



NORTHERN TRUST

THE CARBON ECOSYSTEM

The Carbon Book

DOCUMENT PURPOSE AND DISCLAIMERS FOR USE

The **Carbon Book** has been created in association with the Northern Trust (NT) Carbon Ecosystem, to enable prospective buyers to view information regarding carbon projects that may have Digital Carbon Credits (DCC) available for purchase, and to provide contact information for prospective buyers to externally communicate, discuss, and negotiate directly with project developers for potential transactions.

N.B., A brief project synopsis and highlights are included for information purposes only and have not been reviewed, confirmed or verified by Northern Trust. Project developer contact details are included for the convenience of any prospective buyer.

Northern Trust does not guarantee that:

1. Any project developer with available Digital Carbon Credits will be suitable to a/all prospect buyer(s)
2. Any project developer featured in The **Carbon Book** will be willing to enter into terms for any agreement with a prospect buyer

All users of The **Carbon Book** acknowledges and agree that:

1. It is their sole responsibility to conduct all desired due diligence associated with a potential transaction of Digital Carbon Credits on the NT Carbon Ecosystem
2. All negotiations conducted by or with a project developer in association with a potential transaction, shall not occur on the NT Carbon Ecosystem
3. No information available in The **Carbon Book** constitutes legal, regulatory, financial, trading, and/or any type of advice
4. Northern Trust does not recommend any project or associated Digital Carbon Credit on the NT Carbon Ecosystem

KANSAS, U.S.A.

HIGH PLAINS RECLAMATION PROJECT, GROUP 1: PLUGGING IDLE AND ABANDONED GAS WELLS

DynaVert Holdings, LLC develops and manages projects that generate premium carbon credits. Our clients understand that all project types remain an important part of the set of solutions needed to reach their climate goals. We work with ranching, farming, renewable energy, and methane capture to build a mixed program of project activities that supports both the removal of emissions from the atmosphere and those that avoid further emissions. Our extensive energy experience in the Oil and Gas sector ensures our credits adhere to the highest standards of verification and integrity.

The High Plains, Group 1, Reclamation Project consists of seven idle production wells located in historic Hugoton Gas field in Hamilton & Greeley County, Kansas, originally drilled between 1976 and 2002 to depths of 2,771' to 5,303'. These wells were plugged as part of the initial submissions group utilizing the Methane Capture and Reclamation Protocol which complies with International Organization for Standardization (ISO) 14064-3:2019 standard and utilizing a Reserve Based Probabilistic forecast.

In addition to permanently preventing these wells from leaking methane, and sequestering the gas within the ground, this project provides a host of other benefits to the surrounding environment.

Project Highlights:

- **High Environmental Impact:** Each carbon credit represents a direct reduction in methane, a potent greenhouse gas with eighty times the warming potential of CO₂, creating significant, measurable climate benefits
- **Real:** High Plains, Group 1 prevented a considerable quantity of CO₂e from entering the atmosphere over the next 50 years. This project reduced, removed, and avoided genuine, measurable quantities of GHG emissions
- **Verifiable:** Project underwent rigorous verification by Willowstick Carbon, LLC, an Independent third-party verifier ("TPV"), to ensure that the emission reductions are real, measurable, permanent, and additional
- **Standard:** High Plains, Group 1 utilized, and was compliant with, the Methane Capture and Reclamation Protocol which complies with International Organization for Standardization (ISO) 14064-3:2019 standards utilizing a Reserve Based Probabilistic forecast

As a result of the permanent plugging of these wells, the surrounding areas will experience improved air and water quality, increase habitat for animals, and an economic boost that creates local jobs and incentivizes additional plugging projects.

PROJECT HIGHLIGHTS

-  **CREDITS AVAILABLE**
AVOIDANCE
-  **PROJECT DURATION**
ONGOING (OPERATIONAL)
-  **PROJECT TYPE**
 - ❖ INDUSTRIAL PROCESSES
 - ❖ MANUFACTURING INDUSTRIES
 - ❖ INDUSTRIAL PROCESS EFFICIENCY
-  **STANDARD / METHODOLOGY**
METHANE CAPTURE AND RECLAMATION & INTERNATIONAL ORGANIZATION FOR STANDARDIZATION – ISO 14064-3:2019
-  **VERIFICATION BODIES**
WILLOWSTICK CARBON, LLC
-  **VINTAGES AVAILABLE**
2024
-  **CREDIT TYPE**
VER (EX POST)



CONTACT DETAILS:

DAN ARTHUR
danarthur@dynaertholdings.com

U.S.A.

DYNAMIC CARBON CREDITS

Dynamic Carbon Credits keep your business growing while achieving its sustainability goals. As industries expand, we provide large-scale effective sustainability solutions while supporting productivity. With a growing footprint across the U.S. and beyond, we deliver scalable carbon solutions for businesses of all sizes.

Our agriculturally based Direct Air Capture (DAC) solution sequesters carbon dioxide through a genetically modified, fast-growing industrial plant. The proprietary plant ingests carbon dioxide using biosynthesis. Our offsets have additionality from growing and harvesting. Post harvest, crops go through a pyrolysis generating high-quality biochar. We incorporate biochar and a compost tea ground treatment which also sequesters carbon dioxide. The bacteria application through the vegetative, flowering, and harvest growth stages is a third sequestration path. The Carbon Capture Utilization and Storage (CCUS) mitigates greenhouse gases and improves the land's ability to adapt to a climate related crisis - a twofold strategy to propel businesses.

Our DAC solution permanently sequesters carbon dioxide, absorbs methane, and decreases nitrous oxide. Our biochar's circularity generates no negative by-products and revitalizes soil. We practice no-till farming and consume no electricity while sequestering GHG vs. electricity consuming brick-n-mortar DAC firms. A valuable by-product of our process is biochar - a net-negative solution that serves as an eco-friendly alternative to chemical intensive and fossil fuel-based products. Farmers who partner with Dynamic Carbon Credits are contracted, compensated and supplied with growing and cultivation techniques to deploy our DAC solution while revitalizing marginalized land from the presence of chemicals, fertilizers and toxins.

Project Highlights:

1. Carbon credits are eligible for incentives related to **Section 45Q** of the IRS code
2. **Genetically Modified Industrial Plant:** Enhanced carbon fixation capability, increased biomass production and deep root system development
3. **Bacterial Enhancement:** Carbon-fixing, methane digesting and nitrous oxide reducing bacteria
4. **Biochar Application:** Enhances soil structure and microbial activity
5. **Atmospheric Greenhouse Gas Mitigation:** Carbon dioxide absorption through enhanced photosynthesis
6. **Soil Ecosystem:** Increased organic matter content, enhanced microbial activity and improved soil structure
7. **Carbon Allocation:** Biomass-harvestable carbon above ground and biomass contributing to soil carbon storage below ground
8. **Nutrient Cycling:** Enhanced nitrogen fixation and improved phosphorus solubilization
9. **Water Management:** Improved water retention and reduced irrigation requirements

Co-Benefits:

- **Increased Climate Adaption:** Our activities remove three harmful greenhouse gases and improve the land's ability to adapt to climate impacts such as floods, droughts and wildfires.
- **Enhanced Biodiversity:** Our process restores and protects natural ecosystems by creating habitats for various species and promoting ecological balance.
- **Improved Community Well-Being:** Many of our projects are implemented in rural or underserved communities providing employment opportunities and supporting local economies.



CONTACT DETAILS:

EMILY DAKOSKE
emily@offsets.credit

PROJECT HIGHLIGHTS

-  **CREDITS AVAILABLE**
REMOVAL
-  **PROJECT DURATION**
ONGOING (OPERATIONAL)
-  **PROJECT TYPE**
 - ❖ TECH SOLUTIONS
 - ❖ DIRECT AIR CAPTURE WITH CARBON UTILIZATION
-  **STANDARD / METHODOLOGY**
DIRECT AIR CAPTURE
CARBON CYCLE (CCP) & BIOCHAR CARBON REMOVAL (BCRP) PROTOCOLS(S)
-  **VERIFICATION BODIES**
INDUSTRIAL FORESTRY & WOOD TECHNOLOGY LAB – LCA & DYNAMIC CARBON FOOTPRINT
ENVIANCE SERVICES PRIVATE LIMITED - VERIFICATION
-  **VINTAGES AVAILABLE**
2019-2024 & 2025 ONWARDS
-  **CREDIT TYPE**
VER (EX-POST)

12 RESPONSIBLE CONSUMPTION AND PRODUCTION **13 CLIMATE ACTION** **15 LIFE ON LAND**

PENNSYLVANIA, U.S.A.

VITALECO ORPHAN WELL PLUGGING: MARTHA SMITH

VitalEco is a leader in orphan well remediation and methane prevention in the United States with nine completed projects since 2021. Orphan wells have been permanently sealed in a low-income, senior housing facility in Ohio, a nature conservancy in Pennsylvania, protected wetlands in Louisiana, and agricultural land in Montana. Orphan wells emit methane, a super pollutant that is 80 times more potent than CO2. Methane emissions contribute to ground-level ozone which impacts public health, agricultural yields, water quality, and biodiversity. To date, VitalEco projects have eliminated the equivalent of over 700,000 tonnes of CO2 from entering the atmosphere.

Martha Smith French Creek Valley Conservancy Orphan Well

The French Creek Valley Conservancy in Waterford, Pennsylvania is a nationally recognized watershed and biological "hotspot." It is home to four National Audubon Society Important Bird Areas (IBA) and many species that thrive in the French Creek Valley have been extirpated from their natural ranges due to habitat loss and degradation of water quality.

The Martha Smith natural gas well (API 37-049-224423) was discovered in the Conservancy, reported as venting gas to the Pennsylvania Department of Environmental Protection (PDEP) in 2021, and recorded as an orphan well. It sat on the banks of the LeBoeuf Creek and was in the flood plain with homes within 2,500 feet. The Approval to Plug was accepted, plugging was completed by a local company on December 9, 2022, and PDEP completed its final inspection on December 12, 2022.

Project Highlights:

1. Prevented CO2 from entering the atmosphere over the next 50 years using the CarbonPath Orphaned Well methodology Version 1.3 with a 2022 vintage based on the well plugging date
2. Supports five UN SDG Goals for clean water, innovation, sustainable cities, responsible consumption, and climate action
3. Independently verified using ISO 14064, 14065, 14066, and 17029 standards to ensure project met requirements for additionality, permanence, leakage, and measurement, as well as API RP 65-3 for well plugging and abandonment
4. Adheres to ICVCM Core Carbon Principles as well as "Do No Harm" principle by operating within state and federal regulatory frameworks with government authorities and local landowners to permanently seal the orphaned well, preventing methane and pollutant leaks, restoring the site to support native ecosystems, enhancing public safety while minimizing industrial disturbances, and ensuring alignment with community interests

PROJECT HIGHLIGHTS

- CREDITS AVAILABLE**
AVOIDANCE
- PROJECT DURATION**
ONGOING (OPERATIONAL)
- PROJECT TYPE**
 - ❖ INDUSTRIAL PROCESSES
 - ❖ MANUFACTURING INDUSTRIES
 - ❖ INDUSTRIAL PROCESS EFFICIENCY
- STANDARD / METHODOLOGY**
CARBONPATH DECOMMISSIONING OF ORPHANED WELLBORES VERSION 1.3
- VERIFICATION BODIES**
ALL CONSULTING, ISO 14064-3:2019, API RP 65-3, STATE REGULATION AND FINAL INSPECTION
- VINTAGES AVAILABLE**
2022
- CREDIT TYPE**
VER (EX POST)

6 CLEAN WATER AND SANITATION **9 INDUSTRY, INNOVATION AND INFRASTRUCTURE** **11 SUSTAINABLE CITIES AND COMMUNITIES** **12 RESPONSIBLE CONSUMPTION AND PRODUCTION** **13 CLIMATE ACTION**



CONTACT DETAILS

JAN BELT

jan@vital.eco

U.S.A.

GEMS™ PB-PA PROJECT: HYDROCARBON AVOIDED CONVERSION

The Geologic Environmental Mineral Sequestration (GEMS) PB-PA Project introduces an innovative and effective method for mitigating climate change by stopping the extraction of viable hydrocarbons and sequestering emissions sources deep underground. This transition positive initiative incorporates 100-year deed-restricted covenants prohibiting hydrocarbon development, a 20-year crediting period, 5-year reassessments, and annual monitoring. These proactive measures prevent the conversion of hydrocarbons into GHG, addressing emissions at every stage of the hydrocarbon value chain i.e., extraction, processing, transportation, refining, distribution, and end-use consumption. By offering a comprehensive solution for organizations committed to substantial carbon reduction, the project addresses immediate climate challenges, supporting the global transition to cleaner energy sources, ensuring a positive environmental impact for the next century.

Project Highlights:

1. Based in the Permian Basin, West Texas and covering 43,000 acres over 91 square miles with miles with ~2 million carbon credits generated annually.

2. **Reduction of GHG emissions and other pollutants:**

Hydrocarbon Avoided Conversion reduces a variety of value-chain emissions from upstream, midstream, and downstream sources such as:

<ul style="list-style-type: none">• Crude Production and Extraction• Surface Processing• Transport of Petroleum to Consumers• Transport of Pipeline Gas to Consumers• Gasoline for Cars• Jet Fuel for Planes• Natural Gas and Liquids• Asphalt and Road Oil• Lubricants and Kerosene	<ul style="list-style-type: none">• Methane Flares• Crude Oil Transport• Transport of LNG to Consumers• Fuel Oil for Industrial Use• Diesel for Trucks and Engines• Liquid Heavy Ends for Ships• Liquefied Petroleum Gases• Petro-chemicals Feedstocks• Plastics and Polyester
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3. **Secure Geologic Carbon Storage:**

GEMS 100-Year deed-restricted covenants ensure carbon sequestration in stable underground reservoirs aligning with the global energy transition.

4. **Robust Leakage Mitigation:**

Replacement barrel leakage mitigation addresses production shifting, using a 50% reduction in baseline Barrels of Oil Equivalent (BOE) to ensure credits represent genuine additional emissions reductions.

5. **Multi-Impact Renewable Energy Investment:**

100% of net proceeds is invested in solar farms and battery energy storage systems (BESS), accelerating renewable energy adoption.

6. **In-Kind Replacement Warranty:**

Each credit is secured by a comprehensive in-kind replacement warranty backed by insurance, protecting against reversals and non-permanence risks for 100 years.

7. **Ecosystem and Watershed Preservation:**

Avoiding hydrocarbon production prevents soil erosion, water contamination, and land degradation. GEMS protects habitats and biodiversity, offering co-benefits that may be purchased with Hydrocarbon Avoided Conversion (HAC) credits.

PROJECT HIGHLIGHTS

- CREDITS AVAILABLE**
REDUCTION & AVOIDANCE
- PROJECT DURATION**
20 YEARS
- PROJECT TYPE**
 - ❖ INDUSTRIAL PROCESSES
 - ❖ MANUFACTURING INDUSTRIES
 - ❖ INDUSTRIAL PROCESS EFFICIENCY
- STANDARD / METHODOLOGY**
GEOLOGIC ENVIRONMENTAL MINERAL SEQUESTRATION (GEMS™) VERSION 3.0
- VERIFICATION BODIES**
HAAS & COBB PETROLEUM CONSULTANTS
- VINTAGES AVAILABLE**
2022 - 2026
- CREDIT TYPE**
VER (EX-POST)



CONTACT DETAILS:

BENNY BARTON

benny.barton@badcarbon.com

UNITED KINGDOM

BIOGENIC CO₂ CAPTURE AND STORAGE IN CARBONATED BUILDING MATERIALS

The Carbon Removers (TCR) project focuses on capturing biogenic CO₂ emissions from whisky distilleries and biomethane upgrading plants across the UK. These facilities emit significant amounts of high-purity CO₂ during fermentation and biogas production. Instead of releasing this CO₂ into the atmosphere, TCR captures and liquefies it using modular Nimmons 900 units deployed on-site. The captured CO₂ is then transported to the C-Zero site in South Wales, where it is permanently sequestered through accelerated mineralization, converting it into stable calcium carbonate, which is used in the production of carbon-negative building materials like aggregates.

Project Highlights:

- CO₂ Removal through Circular Economy:** Captured CO₂ is converted into calcium carbonate, providing a dual benefit of permanent sequestration and the production of sustainable construction materials.
- Capturing Biogenic CO₂:** The project captures CO₂ from biogenic sources which are from natural biological processes. These biological processes capture atmospheric CO₂ and ensure that CO₂ is captured and removed efficiently through the fermentation process and our capture technology.
- Innovative Modular Technology:** The Nimmons 900 units are modular and mobile, allowing deployment at diverse sites across the UK, ensuring scalability and flexibility.
- Permanence through Mineralization:** The CO₂ is stored in a highly durable form as calcium carbonate, ensuring long-term storage and eliminating the risk of re-emission.
- Contribution to Net-Zero Goals:** Aligns with the UK's target to reach net-zero by 2050 and Scotland's goal by 2045, making significant contributions to the national decarbonization strategy.

PROJECT HIGHLIGHTS



CREDITS AVAILABLE
REMOVAL



PROJECT DURATION
ONGOING (OPERATIONAL)



PROJECT TYPE
❖ INDUSTRIAL PROCESSES
❖ INDUSTRIAL EMISSIONS
❖ CARBON CAPTURE & STORAGE



STANDARD / METHODOLOGY
ISO 14064 CARBONATED MATERIALS
METHODOLOGY FOR CO₂ REMOVAL
EDITION 2022 v.2



VERIFICATION BODIES
DNV



VINTAGES AVAILABLE
2025 – 2028+



CREDIT TYPE
VER (EX-POST) & PER (EX-ANTE)



CONTACT DETAILS:
SANJAY PAREKH

sparekh@thecarbonremovers.com

BRAZIL

TROCANO ARARETAMA REDD+ PROJECT

1. A large, 1.3-million-hectare site generating ~6.5 million carbon credits per annum
2. Credits generated through Reducing Emissions via avoided Deforestation and Degradation (REDD+)
3. Public, private partnership with Borba Municipality, Amazonas state
4. Project adheres to UK-based carbon standard – Natural Forest Standard (NFS) – exclusively designed for forest-based projects
5. NFS Technical Panel of forestry and earth observation experts with strong academic credentials, led by co-author of Nobel Prize winning IPCC report
6. Robust, transparent, geospatial datasets adds rigor to carbon stock calculations
7. Input and output data quality has been successfully audited by PwC and Frontierra
8. Biodiversity is explicitly included in verification and performance evaluation
9. Reducing pressure on forest ecosystems promotes conservation of biodiversity in the area
10. Forest protection includes active management of illegal logging threats and slash/burn activity
11. Ongoing outreach to local communities to show value of project and to foster cooperation in monitoring forest
12. One initiative funds replanting of degraded areas near Borba Town, ensuring only native species are grown
13. Biodiversity audits are regularly undertaken

Project Highlights:

- Credits directly support community benefits
- Go Balance develops programmes that boost income for local communities and improve living standards – while reducing forest stress
- Introducing honey production with stingless bees
- Clean drinking water provision and other health initiatives
- Eco-agriculture and green manure
- Provision of environmental education
- Collaborating with local experts to meet local needs including Amazonas' INPA and IDAM
- Programmes will expand as voluntary carbon market matures



CONTACT DETAILS:

CIARAN KELLY
ciaran@go-bal.com

U.S.A.

BAYER CARBON PROGRAM U.S. CROPLANDS PROJECT

Bayer is a global enterprise with core competencies in the Life Science fields of health care and agriculture. Bayer is innovating together with a growing number of farmers and partners to advance regenerative agriculture as the way of the future – a future where farming produces more and restores more at the same time.

For Bayer, regenerative agriculture is an outcome-based production model. Key aspects include supporting soil health, mitigating climate change through greenhouse gas emissions reductions and increased carbon removals, conserving water resources through improved water retention and decreases in water run-off, and improving the social and economic well-being of farmers and communities.

Since no one size fits all, the only way for Bayer to attain these outcomes is by matching the right mix of solutions to the specific conditions of each farm. In practice, this means establishing a tailored farming operation – an entire system – that combines different solutions to boost agricultural yields and incomes while also providing measurable environmental benefits. In addition to productivity gains, this approach offers farmers the potential for new revenue streams by rewarding them for their climate and ecosystem contributions – and promotes the development of a market for such value-adding services.

The Bayer Carbon Program is a simple, straightforward program for farmers to enrol in and get paid for implementing carbon-smart farming practices. These farmers are stewards of the land who have implemented sustainable agriculture practices — practices that sequester carbon dioxide from the atmosphere and store it in the soil.

The majority of farmers participating in the Bayer Carbon Program live in the Midwest of the United States. They plant corn, soybeans and/or wheat in a rotation and implement regenerative agriculture practices like no-till, strip-till and/or cover crops on enrolled fields. These crops then go on to feed communities in the US and around the world. Participating farmers are rewarded financially for their carbon-storing practices and often see an improvement in soil quality on their farms as well.

Project Highlights:

- Helps revitalize the ground — by incentivizing practices that can support soil health, reduce erosion, and increase soil water availability
- Third-party verification and quantification with partners like Soil Metrics and NSF
- Generated in line with Nori's peer-reviewed Croplands Methodology

PROJECT HIGHLIGHTS

-  **CREDITS AVAILABLE**
REMOVAL
-  **PROJECT DURATION**
ONGOING (OPERATIONAL)
-  **PROJECT TYPE**
 - ❖ NATURE BASED SOLUTION
 - ❖ SOIL CARBON AND AGRICULTURE
 - ❖ SOIL-RELATED AGRICULTURAL PRACTICES
-  **STANDARD / METHODOLOGY**
NORI CARBON / CROPLANDS METHODOLOGY V1.4
-  **VERIFICATION BODIES**
NSF
-  **VINTAGES AVAILABLE**
2018-2022
-  **CREDIT TYPE**
VER (EX-POST)



CONTACT DETAILS:
GEORGE MAZZELLA
george.mazzella@bayer.com

EUROPE

AGREENA CARBON PROGRAM

Agreena's purpose is to mobilise farmers and corporates to unlock the value of nature and help restore the planet. Agreena has developed AgreenaCarbon – Europe's leading soil carbon programme, operating in 19 countries with more than 1,300 farmers and restoring soil in more than 2.5 Million hectares of farmland (> size of Albania).

Farmers join the programme and provide data to Agreena on their current and historic agricultural practices and the regenerative practices they plan to implement. Agreena verifies the implementation of sustainable practices and quantifies the resulting carbon reductions and removals at the end of the harvest year based on the ISO 14064 methodology.

Project Highlights:

- First soil carbon project to follow rigorous market standards to generate high-integrity carbon credits and insets across 19 countries
- Traceability of impact to exact GPS location enabled by digital Monitoring, Reporting and Verification approaches that use advanced remote sensing, machine learning models to carbon crediting methodology
- Farmer-first impact: Farmers own the credits that they generate and are the direct recipients of the benefits of their efforts which ensures their interests are aligned with project goals while also ensuring the integrity of the credits
- Projected volumes: 2M+ certificates (reductions + removals) per annum

Co-benefits:

Since it promotes regenerative farming practices, the project delivers several positive benefits such as:

- **Biodiversity:** prevents biodiversity loss, increases pollinators, birds, microfauna and nematodes in the soil and farm ecosystem
- **Water retention:** Water runoff reduces by 30-60% in the short term and sometimes fully eliminated after 5-10 years. Furthermore, the reduction of soil disturbance and the presence of cover crops improve soil structure and nutrient uptake. As a result, leaching of nitrates and pesticides into water courses are drastically reduced
- **Food quality:** There is evidence that food grown under regenerative regimes has significantly higher quantities of key nutrients like vitamins B, E, K, calcium, copper and phosphorus



CONTACT DETAILS:

MICHAEL BERTELSEN

Michael.Bertelsen@agreena.com



U.S.A., CANADA, EUROPE

INDUSTRIAL HEMP CARBON PROJECTS

This initiative comprises 16 projects across the USA, Canada, and Europe that utilize industrial hemp to foster sustainable agricultural practices and contribute to the long-term sequestration of CO₂. The methodologies involved offer a variety of approaches to harnessing the beneficial properties of industrial hemp for environmental protection and carbon management.

Regenerative Agriculture: During the growth cycle of the hemp, CO₂ is absorbed from the atmosphere through natural photosynthesis, enhancing soil quality and crop yields through regenerative practices. This stage leverages flux towers to quantify the carbon captured, ensuring each plant contributes to the ecological balance and carbon reduction goals.

Industrial Hemp Biochar: As an alternative to conventional biochar, hemp biochar is produced and applied to soils, locking carbon into the ground and enriching soil fertility. This method not only sequesters carbon effectively but also provides a sustainable option for agricultural amendments, enhancing soil structure and health.

Industrial Hemp Biomass Burial: In this approach, hemp biomass is buried in conditions that prevent aerobic decomposition, thus sequestering carbon for an extended period without releasing it back into the atmosphere. This method capitalizes on the natural durability of hemp to provide a stable carbon sink.

Hempcrete and Construction Products: Post-harvest, the biomass is transformed into hempcrete and other construction materials. Used in building, these materials continue to capture and store carbon, extending the lifecycle of sequestered CO₂ well beyond the growth period of the plant. This not only aids in carbon capture but also promotes the use of sustainable building materials.

Monitoring and Verification: To ensure the integrity and accuracy of the carbon sequestration data, the project utilizes Sentinel 2 satellite imagery and flux towers, which validate the net ecosystem exchange (NEE) of CO₂. This rigorous verification process spans from the initial planting through to the construction phase using hemp-based materials, embodied in a detailed Life Cycle Assessment (LCA).

Project Highlights:

- Certified by Control Union, this project aligns with sustainable agriculture supply chains for a variety of sectors
- Offers a cost-effective solution for high-quality engineered carbon removal, serving as a competitive alternative to traditional biochar credits
- Fully aligned with international environmental standards such as the Core Carbon Principles of the Initiative for Climate, Environment, and Carbon Markets (ICVCM), the Carbon Offsetting and Reduction Scheme for International Aviation (CORSA), and Article 6.2 of the Paris Agreement. The project generates co-benefits like improved crop yields, enhanced soil health, reduction in fossil-based fertilizers, soil decontamination, pollutant absorption, sustainable end-product use, and the creation of green jobs, making it a holistic approach to environmental sustainability and carbon management



CONTACT DETAILS:
DARREN BONDAR
darren.bondar@hempalta.com



CANADA

HIGHWAY 101 LANDFILL GAS CAPTURE PROJECT

The original ~84-acre landfill site opened in 1976 and accepted ~4 million tonnes of waste until 1997. Gas is now extracted from 75 vertical collection wells installed in the landfill. A network of pipes is used to transport the collected gas from the wells to the power plant located at the eastern edge of the landfill. High pressure, centrifugal blowers and compressors located at the power plant apply vacuum to the collection piping to extract LFG (landfill gas) from the wells.

Electrical power is generated via combustion in two reciprocating engines that are specifically designed to operate on LFG. Each of the two engine sets is rated to produce roughly 1,063 kilowatts of electricity. An LFG flare is available as a back-up to the generating station, although the power plant accepts all the LFG that is recovered. The LFG is first treated to remove moisture and particulates. The treated LFG is then pressurized, cooled and injected into engines that are coupled to generators. Combustion of the gas in the engines powers the generators to produce electricity that is then delivered to the electrical grid.

Project Highlights:

- A control system is used to record information about each engine's performance including engine operating hours, engine pressure and temperature, and exported electricity
- The flow rate and concentration of methane is measured as it flows from the landfill site into the engines



CONTACT DETAILS:

ETHAN GILMORE

eg@cut.eco

CANADA

ST FÉLICIEN BIOMASS CONGENERATION PROJECT

The St. Félicien Biomass Cogeneration Plant project uses biomass from the local sawmill for thermal production, displacing fossil fuels for both electricity generation and drying lumber and avoiding the methane emissions associated with decomposing biomass. These include carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), sulphur hexafluoride (SF₆), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs).

As well as the displacement of fossil fuels with the use of biomass for thermal production, the project scenario includes the diversion of biomass from landfill and the avoided decomposition and release of GHG emissions.

In addition, the baseline scenario would have natural gas or fuel oil used for the thermal generation in the drying of wood for a local sawmill, whereas in the project scenario this is completed with excess steam from the biomass boiler.

Project Highlights:

- Simultaneous production of electricity and heat using a single primary fuel
- Low-carbon solution to displace the use of fossil fuels
- Reliable and affordable electricity generation



CONTACT DETAILS:

ETHAN GILMORE

eg@cut.eco

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