



## Backgrounder

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**Climate Change and  
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### **Climate Change and Emissions Management (CCEMC) Corporation announces funding for 13 small and medium sized businesses**

*Projects valued at more than \$34 million*

The Climate Change and Emissions Management (CCEMC) Corporation announced plans to fund 13 new clean technology projects, lead by Small and Medium-sized Enterprises (SMEs) on October 31.

The projects will advance carbon capture and storage efforts, enhance energy efficiency and reduce emissions from fossil fuels. Combined, the projects are valued at more than \$34 million. Each project will receive up to \$500,000 to advance their work.

The following project summaries include descriptive information provided by project proponents as well as media contact information.

The CCEMC applies a standard methodology to estimate emissions reductions and as a result, CCEMC estimates may differ from those of project proponents. Where possible, the CCEMC identifies the estimated GHG emissions reductions over 10 years. In some cases, a project's potential emissions reductions will only be recognized after technology is deployed.

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**Project:** Optimization of Enzymatic System for CO<sub>2</sub> Capture from Oil Sands Production

**Proponent:** CO<sub>2</sub> Solutions Inc.

**Project location:** Province-wide

**Project value:** \$1,789,125

**CCEMC funding:** \$500,000

**CCEMC estimated 10-year cumulative GHG emissions reduction (tonnes CO<sub>2</sub>e):**

Based on the nature of this project, there will be no emissions reductions until the technology moves to the deployment stage.

CO<sub>2</sub> Solutions is an innovator in the field of enzyme-enabled carbon capture and has been actively working to develop and commercialize the technology for stationary sources of carbon pollution. CO<sub>2</sub> Solutions' technology lowers the cost barrier to carbon capture, sequestration and utilization, positioning it as a viable CO<sub>2</sub> mitigation tool, as well as enabling industry to derive profitable new products from these emissions. CO<sub>2</sub> Solutions has built an extensive patent portfolio covering the use of carbonic anhydrase, or analogues thereof, for the efficient post-combustion capture of carbon dioxide with low-energy aqueous solvents.

CO<sub>2</sub> Solutions Inc., working with a major Alberta oil sands producer, will optimize at bench-scale, its biotechnological innovation for low-cost carbon capture from natural gas combustion emissions. The one-year project will prepare the technology for pilot testing at a site of the oil sands partner. The technology is based on the use of an enzyme which functions in humans for the management of CO<sub>2</sub> during respiration, carbonic anhydrase (CA). When introduced in a packed tower scrubbing system, the carbonic anhydrase technology substantially improves CO<sub>2</sub> capture efficiency with low-energy solvents. The technology has strong potential as an economic solution for the large-scale reduction of CO<sub>2</sub> emissions in Alberta, particularly from in-situ oil sands operations.

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**Project:** Direct Air Capture – Pilot Plant Demonstration

**Proponent:** Carbon Engineering Ltd.

**Location:** Calgary, Alberta

**Project value:** \$1,263,783

**CCEMC contribution:** \$499,901

**CCEMC estimated 10 year cumulative GHG emissions reduction (tonnes CO<sub>2</sub>e):**

Based on the nature of this demonstration project, there will be no emissions reductions until the technology moves to the deployment stage.

Carbon Engineering (CE) was founded to design and commercialize technology to cost-effectively capture carbon dioxide directly from the atmosphere at industrial scale. Direct air capture of CO<sub>2</sub> enables large facilities to manage emissions from any source or location so that industrial economies of scale can be applied to the large fraction of emissions that come from distributed and mobile sources such as vehicles, airplanes, and buildings. CE's air-capture process is likely to be profitable under current and emerging legislation on CO<sub>2</sub> emissions in specific markets, such as under California's Low Carbon Fuel Standard. The technology can serve to provide CO<sub>2</sub> for enhanced oil recovery, which creates high-value low carbon-intensity liquid fuels. CE was founded in 2009, is based in Calgary, and currently has 11 employees

CE has recently completed research and development and proof-of-concept phases for their direct air capture technology. CE is now moving to build and operate a small-scale commercial pilot plant within the next three years, which will process atmospheric air and provide pure pipeline-quality CO<sub>2</sub> to an industrial consumer. This pilot plant will be a key enabling step in driving the technology towards deployment-readiness, where there is enormous potential to reduce emissions from sectors that are currently proving costly or difficult from which to mitigate.

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**Project:** Cryogenic Carbon Capture with Energy Storage (CCCES)

**Proponent:** Sustainable Energy Solutions

**Location:** Orem, Utah

**Project value:** \$1,000,000

**CCEMC contribution:** \$499,999

**CCEMC estimated 10 year cumulative GHG emissions reduction (tonnes CO<sub>2</sub>e):** Based on the nature of this demonstration project, there will be no emissions reductions until the technology moves to the deployment stage.

Sustainable Energy Solutions (SES) was founded in 2008 in response to a growing need for solutions to sustainability problems within the energy industry. SES is primarily focused on the development and commercialization of Cryogenic Carbon Capture, a patented carbon capture technology developed in 2008. Since its founding, SES has filed several additional patents on multiple technologies to help realize SES' mission: Create practical solutions to help solve energy problems on a regional and global scale.

Sustainable Energy Solution's CCCES process stores energy efficiently and changes load rapidly over a significant fraction of a power plant capacity. This technology can reduce peak load parasitic losses by shifting loads to non-peak or cheaper generation times. The rapid load change capability provides major grid management capacity that is essential to accommodate intermittent supplies, such as wind and solar energy.

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**Proponent:** E3P Technologies, Inc.  
**Project:** High Efficiency Engine Project  
**Location:** Alberta  
**Project value:** \$5,783,756  
**CCEMC funding:** \$500,000

**CCEMC estimated 10 year cumulative GHG emissions reduction (tonnes CO<sub>2</sub>e):**  
17,667 tonnes

E3P Technologies, Inc. is an Alberta based company which has been researching and developing industrial technology for over 10 years. The Corporation has over 400 shareholders primarily based in Alberta. The company has two employees and several consultants. E3P is located in Calgary and is researching and developing industrial technology.

CCEMC has approved funding support for the initial development of a 100 hp high-efficiency lab scale engine as part of multi-year project to develop a higher hp engine which could be deployed in the upstream gas sector to potentially assist in mitigating GHG emissions. The advancement of the project is contingent on securing additional funding participants, as well as final company and regulatory approvals.

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**Project:** Stack-Top Temperature Reduction Project

**Proponent:** Global Analyzer Systems

**Location:** Manufactured in Calgary, Alberta; may be implemented in gas plant facilities throughout Alberta as well as internationally

**Project value:** \$998,342

**CCEMC contribution:** \$300,000

**CCEMC estimated 10 year cumulative GHG emissions reduction (tonnes CO<sub>2</sub>e):**

145,470 tonnes

Global Analyzer Systems was formed in 2007 by a group of employees after the tragic passing of their founding CEO, Glenn Sabo. Committed to continuing the tradition of providing Alberta's energy producers with equipment and service of the highest quality, Global's reputation for dependability and expertise in the industry has continued to grow exponentially, allowing them to expand their service portfolio to include state of the art, multi-component Continuous Emission Monitoring Systems (CEMS), Data Acquisition and Control Systems, CEMS Online Reporting, Quality Assurance Plans and Compliance Auditing. Global continues to be a trusted source for CEMS support and regulatory compliance and provides high quality, custom built CEMS solutions for a variety of industries that demand efficient and accurate emission reporting.

The new TRS-CEMS technology will enable sulphur recovery units (SRUs) in Alberta and globally, to reduce stack top temperatures while still meeting Alberta Environment's emission guidelines. The innovation advancement builds upon Global Analyzer's existing CEMS sampling technology to allow for continuous TRS measurement in high temperature incinerator stacks – a technology not currently available. This is an innovative product as it will significantly simplify the process and requirements for reducing the stack top temperatures of sulphur recovery unit incinerator stacks, which directly translates to a reduction in energy consumption as well as lower emission rates of GHGs.

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**Project:** NetZero (Ready) Home Design and Demonstration for Production Housing

**Proponent:** Landmark Group of Builders

**Project location:** The project will be implemented province-wide in Edmonton, Red Deer and Calgary areas.

**Project value:** \$2,500,700

**CCEMC funding:** \$499,200

**CCEMC estimated 10-year cumulative GHG emissions reduction (tonnes CO<sub>2</sub>e):**

1,396 tonnes

Landmark Group of Builders (“Landmark”), a private company with offices in Edmonton, Calgary and Red Deer regions, was founded in 1977 and grows into a multi-divisional organization that provides high quality housing solutions to all segments of the new home market. As one of the largest homebuilders in Alberta, Landmark produces on average 1,000 dwelling units per year. At the present, about 70% of Landmark’s products are prefabricated in the Landmark manufacturing facilities, and over 90% of Landmark houses achieved an EnerGuide rating of 80 or higher. The company’s vision is to be a major North American housing solutions provider recognized for sustainability and for leading a revolution in industrialization of housing construction.

NetZero Energy Homes combine highly energy-efficient house designs and on-site energy producing technologies to achieve zero energy consumption and zero carbon emissions on an annual basis. Today, NetZero Homes are technically feasible, but are not regarded by the customers and the industry as economically viable due to high front-end costs and lack of ready-to-use solutions. The objective of this project is to develop, validate and demonstrate cost-effective NetZero Home designs for mainstream housing production. Project results will help the Alberta homebuilding industry to break the existing barriers to NetZero Homes and a well-developed and proved NetZero Home solution and business model will minimize the risk for technology adoption. The work under this project includes the construction and marketing of 20 NetZero Ready and 30 NetZero Homes across the province. This large-scale demonstration will increase customers’ awareness and foster early adopters, thus having the potential to become the start point of market diffusion of NetZero homes in Alberta. Considering the large scale of housing sector (33,800 new homes in Alberta per year) and long replacement cycle of building products, any small change in technology adoption and diffusion will have remarkable impacts on Alberta’s carbon footprint in the future.

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**Proponent:** Seal Well Inc.

**Project:** Permanent Sealing of GHG Emitting or Sequestration Wells with a Bismuth-Based Metal Alloy

**Project Location:** Province-Wide

**Project value:** \$1,063,000

**CCEMC funding** \$500,000

**CCEMC estimated 10-year cumulative GHG emissions reduction (tonnes CO<sub>2</sub>e):**

10,000 tonnes

Seal Well is a private Alberta corporation organized and incorporated in 2009 for the purpose of commercializing its proprietary well sealing technology. They are located in Calgary and presently have two employees.

Traditional cementing procedures for repairing or abandoning oil and gas wells that leak greenhouse gases are unreliable and, according to some knowledgeable observers, even futile. This will especially be the case if cement is used to seal GHG sequestration wells. The reasons for this lie in the fundamental chemical and physical properties and processes that attend the setting of cement and the long term effects of reservoir fluids in contact with it. Seal Well has developed proprietary plugs and procedures to replace cement that are fundamentally more effective, reliable, and less expensive. The Seal Well CCEMC project is intended to demonstrate that permanent sealing of GHG emitting wells, including and especially those that penetrate CO<sub>2</sub> sequestration reservoirs, can be reliably, economically, and permanently accomplished by utilizing a low melting point bismuth alloy, molded in situ, as the well casing and cemented annulus sealing material.

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**Project:** Pump Jack Optimization and GHG Reduction using Best Available Technology

**Proponent:** Pahl's Preventative Maintenance Corp.

**Location:** Various sites in Alberta

**Project value:** \$886,446

**CCEMC contribution:** \$443,223

**CCEMC estimated 10-year cumulative GHG emissions reduction (tonnes CO<sub>2</sub>e):**

1,560 tonnes

This project will demonstrate the environmental, operating and economic benefits of upgrading existing pump jacks with best available technology to reduce GHG emissions. Fuel gas consumption and GHG emissions will be measured at six units before and after optimization and installation of new state-of-the art control devices. The improvements will be documented and shared with government and industry. The project brings together technology from other jurisdictions and local expertise and shared in a novel manner that will encourage uptake by industry. The advantages include increased oil sales, lower water disposal costs, and lower maintenance costs as well as GHG emission reductions.

This project is contingent on finalization of a contribution agreement between CCEMC and the company.

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**Project:** Energy Efficient Membrane Refining of Olefins for the Petrochemical Industry

**Proponent:** Imtex Membranes Corp.

**Location:** Province-wide

**Project value:** \$6,136,740

**CCEMC contribution:** \$500,000

**CCEMC estimated 10-year cumulative GHG emissions reduction (tonnes CO<sub>2</sub>e):**

Based on the nature of this demonstration project, there will be no emissions reductions until the technology moves to the deployment stage.

Imtex Membranes Corp. is a venture stage membrane technology company, founded in 2007 by parent company, Monteco Ltd. of Toronto, Ontario. Imtex and Monteco are privately held. Monteco has enjoyed a successful history of building new businesses based on innovative environmental technology. Imtex was formed to pursue the development and commercialization of innovative membrane technology for refining olefin gases in the petrochemical industry. Imtex remains primarily focused on this initiative but is pursuing other membrane separation technologies as well. Imtex is located in Mississauga, Ontario and directly employs 12 people.

The Imtex project will refine and demonstrate unique membrane technology for refining olefin gases from olefin-paraffin mixtures in the petrochemical industry. The demonstration will include pilot plant deployment and testing at an operational petrochemical plant site in Alberta.

The applications to be demonstrated will include the separation of ethylene from ethane-ethylene mixtures, propylene from propane-propylene mixtures and the separation of butenes from butanes-butenes mixtures. Conventional means of achieving these separations are various distillation processes, including cryogenic distillation. In all cases, the incumbent separation processes are highly energy intensive. The project will demonstrate the effectiveness of achieving these separations using the Imtex membranes in a hybrid form with existing technology or as a standalone solution resulting in a drastic reduction in the energy used, leading directly to an equally significant reduction in GHG emissions. The potential for significant plant operating and capital cost savings will also be validated. Many attempts have been made over time to develop alternative separations technologies for this application. None have proven to deliver the sustainable and stable separation performance necessary for these applications. The innovation of the Imtex membrane resulted in laboratory demonstrated, long term stable performance and high degree of selectivity for olefin species, qualifying it as a candidate for larger scale demonstration leading to further refinement and commercial adoption.

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**Project:** Engineering of the Natural Gas Dual Fuel Blend System for Heavy Duty Diesel Vehicles

**Proponent:** Hitec Fuel Systems Ltd.

**Location:** Province-wide (Alberta)

**Project value:** \$550,050

**CCEMC contribution:** \$274,218

**CCEMC estimated 10-year cumulative GHG emissions reduction (tonnes CO<sub>2</sub>e):**

Based on the nature of this project, there will be no emissions reductions until the technology moves to the deployment stage.

Hitec Fuel Systems is a leading provider of innovative fleet solutions: natural gas conversions, upfitting, maintenance and repair. With a commitment to quality and service, combined with over 20 years of experience, Hitec helps to meet demand for natural gas vehicle and fleet solutions.

Hitec's proposed dual fuel technology is a conversion technology system that is added to an existing heavy duty (HD) vehicle diesel engine, enabling the HD diesel engine to operate on a high proportion of natural gas (NG) blend. Potentially, up to 60% (or greater) of the diesel fuel can be substituted with compressed natural gas (CNG) when utilizing the Hitec dual fuel technology. CNG, the cleanest of all the fossil fuels, contains less carbon than diesel, consequently producing lower CO<sub>2</sub> emissions per vehicle mile traveled. Installing the Hitec dual fuel system in HD vehicle engines throughout Alberta and Canada will produce tangible, long-term, and sustainable CO<sub>2</sub> emission reductions. Additionally, the technology is expected to provide added operational benefits by reducing heavy duty vehicle fuels costs and boosting engine power.

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**Project:** LWS Energy Storage Solution Pilot Project

**Proponent:** Lancaster Wind Systems Inc.

**Location:** Nisku

**Project value:** \$1,249,837

**CCEMC contribution:** \$500,000

**CCEMC estimated 10-year cumulative GHG emissions reduction (tonnes CO<sub>2</sub>e):**

Based on the nature of this pilot project, there will be no emissions reductions until the technology moves to the deployment stage.

Lancaster Wind Systems Inc. (LWS) has developed an Energy Storage solution that allows electrical energy to be stored and then released when required giving the ability to control energy produced for renewable sources such as wind and solar and also supply base load energy to the grid thus allowing the replacement of non-renewable energy sources.

The LWS Energy Storage Solution Pilot Project will construct and test a prototype of the LWS energy solution in Nisku, Alberta. The prototype has already been commissioned and the Pilot project is the next phase of development. The Pilot project will store energy as compressed nitrogen gas for future use.

Currently electricity is transferred in a closed circuit and it cannot be stored as electrical energy so it must be used when produced.

The LWS system consists of three closed loop systems. The systems use hydraulic pressure to store energy as high pressurized nitrogen for conversion back to hydraulic energy and then electrical energy thru hydraulic motors and generators. The ultimate goal is to use this technology in renewable energy applications to store energy and release it when needed thus allowing the renewable energy to be a viable renewable alternative energy requiring no backup.

Without energy storage, uncontrollable renewable sources of energy such as wind and solar cannot be a replacement for conventional non-renewable energy sources. LWS has solved this problem by being able to store energy.

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**Project:** Regional Municipality of Wood Buffalo Aerobic Landfill Project

**Proponent:** SALT Canada Inc.

**Location:** Fort McMurray, Alberta

**Project value:** \$9,035,000

**CCEMC contribution:** \$500,000

**CCEMC estimated 10-year cumulative GHG emissions reduction (tonnes CO<sub>2</sub>e):**

500,000 tonnes

SALT Canada Inc. is located in London, Ontario and was created in 2008. The company has two principal shareholders and a small number of dedicated investors. SALT was created to environmentally and economically improve the process of landfilling municipal solid waste by rapidly eliminating methane production potential, protecting groundwater against contamination and providing a platform for landfill material recovery and reuse while providing lowest life-cycle costs.

The Fort McMurray aerobic landfill will be rapidly transformed from an anaerobic state to an aerobic condition through the injection of compressed air throughout the site. The anaerobic bacteria that produce methane will perish in the presence of the Oxygen contained within the compressed air. Aerobic bacteria quickly and naturally take the place of the anaerobic bacteria and produce no methane, while transforming the organic material into a “compost-like” material about 30 times faster than the anaerobic bacteria. The entire process will typically be completed in about four years as opposed to over one hundred years under traditional technologies.

Utilizing the Alberta Offsets protocol developed for this purpose, SALT Canada calculates that the Fort McMurray project may reduce emissions by as much as 1.5 million tonnes of carbon equivalent in about four years. They believe this could be the largest landfill carbon reduction project in the world and the single largest carbon offset project in Alberta, to date. This project will demonstrate the environmental integrity of the Regional Municipality of Wood Buffalo within the oil-producing province of Alberta while providing a template for other communities to follow.

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**Project:** Low Energy Produced Water Treatment

**Proponent:** Saltworks Technologies Inc.

**Location:** The project work will be completed in Vancouver, British Columbia. At the end of the project and with proven technical and economic feasibility, the pilot unit will be ready for dispatch to an active Albertan oil sands facility.

**Project value:** \$2,190,000

**CCEMC funding:** \$500,000

**CCEMC estimated 10-year cumulative GHG emissions reduction (tonnes CO<sub>2</sub>e):**

Based on the nature of this project, there will be no emissions reductions until the technology moves to the deployment stage.

Saltworks Technologies Inc. (Saltworks) was established in 2008 and is located in Vancouver, British Columbia. Saltworks is a Canadian privately owned cleantech company that delivers innovative solutions for desalination and water treatment. Saltworks' team of 30 consists of professional managers, engineers, scientists and technicians with experience designing, building, and operating a variety of capital projects in the water, oil and gas, and power utility space. Saltworks has built a portfolio of over 30 patents granted or pending and a global customer base including NASA, the Canadian Navy, Teck Resources Ltd., and a series of major oil and gas firms.

The project objective is to develop and test a robust waste heat driven desalination technology intended for treating highly impaired waters in the Albertan oil sands industry. The technology uses waste heat, which is abundant in the oil sands, to produce freshwater from Steam Assisted Gravity Drainage (SAGD) blowdown water. The results are reduced wastewater discharge, reduced freshwater withdrawal, and reduced emissions compared to conventional treatment technologies. Operating at near ambient temperature and pressures, the plant is built largely from engineered plastics. The project work will be completed at Saltworks' fully permitted Vancouver facility. The focus of the project is to confirm technical and economic feasibility on real SAGD blowdown water while preparing for future scale-up and roll-out. The project is structured to accelerate commercialization by inclusion of industry partners and a field ready unit for operation on an active oil sands facility following the completion of the project.

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