CCEMC

CLIMATE CHANGE AND EMISSIONS MANAGEMENT CORPORATION (CCEMC)

2013/2014 ANNUAL REPORT

This annual report has been converted from its original format of an interactive website. For the full experience of the report, please visit

www.ccemc.ca/annual-report-2014

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MESSAGE FROM THE CCEMC

This year marks the fifth year the CCEMC has been in operation. Over the course of five years, we have transitioned from an idea to a fully operational organization, achieving goals and wielding successes – much like the trajectory of the projects we fund. We have funded over 85 projects with an estimated 10.2 megatonnes of greenhouse gas (GHG) reductions by 2020, not including further reductions expected after broad scale market deployment.

This year, we funded three Clean Energy Production and nine Biological projects, as well as 24 Grand Challenge winners from across the globe working toward finding innovative uses for CO_2. The Grand Challenge was this year's highlight, confirming the CCEMC's entry into the global innovation ecosystem with the best carbon-use technologies chosen from 344 submissions from over 37 countries. Celebrated at Zero 2014, a conference for a low carbon future, these projects each have the potential to reduce 1 megatonne of GHG emissions annually by converting CO_2 emissions into new carbon-based products and markets.

It has been a momentous year and we look forward to continuing our contribution to a low carbon future – and the global cooperation, groundbreaking innovation and renewed economy that comes with it.

Eric Newell, CCEMC Chair

Kirk Andries, CCEMC Managing Director

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CO2
CO2

FUNDING LOCAL AND GLOBAL SOLUTIONS THAT IMPACT THE WORLD

Greenhouse gas (GHG) emissions and climate change are continuing to impact our world, and Alberta's Climate Change and Emissions Management Corporation (CCEMC) is taking action to help lead the world toward a low carbon future.

As a not-for-profit organization, our mandate is to participate in funding initiatives that reduce GHG emissions and improve our ability to adapt to climate change, and our mission is to achieve sustainable GHG emissions reductions while facilitating climate change adaptation. This is accomplished by stimulating transformative change through investments in climate change knowledge, clean technology development and operational deployment.

Funded by the Alberta Government's Climate Change and Emissions Fund (CCEMF), the CCEMC invests money from Alberta's large-scale industrial emitters into clean technology projects. These investments have already created positive results, and in as little as five years we've funded projects that are seeing real, measurable change.

5 YEARS SOLID –
A MILESTONE FOR
CHANGE

87 PROJECTS FUNDED

10.2 MEGATONNES
ESTIMATED GHG
EMISSION REDUCTIONS
BY 2020

Since 2009, the CCEMC has grown from a seed of an idea to a fully operational organization with results – much like the trajectory of the projects we fund.

In a five-year term, the CCEMC has funded and supported projects in clean technology development that are in the process of yielding sustainable results. We've also put emphasis on supporting Alberta's resilience to the effects of climate change through the development of our adaptation platform.

Knowing that greenhouse gas emissions and climate change are a global challenge, in 2013 we searched outside our province to see how the rest of the world was reducing their carbon footprint with our Grand Challenge. Celebrated at the Zero 2014 Conference, the worldwide success of Round One confirmed that our local organization was making a global impact.

It's been five years full of success. And it's just the beginning.

5 YEARS IN OPERATION

6.3:1
Average Leverage

9
Projects Have Reached Completion

10.2
Megatonnes of estimated GHG reductions by 2020

87
Projects Funded

$200.7M
Total investments for clean technology projects rounds 1-8

$2.9M
Invested in Biological projects

$7M
Invested in Adaptation projects

$12M
Invested in our Grand Challenge projects

$145M
Committed to future RFPs

$380.5M
Received from the CCEMF

$1.6B
Total Project Value of all CCEMC Projects

OUR YEAR IN CLEAN TECHNOLOGY INNOVATION

SUMMARY

36
Projects Approved For Funding

$57.4M
Total Project Value

$26.6M
Total CCEMC Contribution

CLEAN ENERGY FUNDING

3
Projects

$24.8M
Total Project Value

$12.4M
Total CCEMC Contribution

56,000
Estimated Emissions Reduction (Tonnes CO_2E) By 2020

BIOLOGICAL FUNDING

9
Projects

$4.3M
Total Project Value

$2.3M
Total CCEMC Contribution

0.9 MT
Annual Estimated Emissions Reductions (Tonnes CO_2E) by 2020

GRAND CHALLENGE FUNDING

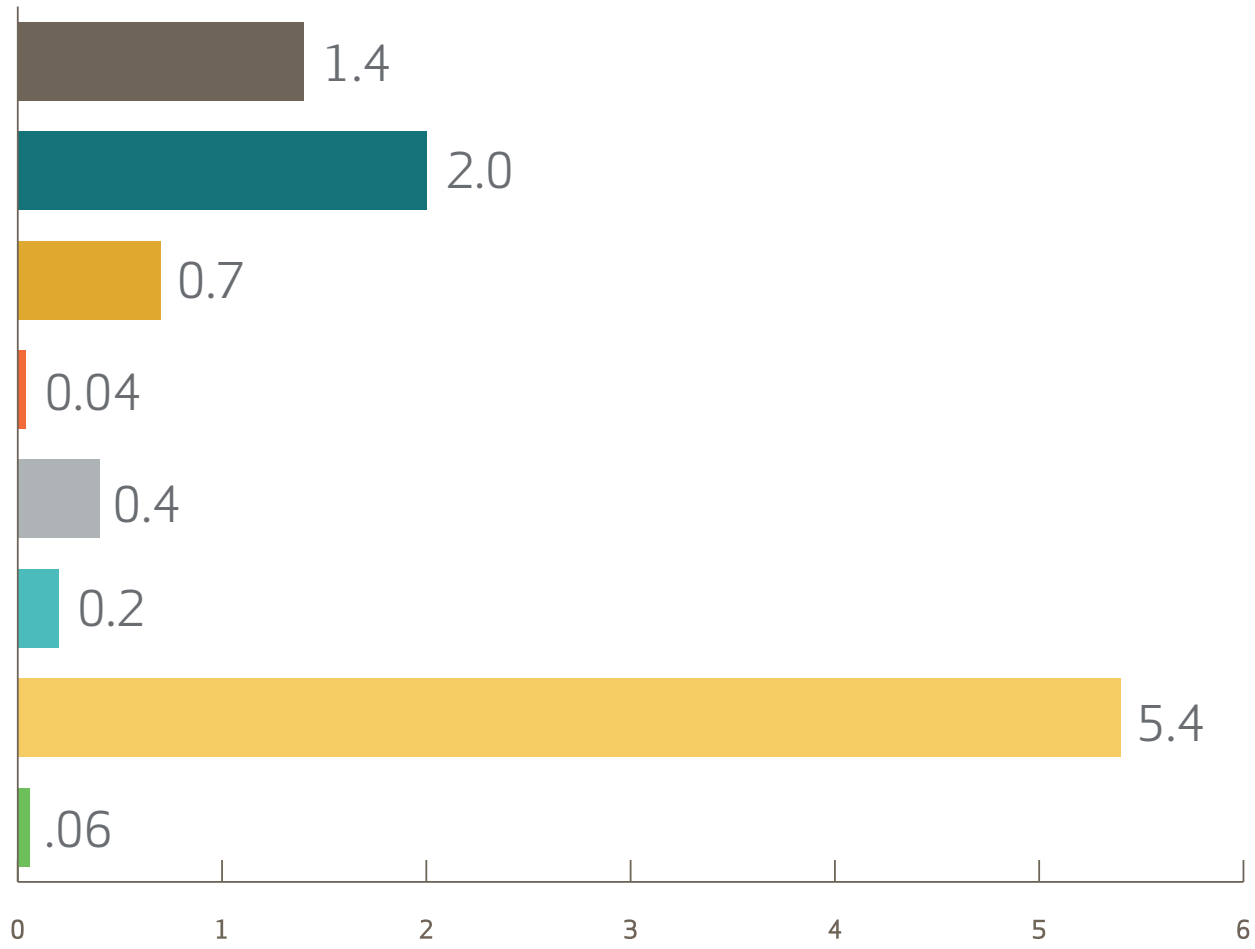
24
Projects

$28.2M
Project Value

$12M
CCEMC Contribution

1 NET MT
Annual GHG Reductions Achieved Once Commercialized

PROJECT EMISSIONS REDUCTIONS BY 2020
(MEGATONNES CO_2E)



CLEAN TECHNOLOGY PROJECTS (JUNE 2010)

CARBON CAPTURE AND STORAGE (JULY 2012)

RENEWABLE PROJECTS (OCTOBER 2013)

ENERGY EFFICIENCY PROJECTS (FEBRUARY 2011)

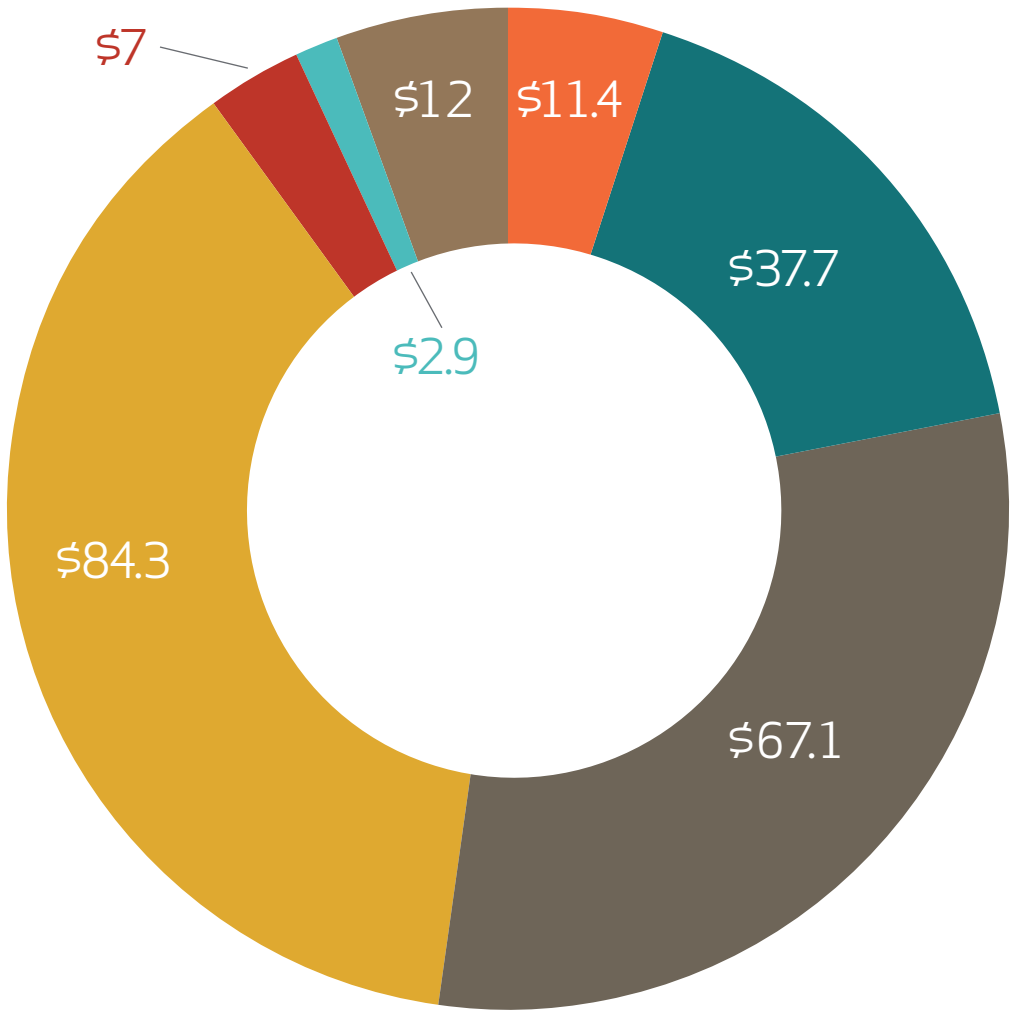
SME PROJECTS (OCTOBER 2012)

CLEANER FOSSIL FUEL PROJECTS (SEPTEMBER 2014)

RENEWABLE PROJECTS (JUNE 2011)

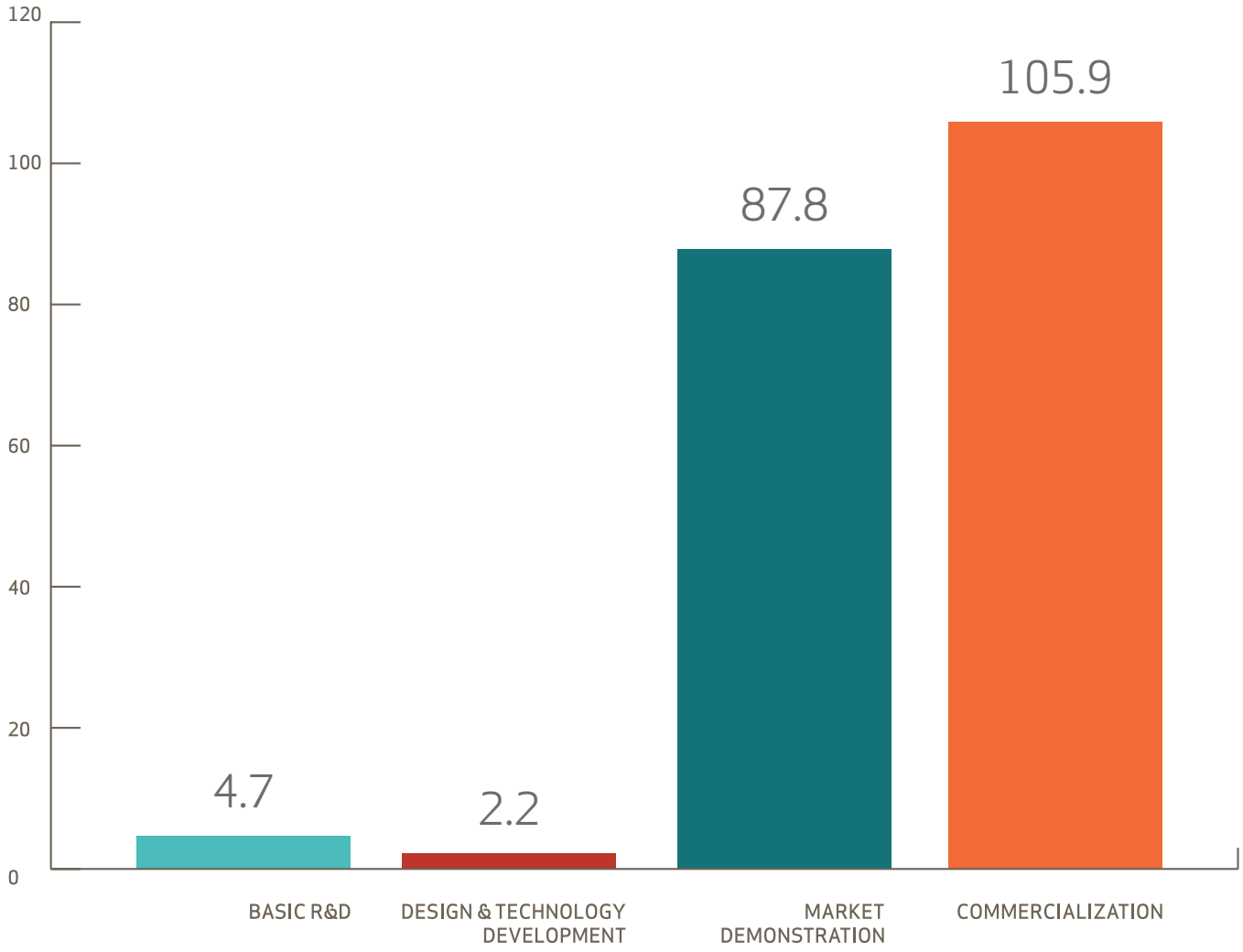
ENERGY EFFICIENCY PROJECTS (NOVEMBER 2013)

FUNDING BY STRATEGIC INVESTMENT AREA
($MILLIONS)



CCS (8 PROJECTS)
RENEWABLE ENERGY (14 PROJECTS)
BIOLOGICAL (12 PROJECTS)
CLEANER ENERGY PRODUCTION AND PROCESSING (12 PROJECTS)
ENERGY EFFICIENCY (14 PROJECTS)
ADAPTATION (3 PROJECTS)
CARBON USES (24 PROJECTS)

CCEMC FUNDING BY INNOVATION STEP
($MILLIONS)



TOGETHER WE'RE CREATING REAL GLOBAL CHANGE

OUR PROJECT ADVANCEMENTS

Over the past five years, the CCEMC has funded many projects in order to reduce GHGs and help Alberta adapt to climate change.

Several projects we funded in our first years of operation have now reached completion and are currently in the process of reducing GHGs. The success of these projects is proof that investing in clean energy innovation leads to the achievement of real, sustainable results – with more to come in the future.

FEATURED PROJECTS

LETHBRIDGE BIOGAS, BIOGAS COGENERATION PROJECT

LETHBRIDGE BIOGAS GENERAL PARTNERSHIP

LOCATION: Lethbridge **CCEMC FUNDING:** $8,200,000 **PROJECT VALUE:** $40,500,000
Estimated to reduce 224,320 Tonnes of CO_2e by 2020 | This project is now operational

Lethbridge Biogas received $8.2 million dollars from the CCEMC to complete their Biogas Cogeneration Project that generates electrical and thermal energy through the anaerobic digestion of organics, reduces greenhouse gas emissions, and helps eliminate landfill waste and odours. The facility is, at this time, the largest biogas cogeneration plant in the country.

See more of our renewable energy projects at ccemc.ca/renewable-energy

OPTIMIZATION OF ENZYMATIC SYSTEM FOR CO_2 CAPTURE FROM OIL SANDS PRODUCTION

CO_2 SOLUTIONS INC.

LOCATION: Province-wide **CCEMC FUNDING:** $500,000 **PROJECT VALUE:** $1,789,125
There will be no GHG emissions reductions until deployment. | In development

Located in Quebéc City, CO_2 Solutions received $500,000 from the CCEMC to brings its Enzymatic System for CO_2 Capture to pilot testing at an oil sands site in Alberta. The technology mimics the human respiratory system's carbon capture process by using the same enzyme, carbonic anhydrase, to manage carbon dioxide.

See more of our carbon capture and storage projects at ccemc.ca/ccs .

BIODIVERSITY MANAGEMENT AND CLIMATE CHANGE ADAPTATION

ALBERTA BIODIVERSITY MONITORING INSTITUTE

LOCATION: Province-wide **CCEMC FUNDING:** $2,400,000 **PROJECT VALUE:** $2,400,000
This project is in its third and final year

The Alberta Biodiversity Monitoring Institute received $2.4 million to complete a Biodiversity Management and Climate Change Adaptation project that will help us understand how our species, ecosystems, and communities need to adapt to climate change.

See more of our adaptation projects at ccemc.ca/adaptation

HTC PURENERGY CO_2 CAPTURE FEED STUDY FOR DEVON'S JACKFISH SAGD FACILITY

HTC PURENERGY INC.

LOCATION: Conklin **CCEMC FUNDING:** $243,259 **PROJECT VALUE:** $486,518
GHG emissions reductions will be achieved through deployment | Project completed

Using their patented Purenergy CCS System, HTC Purenergy Inc. carried out a Front End Engineering and Design (FEED) study and cost estimate for a 1,000-tonne/day capture method in Devon Energy's SAGD boilers at its Jackfish in situ oil sands development. The FEED study allowed Purenergy to demonstrate the success of its post-combustion amine CO_2 capture technology, as well as illustrated the feasibility of applying it across industries and around the world. A pilot project utilizing this technology is now under way at Husky Lashburn.

ALBERTA OIL SANDS ENERGY EFFICIENCY AND GHG MITIGATION ROADMAP PROGRAM

SUNCOR ENERGY INC.

LOCATION: Fort McMurray **CCEMC FUNDING:** $790,905 **PROJECT VALUE:** $1,659,687
GHG emissions reductions will be achieved with deployment | Project completed

In collaboration with Jacobs Consulting, Suncor implemented the Alberta Oil Sands Energy Efficiency and GHG Mitigation Roadmap that assessed and quantified the potential GHG emission reductions in a real-time environment during the mining of bitumen, the use of Steam-Assisted Gravity Drainage (SAGD), and upgrading.

With their initial study completed, Suncor was able to identify a foundation and direction for future work to improve the energy efficiency of oil sands operations and reduce their GHG emissions.

FEATURED PROJECTS

WEYERHAEUSER GRANDE PRAIRIE EVAPORATOR PROJECT

WEYERHAEUSER COMPANY LTD.

LOCATION: Grande Prairie **CCEMC FUNDING:** $5,000,000 **PROJECT VALUE:** $81,791,227
Estimated to reduce 406,552 Tonnes of CO_2e by 2020 | Project completed

The Grande Prairie Evaporator Project is the final addition to a clean energy overhaul at the pulp mill.

This high efficiency evaporator system is able to gather an additional 100,000 pounds of steam per hour – the amount the mill was losing – to generate 23 megawatts of electricity. Together with the mill's new recovery boiler and recently completed turbine, the combined project is putting 27 megawatts of green power into the Alberta power grid.

Weyerhaeuser attributes their ability to bring the project to fruition and surpass their original reduction goals to the funding of the CCEMC.

RELIABLE POWER FOR REMOTE LOCATIONS

EVERGREEN ENERGY TECHNOLOGIES INC.

LOCATION: Calgary **CCEMC FUNDING:** $138,983 **PROJECT VALUE:** $277,966
Estimated to reduce 24,533 Tonnes of CO_2e by 2020 | Project completed</H3>

Darryl West – owner, President, and the only full-time employee of Evergreen Technologies – began his start-up technology company in his Calgary garage with a mandate to develop and commercialize new ideas for curbing the energy industry's environmental impact.

Evergreen's Power Pod Technology replaces pneumatics – venting devices that waste natural gas and emit GHGs – with hybrid Direct Methanol Fuel Cell (DMFC)/solar power generation. Using solar power primarily, DMFC provides a reliable source of energy in the darker winter months.

Field testing of the Power Pod system was successful in proving the system is capable of providing reliable power for unattended continuous applications in remote Canadian situations. It also proved that it could replace the need for GHG-emitting power generators and pneumatics. 18 units of the technology have been sold to date, and Evergreen believes that manufacturing Power Pod units in Alberta could be a profitable venture.

POPLAR CREEK PROJECT, ET-DSP™ FOR DEVELOPMENT OF ATHABASCA OIL SANDS

E-T ENERGY LTD.

LOCATION: Poplar Creek **CCEMC FUNDING**: $6,861,860 **PROJECT VALUE:** $20,631,860
Estimated to reduce 18,068 Tonnes of CO_2e by 2020 | Project completed

Established in 2004, E-T Energy Ltd.'s team of eight scientists has developed environmentally friendly, energy-efficient and economically viable methods of oil sands production through the process of Electro-thermal Dynamic Stripping (ET-DSP™). This is an electrical heating technology used extensively in the environmental industry to remediate contaminated soil and groundwater.

The transfer of ET-DSP™ to oil sands production is demonstrating how the use of water and electricity can nearly eliminate the emission of GHGs on-site. After creating a successful pilot test site on its Poplar Creek property, this project has reached completion.

GPHH INTEGRATED BIOREFINERY™ GROWING POWER HAIRY HILL L.P.

GROWING POWER HAIRY HILL L.P.

LOCATION: Hairy Hill **CCEMC FUNDING:** $5,000,000 **PROJECT VALUE:** $40,250,000
Estimated to reduce 107,632 Tonnes of CO_2e by 2020 | Project completed

In the tiny hamlet of Hairy Hill, approximately 100 kilometres east of Edmonton, GPHH has developed the first Integrated BioRefinery™ in Canada. The refinery, also the world's first carbon neutral biofuel plant, utilizes a unique system that processes a number of raw biomass products into high-value products such as fuel ethanol, green power, and bio-fertilizer.

The GPPH Integrated BioRefinery™ is powered by IMUS™, another Alberta technology that extracts useful energy from agricultural waste while destroying all potentially harmful pathogens and reclaiming water. The plant produces ethanol based on local cattle feed wheat and also produces a high-nutrient byproduct that supplies food to a local cattle feedlot. The GPPH BioFuel plant has an energy balance of 1:7, far higher than conventional ethanol at 1:1.4.

It's a technology that has a worldwide application, and GPHH attributes that to the credibility of being affiliated with the CCEMC.

FEATURED PROJECTS

FARMING 4R LAND, PHASE 1

CANADIAN FERTILIZER INSTITUTE (CFI)

LOCATION: Alberta **CCEMC FUNDING:** $199,860 **PROJECT VALUE:** $224,860
There will be no GHG emissions reductions until deployment | Project completed

As a completed biological initiative project, the Nitrous Oxide Emission Reduction Protocol (NERP) is reducing on-farm emissions of nitrous oxide in a quantifiable, credible and verifiable way that allows farmers to earn carbon credits.

After completion of Phase I, CFI found it conclusive that there are both financial and GHG reducing benefits in adopting the 4R technology. Alberta farmers demonstrated their commitment to being strong stewards of the land, as several of them implemented 4R Nutrient Stewardship plans for the 2013 growing season. The business case for 4R Nutrient stewardship is currently being strengthened and aligned with positive environmental attributes, including GHG emissions reductions. All together, the project received extensive media coverage in Alberta, and key stakeholders have expressed interest in utilizing extension tools and materials to support Alberta's producers.

DEVELOPING AN ADSORBING BIOCARBON TO ACHIEVE GREENHOUSE GAS BENEFITS IN THE REMEDIATION OF PRODUCED WATER IN OIL SANDS OPERATIONS

UNIVERSITY OF CALGARY

LOCATION: Alberta **CCEMC FUNDING:** $57,500 **PROJECT VALUE:** $57,500
There will be no GHG emissions reductions until deployment | Project completed

University of Calgary researchers have investigated the use of Alberta-grown biomass – agricultural and forest crop residues (straw and wood) – to clean up chemical contaminants in produced water from oil sands operations. As a result, they developed an activated biocarbon (or biochar) tailored for adsorbing the naphthenic acids in tailings pond water, preventing the formation and release of methane GHG.

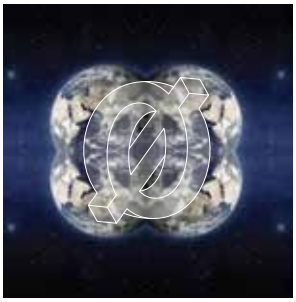
Their completed study concluded that residual biomass from Alberta forest production can be used to produce an adsorbing biochar that has the potential to clean oil sands produced water while reducing GHG emissions and creating a significant sink for atmospheric carbon. Work is continuing in the laboratory to improve the development of an adsorbing biochar using Alberta's biomass resources.

STRATEGIC INITIATIVES THAT REACH BEYOND FUNDING

In addition to our search for innovative climate change solutions, the CCEMC is currently undertaking a number of strategic initiatives. These initiatives are intended to support and expand our goals by enhancing knowledge, engaging key constituencies and informing the decision-making process.

Through initiatives such as collaborating with like-minded organizations and leveraging additional funding for GHG reducing projects, we're creating more ways to contribute to addressing the global climate change challenge.

STRATEGIC INITIATIVES



THE GRAND CHALLENGE

In February 2013, our initiative was to look outside of Alberta to find the best solutions in the world to the global carbon challenge. With 344 project submissions received from 37 countries, our first ever CAD$35 million Grand Challenge enabled us to recognize the most innovative ideas for carbon uses the world has to offer.

With the goal of developing carbon utilization technologies with the ability to reduce at least 1 megatonne of GHG emissions annually, the CCEMC chose 24 projects to receive up to $500,000 each for the first round in order to support the development of their technologies.

The second round of the Grand Challenge will launch in 2015 with the potential for up to five winners to receive up to $3 million each, and the final winning solution will be announced in 2018, where the winner will receive a $10 million grant to support technology commercialization in Alberta.

Winning project must achieve at least 1 net MT GHG reduction annually when commercialized.

ZERO 2014 CONFERENCE

In March 2014, and in partnership with The City of Edmonton, the CCEMC hosted Zero 2014: A conference for a low carbon future at the Shaw Conference Centre in Edmonton, Alberta.

The conference celebrated the 24 Round One Grand Challenge winners from around the world, and functioned as a forum to showcase the proposed technologies to Alberta's innovation ecosystem consisting of venture capitalists and other Alberta-based organizations dedicated to advancing technological development in clean energy innovation.

CARBON MANAGEMENT SYNERGY

With increasing global energy demand and Canada's commitment to reduce GHG emissions by 17% by 2020, the Low Carbon Innovation Alliance (LCIA) has a mission to bring Canada to the forefront of discovery, development and deployment of GHG emission reducing technologies.

The organizations involved in the LCIA meet regularly as senior-level decision makers to identify opportunities for synergies, work together to reduce barriers to collaboration, and annually review progress and assess performance of innovation in GHG emissions reduction in Canada.

THE LOW CARBON INNOVATION ALLIANCE MEMBERS

Alberta Innovates – Energy & Environment Solutions
Alberta Innovates Technology Futures
Carbon Management Canada
Climate Change and Emissions Management Corporation
Canadian Oil Sands Innovation Alliance
NRCan
Sustainable Development Technology Canada

LEVERAGE

The CCEMC developed a leveraging model to attract industry and other financial resources to support selected projects and spur further clean energy innovation.

Currently, for every $1.00 the CCEMC invests in a project, another $6.30 is also supplied from other investors. With this leverage, our funded projects are valued at nearly $1.6 billion.

In addition, the CCEMC is currently working with a potential partner interested in making a joint investment in an RFP targeted at small and medium sized enterprises.

BIOLOGICAL PROJECTS

Biological sources - such as the livestock or forestry industry - can provide large carbon reductions, and the CCEMC has an initiative to conduct three demonstration projects and five to seven research projects annually in this field. The results of these biological projects will be used to advance the application of biological technologies to provide leading-edge solutions to reducing GHG emissions.

STRATEGIC INITIATIVES

ADAPTATION PERFORMANCE

Focusing on adaptation allows us to understand the effects of climate change now so that we can take preventable measures in the future to protect our environment. Adaptation projects help enhance our understanding of the impacts of climate change and the potential responses needed for the preservation of wildlife, ecosystems, forestry and watersheds.

The CCEMC is currently developing performance metrics for adaptation and tracking the performance of approved adaptation projects.

COMMUNICATIONS

This year, the CCEMC expanded its communications program to target strategic audiences across Canada and in select areas globally. Notable examples include holding a series of meetings in other jurisdictions with policy makers and influencers, as well as deploying our first public province-wide advertising campaign featuring CCEMC funded projects.

Our communications program has been designed to better inform Canadian leaders (federal, provincial, business, and others) about the CCEMC, its performance, and the success of technology funds.

CCEMC COMMERCIALS:

Commercials available at youtube.com/CCEMCcanada

36 FUNDED PROJECTS DRIVING CHANGE

This year's funded projects made an impact that extends beyond Alberta. With a grand total of 36 projects funded – the most we've ever supported in one year – this year also marks the first time we funded projects on a global scale.

In Round One of our Grand Challenge, we searched internationally to find innovative technologies to convert CO_2 emissions into new carbon-based products and markets.

With a successful response, the Grand Challenge is just the beginning of the CCEMC addressing the carbon challenge on a global scale.

On a local scale, the CCEMC funded nine Biological projects and three Clean Energy Production projects that demonstrated innovative initiatives in their respective fields.


A GLOBAL PROBLEM CAN ONLY BE SOLVED
WITH ANSWERS FROM AROUND THE WORLD.

THE CCEMC GRAND CHALLENGE: INNOVATIVE CARBON USES

7 FUELS	5 CHEMICAL SYNTHESIS	9 SOLID PRODUCTS	3 BIO FIXATION	344 TOTAL PROJECT SUBMISSIONS

GRAND CHALLENGE PROJECTS

FUELS

By transforming CO_2 into valuable energy sources, these projects include innovative ways to produce valuable methanol, syngas, and transportation fuels.

PIONEER ENERGY – USA

High-Value Synthetic Chemicals and Gasoline Drop-In liquid Fuels from Canada's CO_2 and flare gas emissions

Based on over a decade of research from NASA, the DOE and a number of industrial projects, Pioneer has developed a process to create butanol from greenhouse gases. Butanol is an attractive alternative fuel substitute and has many other applications.

Solving The Challenge

The Butanol from Greenhouse Gases (BFGG) process creates a liquid-fuel substitute for gas and diesel from GHG emissions that can be converted to a number of chemicals safe for commercial use.

Stage of Innovation & Market Potential

Pioneer expects the BFGG process to be ready for commercialization in two years. Within that time, the goal is to validate the process and prepare the groundwork for testing at a pilot plant.

Benefit

Pioneer's process can help reduce environmental impacts while increasing economic growth in Alberta and other parts of the world. The process creates an alternative fuel that has several uses and can be inexpensively produced in almost any region. In addition, low water requirements make the development cycle simpler, faster, and less capital intensive.

Economic Impact

If implemented, BFGG's process will create an alternative fuel to meet a gasoline supply deficit with the capability of shipping to other areas of the world, and provide access to a growing global alternative fuel and petrochemicals market.

UNIVERSITY OF CALIFORNIA RIVERSIDE – USA

CO_2 Conversion to Methanol through Bi-reforming.

The University of California Riverside (UCR) has created an innovative catalyst to be used in the conversion of CO_2 and Methane (CH4) to produce methanol – a valuable fuel and intermediary chemical.

Solving The Challenge

Using a new, efficient catalyst, UCR's project combines CO_2 and CH4 into synthesis gas, which can then be converted into methanol.

Stage of Innovation & Market Potential

The project is estimated to be five to seven years away from the marketing, design construction and production of a greenfield plant. The demand for methanol is increasing in markets globally, particularly in China and North America.

Benefits

Methanol is a commodity chemical that is readily and immediately marketable for a wide range of processes as an intermediate and as a fuel. Additionally, the catalyst that UCR developed can be adopted and used quite easily, minimizing technical and economic risk.

Economic Impact

This technology will utilize resources such as natural gas and large GHG emission sources to create a profitable industry that will manufacture a fuel with high demand both in and outside of Canada.

QUANTIAM TECHNOLOGIES – CANADA

Methanol+: Methanol from Carbon Dioxide and Green Hydrogen

Quantiam Technologies has developed a technology (Methanol+) to combine hydrogen and CO_2 to produce methanol. This process delivers a high-value chemical with a large market and a variety of applications.

Solving the Challenge

Using a unique catalyst database, Quantiam's technology, Methanol+, produces methanol from captured CO_2 emissions and hydrogen. The process simultaneously reduces GHG emissions and produces a high value product.

Stage of Innovation & Market Potential

Within four years, the company hopes to be able to reach an advanced prototype phase and develop a small demonstration facility. By 2020, they hope to reach commercialization of the technology. There is major commercial opportunity expected from both the transportation and petrochemical sectors.

Benefit

Quantiam's technology provides a scalable, low-cost solution to GHG mitigation. It can be implemented on-site to turn emissions directly into a high valued product that is in high demand in global markets. Methanol can be used both as a feedstock for olefin production and as a fuel additive.

Economic Impact

Quantiam's technology has economic benefits that include producing methanol in Alberta to create revenue and meet global demand, creating jobs in Alberta to produce, handle and transport the product, and it will position Alberta as a key supplier of chemical feedstock.

NATIONAL ENERGY TECHNOLOGY LABORATORY – USA

Catalytic CO_2 Conversion to Industrial C1 Chemicals

The National Energy Technology Laboratory (NETL) has created a unique approach to CCS they use renewable energy to power the conversion of captured CO_2 into high-value industrial petrochemicals. This distinct approach helps offset the high cost typically associated with CCS.

Solving the Challenge

NETL's process uses renewable energy sources such as solar or wind power to catalytically convert CO_2 into chemicals for industrial use. It is a hybrid technology: clean energy is used to convert CO_2 emissions into revenue generating chemicals.

Stage of Innovation & Market Potential

The NETL technology is expected to be ready for commercialization in five to eight years.

Benefit

This technology offers the unique benefit of using renewable energy to power the catalytic conversion process. Traditional CCS technologies are cost intensive, but NETL's technology actually offsets many of the costs and illustrates how renewable forms of energy can be used in the manufacturing sector to reduce carbon footprints.

Economic Impact

NETL's approach meets at the intersection between CCS, industrial chemical markets and renewable energy. This intersection has the potential to create new job and business opportunities in the Alberta region.

GRAND CHALLENGE PROJECTS

MCGILL UNIVERSITY – CANADA

Chemical Transformation of Carbon Dioxide via Solar-Powered Artificial Photosynthesis

Using direct sunlight, a technology that was developed for solid-state LED lighting converts CO_2 and non-potable water into commercially valuable chemicals like methanol. Designed by McGill University, this photocatalyst enables an ultra-high conversion efficiency and presents an elegant closed-loop solution for CO_2 and wastewater.

Solving The Challenge

The project uses techniques similar to natural photosynthesis by using only CO_2, sunlight and water. During the process, the CO_2 is chemically transformed into commercially valuable chemical products, including methane (CH4), hydrogen (H_2), Oxygen (O_2), and methanol (CH3Oh).

Stage of Innovation & Market Potential

McGill is currently working to deliver a fully functional system that can demonstrate the technology successfully. The largest market for the technology will be where large amounts of CO_2 are produced, which includes Alberta.

Benefit

Using the nitride nanowires as a platform technology enables a more streamlined development and production of a range of products and technology solutions, including the solar CO_2 converter. The system for the conversion process itself provides an elegant closed-loop solution for the use of CO_2 and wastewater.

Economic Impact

Economic benefits from the project would include the production of value-added products from a direct and low cost CO_2 and wastewater conversion process, new jobs created to meet manufacturing demand, and the reduction or elimination of costs associated with CO_2 conversion.

ROBERT GORDON UNIVERSITY – UK

Integration of Advanced Hybrid Inorganic Membranes for Carbon Dioxide Conversion

Using a small robust catalytic converter, Robert Gordon University (RGU) has created a process that uses CO_2 directly from flue gas at coal and natural gas power stations, or oil sands upgrader plants, to create a variety of commercially important intermediary and feedstock chemicals.

Solving the Challenge

Using a catalytic membrane reactor, RGU has created a technology where CO_2 is converted into useful chemical components. The highly dispersed catalyst converts the feed gases into highly useful chemical constituents such as Fischer-Tropsch fuels, hydrogen and ammonia/urea.

Stage of Innovation & Market Potential

The technology is expected to be ready for commercialization by 2020. The largest market for the technology is expected to be in North America because of the large concentration of fossil fuel generating plants and the availability of low cost natural gas.

Benefit

This technology is a simple, economic, scalable and easily deployable system that yields a value-added product that will result in significant reductions of GHGs. The process uses CO_2 in flue gas directly and does not use any pre-separation steps, giving it a unique advantage over using pre-separated and purified CO_2.

Economic Impact

Economic benefits from the technology include income from the production and sale of high-value chemicals, an increase in employment in off-gas processing and transportation, and further investment and development of chemical processing.

UNIVERSITY OF ALBERTA – CANADA

Novel Internal Dry Reforming Solid Oxide Fuel Cell Technology for CO_2 Utilization

In a unique approach, the University of Alberta (U of A) has developed a fuel cell that can combine natural gas, CO_2 and air to produce carbon monoxide (CO), water and electricity. Where traditional conversion methods consume energy, this reaction creates it, as well as water and CO, an important and profitable commercial chemical.

Solving the Challenge

Using a fuel cell, the reaction combines methane (CH4), CO_2, and oxygen to produce CO, water and electricity. This fuel cell eliminates CO_2, produces an important industrial raw material (CO), and generates a comparable amount of electricity.

Stage of Innovation & Market Potential

It is expected to take five years to produce the process conditions necessary to make the technology viable and ready for use with large-scale fuel companies.

Benefit

This process creates electricity by consuming CO_2. It also releases energy instead of requiring energy input like traditional reactions used to convert methane and CO_2 into syngas. Furthermore, the required fuel mixture for the cell can come from biomass, supporting Alberta's goal of utilizing biomass to its fullest extent.

Economic Impact

From the technology, Alberta will be able to utilize a natural gas reserve that also reduces CO_2 emissions, generates electrical power without greenhouse gas emissions, and increases the availability of CO as precursor for chemical production such as methanol.

ENERKEM INC. – CANADA

Valorizing Industrially Produced CO_2: A Reliable and Cost Effective Solution for Carbon Capture and its Conversion to Marketable Products

Enerkem has developed a technology to convert CO_2 into syngas (hydrogen and carbon monoxide) using a catalytic conversion. With the ability to create syngas at varying ratios, Enerkem can produce a variety of intermediary chemicals that lead to high-value chemical products.

Solving the Challenge

Conceived as a bolt-on small chemical plant/refinery and using a catalytic chemical technology, Enerkem's project intends to convert carbon from industrial CO_2 to an intermediary carbon monoxide (CO). The CO can be used to produce marketable chemical products such as propanol, propionic acid and acrylic acid.

Stage of Innovation & Market Potential

The project is expected to launch a pilot project and reach commercialization at the end of five years. The market potential exists wherever there is an opportunity for CO_2 capture and sequestration.

Benefit

The process would be able to preferentially produce CO, and is small and easily deployable in a number of locations and applications. The nature of the technology allows for production of a diverse variety of valuable chemical products that can be tailored for local need, reducing transportation and storage costs.

Economic Impact

Enerkem's project has a number of economic benefits including developing the chemical sector in Alberta aimed to export into global markets, developing a CO_2 recycling industry that can recycle CO_2 from the petrochemical sector, and the utilization of Alberta's large natural gas resource base.

GRAND CHALLENGE PROJECTS

CHEMICAL SYNTHESIS

Projects in this category focus on transforming CO_2 into high-value chemicals that can be sold or used to create further chemical products.

RTI INTERNATIONAL – USA

Captured-CO_2 Catalyst for the Production of Ethylene Oxide (C3-PEO)

RTI International has developed a process to use the oxygen in CO_2 to convert the CO_2 into useful chemical feedstock. With an environmentally responsible and economically sound process that consumes large amounts of CO_2, the primary products created are sought after in the chemical industry to make everyday products like ski boots and fishing rods.

Solving the Challenge

RTI International's process converts CO_2 and hydrocarbon resources using the oxygen in the CO_2 as a catalyst. The primary products created from the process are ethylene oxide and carbon monoxide. The process can be easily integrated into existing petrochemical infrastructure in Alberta and around the world

Stage of Innovation & Market Potential

In 2020, the C3-PEO process is expected to be ready for commercialization. Because of the usefulness of the primary products created by the process, the technology is attractive to a large group of chemical companies as a method to manufacture common chemical feedstocks in an environmental and economical way.

Benefit

The process is designed to consume high levels of CO_2 and produces high-value chemicals that can be used to make commercial products. The ability to convert high amounts of CO_2 and create feedstock products makes C3-PEO a valuable process. In Alberta, the tecnology would have an almost immediate economic benefit if commercialized.

Economic Impact

RTI International's technology has the potential to add up to $359 million CAD in the first four years of commercialization, provide chemical companies an environmentally responsible alternative way to manufacture common chemical feedstock, and has the potential to meet the established demand for the primary products currently in the marketplace.

LIQUID LIGHT – USA

Converting Carbon Dioxide into Chemicals and Fuels Using Clean, Domestic Sources of Energy in Alberta

Liquid Light's process has the ability to create valuable organic chemicals from CO_2 emissions using renewable energy sources. Offered as a licensable technology, industries could potentially produce more than 60 different organic chemicals that contribute to producing consumer goods like water bottles or materials like polyester.

Solving the Challenge

Using power from renewable sources like wind power, Liquid Light's electro-chemical technology converts CO_2 into organic chemicals like ethylene glycol and water as primary byproducts. With an artificial process similar to photosynthesis, the conversion to organic chemicals occurs without the use of any agricultural resources.

Stage of Innovation & Market Potential

The process is projected to be ready for commercialization as early as 2017. With a large and growing demand for ethylene glycol — increasing by 1 million Tonnes per year — there is a solid demand for a technology that will offer more than 60 different chemicals as the technology matures.

Benefit

Liquid Light technology uses intermittent sources of renewable energy such as wind to create valuable multi-carbon chemicals and produce large amounts of water. These three capabilities contribute to a quadruple benefit: growing renewable energy demand, reducing CO_2 emissions, creating water for industrial applications, and creating valuable multi-carbon organic chemicals.

Economic Impact

The electro-chemical technology developed by Liquid Light will help create economic benefits including consumption of renewable energy resources, profitable technology licensing for emissions producers to create higher profit margins, and an increase in employment to produce organic chemicals in CO_2 emitting industries.

E3TEC SERVICE, LLC – USA

Production of Dimethyl Carbonate (DMC) from Captured CO_2 and Methanol

E3Tec Service has developed a safer alternative to produce Dimethyl Carbonate (DMC) using CO_2 sequestration rather than the toxic chemical procedure currently used. A highly sought after product used in the manufacture of polycarbonates, DMC can be used to produce solvents, fuel additives and lithium ion batteries. The process is energy efficient, environmentally responsible and can adapt to a variety of CO_2 emitting industries in any location.

Solving the Challenge

E3Tec's process captures CO_2 and reacts it with methanol in a distillation process to produce Dimethyl Carbonate (DMC). The process is based on Heat Integrated Reactive Distillation (HIRD). HIRD is an energy efficient process that reduces both energy and capital costs, and replaces the highly toxic phosgene-based process currently in use.

Stage of Innovation & Market Potential

Currently, the team hopes to complete a life cycle analysis to establish net CO_2 sequestration and have the project ready for commercialization in three years. Global consumption of DMC is at 4.9 million Tonnes per year with a 7% annual growth rate.

Benefit

Producing DMC from CO_2 is beneficial, as DMC is a desirable product and consumers are looking for less toxic methods to produce it. Because of this, E3Tec's technology represents significant techno-economic advantages over other CO_2 sequestration methods and products. With a modular design, the process will be adaptable to numerous CO_2 emitting industries.

Economic Impact

Production of DMC in Alberta would have large economic benefits, including the attraction of DMC end-user industries to Alberta such as polycarbonate or lithium-ion battery manufacturers

INSTITUTE OF GAS TECHNOLOGY – USA

Direct Catalytic Synthesis of Acetic Acid from CO_2 AND CH4

The current method for producing acetic acid uses carbon monoxide (CO) and methanol, and emits CO_2. The Institute of Gas Technology (GTI) has developed a technology that uses CO_2 from GHGs and natural gas (CH4) to produce acetic acid. This innovation removes the need for purchasing methanol, provides a net reduction of CO_2 emissions, and reduces the energy needed to produce the same amount of acetic acid.

Solving the Challenge

With GTI's approach, CO_2 arising from GHGs is reacted with CH4 from natural gas in a two-step isothermal, catalytic process. This two-step catalytic process replaces the conventional method for producing acetic acid using carbon monoxide and methanol, providing a cheaper, more efficient method of producing acetic acid.

Stage of Innovation & Market Potential

GTI's engineering scale demonstration and prototype testing is targeted for early 2017. A full-scale demonstration and plant construction – the first of its kind – is targeted to take place by 2020. With a growing demand for acetic acid in Asia and the United States, Alberta would be poised to become a key producer.

Benefit

GTI's technology would help reduce GHG emissions in CO_2 producing industries while producing valuable chemical products, making it potentially the most economical process for creating acetic acid. The process is also energy efficient and doesn't use carbon monoxide, so it reduces energy use and avoids CO_2 emissions.

Economic Impact

With GTI's proposed technology, Alberta's economic benefits would include the positioning of Canada as a key producer and exporter of acetic acid, the creation of jobs to help produce and ship the new product, and an increase of income to CO_2 emitting industries in the province.

GRAND CHALLENGE PROJECTS

UNIVERSITY OF BRITISH COLUMBIA - CANADA

A Coupled CO_2 and Wastewater Treatment Process to Create High Value Gas/Oil Field Chemicals

The University of British Columbia (UBC) has developed a technology that could have a large impact on global CO_2 emissions while addressing dwindling global water reserves. The novel technology uses CO_2 to desalinate industrial wastewater, creating a smaller carbon footprint and an economical alternative to conventional desalination technology. In what could become the standard desalination and wastewater treatment, UBC's technology could have a significant impact on CO_2 removal.

Solving the Challenge

The technology combines salts present in industrial wastewater with CO_2 in an electrochemical cell to mineralize the CO_2 into the form of high-value chemicals such as acids and carbonate salts. This process removes CO_2 while desalinating wastewater. Its modular design makes the technology easy to transport and simple to operate on site.

Stage of Innovation & Market Potential

A pilot scale electrochemical cell that overcomes the technical challenges of the project will be ready for demonstration in the next two years. In 2018, the technology is expected to be ready for commercialization. Based on industrial activity, the key demand would come from Alberta, the United States, Russia and China.

Benefits

The technology addresses a major concern for the oil and gas sector as it converts on-site waste materials to high-value chemicals required by the industry. Wide-scale adoption of the technology in Alberta would result in the removal of approximately 3.5 megatonnes of CO_2 while conserving as much as 170 million barrels of water every year.

Economic Impact

The implementation of the technology in Alberta would expedite the development of Alberta's tight oil and shale gas reserves, provide better access to remote reserves in the province, meet the demand for desalinated water for industrial use, and provide better on-site wastewater treatment for the oil and gas sector.

SOLID PRODUCTS

This area of CO_2 conversion technologies focuses on converting and entrapping CO_2 into an assortment of solid materials. These projects include those that create concrete products, solid fertilizers, carbonates, and pure carbon materials.

NEW SKY ENERGY – USA

Soda Ash and Bicarbonate from a Low Energy Natural Gas Sweetening Process

Using an energy efficient natural gas purification process, New Sky's project will convert CO_2 and hydrogen sulfide (H2S) contaminants from sour gas into valuable commodity chemicals instead of venting the CO_2 from sour natural gas into the atmosphere.

Solving the Challenge

The net result of New Sky's gas sweetening technology is three useful, low carbon products: sweet natural gas, sulfur, and carbonates. The process is energy efficient and economically favorable, with minimal chemical inputs and virtually no waste. Equipment for the process is scalable, inexpensive, and requires no exotic materials.

Stage of Innovation & Market Potential

New Sky's gas treatment and CO_2 mineralization technologies will be ready for broad commercialization as soon as early 2016. Two years from now, New Sky expects to be able to present customers and partners with a robust, scalable, and cost-effective technology that meets the needs in the field.

Benefit

At sour gas sites, the technology will reduce gas treatment costs and CO_2 emissions, and generate revenues from carbonates and sulfur-based products. It would also reduce the CO_2 footprint of glass, paper and other products. Deployed in Alberta, it could reduce over six million Tonnes of CO_2 each year. Deployed worldwide, it could reduce over ten million Tonnes of CO_2.

Economic Impact

This technology brings important economic benefits to Alberta, such as energy efficient sour gas sweetening at a lower cost, the potential to develop sour gas fields that were uneconomical to operate, the production of high value bicarbonates for export or local use, and the potential elimination of costs for sour gas reinjection into the atmosphere.

SKYONIC CORPORATION – USA

Skyonic SkyCycle™ Pilot Demonstration

At its core, Skyonic's SkyCycle™ technology uses waste-heat from the source – a CO_2 emitting plant – to mineralize CO_2 emissions from that same plant. The primary, profitable product from the proposed Canadian SkyCycle™ Plant is hydrochloric acid (HCl).

Solving the Challenge

SkyCycle™ uses a synthetic base to capture the mildly acidic CO_2, which is formed from the thermal decomposition of a hydrated salt. The thermal decomposition yields HCl gas, and the resulting hydrochloric acid regenerates the second salt by reacting with mineral silicates.

Stage of Innovation & Market Potential

By early 2015, Skyonic will install a commercial site pilot plant in preparation for a full-scale commercial plant in 2016. Within two years, they hope to have a pilot-scale module that captures approximately 5,000 Tonnes of CO_2. The CO_2 is mineralized as solid carbonates and the market for these materials is significant.

Benefit

SkyCycle™ is retrofittable and scalable to existing emitters, and produces commercial chemical products at a profit. The technology is indifferent to CO_2 concentrations in flue gas and stores CO_2 as a solid, eliminating the need for costly compression, transport, and storage. The mineral byproducts and co-generated acid are food-grade and suitable for market sale.

Economic Impact

By 2015, Skyonic could be building a 1.3 megatonne/year SkyCycle™ plant in Alberta, helping the province make a significant impact in reducing its emissions, supplying much-needed green chemicals to markets, and creating green jobs for Albertans.

GRAND CHALLENGE PROJECTS

BLUE PLANET LTD. – USA

Carbon Capture and Mineralogic Sequestration: Addressing the World Wide Epidemic on a World Wide Scale

Blue Planet has developed a technology platform called Liquid Condensed Phase (LCP) that creates usable green building products that contain sequestered CO_2. Their LCP solution provides a more efficient, cost effective method for CO_2 emission control for industries from, cement, power, and petrochemical industries.

Solving the Challenge

The LCP process uses natural wastewaters with CO_2 to produce a solution rich in bicarbonate ions. This LCP rich solution can then be used to produce a large variety of carbon-mitigating concrete building materials. These building materials have an emission control service component for refineries, cement plants, natural gas and coal-fired power plants.

Stage of Innovation & Market Potential

Blue Planet expects the LCP technology to be ready for deployment in Alberta in spring 2015 and full-scale deployment in 2017. It provides an emission control solution for CO_2 that is economical and easily utilized, making it marketable to the cement industry, the building materials sector, the power sector, and the petrochemical industry.

Benefit

Blue Planet's system is more efficient at carbon mitigation than current amine scrubbing systems, making it more cost effective. The technology is easily implemented and scalable for a variety of industries at a smaller cost, and CO_2 can be permanently placed in solid carbonate materials such as building materials and roads.

Economic Impact

The economic impacts for Blue Planet's technology include generating extra revenue for CO_2 emitting industries from licenses and service agreements, the production of high-value products that contain permanently sequestered CO_2, and the production of building materials used for provincial infrastructure like roads and buildings.

MCGILL UNIVERSITY – USA

Use of Carbon Dioxide in Making Carbonate-Bond Precast Concrete Products

Carbonation in the cement of concrete products is readily available. McGill's process builds on that process and uses CO_2 to produce an artificial aggregate to be used in the concrete. Because of the unique properties of carbonated concrete, the end product is stronger and more durable than traditional concrete products.

Solving the Challenge

McGill's process uses an advanced self-concentrating absorption process to produce low cost CO_2 that can be collected and converted into calcium carbonates and carbonate bond aggregates for use in concrete products. Similar to existing concrete production methods, the cement binder and aggregates are carbonated with sequestered CO_2 in the process.

Stage of Innovation & Market Potential

McGill is currently researching the utilization of CO_2 within artificial aggregates in concrete, and the technology will be ready for commercialization in 2016. At the commercialization stage, an integrated carbon capture and utilization process will be developed and made ready for production.

Benefit

The technology developed by McGill utilizes carbonated artificial aggregate to produce concrete, and converts calcium compounds to make the final concrete products stronger and more durable. The carbonated content in the concrete will help products win LEED certification and will enhance the economic competitiveness.

Economic Impact

The economic benefits for the process include direct energy savings if natural gas is replaced by CO_2 gas in the concrete curing process, creating a green, durable product that is competitive in the marketplace, waste utilization for value-added products, and a direct emission reduction through utilization.

CCM RESEARCH – UK

High Efficiency Capture Using Novel Fibres in the Production of Soil Conditioning Agents

CCm has created a unique process that fixes CO_2 to base fibre materials to be used for soil conditioners, fertilizers and other polymers. The process delivers a highly efficient permanent capture of CO_2 and creates high-demand products that can help create a positive long-term environmental impact.

Solving the Challenge

During the production of soil agents, CO_2 fixes to fibres and is exposed to another chemical, permanently stabilizing it in carbonate form. The fibre material can then be subjected to other chemical processes, producing a product that can be used as a soil conditioning material or a functional filler in polymers.

Stage of Innovation & Market Potential

Currently, CCm is looking to obtain accurate quantification of CO_2 capture at scale. They expect trial launches in two years with large-scale production coming in three to five years. The largest market will be in soil conditioner materials. Demand for these products is growing in both the developed and developing world.

Benefit

The process developed by CCm combines immediate CO_2 capture savings with the ability to create long-term environmental improvements from product use. The process removes CO_2 permanently from the system and makes money through the sale of products like soil conditioners - making it both environmentally and economically sustainable.

Economic Impact

CCm's process produces income from high-demand products while helping industries avoid of CO_2 production charges. The process will also reduce the production costs for fertilizers and polymers, and creates economic benefits for environmentally sustainable agricultural production.

CARBON CYCLE LIMITED – UK

Process to Capture Carbon Dioxide and Produce Structured Calcium Carbonate and Fertilizer

The premise for Carbon Cycle's project is simple: permanently capture large amounts of CO_2 in a process that produces Precipitated Calcium Carbonate (PCC) and ammonium sulphate fertilizer. With low energy use and high efficiency capabilities, CO_2 is reduced in a process that creates valuable products for both paper and agricultural industries.

Solving the Challenge

The process created by Carbon Cycle utilizes otherwise wasted CO_2 and permanently mineralizes it into Precipitated Calcium Carbonate (PCC) during the process of creating ammonium sulphate fertilizer. The PCC can then be used in a variety of applications, including the paper products industry, while the fertilizer can be used in the agriculture industry.

Stage of Innovation & Market Potential

In 2015, the process is expected to reach commercial optimization and be ready for a large-scale production design. The demand for the technology will be global, and both the fertilizer and the PCC will be useful to Canada because of the agriculture sector in Alberta and the paper-products industry in Canada, respectively.

Benefit

The production of ammonium sulphate and PCC is generally energy intensive and requires high temperatures while Carbon cycle's process produces using ambient temperatures and pressures. The ability to contain certain gases in a flowing gas stream is unique and opens the door to other new and highly useful applications.

Economic Impact

The economic benefits for the Carbon Cycle project include the production of PCC to meet demand for the wood and paper industries as well as for export, the production of low cost nitrogen fertilizer for the agriculture industry, and growth of the labour market for production.

GRAND CHALLENGE PROJECTS

ARCTECH, INC. – USA

HUMASORB®-L for Removal of CO_2, NOx GHGs, along with SOx and Trace Metals from Fossil Fuel Combustion Gases and Recycling of CO_2 into a Value Generation HUMASORB®-CS, a Stable Multipurpose Water Filter

With two innovative products, ARCTECH offers solutions to capture CO_2 from GHG emitting industries and filter industrial wastewater with a solid filter that uses captured carbon. Positioned as passive, low cost products ARCTECH's HUMASORB®-L and HUMASORB®-CS can be used in a number of industries and applications with very little modification.

Solving the Challenge

ARCTECH captures CO_2 using a unique liquid absorbent and converts it into a solid water filter product that removes contaminants from wastewater along with other applications. The liquid absorbent has been proven to remove 100% of CO_2 from coal combustion gases and removes NOx, SOx, and toxic trace metals from greenhouse gas emissions.

Stage of Innovation & Market Potential

In three to five years, ARCTECH expects to be ready for full commercialization of the technology in Alberta. With significant capabilities in the absorption of CO_2 and the filtering of wastewater, ARCTECH expects to reach greenhouse gas emitting industries as well as municipalities.

Benefit

The products ARCTECH produces are flexible and low cost with a variety of unique applications. From capturing CO_2 at the source to being used for environmental cleanup, the products are useful to a number of industries. Because the products are passive, they can also replace active processes and systems that require high costs.

Economic Impact

ARCTECH's products have the potential to contribute value to all major areas of Alberta's economy that generate contaminated wastewater. This includes municipal, manufacturing, mineral extraction, and especially power generation.

JRE PETROLEUM SERVICES – CANADA

CO_2 to Graphene Reactors

JRE Petroleum Services has developed a technology the captures CO_2, combines it with graphite and converts it into graphene. The technology required is small and easily implemented by producers with high CO_2 emissions from a variety of industries. The uses for graphene are continually being developed and represent a large amount of potential.

Solving the Challenge

The technology produces carboxylated layers of graphene that can be used for adding strength to cement or for use in water purification. While many greenhouse gas reduction methods involve storage or conversion into another fuel - only delaying CO_2 emission- this process binds CO_2 into the graphene structure, serving to create a new family of nanoparticle.

Stage of Innovation & Market Potential

The technology could be ready for commercialization as early as 2015, subject to prototype development and field-testing. It would provide major CO_2 emitters in the oil and gas industry in Alberta with an opportunity to both reduce their carbon footprint and create a value-added product for an additional source of revenue.

Benefit

This process creates a stable product that has the ability to keep the captured CO_2 sequestered structurally for over 100 years. This reinforced material can be used for a diverse range of applications - from increasing mechanical strength, to filter water, to potentially serving as a base for high-end electronics.

Economic Impact

The economic benefits for the technology created by JRE include cost reduction based off of greenhouse gas emission reduction, extra revenue stream and job creation from the production of grapheme, and innovation in applications for a new family of nanoparticle.

BIO-FIXATION

Bio-fixation is the use of biological organisms to sequester and convert CO_2 into a variety of products. These projects include bio-fixation from algae, bacteria, and yeast.

INDUSTRIAL MICROBES, INC. – USA

Biological Co-fermentation of Carbon Dioxide and Methane to Malate

Using a biological fermentation process, Industrial Microbes can create malate – a valuable organic compound - from the combination of CO_2 and natural gas. The process is cost-efficient and outperforms traditional malate production methods, consuming CO_2 where other methods create CO_2. Malate has many applications and uses, making it highly sought after in a growing global market.

Solving the Challenge

Malate is produced by natural enzymes inside living cells, similar to how alcohol is produced during fermentation. In Industrial Microbes' process, designer microbes consume CO_2 emissions to produce malate, which is then purified. It can then be used as a food or beverage additive, or it can be chemically converted into a high-performance biodegradable plastic.

Stage of Innovation & Market Potential

Within two years, Industrial Microbes hopes to build a prototype that can produce malate from CO_2 and natural gas. Commercialization is expected between 2018 and 2020. Used as a flavour enhancer in beverages and food or as a pharmaceutical stabilizer in products such as cough syrups, there is a large market for malate that is organically produced.

Benefit

Industrial Microbes' CO_2-based malate is a drop-in replacement for the traditional petroleum-derived malate. This process absorbs CO_2 at high efficiency while petroleum-derived malate produces CO_2 during production. It is estimated that Industrial Microbes' production costs are 50-80% lower than traditional production methods currently in operation.

Economic Impact

The economic benefits from the adoption of Industrial Microbes' technology in Alberta include the development of the first world-scale manufacturing plants for the product in Alberta, an increase in tax revenue and high-quality jobs in related industries, and participation in an emerging market for biodegradable plastics.

UNIVERSITY OF MARYLAND – USA

An Innovative and Highly Efficient Microalgae-Based Carbon Sequestration System to Reduce CO_2 Emission and Produce Valuable Byproducts Including Biofuels in all Climates

The University of Maryland's (U of M) technology integrates multiple breakthrough technologies that efficiently mitigate CO_2 and other GHGs on an industrial scale. The technology also provides the ability to generate additional revenue streams to fund its implementation and maintenance via the sale of valuable byproducts.

Solving the Challenge

In their process, the U of M uses microalgae to mitigate CO_2 from industrial air pollution sources. Once in contact with captured flue gas, the fast-growing, high CO_2-tolerant microalgae consumes CO_2 and other GHGs and vents oxygen via the photosynthesis process. The algal biomass is harvested to produce biofuels, lutein and other byproducts.

Stage of Innovation & Market Potential

After two years, the process will be ready to mitigate greenhouse gas emissions from the power plants at small landfills and wastewater treatment plants. Power plants represent the largest market since the technology works with coal, oil, natural gas, biomass and any other combustible fuel source.

Benefit

The U of M's innovative technology makes it possible to mitigate massive volumes of greenhouse gas emissions on an industrial scale – anywhere in the world and in any climate – while generating byproducts that generate a revenue stream. The resultant biomass is easily convertible to biodiesel and many other marketable products.

Economic Impact

The use of U of M's technology in Alberta can create economic benefits including the reduction of CO_2 and other greenhouse gases throughout the province, additional revenue streams from generated byproducts, investment return creating jobs for installation, operation maintenance, and operation of the technology, and downstream economic benefits from a clean environment.

GRAND CHALLENGE PROJECTS

OAKBIO – USA

Conversion of Industrial CO_2 Emissions into Biofuels and Chemicals

In the effort to make use of CO_2 and H2 emitted from industrial flues, OakBio has developed a biomanufacturing platform that uses a strain of microbes to create bioplastics like butanol for commercial use.

Solving the Challenge

OakBio's approach uses a novel microbial system to convert industrially-emitted CO_2 into butanol, a renewable liquid transportation fuel. The process can continuously separate butanol from the bioreactor from Alberta's highest CO_2 emitting industries — including tar sands mining and upgrading, power generation, and mineral product manufacturing.

Stage of Innovation & Market Potential

OakBio's biomanufacturing platform will be ready for commercialization in six years. The enormous size of the transportation fuels market and the possibility of renewable butanol as a substitute for gasoline offer a realistic opportunity for the technology to significantly reduce CO_2 emissions globally.

Benefit

OakBio's technology creates a flexible platform capable of greatly reducing CO_2 emissions from Alberta industries while producing high-quality drop-in biofuels. This is a benefit for both CO_2 emitting industries such as cement and tar sands and markets looking to replace petroleum-based fuels. It also leverages existing infrastructure, and has a low implementation risk.

Economic Impact

OakBio's solution has economic benefits in Alberta including reduction of Alberta's dependence on oil imports for local fuel supply and extra revenue and expense reduction for large CO_2 emitting industries through the sale of fuels. It also allows for the integration of energy sources like wind power to produce H2, a key feedstock for the OakBio process.

CHANGING THE WORLD THROUGH LOCAL INNOVATION

Every year, the CCEMC funds projects anywhere from early stage research and development to commercialization. In our mission to dramatically reduce GHG emissions, this year we funded projects in the Biological and Clean Energy Production areas across the innovation scale.

CCEMC FUNDED PROJECTS

3 CLEAN ENERGY PRODUCTION PROJECTS

9 BIOLOGICAL PROJECTS

CCEMC FUNDED PROJECTS

CLEAN ENERGY PRODUCTION

FIELD UPGRADING PILOT PLANT

FIELD UPGRADING LIMITED

Project Cost: $17,857,200
CCEMC Funding: $8,928,600
Field Upgrading partnered with Ceramatec, the world's leading specialty ceramics company, to develop a new breakthrough heavy oil desulphurization and upgrading technology called DSU. Field Upgrading's DSU technology selectively targets the components of bitumen, or other heavy petroleum feedstocks, that reduce the value of an upgraded product (including sulphur, heavy metals and TAN) without reducing the volumetric yield. This technology significantly increases the API gravity producing a near pipeline-ready product with no SOx emissions and lower GHG lifecycle emissions. At half the capital intensity of a typical upgrader, the DSU technology has the potential to significantly improve the economics of adding value to bitumen in Alberta. It can also be used to directly convert super heavy oil products, such as vacuum residue and asphaltenes, to low sulphur marine fuel, helping the global shipping industry meet the new standards on sulphur emissions. Field Upgrading will design, build and operate a 10 barrel per day pilot facility to showcase and further test the technology across a range of heavy feedstocks from bitumen to refinery intermediates, including vacuum residue.

CLEAN ENERGY PRODUCT AND GHG EMISSION REDUCTION IN HEAVY OIL PRODUCTION –SUPERSUMP FIELD-SCALE PILOT DEMONSTRATION PROJECT

DISTINCT RESOURCES CORP.

Project Cost: $6,388,669
CCEMC Funding: $3,194,334
Distinct Resources Corp. has created a transformative technology called SuperSump. Supersump combines existing oilfield and waste storage cavern technologies in an innovative manner in order to significantly reduce GHGs, energy consumption, and surface footprints in primary heavy oil operations. This patented technology has the potential to reduce GHG emissions by over 95% in Cold heavy Oil Production with Sand (CHOPS), meaning it could reduce annual CO_2 emissions by two megatonnes per year if fully adopted by today's Alberta Primary Heavy Oil Industry. The SuperSump field-pilot project will confirm initial research by verifying GHG reductions and the economic parameters of the technology prior to full commercialization.

PROJECT: ENZERGY™ THE NEXT GENERATION COAL COMBUSTION FOR CLEANER ENVIRONMENT

B&C ENERGY SERVICES LLC, ATCO POWER, AND NRECA

Project Cost: 274,996
CCEMC Funding: $549,993
B&C Energy Services Inc. (B&CES) is based out of Knoxville, TN and provides engineering and consulting services and products to energy sector clients with a primary focus on coal-fired energy resources. Some of their energy products include fuel-conditioning additives that reduce fuel consumption and create a significant reduction in regulated air pollutants. B&CES's Enzergy™ application is aiming to improve combustion and thermal efficiencies in Alberta while reducing harmful flue gas emissions such as CO_2, NOx, and SO2. From data gathered in their commercial implementation, B&CES believes that Enzergy™ has the potential to help the power industry obtain fuel cost savings while achieving significant greenhouse gas emissions reductions. They also believe that Enzergy™ could provide substantial long-term economic savings over other technologies.

BIOLOGICAL PROJECTS

FARMING 4R LAND, PHASE II

UNIVERSITY OF ALBERTA

CCEMC Funding: $227,500
Total Project Value: $252,500
Farming 4R Land Phase II builds on the producer engagement and economic analysis completed in Phase I of the project. The project goals are to develop implementation strategies for wide spread adoption of the cost-effective 4R Nutrient Stewardship on the farm resulting in quantifiable GHG emission reductions from the use of Nitrous Oxide Emission Reduction Protocol (NERP). This can be accomplished through working with all stakeholders to raise awareness, providing the tools and resources for evaluation of 4R and NERP activities at the field level, measuring the social, economic and environmental impact of the best management practice adoption, and promising the successes of participating demonstration farmers for recognition in their community, within the region, amongst their peers, and within the crop supply chain.

PERFORMANCE VALIDATION OF RFI SELECTED CATTLE UNDER EXTENSIVE COW/CALF PRODUCTION SYSTEMS

UNIVERSITY OF ALBERTA

CCEMC Funding: $168,000
Total Project Value: $413,000
During the natural digestive process, cow herds produce significant amounts of methane. In Alberta, one of North America's largest beef-producing regions, reducing cow herd GHG emissions is crucial to improving the environmental footprint of beef production. The University of Alberta's project will test whether beef cattle production efficiencies are associated with cow/calf performance under open-range grazing production systems. Increasing the efficiency of cow-calf production systems will help ensure the long-term sustainability of the beef industry, and reduce the agriculture industry's environmental footprint, including GHG emissions. This project will utilize cattle currently grazing on the University of Alberta Mattheis Research Range in southeast Alberta, and will integrate other research focused on the impact of cow/calf production systems in altering GHGs. This integration has the potential to innovate policy and encourage GHG reductions on grazed rangelands, as well as develop environmentally sustainable beef production.

CCEMC FUNDED PROJECTS

METHANE EMISSIONS FROM BEEF CATTLE BRED FOR LOW RESIDUAL FEED INTAKE

UNIVERSITY OF ALBERTA

CCEMC Funding: $851,354
Total Project Value: $1,601,354

Methane is a greenhouse gas (GHG) that results from the natural digestive processes in the stomach of cows. The primary purpose of University of Alberta's project is to use cutting-edge gas-sensor technology and other techniques to measure the amount of methane produced from animals bred for low RFI compared with the average animal. The secondary objective is to determine the reliability of alternative, cost effective techniques that identify low-methane emitting animals. The project will use non-invasive techniques to accurately measure the methane mitigation potential of low-RFI herds in real-world Alberta beef production settings without disrupting the animals' feed intake and feeding behavior. With trials taking place from 2015-2017, this work has the potential to open the door to pursuing a type of ruminant that has lower methane emissions, as well as help advance Alberta's leadership role in GHG mitigation.

INTELLIGENT NANOFERTILIZERS: THE DYNAMICS OF SOIL BACTERIAL POPULATIONS ASSOCIATED WITH ROOT EXUDATES AND NITROGEN UPTAKE BY WHEAT AND CANOLA

CARLTON UNIVERSITY

CCEMC Funding: $139,200
Total Project Value: $139,200

In fertilizers, the current nitrogen use efficiency is very low. Between 50-70% of the nitrogen in conventional fertilizers is lost due to the leaching of water-soluble nitrates, emission of gaseous ammonia and nitrous oxide (N2O), and long-term incorporation of mineral nitrogen into soil organic matter by soil microorganisms. As a result, current annual N2O emissions from nitrogen fertilizer equal 2.4 megatonnes carbon dioxide equivalent (CO_2e) for Alberta, and 9.2 megatonnes CO_2e for Canada. To mitigate these emissions, this project will help develop Intelligent NanoFertilizers designed to increase nitrogen use efficiency by crops by at least another 30-50%, thereby reducing greenhouse gas emissions and lowering fertilizer costs for farmers. Currently, nitrogen losses from fertilizer are estimated to cost Canadian farmers nearly $1.5 billion annually, and result in N2O emissions. The successful development, commercialization and adoption of Intelligent NanoFertilizers at the farm level have the potential to reduce GHG emissions while lowering fertilizer costs for farmers.

CONTROL OF POINT-SOURCE LOW-VOLUME METHANE EMISSIONS USING METHANE BIOFILTRATION TECHNOLOGY

UNIVERSITY OF CALGARY

CCEMC Funding: $495,100
Total Project Value: $754,100

This project includes a market study to identify and evaluate the commercial feasibility of methane biofilter applications across several industry sectors and in various situations. The study includes a carbon-offset evaluation to determine carbon dioxide equivalent (CO_2e) reductions of methane biofilter projects and the implementation of several full-scale pilot projects to demonstrate the technical feasibility of various methane biofilter configurations under field conditions. In addition, a cost-effective and robust performance monitoring protocol will be created to accurately measure the filters' performance and the amount of methane reduced and kept out of the atmosphere. Methane biofilters convert methane to carbon dioxide (CO_2) without producing other harmful by-products by using bacterial called methanotrophs (found in soil compost, and other environments) that use methane as an energy source and convert it to CO_2. The CO_2 emitted from the biofilters is about 25 times less potent as a greenhouse gas than methane, reducing a facility's carbon 'footprint' and GHG emissions.

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CCEMC FUNDED PROJECTS

INCORPORATING WETLAND CARBON VALUES INTO SPATIALLY EXPLICIT TOOLS TO INFORM LAND USE DECISIONS

DUCKS UNLIMITED CANADA

CCEMC Funding: $52,290
Total Project Value: $164,790
Wetlands are some of the most productive ecosystems on the planet, storing approximately 25-35% of the world's carbon. Because they store subsurface carbon, wetlands can be negatively altered by industrial activities such as agriculture, oil and gas developments, and forestry, which can result in releasing carbon as GHGs. Several steps are required to fully assess these potential impacts, the first of which is mapping the distribution of carbon on wetlands to provide a foundation for future evaluations. Mapping is particularly useful when intersected with known and predicted locations of landscape change, and would facilitate identification of high value carbon areas that are potentially at risk of alteration due to industrial activities. To be completed in 2015, this project will visually express changes in wetland coverage resulting from drainage or restoration in order to better target wetland protection and restoration efforts.

ALGAE-BASED BIOMASS FOR PRODUCTION OF FUELS AND CHEMICALS

UNIVERSITY OF ALBERTA

CCEMC Funding: $86,250
Total Project Value: $526,250
The University of Alberta's project will be using algae as a feedstock to produce diluent and hydrogen to be used as fuels and chemicals in order to compare it to other production methods. Factors such as cost and lifecycle GHG emissions will be considered in order to arrive at the costs associated with using algae in this process. The overall methodology of this research will include detailed process modeling of the fuels and chemicals produced from algal biomass sources through a range of conversion pathways. Potential benefits of this project include reducing the costs and GHG emissions typically associated with diluent production. In turn, this could reduce the cost associated with Alberta bitumen.

COMMERCIALIZATION OF BIO-BASED SPRAYFOAM

SPRAYFOAM CO.

CCEMC Funding: $200,000
Total Project Value: $240,000
As a major player in the Alberta spray foam market, the companies owned by Sprayfoam Co. provide contracting services to residential, commercial and industrial markets. Spray foam insulation plays a key role in increasing building envelope performance, and as the demand for it grows, Sprayfoam Co. is hoping to provide a low-carbon, safe and locally sourced product. Bio-based spray foam can increase energy efficiency and reduce the overall GHG emissions for residential, commercial and industrial construction. This project is focused on the development, testing and pre-commercialization of a spray foam product that incorporates bio-based materials from the agriculture sector. Though it is expected that bio-based spray foam is more costly to manufacture than its fossil fuel equivalent, the GHG reduction benefits would outweigh any additional cost. With the project taking place between 2014-2015, once the product is tested for quality and accepted by the Canadian Construction Materials Centre, bio-based spray foam will be integrated into the supply chain of Sprayfoam Co., providing an innovative solution to mitigating fossil fuels while greening the building construction sector.

FINANCIAL HIGHLIGHTS

In our mission to achieve real and sustainable GHG emissions reductions to help mitigate climate change, a key component of our success is effectively utilizing the money given to us through the CCEMF to fund projects that can make a difference.

Climate Change and Emissions Management (CCEMC) Corporation

Financial Statements
May 31, 2014

Deloitte LLP
2000 Manulife Place
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Canada

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Independent Auditor's Report

To the Board of Directors of
Climate Change and Emissions Management Corporation

We have audited the accompanying financial statements of Climate Change and Emissions Management Corporation, which comprise the statement of financial position as at May 31, 2014, and the statements of changes in net assets, operations and cash flows for the year then ended, and a summary of significant accounting policies and other explanatory information.

Management's responsibility for the financial statements
Management is responsible for the preparation and fair presentation of these financial statements in accordance with Canadian accounting standards for not-for-profit organizations, and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditor's responsibility
Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with Canadian generally accepted auditing standards. Those standards require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion
In our opinion, the financial statements present fairly, in all material respects, the financial position of Climate Change and Emissions Management Corporation as at May 31, 2014, and the results of its operations and its cash flows for the year then ended in accordance with Canadian accounting standards for not-for-profit organizations.

Deloitte LLP

Chartered Accountants

September 23, 2014

Climate Change and Emissions Management (CCEMC) Corporation

Statement of Financial Position

As at May 31, 2014

	2014 $	2013 $
Assets		
Current assets		
Cash	285,476,706	262,087,651
Accounts receivable	279,792	101,633
Interest receivable	403,259	313,780
Prepaid expenses	1,750	1,750
	286,161,507	262,504,814
Liabilities		
Current liabilities		
Accounts payable and accrued liabilities	4,032,872	2,308,064
Net Assets		
General fund – unrestricted	-	-
Restricted fund (note 3)	282,128,635	260,196,750
	282,128,635	260,196,750
	286,161,507	262,504,814

Commitments and guarantees (note 6)

Approved by the Board of Directors

_____ Director _____ Director

The accompanying notes are an integral part of these financial statements.

Climate Change and Emissions Management (CCEMC) Corporation

Statement of Changes in Net Assets

For the year ended May 31, 2014

	General Fund $	Restricted Fund $	2014 $	2013 $
Balance – Beginning of year	-	260,196,750	260,196,750	231,476,690
Excess of revenue over expenses	(280,567)	22,212,452	21,931,885	28,720,060
Transfer to (from) fund (note 3)	280,567	(280,567)	-	-
Balance – End of year	-	282,128,635	282,128,635	260,196,750

The accompanying notes are an integral part of these financial statements.

Climate Change and Emissions Management (CCEMC) Corporation

Statement of Operations

For the year ended May 31, 2014

	General Fund $	Restricted Fund $	2014 $	2013 $
Revenue				
Grant revenue (note 4)	-	64,117,000	64,117,000	54,628,905
Interest income		4,316,523	4,316,523	3,681,373
Conference	456,002	-	456,002	-
	456,002	68,433,523	68,889,525	58,310,278
Project expenses (note 6)	-	37,129,851	37,129,851	21,980,590
Excess of revenue over project expenses	456,002	31,303,672	31,759,674	36,329,688
Operating expenses				
Program management (note 5)	-	6,840,962	6,840,962	5,858,585
Consulting contracted services	-	1,631,010	1,631,010	1,373,392
Corporate costs	-	400,169	400,169	218,908
Board remuneration and expenses (note 5)	-	91,056	91,056	94,467
Outreach	-	70,727	70,727	17,073
Professional fees	-	46,796	46,796	36,470
Insurance	-	10,500	10,500	10,733
Conference costs	736,569	-	736,569	-
	736,569	9,091,220	9,827,789	7,609,628
Excess of revenue over expenses for the year	(280,567)	22,212,452	21,931,885	28,720,060

The accompanying notes are an integral part of financial statements.

Climate Change and Emissions Management (CCEMC) Corporation

Statement of Cash Flows

For the year ended May 31, 2014

	2014 $	2013 $
Cash provided by (used in)		
Operating activities		
Excess of revenue over expenses for the year	21,931,885	28,720,060
Net change in non-cash working capital items		
Decrease in prepaid expenses	-	83
Increase in accounts receivable	(178,159)	(34,484)
Increase in interest receivable	(89,479)	(34,880)
Increase (decrease) in accounts payable and accrued liabilities	1,724,808	(1,332,247)
Increase in cash	23,389,055	27,318,532
Cash – Beginning of year	262,087,651	234,769,119
Cash – End of year	285,476,706	262,087,651

The accompanying notes are an integral part of these financial statements.

1 Organization

The Climate Change and Emissions Management (CCEMC) Corporation (CCEMC) is an Alberta-based, independent, not-for-profit organization incorporated under the Canada Corporations Act on February 17, 2009, whose operations commenced on June 1, 2009. CCEMC's mandate is to reduce greenhouse gas emissions and adapt to climate change by supporting the discovery, development and deployment of clean technologies. The Climate Change and Emissions Management Fund (the Fund) was established under the *Climate Change and Emissions Management Act* by the Government of Alberta to support investment in innovation and clean technologies that will reduce Alberta's greenhouse gas emissions and improve its ability to adapt to climate change. The Fund provides the primary source of revenue for the CCEMC. As a not-for-profit organization, CCEMC is exempt from tax in accordance with Section 149(1)(l) of the Canadian Income Tax Act.

2 Significant accounting policies

These financial statements have been prepared by management in accordance with Canadian accounting standards for not-for-profit organizations (ASNPO) within the framework of the accounting policies summarized below.

a) Fund accounting

For financial reporting purposes, the accounts have been classified into the following funds:

i) General

The General Fund includes all resources available for immediate purposes and accounts for the Corporation's activities other than those directly attributable to funding innovation and clean technologies and adaptation to climate change.

The General Fund includes all unrestricted monies received that are available for use at the Corporation's discretion.

ii) Restricted

The Restricted Fund includes those funds whose resources are to be used to support investment in innovation and clean technologies and adaptation to climate change.

b) Revenue recognition

These financial statements have been prepared using the restricted fund method of accounting for contributions, the key elements of which are:

i) Unrestricted contributions are recognized as revenue in the General Fund when received or upon becoming receivable if the amount to be received can be estimated and collection is reasonably assured.

ii) Externally restricted contributions are recognized as revenue in the Restricted Fund when received or receivable if the amount to be received can be estimated and collection is reasonably assured. Externally restricted amounts can only be used for the purposes designated by external parties.

iii) Investment income earned on contributions subject to external restrictions is recorded as revenue in the Restricted Fund in the year it is earned.

c) Financial instruments

Financial assets and financial liabilities are initially recognized at fair value less transaction costs when CCEMC becomes a party to the contractual provisions of the financial instrument and subsequently measured at amortized cost with any changes recorded in the statements of operations. CCEMC currently does not hold any equity instruments that would be measured after initial recognition at fair value.

d) Cash

Cash consists of cash on deposit.

e) Project expenses and liabilities

Project expenses and the associated project liability (included in accounts payable and accrued liabilities) are recognized upon receipt of a valid project progress report and associated milestone invoices by CCEMC. A commitment for a project expense is disclosed as such when a contribution agreement is executed.

3 Restricted Fund

The Restricted Fund consists of funds that are externally restricted by the Government of Alberta for the purpose of investing in various initiatives and projects relating to one of the four strategic investment areas: conservation and efficiency, carbon capture and storage, greening energy production and adaptation and knowledge. The funds are also restricted for the purpose of administering CCEMC which includes fees, expenses, liabilities and other costs.

During the year, $280,567 (2013 – $nil) was transferred from the Restricted Fund to the General Fund for the purpose of supporting the Zero 2014 conference held in April, 2014. This expenditure was approved in the annual CCEMC business plan.

4 Grant revenue

Funds are granted from the Government of Alberta to CCEMC on an annual basis through the Grant Agreement dated March 31, 2009 (Grant Agreement), which is effective through to September 1, 2014. The Grant Agreement was amended on March 30, 2010. The Annual Grant amount is determined each provincial year-end and is based on the amount contributed to the Fund in the previous compliance year.

Annual Grant Amount	2014 $	2013 $
March 31, 2012	-	54,628,905
March 31, 2013	64,117,000	-
	64,117,000	54,628,905

5 Board and management remuneration

Total honorariums and expenses related to the directors of the Board were $89,713 (2013 – $93,838) in the fiscal year. Remuneration paid to directors or their employers includes honorariums totalling $64,365 (2013 – $58,876) as follows:

	2014 $	2013 $
D. Beever	1,274	2,067
J. Carter	1,851	782
P. Clark	10,587	17,896
I. Evans	2,986	-
A. Falkenberg	2,932	3,471
S. Flint	-	-
C. Fischer	1,564	1,247
B. Kenny	3,447	2,067
D. Lewin	13,895	8,776
D. Lynch	2,056	3,013
R. L. Mansell	3,984	2,094
P. Merrin	4,864	4,596
E. Newell	9,361	7,497
R. Neehall	-	2,029
L. Rosen	984	-
A. Tasker	4,580	3,341
D. Wicklum	-	-
	64,365	58,876

Of these amounts, $11,898 (2013 – $2,693) is included in accounts payable and accrued liabilities. Expenses paid to directors of $25,348 (2013 – $34,962) relates to reimbursements for meals, travel and accommodations.

Program management expenses include remuneration to contract management who report directly to the Board, totalling fees of $6,840,962 (2013 – $5,858,585) of this amount, $653,026 (2013 – $103,738) is included in accounts payable and accrued liabilities.

6 Commitments and guarantees

During the year, contribution agreements for CCEMC funding were executed for 38 projects (2013 – 22). Also during the year, 2 of the executed contribution agreements were cancelled. As at May 31, 2014, the CCEMC has 80 executed contribution agreements outstanding and has commenced or completed funding for 65 of these approved projects. Total committed funds for executed projects is the difference between the total funding approved for executed contribution agreements and project expenses incurred to date or contribution agreements cancelled. A summary of these amounts is outlined as follows:

	2014 $	2013 $
Total committed funds for executed projects – Beginning of the year	110,090,075	76,106,231
Total funds for executed projects approved or adjusted during the year	57,174,858	58,189,434
Project expenses incurred during the year	(37,129,851)	(21,980,590)
Contribution agreements cancelled during the year	(3,591,707)	(2,225,000)
Total committed funds for executed projects – End of the year	126,543,375	110,090,075

As of May 31, 2014, funding for 15 of the 80 executed projects has not commenced. Funds allocated to the executed contribution agreements are subject to CCEMC's review and approval prior to disbursement to ensure full compliance with the terms of the contribution agreement. The actual financial commitment could therefore differ materially from $126,543,375, but will not exceed this amount.

There are also an additional 12 projects, totalling $28,847,677 (2013 – $70,278,804), that have been approved for funding by CCEMC's Board of Directors but for which contribution agreements have not yet been executed. Subsequent to year-end, 1 executed project, totalling $38,994, has been cancelled, 4 of the approved projects, totalling $15,129,943 have been cancelled and 1 of the approved projects, totalling $274,996, has executed its contribution agreement. As of September 23, 2014, the CCEMC has 7 projects remaining, totalling $13,442,738, that have been approved for funding by CCEMC's Board of Directors but for which contribution agreements have not been executed.

CCEMC indemnifies its directors against claims reasonably incurred and resulting from the performance of their services to the CCEMC. No amounts are reflected in the financial statements related to these indemnifications.

7 Financial instruments

CCEMC's financial instruments are exposed to certain financial risks, including credit risk, market risk and liquidity risk.

Credit risk

Credit risk is the risk of financial loss to CCEMC if a party to a financial instrument fails to meet its contractual obligation and arises principally from the cash, short-term investments and accounts receivable. The maximum amount of credit risk exposure is limited to the carrying value of the balances disclosed in these financial statements.

Management monitors these accounts regularly and does not believe that CCEMC is exposed to significant credit risk at the statement of financial position date.

Market risk

Market risk is the risk that changes in market prices such as interest rates will affect the CCEMC's interest income or the value of the financial instruments held. CCEMC is subject to interest rate cash flow risk arising primarily from fluctuations in interest rates applied to its cash balance, which are subject to floating interest rates.

Liquidity risk

Liquidity risk is the risk that CCEMC will not be able to meet its financial obligations as they become due. Management mitigates liquidity risk by monitoring forecasted and actual cash flows to ensure sufficient liquidity to meet its liabilities. Accounts payable and accrued liabilities are due within the current operating period.

8 Economic dependence

100% of CCEMC's grant revenue is received from the Fund. The loss of this funding would have a material adverse impact on CCEMC's operations and financial position. Should a loss of funding occur, all approved project commitments would remain in effect.

9 Comparative figures

Certain amounts have been reclassified to conform with the current year presentation. During the year, $1,206,795 was reclassified from program management to consulting contracted services to more accurately reflect operating expenses for CCEMC.

Climate Change and Emissions Management (CCEMC) Corporation

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