to as the “Test Results.”
- g. In the event Supplier conducts the Retest, the testing period shall be deemed to have been extended an additional 30 days to allow the remedial/corrective work to be performed and for the Retest to occur.
- h. Following a successful pilot, the County may elect to proceed with a competitive procurement for a permanent Carbon Capture Utilization and Sequestration facility, if federal and/or state grant funding is made available and the County is successful in obtaining such grant funding to cover all or substantially all the cost of a permanent Carbon Capture Utilization and Sequestration facility.

- i. At the end of the testing period, Supplier shall remove the Equipment within 90 days at its own expense with no further obligation on the part of the County to purchase the Equipment or contract for the installation of permanent carbon capture utilization and sequestration technology to be furnished by Supplier. In such event the parties shall have no further liabilities or obligations to each other under this Agreement, except as to obligations expressly stated to survive termination of this Agreement in paragraph 16 below.

4. Equipment Byproduct/Carbon Credits.

The Supplier shall be entitled to all calcium carbonate byproduct (the “Byproduct”) generated by the Equipment. The Supplier shall retain title to any Byproduct generated by the Equipment. All records of the sale of the byproduct shall be made available to the County. The County shall have sole title to any carbon credits associated with the operation of the Equipment.

5. Final Documents.

Supplier shall provide to the County all record documents, as-built surveys, and plans associated with the Equipment. Supplier shall also furnish a manual of instruction to the County providing operating instructions or the Equipment if requested by the County.

6. Pilot Test Costs.

The Supplier shall carry out the testing period at its own cost, including supply of equipment and materials for the 1-ton test of carbon dioxide per day.

7. Air Quality Permit Violations.

To the extent the operation of the Equipment results in air quality permit violations, Supplier shall defend, indemnify, and hold the County and its employees and agents harmless to the extent of any resulting claims, demands, losses, damages, liabilities, expenses, or costs, including reasonable attorney’s fees, costs and expenses of investigation, penalties, interest and amounts paid in settlement incurred or to be incurred by County as a result.

8. Insurance.

Supplier shall procure the following insurance which shall be in effect during the Substantiation Period. The County shall be named as an additional insured under the Commercial General Liability policy and the Business or Commercial Automobile Liability Insurance policy.

Commercial General Liability Insurance:  
\$1,000,000 Each Occurrence Limit (Bodily Injury and Property Damage)  
\$2,000,000 General Aggregate per Project

\$2,000,000 Products & Completed Operations Aggregate  
\$1,000,000 Personal and Advertising Injury Limit

Business or Commercial Automobile Liability Insurance:  
\$1,000,000 combined single limit per accident

Workers' Compensation Insurance  
\$100,000 Each Accident  
\$100,000 Each Employee for Injury by Disease  
\$500,000 Aggregate for Injury by Disease

9. Risk of Loss.

Supplier shall bear the risk of accidental loss or damage to the Equipment.

10. Warranty.

Supplier warrants to County that all materials and equipment furnished for the Substantiation Period will be new unless otherwise specified and that all work performed under this Agreement will be performed in a good and workmanlike manner, shall be of good quality, free from faults and defects. Supplier warrants and guarantees the work against all defects in material or workmanship. **THERE ARE NO OTHER EXPRESS OR IMPLIED WARRANTIES, EXCEPT AS SPECIFICALLY SET FORTH IN THIS AGREEMENT.**

11. Intellectual Property Rights.

During the time the Equipment is being tested, Supplier grants a limited nonexclusive license to County for any patent rights, copyrights, trademarks, trade dress, or other intellectual property rights which are associated with the Equipment, its component parts, or the Equipment plans (the "IP Rights"). No other intellectual property rights are expressed or implied and Supplier retains ownership of any such IP Rights in all events.

12. Independent Contractor.

Supplier shall be an independent contractor in all respects and shall be solely responsible for determining the means and methods of performing the work, except as explicitly provided in this Agreement.

13. County Approval.

Unless expressly stated otherwise, in all instances in which the County's approval is required under this Agreement, the County shall not unreasonably withhold condition or delay such approval and shall provide such approval in a timely manner. The above provision shall not be construed to require the County in any way to waive its rights to the Supplier's full performance of its obligations under this Agreement.

14. Further Assurances.

Each Party agrees to, and shall use all reasonable efforts to, provide such information, execute and deliver any instruments and documents and take such action as may be necessary or reasonably requested or required by the other Party which are not inconsistent with the provisions of this Agreement and which do not involve the assumption of obligations other than those provided for in this Agreement in order to give full effect to this Agreement and to carry out the intent of this Agreement.

15. Termination for Cause.

If either Party shall at any time materially breach this Agreement, the non-breaching party may, after ten (10) days written notice of default and demand to cure said default or such longer time as is reasonably necessary to cure such default, and if such default is not cured within such time frame, terminate this agreement.

16. Survival of Termination.

The obligations and representations in Paragraphs 10, and 17 to 31 of this Agreement shall survive termination of the Agreement.

17. Indemnification.

- a. The Supplier shall defend, indemnify, and hold the County and its employees and agents harmless from and against any and all claims, demands, losses, damages, liabilities, expenses, or costs, including reasonable attorney's fees, costs and expenses of investigation, penalties, interest and amounts paid in settlement (collectively "Losses") incurred or to be incurred by County, to the extent arising out of, relating to, or resulting from any negligence, personal injury, wrongful death or property damages which is caused or occasioned by the wrongful acts or omissions of Supplier and/or anyone directly or indirectly employed by Supplier or anyone for whose wrongful acts or omissions Supplier may be liable. Furthermore, the Supplier shall indemnify and hold harmless the County from and against liabilities, damages, losses, and costs, including, but not limited to, reasonable attorney's fees, to the extent caused by any infringement by Supplier or persons for whom Supplier is responsible for in the performance of this Agreement, of patent rights, copyrights, trademarks, trade dress, or other intellectual property rights, in each case held by others.
- b. With respect to any work, services and/or goods provided pursuant to this Contract, the Supplier shall indemnify, defend, and hold harmless the County from any suits, actions, damages, and costs of every name and description, including attorneys' fees, arising from or relating to violation or infringement of trademark, copyright patent, trade secret or intellectual property right, provided, however, that the foregoing obligation shall not apply to a County's misuse or modification of Supplier's products or County's operation or use of Supplier's products in a manner not contemplated by the Contract.

- c. If any product is the subject of an infringement suit, or in the Supplier's opinion is likely to become the subject of such a suit, the Supplier may, at its sole expense, procure for the County the right to continue using the product or to modify it to become non-infringing. If the Supplier is not reasonably able to modify or otherwise secure for the County the right to continue using the product, the Supplier shall remove the product and refund the County the amounts paid in excess of a reasonable rental for past use. The County shall not be liable for any royalties.

18. Damages and Waiver of Consequential Damages.

Notwithstanding anything in this Agreement to the contrary, in no event shall either Party to this Agreement be liable to the other Party for any incidental, special, punitive, lost profit, consequential, or indirect damages, whether arising in contract, tort (including negligence) or otherwise even if the possibility thereof may be known in advance to one or more parties. This mutual waiver is applicable, without limitation, to all incidental, special, punitive, consequential, and indirect damages due to either Party's termination in accordance with this Agreement.

19. Representations and Warranties of the County.

The County has the power, authority, and legal right to enter into and perform its obligations the execution, delivery and performance hereof by the County. The Agreement (1) has been duly authorized by the County, acting by and through its Board, (2) does not require any other approvals by any other governmental officer or body, (3) does not require any consent or referendum of voters, and (4) will not violate any applicable laws applicable to the County.

20. Amendment or Waiver.

Any failure by either Party to insist upon performance the other Party of any of the terms and provisions of this Agreement shall not be deemed to be a waiver of any of the terms or provisions hereof, and either Party, the Party such failure, shall have the right thereafter to insist upon the performance by Supplier of all of the terms and provisions of this Agreement. This Agreement may not be modified, altered, or amended except by an agreement in writing signed by the Parties. This requirement cannot be waived, precluded by estoppel, or modified verbally or by custom and usage.

21. Severability.

Should any provision of this agreement be deemed or determined to be unenforceable by a court of competent jurisdiction, the remaining contract provisions shall remain in full force and effect.



22. Interpretation of Documents.

The Parties agree that the Agreement shall be deemed to have been drafted jointly by the Parties, and no terms shall be construed against either Party.

23. Venue/Applicable Law.

This Agreement shall be governed by the laws of the State of Florida. The exclusive venue for any legal or equitable action arising out of or relating to this Agreement shall be any court of competent jurisdiction located in Hillsborough County, Florida.

24. Notices.

Any notice, statement, demand, or other communication required or permitted to be delivered or served or given by either Party to the other shall be deemed delivered or served or given, if mailed in any general or branch United States Post Office enclosed in a registered or certified envelope addressed to the respective Parties as follows:

COUNTY:                                   Public Works Administration  
601 E. Kennedy Blvd., 22<sup>nd</sup> Floor  
Tampa, FL 33602

With a copy to:  
Hillsborough County Attorney's Office  
Attention: County Attorney  
601 E. Kennedy Blvd., 27<sup>th</sup> Floor  
Tampa, FL 33602

Supplier:                                   LowCarbon America Corporation  
Attention: Henry Jeong  
3001 N Rocky Point Dr East, Suite 240, Tampa, Florida 33607

With a copy to:  
Michael R. Carey, Esq.  
Carey, O'Malley, Whitaker, Mueller, Roberts & Smith, P.A.  
712 S. Oregon Ave. Tampa, Florida 33606

25. Equal Employment Opportunity; Non-Discrimination

The Supplier agrees to comply with Hillsborough County, Florida – Code of Ordinances and Laws, Part A, Chapter 30, Article II (Hillsborough County Human Rights Ordinance) as amended, which prohibits illegal discrimination on the bases of actual or perceived race, color, sex, age, religion, national origin, disability, marital status, sexual orientation or gender identity or expression, in employment, public accommodations, real estate

transactions and practices, County contracting and procurement activities, and credit extension practices.

The Supplier shall also comply with the requirements of all applicable federal, state and local laws, rules, regulations, ordinances and executive orders prohibiting and/or relating to discrimination, as amended and supplemented. All of the aforementioned laws, rules, regulations, ordinances and executive orders are incorporated herein by reference.

26. Legally Required Statement and Provisions Regarding Access to Records for Services Contracts

The Parties acknowledge and agree that the statement and provisions below are required by Florida Statute to be included in this contract for services. The inclusion of this statement and provisions below shall not be construed to imply that the Supplier has been delegated any governmental decision-making authority, governmental responsibility, or governmental function or that the Supplier is acting on behalf of the County as provided under Section 119.011(2), Florida Statutes, or that the statement or provisions are otherwise applicable to the Supplier. As stated below, the Supplier may contact the County's Custodian of Public Records with questions regarding the application of the Public Records Law; however, the Supplier is advised to seek independent legal counsel as to its legal obligations. The County cannot provide the Supplier advice regarding its legal rights or obligations.

**IF THE SUPPLIER HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE SUPPLIER'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS CONTRACT, CONTACT THE CUSTODIAN OF PUBLIC RECORDS AT:**

**813-612-7718,**

**ByerK@HCFLGov.net,**

**Public Works Administration, 601 E. Kennedy Blvd., 22<sup>nd</sup> Floor,  
Tampa, FL 33602**

If under this Contract, the Supplier is providing services and is acting on behalf of the County as provided under Section 119.011(2), Florida Statutes, the Supplier will comply with public records law, and agrees to:

9.1.1 Keep and maintain public records required by the County to perform the services.

9.1.2 Upon request from the County's custodian of public records, provide the County with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in Chapter 119 Florida Statutes or as otherwise provided by law.

9.1.3 Ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of the Contract Term and following completion of the Contract if the Supplier does not transfer the records to the County.

9.1.4 Upon completion of the Contract, transfer at no cost to the County, all public records in possession of the Supplier or keep and maintain public records required by the County to perform the service. If the Supplier transfers all public records to the County upon completion of the Contract, the Supplier shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If the Contractor keeps and maintains public records upon completion of the Contract, the Supplier shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to the County, upon request from the County's custodian of public records, in a format that is compatible with the information technology systems of the County.

Failure of the Supplier to comply with Chapter 119, Florida Statutes, and/or the provisions set forth above, where applicable, shall be grounds for immediate unilateral termination of this Contract by the County.

#### 27. Public Entity Crimes Statement

A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit an offer, or reply on a contract to provide any goods or services to a public entity; may not submit an offer, or reply on a contract with a public entity for the construction or repair of a public building or public work; may not submit offers, or replies on leases of real property to a public entity; may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity; and may not transact business with any public entity in excess of the threshold amount provided in Section 287.017, Florida Statutes, for CATEGORY TWO for a period of thirty-six (36) months following the date of being placed on the convicted vendor list. Additionally, pursuant to County policy, a conviction of a public entity crime may cause the rejection of an offer. The County may make inquiries regarding alleged convictions of public entity crimes. The unreasonable failure of the Supplier to promptly supply information in connection with an inquiry may be grounds for rejection of an Offer.

#### 28. Prohibition Against Contracting with Entities of Foreign Countries of Concern if Entity Would Give Access to an Individual's Personal Identifying Information

Supplier is advised that pursuant to Florida Statutes, Section 287.138, beginning January 1, 2024, the County cannot accept a bid on, proposal for, or reply to, or enter into a contract with an entity that would give access to an individual's personal identifying information if (a) the entity is owned by the government of a Foreign Country of Concern, (b) the government of a Foreign Country of Concern has a controlling interest in the entity, or (c) the entity is organized under the laws of or has its principal place of business in a Foreign

Country of Concern. For purposes of this section, a “Foreign Country of Concern” shall mean the People’s Republic of China, the Russian Federation, the Islamic Republic of Iran, the Democratic People’s Republic of Korea, the Republic of Cuba, the Venezuelan regime of Nicolas Maduro, or the Syrian Arab Republic, including any agency of or any other entity of significant control of such foreign country.

29. Supplier’s Use of Hillsborough County for Marketing Prohibited

The Supplier shall in no way use any statements, whether written or oral, made by the County’s employees to market, sell, promote, or highlight the Supplier and/or the Supplier’s product(s) and/or service(s) unless authorized to do so, in writing, by the County Administrator or his/her designee. In addition, the Supplier shall not use subjective or perceived interpretations, even if factual, regarding the County's opinion of the Supplier’s performance, product(s) and/or service(s) in any document, article, publication or press release designed to market, promote, or highlight the Supplier and/or the Supplier’s product(s) and/or service(s). This does not prevent the Supplier from including the County on its client lists and/or listing or using the County as a reference.

30. Entire Agreement.

This Agreement, including the Exhibits hereto and documents included by reference herein, constitutes the entire Agreement between the Parties with respect to its subject matter and shall supersede, replace, and nullify any and all prior agreements or understandings, written or oral, relating to the matters set forth herein, and any such prior agreements or understandings shall have no force or effect whatever on this Agreement.

31. Counterparts.

This Agreement may be signed in counterparts, each of which when executed and delivered shall be deemed to be an original and all of which, taken together, shall be deemed to be one and the same instrument. For purposes of execution and delivery of this Agreement, a document signed and transmitted by: (i) emailed PDF scan, or (ii) by electronic signature using DocuSign or other similar technology, shall be treated as an original document.

**[THE REMAINDER OF THIS PAGE HAS BEEN INTENTIONALLY LEFT BLANK]**

**IN WITNESS WHEREOF**, the parties have executed this Agreement as of the date above written.

ATTEST:

Cindy Stuart,  
CLERK OF THE CIRCUIT COURT

COUNTY

By: \_\_\_\_\_  
Deputy Clerk

By: \_\_\_\_\_  
Ken Hagan, Chair

Date: \_\_\_\_\_

**Legal Sufficiency:**

\_\_\_\_\_  
Hank Ennis  
Chief Administrative Counsel

**SUPPLIER:**

By  \_\_\_\_\_

Name \_\_\_\_\_  
Cheol Lee, CEO

Date \_\_\_\_\_

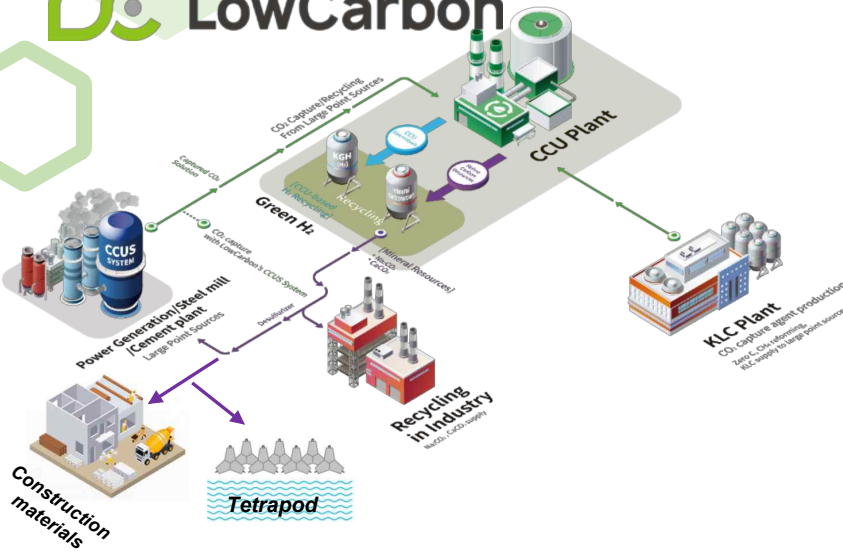
STATE OF FLORIDA  
COUNTY OF HILLSBOROUGH

SWORN TO OR AFFIRMED before me by means of  physical appearance OR  online  
notarization this \_\_\_\_\_ day of \_\_\_\_\_, 2024, by \_\_\_\_\_, who  
is  personally known OR  produced identification in the form of \_\_\_\_\_.

\_\_\_\_\_  
Notary Public, State of Florida

My Commission Expires:

\_\_\_\_\_  
Printed Name of Notary



# HILLSBOROUGH COUNTY

## WASTE MANAGEMENT FACILITY

# CCUS PLANT PROPOSAL

April 3, 2024 rev.5



# **C O N T E N T S**

## **1. INTRODUCTION**

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- 1.2 MISSION & VISION**
- 1.3 INTELLECTUAL PROPERTY RIGHTS**

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- 2.1 DEFINITION OF C C U S (C A R B O N C A P T U R E U T I L I Z A T I O N S E Q U E S T R A T I O N)**
- 2.2 L O W C A R B O N C C U S S Y S T E M**
- 2.3 L O W C A R B O N C C U S**
- 2.4 I N T R O D U C T I O N O F U T I L I Z A T I O N**

## **3. C O M M E R C I A L P R O P O S A L**

- 3.1 S U P P L Y O F S C O P E**
- 3.2 S C H E D U L E**
- 3.3 E S T I M A T E**
- 3.4 E X P E C T E D B E N E F I T W H E N I N S T A L L I N G C C U S S Y S T E M**
- 3.5 P E R M A N E N T C C U S P L A N T N E X T**



## 1. INSTRUCTION

We create a clear sky with LowCarbon environmental innovation technology.

We have secured market competitiveness through continuous increase of production facilities and expansion of research manpower and are growing based on innovative technologies that can change the paradigm of existing industries.

We create a clear sky without fine dust through innovative technology of LowCarbon. The optimal solution for air pollution and global warming is LowCarbon.

We contribute to solving global warming and climate problems with LowCarbon carbon dioxide reduction technology that will realize 2050 carbon neutrality.

Scary flames caused by forest fires continue in Greece and other parts of the world. Few people deny that global warming is a climate disaster. It's time to practice solving the human survival problem of global warming. We will draw a big picture of greenhouse gas reduction through KLC based CCUS technology, which is LowCarbon carbon dioxide capture and conversion catalyst.

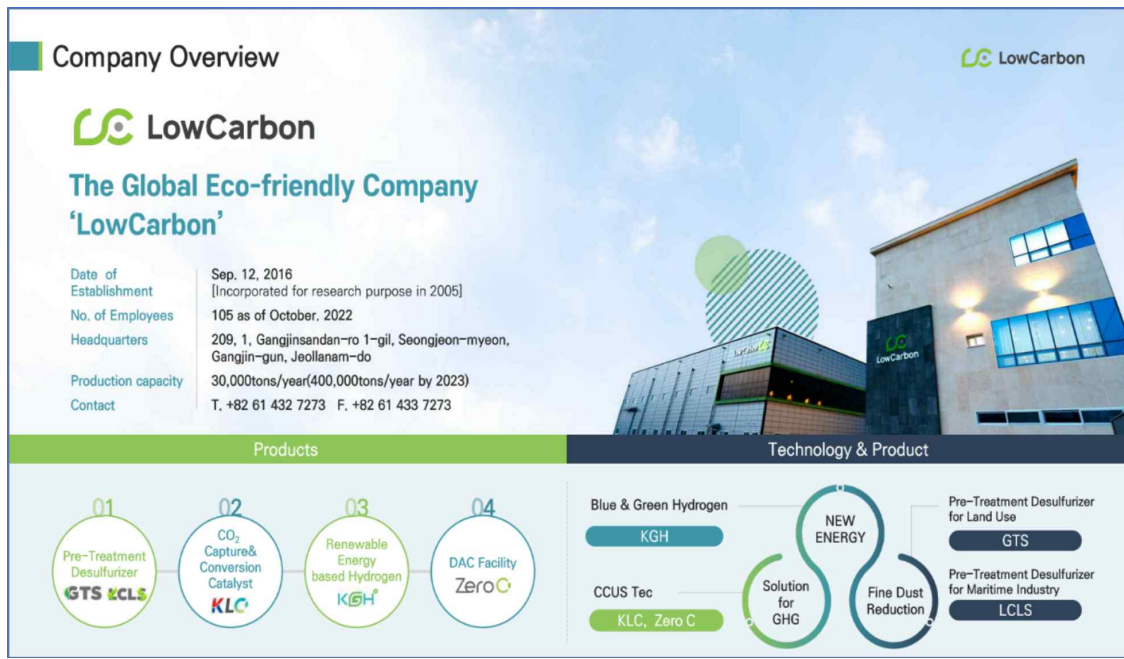
We will achieve 2050 carbon neutrality with LowCarbon technology.

Beyond Blue Hydrogen to Green Hydrogen.

Leading in the energy transition era, we will become world No. 1 environmental company that produces clean hydrogen.

Hydrogen (H<sub>2</sub>) is in the spotlight as an alternative energy source for oil and coal. Korea is taking the lead in creating a hydrogen ecosystem, including the enactment of the hydrogen law. Creating demand and supply through mass production of blue hydrogen will speed up the creation of a hydrogen ecosystem. During NG modification, about 10 tons of carbon dioxide are emitted per ton of hydrogen production. Converts this gray hydrogen to blue hydrogen using CCUS technology from LowCarbon. We will implement a hydrogen ecosystem with LowCarbon technology to convert gray hydrogen into blue hydrogen and blue hydrogen into green hydrogen.

## 1.1 COMPANY OVERVIEW



**Company Overview**

**LowCarbon**  
 The Global Eco-friendly Company  
 'LowCarbon'

Date of Establishment	Sep. 12, 2016 [Incorporated for research purpose in 2005]
No. of Employees	105 as of October, 2022
Headquarters	209, 1, Gangjinsandan-ro 1-gil, Seongjeon-myeon, Gangjin-gun, Jeollanam-do
Production capacity	30,000tons/year(400,000tons/year by 2023)
Contact	T. +82 61 432 7273 F. +82 61 433 7273

**Products**

- 01 Pre-Treatment Desulfurizer (GTS, LCLS)
- 02 CO<sub>2</sub> Capture & Conversion Catalyst (KLC)
- 03 Renewable Energy based Hydrogen (KGH)
- 04 DAC Facility (Zero C)

**Technology & Product**

- Blue & Green Hydrogen (KGH)
- CCUS Tec (KLC, Zero C)
- NEW ENERGY
- Solution for GHG
- Fine Dust Reduction
- Pre-Treatment Desulfurizer for Land Use (GTS)
- Pre-Treatment Desulfurizer for Maritime Industry (LCLS)

## 1.2 MISSION & VISION

### 1.2.1 MISSION



- To purify the global environment with SO<sub>2</sub> reduction technology and CO<sub>2</sub> capture/recycling technology.
- To establish the green hydrogen production system with CCUS based hydrogen resource technology.

global commercialization of CCUS tech, we will implement Uranus Project and will lead the green hydrogen era.

### 1.2.2 VISION OF LOW CARBON

To implement 'Carbon Negative' based on CCUS system

### 1.2.3 URANUS PROJECT

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- To establish a clean industrial cluster for implementing hydrogen system

as a global CCUS leader by accomplishing ceaseless research and development.”

## 1.3 INTELLECTUAL PROPERTY RIGHTS

### 1.3.1 CERTIFICATE

- Ministry of Oceans and Fisheries NET New Technology Certificate
- Certificate of designation of innovative product by Public Procurement Service
- Global IP Star Company
- Certificate of Companies Specializing in materials, parts, and equipment
- Certificate of Outstanding technology Competency(T3)
- Business Innovation Small & Medium Business confirmation

### 1.3.2 IPR (Intellectual Property Rights)

- Domestic
  - Patent: 11 Registered Applied of 17
  - Trademarks: 5 Registered Applied of 81
- Overseas

- Patent: 3 Registered Applied of 21
- Trademarks: 12 Registered Applied of 15
- PCT: Applied of 13
- Patent: 11 Registered Applied of 17
- Trademarks: 5 Registered Applied of 81

## 2 TECHNICAL PROPOSAL

### 2.1 DEFINITION OF CCUS (CARBON CAPTURE UTILIZATION & SEQUESTRATION)

#### 2.1.1 Technical Background

- 121 Countries around the world have joined the climate alliance with the aim of 2050 carbon neutrality (Net-Zero).
- Major developed countries are shifting to low-carbon Eco-friendly economic structures through expansion of greenhouse gas emission trading systems, imposition of carbon taxes, and carbon border taxes.
- In order to fulfill carbon neutrality, Emitted CO<sub>2</sub> must be collected and treated, and CCUS technology must be introduced for this purpose.
- In particular, CCUS technology is attracting attention as a carbon neutral with high potential in terms of purifying eco-friendly resources by linking and utilizing renewable energy.
- The International Energy Agency (IEA) presents the contribution of CCUS technology to 18% of the total reduction in the global carbon neutral scenario in 2050. IEA (2021)
- The IEA publishes a special report on the role of CCUS in energy conversion, stating that CCUS technology is key to realizing carbon neutrality.
- Although CO<sub>2</sub> emissions can be reduced by using clean energy, CCUS technology is required for industries where CO<sub>2</sub> emissions are inevitable.
- According to the IPCC 1.5°C Special report, the necessity of carbon neutrality in 2050 is suggested globally to control the increase in the global average temperature to within 1.5°C compared to before industrialization.

At the Paris Climate Conference (COP21), G20 members agreed to double clean energy R&D over the next five years through the declaration of an innovation mission and select CO<sub>2</sub> Capture/Utilization/Storage technology as the main investment technology.

#### 2.1.2 Trends of CCUS

- The global supply and demand for CO<sub>2</sub> in CCUS-related industries is 2.9 billion tons per year, flowed by Ammonia (44%), Hydrogen (16%), and Natural gas production (16%) as of 2016, focusing on industries that emit high concentrations of CO<sub>2</sub>,
- In terms of demand, CO<sub>2</sub> is directly used as food, process, industrial gas, or converted into raw materials or substances, and the ammonia and inorganic carbonate industries utilize the generated CO<sub>2</sub> in their immediate process, accounting for 70% of the total CO<sub>2</sub> demand.

- Although CO<sub>2</sub> emissions from power generation are 9.1 billion tons per year, it is essential to reduce the capture cost in order to expand the supply of CCUS because of the low CO<sub>2</sub> concentration of combustion exhaust gas.
- Ethanol, Hydrogen, and Ammonia, which are sources of high concentration CO<sub>2</sub>, have low capture costs, but their emissions are 0.03 times higher than power generation.

Among the CO<sub>2</sub> capture technologies, wet capture technology has the highest level of technological maturity that can be applied to all industries. LowCarbon will apply the wet capture technology for your demonstration plant. However, dry capture technology & separator capture technology are at the pilot test level.

### **2.1.3 Definition CCUS system**

Carbon Capture, Utilization and Sequestration (CCUS) technology is a technology that integrates the technology that prevents carbon dioxide from being released into the air at the source where a large amount of carbon dioxide is produced due to the use of fossil fuels.

It includes technology that captures carbon dioxide generated from industrial facilities and sequestration it in the materials (Carbon Capture & Sequestration, CCS) as well as technology that utilizes carbon dioxide (Carbon Capture & Utilization, CCU) and converts it into useful resource materials with high added value.

## **2.2 LOWCARBON CCUS SYSTEM**

### **2.2.1 LowCarbon CCUS system is,**

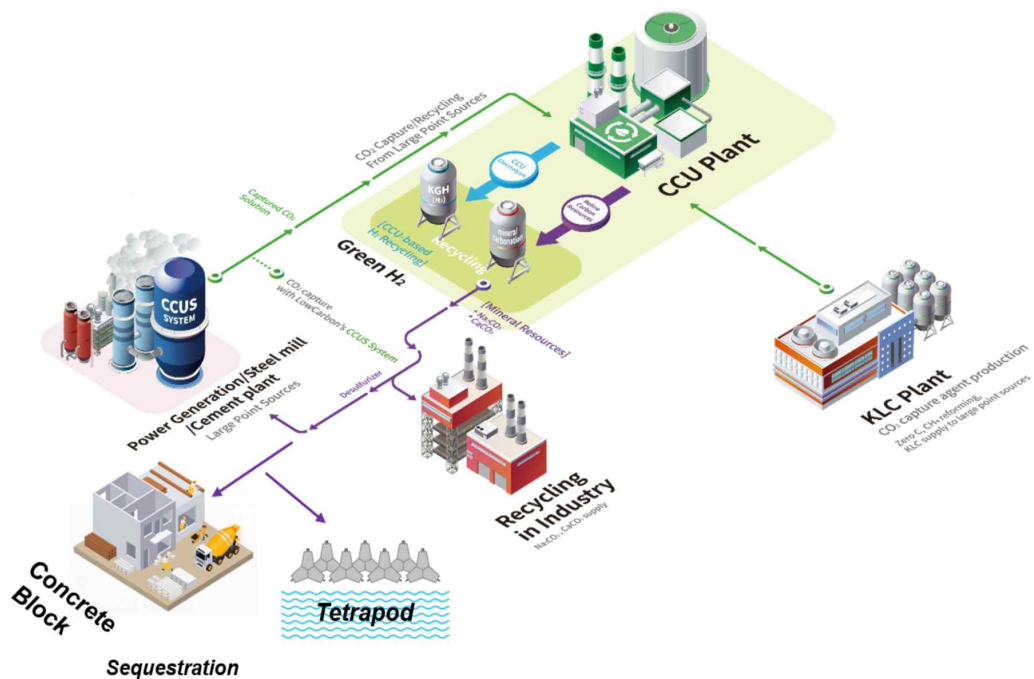
- A technology that captures CO<sub>2</sub>(carbon dioxide) generated during the process in a wet method and converts it into a carbonate resource material.
- It is a system that sprays a KLC catalyst into a scrubber to increase the amount of CO<sub>2</sub> captured and converts it into a carbonate resource material.

### **2.2.2 LowCarbon KLC is,**

- A catalyst that converts CO<sub>2</sub> present in the atmosphere of the pollutant into a carbonate resource material of CaCO<sub>3</sub> by contacting the KLC+H<sub>2</sub>O solution.

## 2.3 LOWCARBON CCUS

A high-purity sodium carbonate powder ( $\text{CaCO}_3$ ) is mixed with cement to be used as Tetrapod or concrete for construction, and the  $\text{CO}_2$  is permanently sequestered.



[LowCarbon CCUS Plant Overview]

- $\text{CO}_2$  generated from industrial  $\text{CO}_2$  emission sources (Incineration facility) is captured by LowCarbon CCUS system.
- KLC to be used as  $\text{CO}_2$  capture catalyst is supplied from LowCarbon KLC production plant and be used for CCU plant.
- Capture and resource  $\text{CO}_2$  with KLC solution in CCU plant : Mineral Carbonation Resources – Recycled as  $\text{CaCO}_3$
- Recycled materials are mixed with cement and used as Construction materials, Tetrapod, and concrete blocks, paints, PVC. Most of all it is widely used as a construction material. Fine powder made of  $\text{CaCO}_3$  is used as a filler in concrete.



## 2.4 INTRODUCTION OF UTILIZATION

### 2.4.1 APPLIED CaCO<sub>3</sub> CCUS Model

Carbon dioxide in flue gas is captured by KLC and converted to carbonate to make CaCO<sub>3</sub>, a resource material.

[Resource CaCO <sub>3</sub> Application]			
	Raw materials for construction	Raw materials for PVC	Raw materials for Paint and coatings

- It is the most perfect system for reducing carbon dioxide and recycling resources by converting carbon dioxide into carbonate form using LowCarbon CCU (Carbon capture utilization) technology.
- Construction materials industry: CaCO<sub>3</sub> is used in construction materials to improve the strength, durability, and fire resistance of the materials. It is also used as a filler to reduce the cost of the materials.
- CaCO<sub>3</sub> is used in construction materials, PVC fillers, paper coatings, protective coating, and Paints. (CaCO<sub>3</sub> is used at about 10 billion tons per year)

- MASS & HEAT BALANCE SUMMARY

□ **CCU PILOT PLANT**

1) 16HR OPERATING TEST

• CO<sub>2</sub> capture

- CO<sub>2</sub> Inhalation amount: 1.062 ton/16hr (66.4kg/hr)

- CO<sub>2</sub> Capturing amount: 0.957 ton/16hr (59.8kg/hr)

- CO<sub>2</sub> Emission amount: 104 kg /16hr (6.5kg/hr)

- CO<sub>2</sub> Reduction Rate (%): 90%

• CaCO<sub>3</sub>

- CaCO<sub>3</sub> Product amount: 1.95 ton/16hr

2) 10HR OPERATING TEST

• CO<sub>2</sub> capture

- CO<sub>2</sub> Inhalation amount: 664 kg/10hr (66.4kg/hr)

- CO<sub>2</sub> Capturing amount: 598 kg/10hr (59.8kg/hr)

- CO<sub>2</sub> Emission amount: 65 kg /10hr (6.5kg/hr)

- CO<sub>2</sub> Reduction Rate (%): 90%

• CaCO<sub>3</sub>

- CaCO<sub>3</sub> Product amount: 1.22 ton/10hr

### **3 COMMERCIAL PROPOSAL**

#### **3.1 SUPPLY OF SCOPE**

In Connection with CCU Plant Project LowCarbon Typical Scope of Supply Is:

During the Pilot phase, LowCarbon will bear the expenses of the KLC.

Major equipment is produced and assembled at the vendor factory and supplied to the site. The connection and installation work of major equipment is done on site.

##### **3.1.1 CCUS 1TON PER DAY**

- **PROPRIETORIAL RIGHTS: PILOT PLANT OF LOWCARBON**
- **SCOPE OF WORK**
  - For the validation of the pilot plant, we independently produce equipment and connect it to an incinerator in order to conduct a demonstration test

#### **3.2 SCHEDULE**

Although some schedules may overlap, the overall project timeline is expected to be as follows.

(In case of quick approval by Hillsborough County, the schedule may be shortened.)

##### **3.2.1 CCUS Pilot for 1 Ton per day**

- It installs the CCUS Pilot equipment and systematically conduct commissioning tests to verify its functionality. The initial installation and validation process takes approximately two weeks to one month.

The Substantiation period will be set at 60 calendar days.

#### **3.3 ESTIMATE**

##### **3.3.1 CCU Pilot Plant for 1 Ton per day**

**This is to be borne by LowCarbon**

The 1-ton pilot plant will be fabricated and installed, and tested at LowCarbon' expense.

#### **3.4 EXPECTED BENEFIT WHEN INSTALLING CCUS SYSTEM**

- 1) CaCO<sub>3</sub> Utilization & Sequestration Profit

- 2) 45Q Tax Credit
- 3) Climate-Related Disclosure
- 4) Carbon Credit (Certified Emission Reductions)

### **3.5 PERMANANT CCUS PLANT NEXT STEP**

This CCUS project aims to progress in stages, starting from a 1 ton per day pilot scale. Following a successful 1 ton per day pilot, a permanent CCUS facility, capable of handling 100 to 400 tons per day, may be proposed if government grant is made available.