

EMISSIONS REDUCTION ALBERTA PROJECTS

CLEANER ENERGY PRODUCTION PROJECTS

ORGANIZATION	CCEMC FUNDING	PROJECT	LOCATION	PROJECT COMPLETION	GHG EMISSION REDUCTIONS BY 2020	STAGE OF INNOVATION	TOTAL PROJECT VALUE
E-T Energy Ltd.	\$6,861,860	Poplar Creek Project, ET-DSPTM for Development of Athabasca Oil Sands	Poplar Creek	100%	*	Demonstration	\$20.6 million
ESEIEH Consortium	\$16,474,830	Enhanced Solvent Extraction Incorporating Electromagnetic Heating	Fort Mackay	90%	*	Demonstration	\$91.4 million
Evergreen Energy Technologies Inc.	\$138,983	Reliable Power for Remote Locations	Calgary	100%	24,000	Demonstration	\$278,000
Imperial Oil	\$10,000,000	Cyclic Solvent Process Pilot	Cold Lake	70%	*	Demonstration	\$102.5 million
MEG Energy Corp.	\$10,000,000	Heavy Crude Quality Improvement	Alberta Industrial Heartland Region	35%	**	Demonstration	\$107.4 million
N-Solv Corporation	\$10,000,000	N-Solv BEST Pilot Plant at Suncor Dover	Fort McMurray	100%	*	Demonstration	\$83 million
Seal Well Inc.	\$492,012	Permanent Sealing of GHG Emitting or Sequestration Wells with a Bismuth-Based Metal Alloy	Alberta	100%	7,000	Development	\$1 million
Hi-Tec Fuel and Auto Ltd.	\$273,157	Engineering of the Natural Gas Dual Fuel Blend System for Heavy Duty Diesel Vehicles	Edmonton	100%	*	Demonstration	\$559,000
B&C Energy Services Inc.	\$232,541	Enzergy™ the Next Generation Coal Combustion for Cleaner Environment	Alberta	100%	*	Demonstration	\$557,000
Field Upgrading Ltd.	\$8,928,600	Field Upgrading Pilot Plant	Fort Saskatchewan	85%	*	Demonstration	\$29.1 million
N-Solv Corporation	\$25,000,000	N-Solv best oil sands scale-up project	Fort McMurray	0%	247,000	Demonstration	\$238 million
Saltworks Technologies Inc.	\$500,000	Low energy produced water treatment	Vancouver	100%	*	Implementation	\$3.4 million

**MEG is expected to result in emission reductions but the quantification is contingent upon project results.

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CARBON CAPTURE AND STORAGE PROJECTS

ORGANIZATION	CCEMC FUNDING	PROJECT	LOCATION	PROJECT COMPLETION	GHG EMISSION REDUCTIONS BY 2020	STAGE OF INNOVATION	TOTAL PROJECT VALUE
HTC Pureenergy Inc.	\$243,259	HTC Pureenergy CO ₂ Capture FEED Study for Devon's Jackfish SAGD Facility	Conklin	100%	*	Development	\$487,000
GE	\$1,176,181	Ceramic membrane-based technology for H ₂ production with CO ₂ capture and sequestration	Edmonton	Ended early	*	R&D	\$2.4 million
Suncor Energy Inc.	\$2,499,999	OTSG Oxy-fuel Demonstration	Christina Lake	100%	*	Demonstration	\$6.1 million
Husky Oil Operations Ltd.	\$2,955,000	Lashburn CO ₂ Capture Demonstration Project	Waseka, Saskatchewan	95%	*	Demonstration	\$17.3 million
Inventys Thermal Technologies Inc.	\$3,068,000	VeloxoTherm™ CO ₂ Capture Project	BC and Saskatchewan	35%	*	Demonstration	\$20.2 million
Carbon Engineering Ltd.	\$499,901	Direct Air Capture - Pilot Plant Demonstration	Squamish, BC	85%	*	Development	\$7.6 million
CO ₂ Solutions Inc.	\$500,000	Optimization of Enzymatic System for CO ₂ Capture from Oil Sands Production	Alberta	100%	*	Development	\$1.8 million
Sustainable Energy Solutions	\$490,305	Cryogenic Carbon Capture with Energy Storage (CCCES)	Orem, Utah	100%	*	Development	\$981,000
CO ₂ Solutions Inc.	\$15,000,000	Commercial Demonstration of Biocatalytic process for Low Cost Carbon Capture	Redwater	0%	*	Demonstration	\$30 million

*Carbon Capture and Storage projects focus on reducing the cost of capture, which is the biggest impediment to implementation.

EMISSIONS REDUCTION ALBERTA PROJECTS

RENEWABLE ENERGY PROJECTS

ORGANIZATION	CCEMC FUNDING	PROJECT	LOCATION	PROJECT COMPLETION	GHG EMISSION REDUCTIONS BY 2020	STAGE OF INNOVATION	TOTAL PROJECT VALUE
West Fraser Timber	\$5,000,000	Slave Lake Pulp Bio-Methanation Project	Slave Lake	100%	321,000	Implementation	\$40 million
Growing Power Hairy Hill L.P.	\$5,000,000	GPBH Integrated BioRefinery™	Hairy Hill	100%	22,000	Implementation	\$40.3 million
Salt Canada Inc.	\$500,000	Regional Municipality of Wood Buffalo Aerobic Landfill Project	Fort McMurray	45%	*	Demonstration	\$13.4 million
Blackspring Ridge / Wind Project	\$10,000,000	300 MW Blackspring Ridge I Wind Project	Vulcan County	100%	3,700,000	Implementation	\$600 million
City of Edmonton	\$10,000,000	Implementation of High Solids Anaerobic Digestion Technology at the Edmonton Waste Management Centre	Edmonton	0%	159,000	Implementation	\$30.8 million
Growtec	\$3,572,988	Source Separated Organics and Agricultural Waste Anaerobic Digester	Chin/Coaldale	100%	4,000	Implementation	\$7.2 million
Landmark Group of Builders	\$2,311,800	Large Scale Building Integrated Solar PV Demonstration in Production Housing	Edmonton, Red Deer and Calgary areas	40%	6,900	Implementation	\$5.7 million
University of California Santa Cruz	\$420,000	Wavelength-Selective Solar Collectors for Power Generating Greenhouses and Carbon Capture	Vegreville and California	45%	90	R&D	\$846,000

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Enerkem Inc.	\$1,800,000	Reduction of GHG Emissions through Greening Biofuel Production and CO2 Utilization: From Pilot Plant to Commercialization	Edmonton	75%	*	R&D	\$5.5 million
City of Medicine Hat	\$3,000,000	Medicine Hat Concentrating Solar Thermal Power Project	Medicine Hat	95%	3,000	Demonstration	\$14 million
Lethbridge Biogas General Partnership	\$8,200,000	Lethbridge Biogas, Biogas Cogeneration Project	Lethbridge	100%	39,000	Implementation	\$28.6 million
Enmax Corp.	\$14,517,000	Micro Generation Solutions	Alberta	30%	156,000	Implementation	\$64 million
Morgan Solar Inc.	\$10,000,000	Alberta Solar One	Vulcan	0%	9,000	Demonstration	\$23 million
GTE Solar Inc.	\$14,997,000	GTE Solar Brooks #1	Brooks	0%	72,000	Implementation	\$30 million
Transalta Corporation	\$11,146,300	Enabling increased intermittent green generation via wind energy storage	Pincher Creek	0%	**	Demonstration	\$22.7 million

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** Battery storage has the potential to reduce greenhouse gas emissions through improving grid efficiency, displacing higher greenhouse gas intensive electricity generation, and supporting the installation of more solar and wind electricity. The GHG emissions reductions will be reported at the completion of this project

EMISSIONS REDUCTION ALBERTA PROJECTS

ENERGY EFFICIENCY PROJECTS

ORGANIZATION	CCEMC FUNDING	PROJECT	LOCATION	PROJECT COMPLETION	GHG EMISSION REDUCTIONS BY 2020	STAGE OF INNOVATION	TOTAL PROJECT VALUE
May-Ruben Technologies Inc.	\$569,704	BFE Thermally Driven Refrigeration System	Calgary	100%	*	R&D	\$3.7million
Nova Chemicals Corp.	\$700,000	Energy Footprint Reduction for Ethylene Manufacturing	Calgary and Edmonton	100%	*	R&D	\$1.4 million
Suncor Energy Inc.	\$790,905	Alberta Oil Sands Energy Efficiency and GHG Mitigation Roadmap	Fort McMurray	100%	*	Implementation	\$1.6 million
Weyerhaeuser Company Ltd.	\$5,000,000	Weyerhaeuser Grande Prairie Evaporator Project	Grande Prairie	100%	607,000	Implementation	\$81.8 million
EnCana Corp.	\$2,400,000	Vent Gas Capture for Engine Fuel Use	Southern Alberta	100%	488,000	Implementation	\$5.9 million
ConocoPhillips Canada	\$6,971,285	Company-Wide Rollout of a Systematic Energy Efficiency Program Leading to Significant GHG Reductions in Alberta's Oil and Gas Industry	Alberta	100%	592,000	Implementation	\$13.9 million
Cenovus Energy Inc.	\$2,676,714	REMVue/Slipstream Air/Fuel Ratio Control and Vent Capture Project.	Alderson, Alberta	100%	142,000	Implementation	\$7.7 million
NRGreen Power Ltd.	\$7,000,000	Whitecourt Recovered Energy Project	Whitecourt	100%	375,000	Demonstration	\$97 million
Global Analyzer Systems Ltd.	\$300,000	Stack-Top Temperature Reduction Project	Calgary	95%	102,000	Demonstration	\$690,000
Landmark Group of Builders	\$499,200	NetZero (Ready) Home Design and Demonstration for Production Housing	Calgary, Edmonton, Red Deer	95%	1,200	Demonstration	\$2.1 million

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ATCO Gas	\$1,834,642	Combined Heat and Power for Commercial and Institutional Buildings	Alberta	25%	25,000	Implementation	\$5.6 million
Genalta Power Inc.	\$4,881,763	Emission-free electrical power from multiple waste energy sources	North of Calgary	0%	65,000	Implementation	\$14.9 million

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BIOLOGICAL PROJECTS

ORGANIZATION	CCEMC FUNDING	PROJECT	LOCATION	PROJECT COMPLETION	GHG EMISSION REDUCTIONS BY 2020	STAGE OF INNOVATION	TOTAL PROJECT VALUE
Canadian Fertilizer Institute (CFI)	\$199,860	Farming 4R Land, Phase I	Alberta	100%	*	Demonstration	\$225,000
University of Calgary - Dr. Layzell	\$57,500	Developing an adsorbing biocarbon to achieve greenhouse gas benefits in the remediation of produced water in oil sands operations	Calgary	100%	*	R&D	\$57,500
The Prasino Group	\$290,834	Protocol validation studies	Calgary and Edmonton	100%	*	Demonstration	\$290,834
University of Calgary - Dr. Hettiaratchi	\$495,100	Control of point-source low-volume methane emissions using methane biofiltration technology	Calgary	70%	*	Demonstration	\$974,000
Canadian Fertilizer Institute (CFI)	\$227,500	Farming 4R land, phase II	Alberta	100%	*	Demonstration	\$252,000
Carlton University - Dr. Monreal	\$139,200	Intelligent NanoFertilizers: The dynamics of soil bacterial populations associated with root exudates and nitrogen uptake by wheat and canola	Alberta & Ontario	95%	*	Demonstration	\$139,200
Ducks Unlimited - Canada's Institute for Wetland and Waterfowl Research	\$52,076	Incorporating wetland carbon values into spatially explicit tools to inform land-use decisions	Manitoba, Saskatchewan and Alberta	100%	*	R&D	\$164,000
University of Alberta - Dr. Bork	\$168,000	Performance validation of cattle selected for feed efficiency under extensive cow/calf production systems	Alberta	55%	*	R&D	\$413,000
Sprayfoam Co.	\$200,000	Commercialization of Bio-Based Spray Foam	Red Deer	100%	*	R&D	\$240,000
University of Alberta - Dr. Basarab	\$851,354	Methane emissions from beef cattle bred for low residual feed intake	Alberta	40%	*	Demonstration	\$1.6 million

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University of Alberta - Dr. Guillermo Hernandez	\$75,000	Use of nitrification inhibitors to reduce nitrous oxide emissions from crop fields and receiving liquid manure inspection in the fall versus spring	Edmonton	65%	*	R&D	\$235,000
University of Alberta - Dr. Kumar	\$86,250	Algae-based biomass for production of fuels and chemicals	Edmonton	20%	*	R&D	\$426,000
City of Lethbridge	\$69,000	Waste Characterization Study	Lethbridge	80%	*	R&D	\$124,000
Mikro-Tek Inc.	\$453,000	Biological Plant Inoculants to Increase Carbon Sequestration in Alberta's Agriculture and Forestry Sectors	Slave Lake	15%	*	Development	\$968,000
Mustus Energy Ltd.	\$10,000,000	Forestry Waste to Electrical Power - Fuel Variability Minimization Project	La Crete	25%	523,000	Implementation	\$157.8 million
SBI Fine Chemicals	\$10,000,000	Drop-In Renewable Diesel Fuel replacing fossil fuel	Edmonton	0%	38,000	Demonstration	\$20.5 million
Tetra Tech Inc.	\$1,745,166	Biocovers for Greenhouse Gas Mitigation from Landfills	Leduc	0%	*	Demonstration	\$3.5 million
Queens University - Dr. Allison Rutter	\$56,830	Sustainable remediation of petroleum hydrocarbons (PHCS) using phytotechnologies	Ontario	100%	*	R&D	\$56,800
University of Alberta - Dr. Carlo Montemagno	\$500,000	Artificial photosynthesis for managing industrially produced CO ₂ emissions through carbon capture and value creation	Edmonton	25%	*	Development	\$1.3 million
University of Calgary - Dr. Peter Dunfield	\$57,500	Eco-mimicry approach to methane capture in tailings ponds: design of a multi bioreactor and gas sampling system for testing the performances of known methane oxidizing materials	Calgary	65%	*	R&D	\$70,000

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University of Alberta - Dr. Cameron Carlyle	\$487,500	Regionally appropriate grazing	Edmonton	0%	*	R&D	\$715,000
University of Calgary - Dr. Maria Strack	\$277,070	Improved construction of roads and pipelines to minimize impact on peatland GHG emissions	Waterloo, Ontario and Calgary, Edmonton and Carmon Creek, Alberta	20%	*	R&D	\$555,000
Agriculture and Agri-Food Canada	\$1,377,523	Technologies for reducing GHG emissions and providing offset options for the beef and dairy industries	Lethbridge and Australia	20%	100	R&D	\$2.8 million
University of Manitoba	\$711,022	A matter of timing and source: enhanced efficiency nitrogen fertilizers and products to reduce nitrous oxide emissions in the prairie provinces	Winnipeg, Regina, Edmonton	5%	*	R&D	\$1.6 million
Growsafe Systems Ltd.	\$994,334	Deploying an advanced analytics platform to quantify livestock GHG emissions and monitor reduction strategies at individual animal and whole operation scale	Airdrie	0%	*	Demonstration	\$2 million

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ADAPTATION PROJECTS

ORGANIZATION	CCEMC FUNDING	PROJECT	LOCATION	PROJECT COMPLETION	GHG EMISSION REDUCTIONS BY 2020	TOTAL PROJECT VALUE
Foothills Research Institute/ Tree Improvement Alberta	\$2,996,031	Tree Species Adaptation Risk Management Project	Alberta	100%	*	\$3 million
Alberta Biodiversity Monitoring Institute	\$2,394,631	Biodiversity Management and Climate Change Adaptation	Calgary, Edmonton, Vegreville	100%	*	\$2.4 million
Alberta Innovates - Energy and Environment Solutions and WaterSMART Solutions Ltd.	\$1,600,000	South Saskatchewan River Basin (SSRB) Adaptation to Climate Variability Project	Calgary	100%	*	\$1.6 million

*Our climate change adaptation projects will enhance our understanding of the impacts and potential management responses on wildlife, ecosystems, forestry and watersheds.

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CCEMC GRAND CHALLENGE - CARBON UTILIZATION PROJECTS

ORGANIZATION	CCEMC FUNDING	PROJECT	LOCATION	PROJECT COMPLETION	GHG EMISSION REDUCTIONS BY 2020	TOTAL PROJECT VALUE
Pioneer Energy	\$500,000	High-Value Synthetic Chemicals and Gasoline Drop-In Liquid Fuels from Canada's CO ₂ and Flare Gas Emissions	Colorado	100%	*	\$754,000
University of Alberta	\$500,000	Novel Internal Dry Reforming Solid Oxide Fuel Cell Technology for CO ₂ Utilization	Edmonton	100%	*	\$500,000
Robert Gordon University	\$478,130	Integration of Advanced Hybrid Inorganic Membranes for Carbon Dioxide Conversion	Scotland	30%	*	\$776,000
University of Maryland	\$499,848	An Innovative and Highly Efficient Microalgae-Based Carbon Sequestration System to Reduce CO ₂ Emissions and Produce Valuable Byproducts Including Biofuels In All Climate	Maryland	100%	*	\$499,848
Liquid Light, Inc	\$500,000	Converting Carbon Dioxide Into Chemicals and Fuels Using Clean, Domestic Sources of Energy in Alberta	New Jersey	100%	*	\$7.4 million
McGill University	\$500,000	Use of Carbon Dioxide in Making Carbonate-Bond Precast Concrete Products	Quebec	100%	*	\$500,000
E3Tec Service, LLC	\$499,420	Production of Dimethyl Carbonate (DMC) from Captured CO ₂ and Methanol	Maryland	100%	*	\$517,000
CCm Research Ltd.	\$498,988	High Efficiency CO ₂ Capture Using Novel Fibres in the Production of Soil Conditioning Agents Polymer Replacements	England	100%	*	\$499,988

*Winning projects must achieve at least 1 net MT GHG reductions annually when commercialized.

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CCEMC GRAND CHALLENGE - CARBON UTILIZATION PROJECTS

ORGANIZATION	CCEMC FUNDING	PROJECT	LOCATION	PROJECT COMPLETION	GHG EMISSION REDUCTIONS BY 2020	TOTAL PROJECT VALUE
Carbon Cycle Ltd.	\$500,000	Process to Capture Carbon Dioxide and Produce Structured Calcium Carbonate and Fertilizer	England	70%	*	\$500,000
OakBio	\$500,000	Conversion of Industrial CO ₂ Emissions Into Biofuels and Chemicals	California	100%	*	\$500,000
McGill University	\$423,000	Chemical Transformation of Carbon Dioxide Via Solar-Powered Artificial Photosynthesis	Quebec	100%	*	\$423,000
Enerkem Inc.	\$500,000	Valorizing Industrially Produced CO ₂ : A Reliable and Cost-Effective Solution for Carbon Capture and Its Conversion to Marketable Products	Quebec	100%	*	\$514,000
ARCTECH, Inc.	\$423,256	HUMASORB [®] -L for Removal of CO ₂ , NOX GHGs, Along with SOX and Trace Metals	Virginia	100%	*	\$605,000
University of British Columbia	\$500,000	A Coupled CO ₂ and Wastewater Treatment Process to Create High Value Gas/Oil Field Chemicals	British Columbia	100%	*	\$500,000
University of California Riverside	\$499,886	CO ₂ Conversion to Methanol through Bi-reforming	California	100%	*	\$499,886
Industrial Microbes, Inc.	\$500,000	Biological Co-fermentation of Carbon Dioxide and Methane to Malate	California	70%	*	\$500,000

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Blue Planet Ltd.	\$477,421	Carbon Capture and Mineralogic Sequestration: Addressing the World Wide Epidemic on a World Wide Scale	California	100%	*	\$942,000
Skyonic Corporation	\$500,000	Skyonic SkyCycle™ Pilot Demonstration	Texas	100%	*	\$4.2 million
RTI International	\$467,738	Captured-CO ₂ Catalyst for the Production of Ethylene Oxide (C3-PEO)	North Carolina	100%	*	\$468,000
Quantiam Technologies Inc.	\$500,000	Green Methanol From Carbon Dioxide and Renewable Hydrogen (Methanol +)	Edmonton	100%	*	\$1.4 million
Solidia Technologies	\$500,000	Solidia Concrete - A Sustainable Method For Cement Production and CO ₂ Utilization	New Jersey	100%	*	\$1.3 million
Carbon Upcycling Technologies	\$488,950	CO ₂ to Graphene Reactors	Calgary	100%	*	\$517,000
New Sky Energy	\$500,000	Soda Ash and Bicarbonate From a Low Energy Natural Gas Sweetening Process	Colorado	100%	*	\$750,000
Gas Technology Institute	\$500,000	Direct Catalytic Synthesis of Acetic Acid From CO ₂ and CH ₄	Illinois	70%	*	\$500,000

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EMISSIONS REDUCTION ALBERTA PROJECTS

ACCELERATOR PROJECT

ORGANIZATION	CCEMC POTENTIAL FUNDING	PROJECT	LOCATION	PROJECT COMPLETION	GHG EMISSION REDUCTIONS BY 2020	STAGE OF INNOVATION	TOTAL PROJECT VALUE
Cenovus	\$15,000,000	Post combustion carbon capture using molten carbonate fuel cell pilot	Calgary	0%	*	Demonstration	\$38 million

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STAGE OF INNOVATION DEFINITIONS

Applied R&D (Research & Development):

At this stage of development, the technology has been formulated for specific applications and is ready to be proven in a controlled setting. Projects in this category include the integration of critical technology components and proof-of-concept demonstration to establish the technical feasibility of a prototype.

Technology Development:

At this stage of development, the concept has been proven and is ready for prototype development. Projects in this category include technology improvement, development of a representative prototype system, and testing in a simulated operational environment.

Technology Demonstration:

At this stage of development, a prototype system is ready to be field tested in a small-scale operational environment and scaled up to near commercial sizes. Projects in this category include small-scale field pilots and large-scale demonstration facilities.

Commercial Implementation and Market Adoption:

At this stage of development, the technology has been proven to work under expected conditions in its final form. Projects in this category include first-of-kind commercial implementation and market adoption through subsequent deployments.