

Supplement to the 2011 Annual Report

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Introduction

In accordance with the terms and conditions of both Funding Agreement Three pertaining to the Sustainable Development Technology Fund (SD Tech Fund™) between Sustainable Development Technology Canada (SDTC) and the Government of Canada, executed March 31, 2005, and the Funding Agreement pertaining to the Next-Generation Biofuels Fund (NextGen Biofuels Fund™) between the same parties executed September 4, 2007, SDTC is required to publish an Annual Report Supplement to provide specific additional details of projects funded by SDTC. Within this supplement, SDTC provides the required information relating to both Funds.

This Annual Report Supplement, which complements the SDTC Annual Report, is to be tabled in Parliament along with the Annual Report and the Corporate Plan Executive Summary by the Minister of Natural Resources. These documents are made available to the public on SDTC's website.

Purpose and Selection Criteria of each Fund

Each Fund has a unique purpose and set of criteria for qualifying, assessing and approving projects. This is summarized in this report, at the beginning of the respective sections, for the SD Tech Fund™ and the NextGen Biofuels Fund™.

Conflict of Interest and Non-Disclosure Requirements for SDTC's Funding

Allocation Process for both Funds

All due diligence and decision making processes at SDTC require that the individuals involved are subject to conflict of interest guidelines and non-disclosure agreements. This is applied consistently whether the individuals are experts reviewing applications or part of the SDTC organization. It should be noted that Directors of the Board are also subject to conflict of interest guidelines that require Directors to declare potential conflicts of interest and refrain from participating in any discussion regarding matters that could give rise to a conflict of interest.

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SD Tech Fund™ Introduction

Purpose

The purpose of the SD Tech Fund™ is to:

- Fund the development and demonstration of new sustainable development technologies related to climate change, clean air, clean water, and clean soil in order to make progress towards sustainable development;
- Foster and encourage innovative collaboration and partnering amongst diverse persons in the private sector and in academic and not-for profit organizations to channel and strengthen the Canadian capacity to develop and demonstrate sustainable development technologies with respect to climate change, clean air, clean water, clean soil; and
- Ensure timely diffusion by funded recipients of new sustainable development technologies in relevant market sectors throughout Canada.

Funding provided by SDTC is considered to be a non-repayable grant provided Eligible Recipients meet the required conditions of the contribution.

Eligible Projects

To be eligible, a project must be carried on, or primarily carried on, in Canada to develop and demonstrate new technologies to promote Sustainable Development, such as:

- Technologies related to energy end-use, such as transportation and building technologies, and technologies to reduce ground level ozone;
- Technologies related to the hydrogen economy, such as mobile and stationary fuel cells, the production, distribution and storage of hydrogen as well as transition fuels and related technologies;
- Technologies related to the sustainable production of fossil fuels (“clean fossil fuel technologies”), such as the efficient combustion or conversion of fossil fuels (including advanced coal gasification), CO₂ capture and storage, more efficient technologies for surface and in-situ oil sands production, and access to frontier and unconventional natural gas resources;
- Renewable energy technologies, including biomass, solar, wind, wave and tidal technologies;
- Greenhouse Gas emissions reduction technologies related to areas other than energy production and use, such as technologies to reduce CO₂ in cement manufacturing;
- Air quality improvement technologies, including toxic substance recovery systems, particulate control technologies and acid rain technologies;
- Enabling or cross-cutting technologies, including sensors and controls, closed loop process waste, or air, water or soil treatment technologies, and process technologies for the purpose of increasing energy efficiency;
- Water quality and quantity improvement technologies, including, the conservation of water and the disinfection and the mitigation or abatement of contaminants in water, sewage or sludges generated in the treatment of wastewater or potable water; including associated equipment for detection, quantification, analysis and calibration;

- Waste management technologies, including those designed to prevent, reduce, or eliminate solid waste generation or discharge, as well as materials recovery processes, composting, thermal treatment, and biotechnology-based systems, and associated equipment for detection, quantification, analysis, and calibration;
- Soil quality improvement technologies, including the remediation of contaminants in soil and sediments, through containment, removal, recovery, reduced bio-availability, and destruction methods applied either in-situ or ex-situ using physical, chemical, thermal or biological processes, and associated equipment for detection, quantification, analysis, and calibration.

Funding Criteria

The Foundation only awards funding to eligible recipients who demonstrate that:

- The proposed project is technically sound and will, in the opinion of the Board, result in the development or demonstration of new sustainable development technologies;
- The Eligible Recipient brings together the necessary technical, financial and management capacity to successfully undertake the Eligible Project in a collaborative and innovative manner;
- The funding by the Foundation is necessary to ensure that the Eligible Project proceeds within the scope, with the timing or at the location necessary to ensure that significant broad benefits accrue to Canadians nationally or regionally; and
- The Eligible Recipient has provided a description and assumptions for the timely diffusion and deployment in relevant market sectors of the new sustainable development technology resulting from the proposed Eligible Project and any related incremental intellectual property.

More detail on the funding process can be found in the Funding section of the SDTC website at: www.sdtc.ca

SD Tech Fund™ Completed Projects

This section provides a summary of all projects completed to date. Since inception, sixty-three (63) projects have been completed as follows:

- Seven (7) projects completed in 2005;
- Three (3) projects completed in 2006;
- Seven (7) projects completed in 2007;
- Nine (9) projects completed in 2008;
- Seven (7) projects completed in 2009;
- Eight (8) projects completed in 2010; and
- Twenty-two (22) projects completed in 2011.

For each completed project, the project results have been highlighted and an evaluation of the Project Impact¹ has been included within this section. Post-project reporting continues past project completion so as to understand the evolution of the technologies and the Market Impact of each funded project. Such Market Impacts are reported two years after completion and the relevant project updates are included in this report as applicable.

It is important to recognize that SDTC funding is focused on the development and demonstration of new technologies. In so doing, projects progress from early development along the innovation chain towards commercialization. This staged approach to innovation results in some successful projects requiring further development and/or demonstration before reaching commercialization. Understanding that the purpose of the fund is to assist with de-risking of technology, it is to be expected that a number of projects may not succeed either from a technological or economical perspective.

¹It should be noted that while the project activity may be completed in a particular year, SDTC can only report Projects Impacts after the final reports have been submitted and reviewed. As such, for 2011 eleven (11) projects completed close to year end and will be reported next year once the final reports are received.

Terragon Environmental Technologies Inc.

Round 10-2006B

Sector:

Waste Management

Project Delivery Completion:

June 2011

Market Impact Report Due:

June 2013

Total Project Value:

\$4,097,783

SDTC Funding:

\$1,592,500

Leveraged Funding:

\$2,505,283

Consortium Members:

Terragon Environmental Technologies Inc.

Department of National Defense and
Canadian Forces

Fairmont Le Château Montebello

US Department of Naval Research

Environmental Benefits

(primary benefit bolded):

Climate Change

Clean Soil

Clean Water

Clean Air

Project Title:

Demonstration of the Micro Auto Gasification System (MAGS)

Project Description:

Environmental and public health concerns have been mounting in northern communities, tourist resorts, and various enterprises due to increasing challenges dealing with waste. Terragon has responded to this problem by developing a Micro Auto Gasification System designed to convert mixed waste into carbonaceous ash and a clean gas fuel which can be used to power the waste treatment system and provide additional energy to the user. Terragon successfully demonstrated their technology in a large hotel and on a naval ship.

Objectives:

- Develop and demonstrate the MAGS technology in multiple locations for the elimination of waste.
- Treat up to 1.2 t/week of solid waste (biomedical and sewage sludge) at the Terragon lab facility.
- Meet municipal and provincial incinerator emission targets for CO, HCl, NO_x, SO_x, particulates, dioxins and furans.
- Produce a volume of char that is less than 20% of the original volume of waste.

Results:

- Successfully treated waste composed of a range of material including paper, cardboard, plastics, food, wood, rags, as well as incidental items generated by the demonstration sites (e.g. oil filters, shoes, electronics).
- Successfully processed 3.2 tonnes of waste at the hotel site, and 6.4 tonnes on the naval ship representing 2.0 tonnes/week, and 1.6 tonnes/week respectively.
- Gaseous emissions of CO, SO_x, NO_x, HCl, particulates, metals and dioxins/furans were well below the limits set by the City of Montreal, the Ministère du Développement Durable de l'Environnement and the Marine Environment Protection Committee regulations for incinerators.
- Typical volume of char was 4-5% of the original waste volume, and usable as a soil amendment.

Project Impacts:

- During the project period MAGS reduced GHG emissions by 3.8 t CO₂e at the hotel site, and by 4.8 t CO₂e on the naval ship achieving total GHG emission reductions of 8.6 t CO₂e.
- On average, annual GHG emission reductions are expected to be 0.6 t CO₂e per tonne of MAGS waste processing capacity deployed in Canada and 0.73 t CO₂e per tonne of MAGS waste processing capacity deployed in the rest of the world.

Path to Market:

- MAGS has been validated to be a cost-effective remote treatment of solid waste with minimal residue and negligible environmental impact in real world applications.
- Terragon is marketing the technology to individuals, groups and businesses and will be rolling out several MAGS units for both marine and on land applications beginning in 2012.
- Primary target markets are marine (ships, rigs) and military/security (naval/coast guard ships, army bases, expeditionary forces, embassies, borders, prisons). Secondary target markets are hotels, resorts, work camps, hospitals, airports and remote communities.
- GHG emission reductions based on the forecasted market rollout are expected to reach 117 kt CO₂e/year in Canada and 2.6 Mt CO₂e/year in the rest of the world by 2020.

Chinook Mobile Heating and De-Icing Ltd.

Round 8 2005B

Sector:
Transportation

Project Delivery Completion:
June 2011

Market Impact Report Due:
June 2013

Total Project Value:
\$7,378,282

SDTC Funding:
\$3,063,766

Leveraged Funding:
\$4,314,516

Consortium Members:

Chinook Mobile Heating & Deicing Corp.
Hovey Manufacturing
Flakt Coiltech Inc.
Transport Canada

Environmental Benefits
(primary benefit bolded):

Climate Change

Clean Air
Clean Soil

Project Title:

Tempered Steam Technology for Aircraft Defrosting & De-icing

Project Description:

Chinook Mobile Heating and Deicing Inc. demonstrated an innovative aircraft de-icing technology that significantly reduces the environmental, economic and health costs of de-icing compared to existing methods employing glycol. The Tempered Steam Technology (TST) uses heated, steam-infused air to melt ice on aircraft surfaces, then heated air alone for drying. The technique can be performed at the gate, reducing aircraft fuel usage incurred during live, engine-on de-icing operations while providing operational cost savings to airport operators. The process eliminates GHG emissions from engine idling and from the oxidation of unrecovered glycol. Currently, more than 20 million litres of glycol-based fluids are used annually in Canadian winter operations.

Objectives:

- Develop and demonstrate aircraft defrosting and de-icing units for use in small airport applications, on regional jets, and on narrow and wide body commercial aircraft.
- Reduce the amount of glycol used for de-icing and jet fuel consumption.
- Reduce environmental (air, soil and water) impacts and health risks by demonstrating aircraft de-icing in an operational setting at an airport gate.
- Increase on-time departures for aircraft requiring de-icing.
- Lower operational costs of the TST system relative to current glycol de-icing.
- Introduce TST into its first aviation marketplace application - defrosting of regional jet aircraft.

Results:

- Successfully developed and demonstrated commercial aircraft de-icing, and commenced development of the ADS5 unit for small airport applications.
- Demonstrated reduced glycol fluid use by 60%, although a larger reduction is expected with improved operator training.
- De-icing aircraft at gate positions reduced the overall consumption of jet fuel.
- Demonstrated that the average time savings per aircraft de-iced was 12 minutes at the Ottawa International Airport and six minutes at the Toronto Island Airport.

Project Impacts:

- Environmental benefits arise from reduced use of glycol solutions in aircraft de-icing. During the project period GHG emissions were reduced by 72.4 t CO₂e.
- Each operational ADS-4 TST unit (used at large commercial airports) is expected to reduce GHG emissions annually by 1.3 kt CO₂e while each operational ADS-6 TST unit (used at small regional airports) is expected to reduce GHG emissions annually by 215 t CO₂e.

Path to Market:

- Chinook continues to work to complete the next generation of the Chinook technology which is expected to be commercially available in 2012.
- Finnair has ordered two engine de-icing systems for delivery in 2012.
- Following successful market introduction of the defrosting application, Chinook plans to systematically introduce TST to address other aircraft de-icing applications and operations.
- Chinook has completed some testing on the small aircraft core de-icing technology for specialty situations, de-icing in urban areas, and on construction sites.
- On an annual basis, it is estimated that implementation of the TST technology to de-ice Air Canada aircraft at the Ottawa International Airport would eliminate the use of 139,105 liters of glycol and save 205,542 litres of jet fuel providing direct savings of over \$2 million, and eliminate over 230 hours of aircraft time on the ground (between push back from the gate and take off) reducing passenger delays and missed flights, crew time, and engine time and maintenance.
- Market rollout of this technology is expected to reduce annual GHG emissions by 16 kt CO₂e/yr in Canada and by 36.4 kt CO₂e/yr in the rest of the world by 2020.

ARISE Technologies Corporation

Round 8-2005B

Sector:

Power Generation

Project Delivery Completion:

June 2011

Market Impact Report Due:

June 2013

Total Project Value:

\$19,631,211

SDTC Funding:

\$6,439,037

Leveraged Funding:

\$13,192,174

Consortium Members:

ARISE Technologies Corp.

University of Toronto

University of Waterloo

Topsil

Environmental Benefits

(primary benefit bolded):

Climate Change

Clean Air

Project Title:

Silicon Feedstock Pilot Plant Project

Project Description:

ARISE Technologies Corp. developed and demonstrated a new approach to refining high purity solar grade silicon feedstock for photovoltaic (PV) applications. A major constraint in the PV value chain has been the unpredictable supply of silicon. The ARISE approach uses a new technique to produce high purity silicon feedstock that can be used to produce crystalline silicon ingots for solar cells in a simplified, cost effective, and less energy intensive manner. The approach allows for the recovery and reuse of waste silicon. The silicon produced exceeds the specifications of high-efficiency solar PV cell manufacturers.

Objectives:

- Design and build a custom pilot plant facility to manufacture commercial scale silicon rods at a production cost of less than \$26/kg.
- Design and build a mini pilot reactor furnace that minimizes energy consumption.
- Produce solar grade silicon rods >30 cm long for silicon ingot production.
- Produce PV quality polysilicon at a cost sufficiently below established conventional alternatives, to justify scale-up to production at >1,000 t /year rates.

Results:

- Successfully demonstrated the energy and cost efficiency of the process as well as the high quality of the final silicon product.
- Produced mono-crystalline wafers used to make PV test cells with efficiencies up to 17%.
- Produced 7N+ material with regards to metallic impurities, with low carbon and oxygen and resistivity >2 Ohm-cm.
- Achieved comparable deposition rates of 0.5mm/hr to the conventional Siemens process with their simplified refining process.
- Achieved competitive production costs at a much smaller annual volume than the traditional Siemens process.

Project Impacts:

- For every tonne of ARISE solar grade silicon deployed in operational solar panels, GHG emissions will be reduced by 9.2 t CO₂e in Canada and 23 t CO₂e in the rest of the world.

Path to Market:

- Sunlogics Power Fund Management Inc. (a wholly owned subsidiary of Salomon Group Inc.) completed the court approved acquisition of the assets of ARISE. The company intends to use partnering agreements for the ARISE technology for its own silicon manufacturing needs when appropriate, significantly lowering the manufacturing cost of silicon solar modules and increasing profitability of its solar power projects.
- ARISE Technology has the ability to produce solar grade silicon at less than \$26/kg as compared to silicon produced by the Siemens process at \$54/kg.
- The technology has demonstrated the ability to support a 5,000 tonne/year facility for two thirds the capital cost of a Siemens plant with the same silicon production capacity.
- The ARISE technology is expected to refine silicon on a 500 to 5,000 tonnes/year scale opening the opportunity to license their technology or enter into joint venture partnerships.
- In Ontario, GHG emission reductions resulting from the forecasted market rollout have the potential to reach 207kt CO₂e/year by 2020 (pre acquisition forecast).

RSW-RER Ltd.**Round 15-2009A**

Sector:
Power Generation

Project Delivery Completion:
April 2011

Market Impact Report Due:
April 2013

Total Project Value:
\$19,782,725

SDTC Funding:
\$2,760,000

Leveraged Funding:
\$17,022,725

Consortium Members:

RSW-RER Ltd.
 ABB Inc.

Environmental Benefits
 (primary benefit bolded):

Climate Change
 Clean Air

Project Title:

Hydro Kinetic Energy Recovery Turbine (TREK)

Project Description:

RSW-RER Ltd. developed and demonstrated a modular, shrouded, self-anchoring highly robust hydrokinetic turbine. The TREK expects to deliver renewable base load electricity at a lower cost than other renewable energy options and potentially current large hydro power projects. The technology can also be used to provide dispatchable and remote electricity currently being produced by diesel. A resource assessment conducted by RSW-RER indicated a potential for over 25 GW of clean electricity generation capacity from the TREK technology across Canada, with at least a further 1,000 GW of TREK capacity internationally. During the project one 250 kW (name plate capacity) TREK turbine was successfully installed and operated in the St. Lawrence River, near the Old Port of Montreal, delivering continuous power to the grid.

Objectives:

- Fully develop and test the TREK river turbine technology to ensure that it meets industry requirements in terms of durability, cost, performance and grid connection capability with minimal environmental impact.
- Validate the gravity base structure for deployment on the river bed and confirm the robustness of the entire energy conversion system.

Results:

- RSW-RER successfully developed and deployed a 250 kW turbine which under test conditions achieved 340 kW at 4.5 m/s, and which has been continuously delivering power to the grid since its installation in August 2010.
- Demonstrated net overall mechanical-to-electrical conversion efficiency greater than 95%.
- Operated the RER turbine successfully in water flow velocities between 1.5 and 3.25 m/s.
- Confirmed minimal environmental impact, in particular relating to fish populations.
- Validated equivalent of nearly 6.5 years of successful operation under accelerated fatigue and thermal cycling testing on in-house test benches, confirming a 10 year maintenance free life.
- Demonstrated the feasibility to economically produce clean base load electricity at par with all other renewable energy production options.

Project Impacts:

- During the project period GHG emissions were reduced by 9 t CO₂e.
- Each 250 kW hydrokinetic turbine is expected to reduce GHG emissions by 162 t CO₂e/yr in Canada and by 415 t CO₂e/yr in the rest of the world.

Path to Market:

- In most jurisdictions, RSW-RER is able to economically produce base load power at a lower cost than new clean power production.
- RSW-RER is currently developing a 20 unit integrated turbine farm demonstration project to validate multi-unit operations prior to full commercialization (SDTC Project 2011A).
- RSW-RER has entered into an agreement with Northland Power Inc. to develop hydrokinetic power generation projects in North America.

Prairie Pulp & Paper Inc.

Round 6 - 2004B

Sector:

Forestry, Wood Products and Pulp & Paper Products

Project Delivery Completion:
March 2011

Market Impact Report Due:
March 2013

Total Project Value:
\$3,699,781

SDTC Funding:
\$1,250,141

Leveraged Funding:
\$2,449,640

Consortium Members:

Prairie Pulp and Paper Inc.
Manitoba Straw Producers Co-op Ltd.
Unisource Canada Inc.

Environmental Benefits
(primary benefit bolded):

Climate Change
Clean Air Clean Soil

Project Title:

Tree-Free Agricultural Fibre Paper Mill

Project Description:

Prairie Pulp & Paper Inc. (PPP) demonstrated production of high quality paper products, including computer printer, facsimile and photocopy paper using 100 percent agricultural residues such as flax stock. Employing an innovative agricultural fibre pulping process, this technology reuses otherwise discarded (and often openly burned) agricultural residues, which will generate profit-from-waste for Manitoba farmers, and offset the environmental impacts (energy, deforestation and chemical solvents) associated with producing paper from trees.

Objectives:

- Develop and demonstrate a tree-free process as an effective method of producing consumer grade paper with reduced environmental impacts.
- Determine whether office-use paper can be produced from a non-wood pulp consisting primarily of bleached flax straw and bleached wheat straw.
- Produce 200,000 sheets of paper to meet current industry specifications and performance standards for photocopy, lasergraphic, and inkjet copy applications.
- Determine if the quality of paper is acceptable and the product is cost effective enough to successfully compete in the large commodity paper market.

Results:

- Demonstrated the ability to manufacture high quality paper from non-tree sources by producing a 3,500 sheet batch print quality paper meeting current industry specifications and performance standards for photocopy, lasergraphic, and inkjet copy from 95% wheat and 5% flax.
- Due to a contaminated batch of chemicals, industry specifications and performance standards for photocopy, lasergraphic, and inkjet paper could not be met during the run of 200,000 sheets.
- Successfully distributed the 200,000 sheet run to Ecojot who used the paper to make notebooks with a natural look and feel, marketing them throughout North America.

Project Impacts:

- During the project period, GHG emissions were reduced by 2.2 t CO₂e.
- Globally, the Prairie Pulp & Paper technology is expected to reduce GHG emissions by 2.5 t CO₂e/tonne of tree-free paper displacing traditional paper.

Path to Market:

- Prairie Pulp & Paper is planning to construct a full-scale 200,000 tonnes/year tree-free paper plant, employing up to 500 people in rural Manitoba, and providing an income to farmers for their crop residue, replacing current costs to burn stubble.
- The paper mill is expected to provide the Manitoba farm community with total benefits in excess of \$75 million/year while opening up a high value market for agricultural residues for commercial paper production.
- Prairie Pulp & Paper has an agreement with Unisource for paper distribution to big box customers and Business to Business accounts nationwide.
- Market rollout of this technology is expected to reduce annual GHG emissions by 1 Mt CO₂e/yr in Canada.

EcoSmart Foundation

Round 7-2005A

Sector:
Energy Utilization

Project Delivery Completion:
January 2011

Market Impact Report Due:
January 2013

Total Project Value:
\$3,828,862

SDTC Funding:
\$1,866,630

Leveraged Funding:
\$1,962,232

Consortium Members:

EcoSmart Foundation Inc.
Lafarge Canada Inc.
Holcim (US) Cement
Busby, Perkins + Will Architects
Levelton Consultants Ltd.
Windmill Development Group Ltd.
Halcrow Yolles
C&CS Atlantic Inc.
University of Calgary
AMEC Earth & Environmental
Read Jones Christoffersen Ltd.
Graham Group Ltd.
University of Toronto
Canadian Steel Producers Association
Natural Resources Canada - CANMET
Greater Vancouver Regional District
Public Works and Government Services
Canada
EBA Engineering Consultants Ltd.
BCIT
Groupe SEM (SIMCO Technologies Inc.)
Lehigh North West Cement Ltd.
Environment Canada

Environmental Benefits

(primary benefit bolded):

Climate Change

Clean Air

Project Title:

Supplementary Cementing Materials (SCM) Optimization System

Project Description:

EcoSmart Foundation Inc. successfully demonstrated a Supplementary Cementing Materials Optimization System (SOS) that allows developers, architects, engineers, contractors and material suppliers to optimize the use of supplementary cementing materials (SCMs) by simulating the effects of varying the multitude of parameters that interplay on construction projects. By determining optimal SCM levels and tradeoffs, the system enables users to reduce GHG emissions and construction costs, and lower the environmental footprint by directly reducing the amount of Portland cement required for construction projects.

Objectives:

- Develop a web-based computer software application that provides on-line expert guidance for the optimum selection of SCMs to be used in concrete. Typical examples of SCMs include natural pozzolans (like volcanic ash), fly ash, ground granulated blast furnace slag, rice husk ash, and silica fume.
- Reduce GHG emissions through reduction in cement usage.
- Facilitate rapid uptake in SCM use in the construction industry.

Results:

- Demonstrated a successful integrated decision-support system that allows developers, architects, engineers, suppliers and builders to simulate the effects of varying the type and level of supplementary cementing materials (SCM) on a construction project.
- Interactively determined the optimum make-up and quantities of SCM.
- Produced query tools for various concrete applications.
- Developed a reference database populated with scientific and technical knowledge including mixture characteristics, environmental data, codes and standards, material costs, and experience.
- Successfully completed numerous consortium partner member SCM tests, validating the efficacy of the technology to enable GHG emission reductions.

Project Impacts:

- For every tonne of cement displaced using the EcoSmart software, GHG emissions will be reduced by 0.8 t CO₂e.

Path to Market:

- The SOS technology is currently commercially available.
- EcoSmart and their consortium partners, continue to augment the database content, expanding their ability to deliver the SOS technology to the construction industry in Canada and internationally.
- EcoSmart has been successful in penetrating the Chinese market where the technology is positioned to enable significant GHG emission reductions.
- The SOS technology has the potential to enable the reduction of GHG emissions by 578 kt CO₂e/year in Canada and 290 Mt CO₂e/year in the rest of the world by 2020, based on construction industry adoption projections.

Paragon Soil and Environmental Consulting Inc.

Round 13 2008A

Sector:
Agriculture

Project Delivery Completion:
December 2010*

Market Impact Report Due:
December 2012

Total Project Value:
\$527,743

SDTC Funding:
\$231,151

Leveraged Funding:
\$296,592

Consortium Members:

Paragon Soil and Environmental Consulting Inc.
EarthRenew
University of Saskatchewan
TransCanada Pipelines Ltd.
Canadian Natural Resources Ltd.

Environmental Benefits

(primary benefit bolded):

Climate Change
Clean Air
Clean Soil
Clean Water

*Project related activities were completed in December 2010. However, final project reporting was completed in 2011.

Project Title:

Subsoil Injection of Compost Pellets

Project Description:

Meeting regulated standards for land reclamation after oil drilling activities are completed on a site is often a lengthy and expensive process. Paragon Soil and Environmental Consulting Inc. (Paragon) developed and demonstrated their organic pellet injection system that simultaneously loosens soil compacted by activities associated with oil well drilling and pipeline construction, while adding organic pellets. The pellets help to prevent re-compaction by introducing organic material and promoting deep root growth. The Paragon technology reduces the time to meet site reclamation standards by improving soil quality and reducing costs by eliminating the need for repeat treatments.

Objectives:

- Successfully develop and demonstrate an operational scale two shank subsoiler, pellet injector system and air permeameter system for rehabilitation of compacted well sites and pipeline corridors in Alberta.
- Apply three different treatments (a control - no treatment; subsoiling only; and subsoiling with pellet injection) at sixteen one hectare sites;
 - Demonstrate measurable improvement in post treatment land rehabilitation;
 - Quantify environmental benefits and costs at the operational scale for different locations, soils, and land uses.

Results:

The Paragon subsoiling and pellet injection technology, as compared to the control plots where no treatment was undertaken:

- Reduced soil compaction 17 to 40% in all second year sites and half of first year sites.
- Increased soil water content up to 72%.
- Increased organic carbon and total nitrogen content at all sites.
- Increased grain yield by 53 to 88% for canola, and 58% for wheat.
- Improved soil nutrient supply, rooting depth and soil structure.
- Raised the humus (stable organic matter) content in the soil.

Project Impacts:

During the project period four hectares (one quarter of each of the 16 sites) were treated with the Paragon technology achieving the following:

- 7% increase in plant height.
- 13% increase in dry biomass production.
- Twofold increase in rooting depth and density.
- The increase in these nutrients and the increased ability of the soil to absorb and retain water will allow vegetation growth, crop yield, and full site reclamation.
- 15 t CO₂e emissions avoided from biomass sequestration underground in plant root systems and organic pellets.
- Application of the technology is expected to reduce GHG emissions by 18 t CO₂e/ha/yr.

Path to Market:

- Through their newly formed company, Soil Savvy Inc., Paragon Soils is in the process of commercializing the technology, with 500 tonnes (25 ha) of pellets applied as of 2011.
- Target clients are oil and gas operators, pipeline companies, oil sands, mines and Steam Assisted Gravity Drainage (SAGD) operations, and railway and highway construction companies.
- In Canada by 2016, based on the Paragon market rollout, 7.1 kt of organic carbon, and 1 kt of total nitrogen are expected to be added to soil at disturbed well sites and pipeline corridors. GHG emissions are expected to be reduced by 2.7 kt CO₂e/year.

Petroleum Technology Research Centre (PTRC)

Round 7-2005A

Sector:
Energy Exploration and Production

Project Delivery Completion:
October 2010*

Market Impact Report Due:
October 2012

Total Project Value:
\$9,603,000

SDTC Funding:
\$3,168,990

Leveraged Funding:
\$6,434,010

Consortium Members:

Petroleum Technology Research Centre
 Husky Energy Inc.
 Nexen Inc.
 Canadian Natural Resources Ltd. (CNRL)

Environmental Benefits

(primary benefit bolded):

Climate Change

Clean Air

*Project related activities were completed in October 2010. However, final project reporting was completed in 2011.

Project Title:

Joint Implementation of Vapour Extraction (JIVE)

Project Description:

PTRC developed and demonstrated a simulation and analytical system that was expected to provide an environmentally sensitive and energy-efficient enhanced oil recovery (EOR) process for heavy oil reservoirs in Western Canada. This technology is a solvent vapour extraction (SVX) process intended as an alternative to thermal processes for enhanced recovery of heavy oil from reservoirs following Cold Heavy Oil Production with Sand (CHOPS). Compared to thermal processes such as steam assisted gravity drainage (SAGD) and cyclic steam stimulation (CSS), the technology uses 90 percent less water while targeting decreased greenhouse gas intensity per barrel produced. This technology was developed as a means to recover heavy oil from the significant reserves that remain in place following CHOPS production, where thermal technologies are not currently cost effective, and in many cases unsuited to the reservoir geology.

Objectives:

- Conduct a series of laboratory studies in coordination with three field pilot tests being undertaken by industry partners Nexen, Husky and CNRL.
- Field test various solvent combinations to determine if they can be utilized to increase recovery as an alternative to steaming in heavy oil reservoirs.
- Determine whether the results of the field tests of solvent injection can be predicted with numerical simulation and physical models to effectively forecast production performance.

Results:

- Demonstrated that solvent (propane) injection in heavy oil reservoirs following CHOPS oil recovery is feasible.
- The cost of the solvent needed to re-pressurize the reservoir prior to production is a challenge to the economic viability of the technology.
- Various combinations of temperature, volume and pressure affected the precipitation of asphaltenes in situ, presenting challenges during production.

Project Impacts:

- This project significantly advanced industry knowledge of using SVX processes to produce heavy oil, catalyzing further development work and optimization beyond the scope of the SDTC project.

Path to Market:

- By completing some of the first SVX feasibility tests undertaken in the heavy oil industry, the PTRC JIVE project set the stage for commercial development of SVX technology.
- Husky Energy continues to pursue the development of this technology as a means to enhance production in large heavy oil post CHOPS reservoirs where only 5% to 10% of the oil has been recovered.
- Post commercialization, the SVX technology is expected to have a lower carbon and water use footprint than thermal EOR alternatives.

N-Solv Corp.

Round 7 -2005A

Sector:
Energy Exploration & Production

Project Delivery Completion:
October 2010

Market Impact Report Due:
Not Applicable

Total Project Value:
\$18,398,296

SDTC Funding:
\$5,404,672

Leveraged Funding:
\$12,994,254

Consortium Members:

N-Solv Corp.
Suncor Energy Inc.
Nenniger Engineering Inc.
Hatch Inc.

Environmental Benefits
(primary benefit bolded):

Climate Change
Clean Air

Project Title:

Enhanced Solvent Extraction Process for In Situ Oil Sands

Project Description:

The N-Solv Corp. project was to build a 300-barrels-of-oil-per-day demonstration plant to field test a patented process (N-Solv™) for in-situ extraction of oil from oil sands using a pure condensing solvent. The process aimed to offer commercially attractive oil-production rates and an 80 percent reduction in greenhouse gas emissions when compared to conventional steam-based extraction processes. In addition, the technology was developed to avoid consumption of any process water and produce an enhanced-quality oil product with higher value.

Objectives:

To apply the N-Solv process to a heavy oil reservoir in order to assess and demonstrate the commercial feasibility of the N-Solv technology for in-situ recovery of bitumen from oil sands, including:

- Eliminate the need for process water for in situ bitumen production.
- Reduce greenhouse gas emissions by 80% compared to steam assisted gravity drainage (SAGD).
- Demonstrate sustained bitumen production rates comparable to a SAGD (i.e. 300 bpd for a 300m horizontal well.)

Results:

Initial steps taken at the Alberta Research Council involved scaling up demonstrated laboratory results to calculate expected commercial production rates.

During the development phase for creation of the field test facilities the following was achieved:

- Tested injection solvent at 60° C and 2,000 psi to validate previous test results.
- Completion of process flow diagrams (PFDs) and piping and instrumentation diagrams (P&IDs),
- Completion of reservoir characterization and modelling in support of the drilling program.
- Mechanical equipment specification development.
- Site layout and hazard review.

The work completed during the project reconfirmed the modelling and assumptions, providing the necessary information to move forward to a commercial scale demonstration and continued development of the technology.

Project Impacts:

- Site relocation and changes in the oil sands operator host and demonstration resulted in project delay beyond the SDTC funding time period.
- Timeline challenges prohibited commercial scale testing of the technology, therefore bitumen could not be extracted and measurable environmental benefits were not created during the project period.
- The results obtained during the project confirmed the value of this technology.

Path to Market:

- N-Solv continues to pursue technology development and commercialization as there remains strong interest and need for novel in-situ extraction techniques to replace or improve the energy and water intensive processes currently in widespread use (SDTC Project Round 18 2010B).
- Findings are expected to lead to a field demonstration of the N-Solv process prior to commercialization and market uptake.
- Future work commercializing the technology will be supported by a strategic partnership established with industrial fabricator Berry Y&V.

Hydrogenics Corp.

Round 8-2005B

Sector:

Transportation

Project Delivery Completion:

September 2010*

Market Impact Report Due:

September 2012

Total Project Value:

\$7,917,229

SDTC Funding:

\$2,248,493

Leveraged Funding:

\$5,688,736

Consortium Members:

Hydrogenics Corporation

General Motors of Canada Ltd.

NACCO Materials Handling Group

Environmental Benefits

(primary benefit bolded):

Climate Change

Clean Air

*Project related activities were completed in September 2010, however, final project reporting was received in 2011.

Project Title:

Fuel Cell-Powered Forklift Project (Phase 2)

Project Description:

Hydrogenics Corporation and General Motors of Canada (GM) partnered to demonstrate fuel cell technology for the material handling industry. The consortium deployed 19 forklift trucks outfitted with fuel cell power packs at GM's Oshawa assembly plant. This project represented one of the first large deployments of fuel cells in material handling vehicles in a demanding commercial environment which was considered a critical step toward commercialization in this market.

Objectives:

- Design, develop, install and demonstrate the Hydrogenics next generation model fuel cell stacks and power modules in a fleet of 19 forklifts for use in the day-to-day operations at a GM production facility in Oshawa over a period of 24 months.
- Construct, deploy and demonstrate a hydrogen re-fuelling station.
- Monitor and analyse end-user data and feedback on operating costs, maintenance costs and product performance demonstrating enhanced performance compared to battery powered forklifts.

Results:

The following results are based on a total cumulative forklift run time of over 30,000 hours across the 19 fuel cell forklifts:

- Maximum number of hours a single fuel cell powered forklift operated was 2,701.
- Achieved an average refuel time of roughly 2.5 minutes, as compared to 15 minutes for lead-acid battery forklifts, which included battery swap out and recharging.
- Productivity loss due to the voltage drop prior to refueling in the battery powered forklifts was calculated to be approximately 5%, whereas fuel cell powered forklifts do not experience decreases in power.
- Further technology development and demonstration is required to improve and validate field durability, although the core functionality of the technology was demonstrated.

Project Impacts:

- The demonstration validated that when the Hydrogenics fuel cell powered forklift technology replaces a combination of battery powered and internal combustion engine forklifts, the GHG emission reductions are expected to be 2.9 t CO₂e/forklift-year in Canada and 5.4 t CO₂e/forklift-year in the rest of the world.

Path to Market:

- The Hydrogenics technology requires further development and demonstration iterations prior to commercialization in forklift applications.
- The company expects that manufacturing volumes will be driven from other markets such as telecom backup power, which economies of scale can then be leveraged and applied to the forklift market.

Electrovaya Inc.

Round 6-2004B

Sector:
Transportation

Project Delivery Completion:
August 2010*

Market Impact Report Due:
August 2012

Total Project Value:
\$5,634,940

SDTC Funding:
\$1,859,530

Leveraged Funding:
\$3,775,410

Consortium Members:

Electrovaya Inc.
Unicell Ltd.
SouthWestern Energy Inc.
Halton Hills Hydro Inc.
Purolator Courier Ltd.

Environmental Benefits

(primary benefit bolded):

Climate Change

Clean Air

*Project related activities were completed in August of 2010. However, final project reporting was completed in 2011.

Project Title:

Lithium Ion SuperPolymer® Battery for Application in Zero-Emissions Commercial Fleet Vehicles

Project Description:

Electrovaya Corp. demonstrated its patented Lithium Ion SuperPolymer® battery system for zero-emission battery-operated electric vehicles. Electrovaya's award-winning battery technology delivers among the highest energy densities of any battery technology on the market today, enabling electric and hybrid-electric vehicles to operate over a long range.

Objectives:

- Demonstrate a viable electric vehicle battery, based on a scaled up version of the battery module Electrovaya had developed using their proprietary lithium polymer technology, and a variant of the electric drivetrain, previously incorporated in their Maya low speed commuter vehicle.
- Incorporate key requirements set by commercial electric vehicle manufacturers, including cycle lifetime, inherent safety, thermal management, electronic control interface and ease of integration.
- Introduce a battery powered electric vehicle for commercial fleet applications.

Results:

Electrovaya succeeded in taking their small scale (10-30kWh) battery packs and producing electric vehicle scale (>100kWh) prototype battery packs with an integrated battery management system, achieving the following:

- Development and delivery of a 700V representative prototype battery to Unicell.
- Development of lithium iron phosphate cell for automotive applications and evolution to lithium mixed oxide cell chemistry from initial small batch lab evaluation to full-sized integrated battery packs.
- Developed an advanced battery management system (over two generations) that addresses challenges associated with managing charge flow, cell thermal environment and possible voltage imbalances within the battery pack.

Project Impacts:

- The technology as applied to courier vans is estimated to reduce GHG emissions by 707 g CO₂e/km in Canada, which will increase in countries with higher grid emission factors.
- During the project there were no environmental impacts as the fleet demonstrations did not take place.

Path to Market:

- As part of the final scale up required prior to commercialization, Electrovaya and Chrysler Group LLC are developing a battery for the plug-in electric hybrid version of the Dodge Ram pick-up truck, an SDTC funded project (2009A).

Fifth Light Technology Ltd.

Round 6-2006B

Sector:
Energy Utilization

Project Delivery Completion:
July 2010

Market Impact Report Due:
July 2012

Total Project Value:
\$12,836,640

SDTC Funding:
\$3,911,300

Leveraged Funding:
\$8,925,340

Consortium Members:

Fifth Light Technology Ltd.
Carleton University
Marnoch Energy
Ozz Electronic Inc.
Ellis Don Corp
Toronto Hydro Energy Services

Environmental Benefits
(primary benefit bolded):

Climate Change
Clean Air

Project Title:

Lighting Management Control System II (LMS II)

Project Description:

Building on their success of over 60% energy savings with magnetic ballast based fluorescent light dimming technology, Fifth Light have added a management control system and adapted their technology to other types of devices such as high intensity discharge and compact fluorescent lamps. The LMS II technology enables building owners or occupants to control their energy costs, reduce their environmental footprint and participate in demand response programs by remotely controlling electronic ballast based lighting, building sensors and power switches.

Objectives:

- Develop, validate, test and demonstrate the various technological components that form the backbone of the lighting system.
- Deploy the technology at demonstration sites representing diverse building environments for the validation of the technology and proof of its commercial viability.

Results:

- Successfully demonstrated a complete integrated lighting solution providing full interoperability using the open Digital Addressable Lighting Interface (DALI) protocol.
- Deployed their LMS II technology at 17 different demonstration sites representing a variety of different types of commercial and industrial buildings and a mix of new construction and retrofit projects.
- Demonstrated an energy savings over the baseline case at all 17 demonstration sites achieving an average energy consumption reduction of 21.6 kWh/fixture/mo, a 54.5% savings over baseline levels.
- Reduced GHG emissions through decreased electrical energy consumption.

Project Impacts:

- During the project period GHG emissions were reduced by 270.8 t CO₂e.
- LMS II implementations will reduce GHG emissions by 0.052 t CO₂e/fixture/yr in Canada, and by 0.13 t CO₂e/fixture/yr in the rest of the world.

Path to Market:

- Fifth Light will initially target large (> 2,000 m³) industrial, commercial, and institutional buildings for their LMS II technology.
- Through distribution partners and value added resellers, Fifth Light plans to realize a 5% market share in new construction (500,000 units/yr), and a 1% market share in the retrofit market (1,000,000 units/yr) in Canada by 2020.
- GHG emission reductions resulting from the forecasted market rollout have the potential to reach 23 kt CO₂e/yr within Canada, and 196 kt CO₂e/yr in the rest of the world by 2015.

Group IV Semiconductor Inc.

Round 6-2004B

Sector:

Energy Utilization

Project Delivery Completion:

June 2010

Market Impact Report Due:

June 2012

Total Project Value:

\$12,016,734

SDTC Funding:

\$3,724,663

Leveraged Funding:

\$8,292,072

Consortium Members:

Group IV Semiconductor Inc.

McMaster University, Faculty of
Engineering

National Research Council – Canadian
Photonics

Fabrication Centre

Carleton University, Faculty of Engineering

EnCana Corp. Environmental Innovation
Fund

Environmental Benefits

(primary benefit bolded):

Climate Change

Clean Air

Project Title:

Solid State Lighting that Replaces Conventional Light Bulbs Used for General Illumination

Project Description:

Group IV Semiconductor Inc. planned to demonstrate a new breed of low cost, high efficiency silicon based solid-state lighting (SSL) products. The project built on a revolutionary silicon thin-film process that provides cost effective solid-state lighting technology to the mass market. The benefits of solid-state lighting are derived from a much higher efficiency than conventional light bulbs, reducing energy consumption by as much as 80 per cent. Unlike compact fluorescent light bulbs, solid-state lighting is able to reproduce the full colour spectrum required by mainstream applications.

Objectives:

- Create lab prototype full-spectrum emitters to demonstrate the SSL performance capability.
- Select a demonstration partner and engage in technical trials of Group IV emitters.
- Build prototype emitters meeting the technical requirements for a trial installation.
- Produce the first 1,000 lamps incorporating Group IV emitters for demonstration.

Results:

This was an early stage project which went from concept to prototype device. The project resulted in patented technology and achievement of the following:

- Developed and demonstrated the SSL emitters, advancing performance parameters from concept through development to component demonstration which met or exceeded original performance targets for luminous efficacy and light output.
- Demonstrated a prototype lamp incorporating a Group IV emitter array and an integrated power supply for a standard 115v light fixture.
- Developed the procedures, hardware, and software required to fabricate and test the devices, including a manufacturing scale ultrathin layering process, wafer processing, device testing, modelling and simulation.

Project Impacts:

- Group IV was unable to conduct any prolonged demonstration of the SSL technology, therefore there were no measurable environmental benefits.

Path to Market:

- As a successful early stage project, further development is now required to address device manufacturability for commercial adoption.

6N Silicon ***Round 10-2006B**Sector:
Energy UtilizationProject Delivery Completion:
April 2010Market Impact Report Due:
April 2012Total Project Value:
\$15,656,809SDTC Funding:
\$4,074,505Leveraged Funding:
\$11,582,304**Consortium Members:**6N Silicon Inc.
McMaster University**Environmental Benefits**
(primary benefit bolded):**Climate Change**
Clean Air**Project Title:**

A Proprietary Process for Purifying Metallurgical Grade Silicon into Solar Grade Silicon Using Low Cost Metallurgical Processing

Project Description:

6N's proprietary low-cost silicon purification process provides a novel less capital intensive approach to the production of solar grade silicon for the photovoltaic industry. By converting cheap, readily available metallurgical grade silicon (mg-Si) directly into solar-grade silicon, 6N is able to avoid the chemically-intensive and expensive process employed by the semiconductor industry. By significantly reducing the cost and energy consumed to purify the principal material used in the manufacturing of crystalline photovoltaic cells, the technology is positioned to help speed up the adoption and growth of photovoltaic power.

Objectives:

- Develop a technology based on metallurgical practices capable of producing silicon of sufficient purity to use to directly manufacture silicon solar cells.
- To reduce energy requirements during the silicon purification process displacing fossil fuel for electricity generation.

Results:

- Demonstrated a multistep process using conventional metallurgical melting furnaces, gas injection and directional solidification in a unique and proprietary manner to remove impurities from readily available mg-Si.
- Produced 13.3 tonnes of solar grade silicon which met solar PV cell manufacturing requirements.
- Their novel process demonstrated that it eliminates the creation of chlorosilanes during silicon production. (Chlorosilanes are highly toxic, corrosive and often explosive chemical by products created by all other silicon manufacturing processes currently in production).
- Produced solar grade silicon much more economically as compared to upgraded metallurgical silicon (> 20% less) or electronic grade silicon (>40% less).

Project Impacts:

- Elimination of chlorosilanes from the silicon production process and reduction of volatile organic compounds by 57% in Canada and 69% in the rest of the world, decreasing air pollution.
- Emissions for the monitored project period were 878 t CO₂e, a net decrease of 468 t CO₂e as compared to an equivalent amount of solar grade silicon produced in the U.S., and 1,000 t CO₂e in China.
- The 6N silicon process produces net GHG emission reductions of 11.4 t CO₂e/t sg-Si globally.

Path to Market:

- There are currently more than 30 MW of 6N cells connected to the grid globally. The 6N material enables the solar industry to move towards grid parity with conventional power sources by economically addressing the needs of solar cell and module manufacturers.
- The 6N manufacturing facility is expected to reach a production capacity of 1,300 Mt by the end of 2011. Subsequent expansion of the Ontario plant are expected to more than double that capacity.
- As of 2010, 6N has been fully using or selling all available production of solar grade silicon to customers in North America, Asia and Europe.
- Modules using cells containing 6N purified silicon have passed both International Electrotechnical Commission (IEC) and UL certifications and have been used globally in standard 60-cell modules.
- Annual global emission reductions for silicon produced by 6N are projected to be 2.1 Mt CO₂e/yr by 2020, based on current market roll-out forecasts.

*In 2011, 6N was purchased by Calisolar Inc.

Alcoa Ltd.

Round 14-2008B

Sector:
Energy Utilization

Project Delivery Completion:
March 2010

Market Impact Report Due:
March 2012

Total Project Value:
\$599,845

SDTC Funding:
\$228,600

Leveraged Funding:
\$371,245

Consortium Members:

Alcoa Ltd.
SNC Lavalin Inc.
Nels Consulting Services Inc.

Environmental Benefits

(primary benefit bolded):

Climate Change
Clean Air
Clean Water
Clean Soil

Project Title:

In-Duct SO₂ Scrubber, Alcoa Aluminerie Deschambault Project

Project Description:

The Alcoa technology is designed to provide a low cost and sustainable solution for aluminum smelters world-wide to reduce SO₂ emissions. The aluminum smelter industry currently uses low sulphur calcined petroleum coke (CPC) to achieve lower SO₂ emissions. Compared to other commercial technologies, Alcoa's In-Duct Scrubber (IDS) technology is expected to result in a 25-30% reduction in energy consumption, 10% less solid residual generation, 50-60% lower capital cost, a smaller footprint, and high-quality by-product gypsum. With a shortage of low-sulphur CPC and in anticipation of more stringent future regulation of air pollutants Alcoa planned to demonstrate their IDS technology at commercial scale to achieve continuous removal of greater than 90% of SO₂ from smelter off-gases.

Objectives:

Overall project objectives consisted of:

- Design and development of a pilot unit to demonstrate SO₂ removal from aluminum smelter exhaust using Alcoa's in-duct scrubbing technology.
- Processing of 1/12 of the smelter gas flow (158,300 Nm³/hr) at Alcoa's Deschambault smelter achieving >90% SO₂ removal.
- Measurement of other gas emission reductions (NO_x, CO, HF, CO₂). A phased approach to technology development and demonstration.

Phase I project objectives consisted of:

- Completion of the FEL3 Design Drawing Package consisting of the basic engineering design of all plant components.
- Development of Procurement Specifications for the scrubber building, in-duct absorber; thickener; gypsum de-watering filter, induced draft fan and wet stack.
- Full scale Mist Eliminator testing to optimize the scrubber unit.
- Preliminary Computational Fluid Dynamics modeling to simulate the gas flow distribution within the scrubber.
- Project cost estimate at +/-10% accuracy level and execution schedule.

Phase II of the project targeted a full scale commercial demonstration of the Alcoa technology based on the results of Phase I.

Results:

Completed Basic Engineering Design (FEL3) including development of:

- Schematics and major equipment specifications.
- Computational Fluid Dynamics (CFD) modeling was completed in support of the FEL3 engineering design of Alcoa's In-Duct Scrubber device for >90% SO₂ removal from 8% of the pot exhaust gas at the Deschambault smelter.
- Mist eliminator testing was conducted on a new generation of mist eliminators to remove any droplet (mist) carryover from the scrubber to the stack.
- Detailed project schedule and execution plan.

Alcoa has decided not to pursue Phase II construction of a full-scale demonstration at this time.

Project Impacts:

- There were no environmental benefits delivered during the project period as deliverables consisted of detailed engineering design drawings and modeling tests.

Path to Market:

- Path to market will be contingent on completion of Alcoa proceeding to Phase II.

Radiant Technologies Inc.

Round 2-2002B

Sector:
Energy Utilization

Project Delivery Completion:
March 2010*

Market Impact Report Due:
March 2012

Total Project Value:
\$2,528,144

SDTC Funding:
\$1,000,000

Leveraged Funding:
\$1,528,144

Consortium Members:

Radiant Technologies Inc.
Bunge Canada
NORAM Engineering and
Constructors Ltd.

Environmental Benefits
(primary benefit bolded):

Climate Change
Clean Air

*Project related activities were completed in March 2010, however, final project reporting was received in 2011.

Project Title:

Development and Pre-Commercial Demonstration of Cross-Cutting Technologies based on Microwave Assisted Processes (MAP)

Project Description:

Radiant Technologies demonstrated a novel natural product extraction technology known as MAP™ (Microwave Assisted Processing) for the production of value-added products from a variety of agricultural crops for eventual sale into nutraceutical, pharmaceutical, food and cosmetic markets. Compared to conventional extraction methods, Radiant's technology has the potential to significantly reduce process energy requirements and thus mitigate GHG emissions resulting from electricity production and on-site steam production. In addition, MAP can result in reduced process solvent requirements and reduced solvent losses, leading to further reductions in emissions of criteria air contaminants. It is also possible to substitute the use of toxic solvents with non-toxic alternatives and so potentially completely eliminate toxic solvent emissions.

Objectives:

Design, construct and test a demonstration-scale MAP facility for extraction, and processing of edible oils and other high-value compounds from agricultural and plant-based biomass including:

- Demonstrate 0.2 tonnes/hr (~5 tonnes/day) MAP extraction using a two phased scale up: Stage 1, 1 t/day capacity, and Stage 2, 5 t/day capacity.
- Reduce energy usage by 3.5 times and solvent usage by 4 times as compared to conventional solvent extraction.
- Evaluate the use of sub-critical CO₂ as an energy-efficient, CAC-free solvent for large-scale extraction of specialty natural products.

Results:

- Completed successful laboratory bench scale extraction testing for soybeans, residual flavour constituents from low quality vanilla beans, and essential fatty acids from oilseeds.
- Conducted additional bench scale extraction testing of specialty products including antioxidants from rosemary and pigments from microalgae, using both liquefied butane and conventional solvents.
- Tested sub-critical CO₂ MAP extraction of soybean flakes. MAP extraction of oil into sub-critical CO₂ was not found to be viable.
- Demonstrated a pilot-scale extraction facility with a throughput of 1 tonne/day dry material (Stage 1)
- Stage 2 was not completed during the project period due to delays securing a plant site. Radiant continues to build and commission their 5 tonne/day dry material demonstration plant.

Project Impacts:

- Due to the small testing scale, minimal environmental impacts were realized during the project.
- The Radiant technology forecasts GHG emissions reductions by 19.4 kg CO₂e/t seed processed.

Path to Market:

- Radiant is planning to use the MAP technology to produce high value compounds and ingredients for clients, as well as market the process through licensing agreements.
- Radiant is actively targeting a mix of clients primarily in the US and Europe with a selective focus on Asia.

Tenova Goodfellow Inc.

Round 5 2004A

Sector:

Energy Utilization

Project Delivery Completion:
December 2009*

Market Impact Report Due:
December 2011

Total Project Value:
\$11,077,549

SDTC Funding:
\$3,322,441

Leveraged Funding:
\$7,755,108

Consortium Members:

Tenova Goodfellow Inc.
Unisearch Associates Inc.
University of Toronto
Ontario Centre for Environmental
Technology Advancement
Hamilton Steel Group Inc.
St. Mary's Cement Inc.
Ontario Power Generation Inc.
(Northwest Division)
Tenova Campagnia Int. S.p.A. (Italy)

Environmental Benefits

(primary benefit bolded):

Climate Change

Clean Air

*Project related activities were completed in December of 2009. However final project reporting was completed in 2010.

Project Title:

Development and Demonstration of Goodfellow EFSOP™ Technology

Project Description:

Tenova Goodfellow Inc. demonstrated a full-scale version of their proprietary EFSOP™ (Expert Furnace System Optimization Process), a reliable off gas measurement and control system, capable of continuously measuring the composition of exhaust gases from the harsh steelmaking Electric Arc Furnace (EAF) environment. EFSOP™ enables the optimization of furnace operation reducing energy consumption and GHG emissions. The project involved the adaptation of EFSOP™ for use in a basic oxygen furnace (BOF) at steel mills, cement plants and coal fired generating stations. Managing these energy-intensive processes more accurately enables cost savings and higher environmental performance.

Objectives:

To adapt the EFSOP™ technology, which has been successfully commercialized for EAF steel making, to Basic Oxygen Furnace (BOF) steel making (*i*BOF), cement making (*i*COMBUSTION) and thermal energy generation for the purposes of lowering energy consumption, reducing operating costs, and reducing greenhouse gas emissions.

Results:

*i*BOF Technology for BOF Steelmaking

- Reduced emissions and energy consumption in BOF steel making.
- Achieved substantial productivity gains and cost reductions by predicting end point more accurately.
- Demonstrated BOF steel quality prediction capability of $\pm 0.01\%$ accuracy greater than 90% of the time.
- *i*BOF was endorsed by US Steel as having met their required BOF quality acceptance criteria.

*i*COMBUSTION Technology for Cement Manufacturing

- Measured the exhaust gases from industrial furnaces using continuous control algorithms and computer models based on combustion chemistry.
- Dynamically improved furnace operating efficiency and reduced energy consumption (electricity, petroleum and coke) in a cement pre-calciner.
- Achieved emissions reductions of 0.015 t CO₂e/t cement clinker.

Baseline data collection at a coal-fired power plant verified the applicability of the technology to thermal energy generation.

Project Impacts:

BOF Steelmaking

- Steel production time was shortened 0.2 minutes per heat cycle reducing diesel consumption by 1.5 l/heat cycle, and coal consumption by 5 kg/heat cycle.
- Electricity consumption was reduced by 41 kWh/heat cycle, which translates into 0.289 kWh/t of steel.
- Steel production was increased by 330 tonnes annually.
- Savings (excluding yield & productivity) were in excess of \$1.20/t liquid steel.
- *i*BOF implementations are expected to have payback periods of 10 to 11 months.

Cement Manufacturing

- Clinker production rates per tonne of raw feed was increased by 5.5%.
- Fuel and electricity consumption was reduced by 1.38 kWh/t of cement clinker.
- Petroleum coke was reduced by 4.7 kg/t of cement clinker.
- Emission reductions were 0.015 t CO₂e/t clinker, for a total of 1,950 t CO₂e.

Path to Market:

BOF Steelmaking

- Tenova has commenced commercial worldwide rollout.
- Based on the current market rollout, emission reductions in Canada could total 13.5 kt CO₂e/yr and in the rest of the world 167.7 kt CO₂e/yr by 2015.

Cement Manufacturing

- To gain broad market acceptance Tenova will combine direct marketing of *i*COMBUSTION as well as engaging a strategic partner with established technologies and sales channels in the cement industry.
- The *i*COMBUSTION technology applied to cement manufacturing is expected to reduce emissions by 15 kg CO₂e/t clinker within Canada and the rest of the world. Based on the current market roll-out emission reductions could reach 114.5 kt CO₂e/yr in Canada and 439 kt CO₂e/yr in the rest of the world by 2015.

Market Impact:

- Tenova Goodfellow currently employs 24 individuals to implement their EFSOP™ technology.
- *i*BOF systems have been sold to US Steel Canada (1), Riva Italy (1) and AK Steel in the US (2).

Vaperma Inc.**Round 7 2005A**

Sector:
Energy Exploration & Production

Project Delivery Completion:
December 2009

Market Impact Report Due:
December 2011

Total Project Value:
\$15,149,873

SDTC Funding:
\$5,049,958

Leveraged Funding:
\$10,099,915

Consortium Members:

Vaperma Inc.
Greenfield Ethanol
UOP LLC
Lignol Innovations Ltd.
Enbridge Gas Distribution Inc.

Environmental Benefits
(primary benefit bolded):

Climate Change
Clean Air

Project Title:

Biofuel Advanced Dehydration System Using Novel Vapour Permeation Membranes

Project Description:

Vaperma Inc. demonstrated a technology that improves the efficiency and cost-effectiveness of ethanol production. Using an innovative polymer membrane to separate water vapour from ethanol fuel (normally a very energy-intensive process), Vaperma's technology is able to lower the energy cost required to produce ethanol by up to 40 per cent. In addition, the technology offers lower greenhouse gas emissions, modularity, flexibility, simple operation and low maintenance. The process is adaptable to existing and new ethanol production plants, making this a technology that could be leveraged both in Canada and the rest of the world.

Objectives:

Develop and demonstrate a proprietary vapour permeation membrane separation technology with applications in the biofuels and gas processing industries. Specific project objectives included:

- Construction and operation of a 100 m² Sifteck™ pilot unit for ethanol dehydration at the Greenfield Ethanol plant to produce >99%, by weight, fuel-grade ethanol.
- The ability to dewater water/ethanol blends as low as 3% ethanol.
- Design, install and operate two demo units with the Vaperma spinning process (one 30 m²/day and one 60 m²/day capacity) for corn-to-ethanol and for natural gas dehydration applications, and fabrication and testing of 100 m² membrane modules.
- Design, construct and test two new movable pilot units, one for the distillation and membrane dehydration of cellulosic ethanol liquid feeds, and one for the dehydration of a methane-bearing gas.

Results:

- Installed, operated and tested a pilot demo unit for ethanol dehydration.
- Upgraded the membrane spinning process and installed two 50 kg/hour membrane pilot manufacturing lines.
- Fabricated and tested 100 m² membrane modules.
- Successfully installed Vaperma's first industrial, pre-commercial demonstration system for refining fuel grade ethanol using its Siftek™ polymeric membranes at the Greenfield Ethanol Plant in Chatham, Ontario.
- Demonstrated that the Vaperma membrane technology is an efficient technology for the dehydration of ethanol/water vapour streams. The membrane technology was shown to reduce steam consumption and thereby reduce emissions when compared to conventional molecular sieve dehydration (MSD) technology.

Project Impacts:

- Reduced steam consumption by 108,976 kJ/hour which resulted in a total GHG emission reduction of 13.74 t CO₂e over the 4.5 month test period.

Path to Market:

- Vaperma will not be pursuing commercialization. Any future market distribution will be through the new IP owners.

Market Impact:

- The company has ceased operations, therefore there are no market impacts to report.

Atlantic Packaging Products Ltd.

Round 5 2004A

Sector:

Forestry, Wood Products and Pulp & Paper Products

Project Delivery Completion:

October 2009*

Market Impact Report Due:

October 2011

Total Project Value:

\$7,959,404

SDTC Funding:

\$2,268,430

Leveraged Funding:

\$5,690,974

Consortium Members:

Atlantic Packaging Products Ltd.

Torftech (Canada) Inc.

Environmental Benefits

(primary benefit bolded):

Climate Change

Clean Air

Clean Soil

*Project related activities were completed in October 2009. However final project reporting was completed in 2010.

Project Title:

TORBED Paper Combustion Reactor

Project Description:

Atlantic Packaging has demonstrated a system developed by Torftech which converts paper mill biomass waste to energy while recovering clay from the waste. The energy generated is being used to produce steam for the operation thereby reducing the paper mill's consumption of natural gas while minimizing landfill utilization. This sustainable, integrated approach is environmentally beneficial and reduces costs when heat energy is used to offset gas consumption.

Objectives:

- Construct a production-scale TORBED reactor at Atlantic Packaging's Scarborough Ontario facility.
- Demonstrate the economic and environmental benefits associated with processing waste sludge using the TORBED system.
- Produce calcined clay by-product from the sludge combustion and use as a clay substitute for the production of cement.
- Convert biosolids waste stream into fuel for use onsite.

Results:

- Achieved steady state operation of the TORBED reactor system with 45% uptime and identified design improvements are expected to result in the achievement of 95% uptime.
- Processed approx. 50 tonnes of sludge/day generating 933,600 lbs steam/day.
- Recovered 8 to 12 tonnes of clay per day from waste sludge processing reducing sludge disposal in landfills. Extracted heat energy from the sludge through combustion providing the capability to reduce total natural gas consumption.

Project Impacts:

- During the project 30,190 tonnes of sludge were processed reducing GHG emissions by 736 t CO₂e, landfill requirements by 75% (by volume), and associated landfill methane emissions.
- 2,768 tonnes of residual calcinated clay was produced and used for cement production eliminating emissions that would otherwise have been created during the production of an equivalent amount of clinker (cement).
- The TORBED system reduces GHG emissions by 0.03 t CO₂e/t sludge processed.

Path to Market:

- Atlantic Packaging will continue to implement the TORBED reactor within their organization.
- Torftech, as the TORBED reactor developer, will continue ongoing product improvement, sales and support as part of their market rollout.
- Combined GHG emission reductions for both Atlantic Packaging and the Torftech market rollout are projected to be 18.8 kt CO₂e/yr in Canada and 10.1 kt CO₂e/yr in the rest of the world by 2015.

Market Impact:

- Torftech Inc. is responsible for the market rollout of the Atlantic Packaging technology.

Synodon Inc.

Round 4 2003B

Sector:
Energy Exploration and Production

Project Delivery Completion:
October 2009*

Market Impact Report Due:
October 2011

Total Project Value:
\$4,572,871

SDTC Funding:
\$1,056,790

Leveraged Funding:
\$3,516,081

Consortium Members:

Synodon Inc.
TransCanada Pipelines Ltd.
Airborne Energy Solutions Ltd.

Environmental Benefits

(primary benefit bolded):

Climate Change

*Project related activities were completed in October of 2009. however, final project reporting was completed in 2010.

Project Title:

realSens™ - An Aircraft-based Remote Sensing Survey Technology to Detect and Monitor Fugitive Emissions or Natural Gas

Project Description:

Synodon has successfully developed an infrared passive remote sensing technology, called realSens™, for detecting ground level gas plumes from a helicopter. The first version of realSens™ is designed for detection of either methane or ethane and the first target market is natural gas pipeline leak detection.

Objectives:

Design, build and test the first commercial model realSens™ instrument for remote detection and measurement of leaked natural gas from an aircraft platform. Specific objectives included:

- Engineering design and construction of the instrument.
- Development and demonstration of systems interfaces to integrate the realSens™ instrument to the helicopter, including operational and data retrieval computer codes.
- Confirmation and assessment of the expected performance of the instrument during laboratory and outdoor demonstrations.
- Demonstrate detection sensitivity of less than 300 microns methane in field trial from a height of 300 meters which would enable multiple applications including potential flights over cities.

Results:

- Synodon has received Supplemental Type Certificates (STCs) from both Transport Canada and the Federal Aviation Authority (FAA) in the U.S.A. These STCs allow Synodon to mount the realSens™ instrument pod on any Bell 206L helicopter in Canada or the U.S.A., without requiring any additional authorization.
- Successfully designed, built, and assessed the performance of the realSens™ commercial model instrument technology including the optical, mechanical, electrical, electronic and thermal systems both in the lab and in the field.
- Identified the structural and thermal properties of the instrument for operation on an airborne platform and the spectroscopic characteristics and calibration requirements.
- Implemented system interfaces between the realSens™ technology and other instruments operating in the helicopter pod to provide position, attitude and ambient data for real-time monitoring by the pilot.
- Achieved the target of detecting a 100 standard cubic feet per hour (scfh) ethane leak under good ambient conditions (low wind and high sun) during field testing.
- A service has also been added to inspect the visual images to look for right-of-way incursions such as heavy equipment, erosion, etc. Each visible image is geo-referenced (using the GPS and INS data) and stitched together.
- Detected ethane leaks of 170 scfh, 135 scfh and 125 scfh under non-optimal conditions (high wind).

Project Impacts:

- Based on industry standard practice and commitment to prioritize and repair detected leaks, the realSens™ technology has identified GHG emission reductions of 11.6 t CO₂e/km transmission (upstream) pipeline surveyed, and 3.1 t CO₂e/km distribution (downstream) pipeline surveyed.

Path to Market:

- Synodon will provide fugitive natural gas emission detection services making available various reports either directly to customers, or via third party licensed service providers.
- The primary target market is the global natural gas pipeline network, with future expansion into such secondary markets as pollution monitoring for industrial applications, landfills, and greenhouse gas mapping.

Market Impact:

- Synodon has been offering the realSens™ services to the natural gas pipeline sector since 2009. Since then the company has been relatively successful at signing contracts with a number of significant market players as listed: Nova Chemicals, Keyera Energy, ATCO Pipelines, Conoco Phillips, TransGas, Terasen, Encana, PG&E, and El Paso Corporation.
- In addition to the signed customer contracts, Synodon has also been pursuing new customers around the world with a more significant effort in the US which represents roughly 40% of the world market. The sales strategy is primarily focused on direct sales while marketing is focusing on important trade conferences and events where Synodon participates as an exhibitor and very regularly presents papers and research results.

Saskatchewan Power Corp. (SaskPower)

Round 3 2003A

Sector:
Power Generation

Project Delivery Completion:
September 2009

Market Impact Report Due:
September 2011

Total Project Value:
\$11,149,608

SDTC Funding:
\$2,682,900

Leveraged Funding:
\$8,466,708

Consortium Members:

Saskatchewan Power Corp.
ALSTOM Canada Ltd.
Sherrit Coal
University of North Dakota, Environmental
and Energy Research Centre
Natural Resources Canada – CANMET
Energy Technology Centre

Environmental Benefits
(primary benefit bolded):

Clean Air

Project Title:

Field Evaluation of Activated Carbon Injection to Control Mercury Emissions from Coal-Fired Power Plant

Project Description:

Saskatchewan Power Corp. demonstrated an innovative mercury removal technology that uses recyclable activated carbon to capture mercury emissions generated from coal fired power plants. Large quantities of mercury that accumulate in our food system can lead to neurological and nervous system disorders. Currently, there is no economically feasible technology available for reducing mercury emissions from coal fired generating plants beyond the current standard. SaskPower's leadership will enable the creation of higher standards for mercury emission control in this industry.

Objectives:

- Design, construct and install the mercury removal technology at SaskPower's Poplar River Power Station.
- Acquire and/or prepare and verify sufficient activated carbon material(s) to be tested.
- Evaluate the performance of several activated carbon materials for mercury capture.
- Provide economics of full-scale application of the mercury control technology demonstrated.

Results:

SaskPower completed the installation and commissioning of a full-scale activated carbon injection system at the Poplar River Power Station successfully testing and demonstrating the following:

- Mercury removal in a slipstream using a small scale electrostatic precipitator (ESP) at SaskPower's pilot facility as well as full scale testing in one of the 300 MW units.
- The dedicated fabric filter with activated carbon reduced mercury concentration in the processed gas by 90%, the slipstream electrostatic precipitator by 60% and the full-scale ESP by up to 80%, meeting upcoming Canadian legislation requirements.
- The presence of a fabric filter/bag house also contributes to improved capture and will likely be required with capture targets higher than 75% to 80%; and
- Activated biochar performance is comparable to that of current commercially available activated carbon.

Project Impacts:

- Mercury emission reductions during the project period were 120 kg.
- The technology is expected to reduce mercury emissions by 0.09 kg per MWh with a 70% capture rate.

Path to Market:

- ALSTOM now markets and sells systems commercially in North America under the process name Filsorption™.
- A broader market adoption will depend on the individual utilities' response to the current and proposed mercury emission reduction standards and regulations.
- The supply infrastructure for activated carbons is being developed by companies such as Sherritt and Norit as evidenced by the construction of up to four plants in Saskatchewan to produce up to 60 kt of powdered activated carbon for mercury removal.

Market Impact:

- SaskPower completed the installation and commissioning of a full-scale activated carbon injection system for both units at the Poplar River Power Station.
- Over 20 contracts for ALSTOM's Filsorption™ systems were booked as of March 2009. The technology has also been successfully tested in several plants in the US and the market penetration potential in that country is promising.

Plasco Trail Road Inc.

Round 7 2005A

Sector:

Power Generation

Project Delivery Completion:
July 2009

Market Impact Report Due:
July 2011

Total Project Value:
\$71,144,194

SDTC Funding:
\$9,494,466

Leveraged Funding:
\$61,649,728

Consortium Members:

Plasco Trail Road Inc.
Plasco Energy Group Inc.
Hera Holdings S. L.
City of Ottawa

Environmental Benefits
(primary benefit bolded):

Climate Change

Clean Air
Clean Water

Project Title:

Plasma Gasification for Municipal Solid Waste (MSW)

Project Description:

Plasco Trail Road Inc. has demonstrated their Plasco Conversion System (PCS), a plasma gasification process that converts up to 85 tonnes/day of MSW into synthetic gas, inert solid material and heat. The heat and gas were utilized in a power plant to produce electricity for sale into the local electricity grid. By avoiding current disposal methods, such as landfill or incineration, Plasco's new approach represents a breakthrough in environmental attractiveness.

Objectives:

Demonstrate the technology's scalability, operating efficiency, uptime and the ability to produce a synthetic gas that will generate electricity, supplying net power generated to the grid. Specific project objectives included:

- Process 75 tonnes/day of MSW supplied by the City of Ottawa. The plant also had the option to process up to 10 tonnes/day of consistent-carbon waste (such as plastics and tires) to supplement the energy content of the resulting syngas.
- Net power generation of >3.2 MW.
- Plant availability of >80%.

Results:

Successful construction and commissioning of a pilot plant which was able to demonstrate the following:

- Process up to 4 tonnes of MSW/hour (96 tonnes MSW/day).
- Conversion efficiency of up to 71% which, based on a validated captive power requirement of ~1 MW for a nominal plant capacity of 100 t/day, can potentially produce net power of > 3 MW, depending on the energy content of the waste.
- 63% pilot plant availability, however engineering improvements have been identified that will be introduced during market rollout to achieve >80% availability.

Project Impacts:

- 3,236 tonnes (wet) of MSW was processed.
- 43,459 KWh of gross electricity was generated.
- There were no net GHG reductions due to the intermittent pilot plant operation. In Canada, commercial implementations are expected to reduce GHG emissions by 0.7 t CO₂e/tonne MSW processed, as compared to landfill sites with an operational methane capture and flaring system based on average Canadian CO₂e emission factor per MWh of power generated.

Path to Market:

- Targeted early adopters are municipalities with limited or diminishing landfill capacity, and municipalities that are required to meet air emission standards.
- Plasco directly markets their plants to municipalities in Canada, the US, Europe and Asia, focusing on the sale of plants with a 200 and 500 tonnes/day throughput capacity.

Market Impact:

- As of March 2011, Plasco employed 106 individuals.
- The Ottawa demonstration plant has received permanent Certificates of Approval to operate, and has processed a total of 6.7 kt of MSW generating 287 MWh of electricity to date, achieving 69% availability.
- The Ottawa City Council has approved a 20 year waste processing contract with Plasco to process 300 t/day through a new PCS 3 module facility to be constructed and operating by 2016.
- Plasco was selected to build a three module facility for the Salinas Valley Solid Waste Authority in Salinas Valley, California.
- Plasco's PCS has been pre-certified by the California Energy Commission as eligible for California's Renewables Portfolio Standard (RPS) for the Salinas Valley project, classifying 100% of the power produced as renewable.

Advanced Lithium Power Inc.

Round 10 2006B

Sector:
Transportation

Project Delivery Completion:
June 2009

Market Impact Report Due:
June 2011

Total Project Value:
\$5,534,876

SDTC Funding:
\$1,400,000

Leveraged Funding:
\$4,134,876

Consortium Members:

Advanced Lithium Power Inc.
Quantum Fuel Systems Technologies
Worldwide Inc.
E-One Moli (Canada) Ltd.

Environmental Benefits (primary benefit bolded):

Clean Air
Climate Change

Project Title:

HEV Battery Packs

Project Description:

Automotive manufacturers have identified advanced lithium-ion batteries as a strong technology of choice for hybrid electric vehicles (HEV) and plug-in hybrid electric vehicles (PHEV). Lithium-ion batteries have twice the energy and power density of current nickel-metal hydride batteries, half the size and weight, and are expected to be lower cost. Advanced Lithium Power (ALP) has developed and integrated a complete lithium-ion battery system into a current model hybrid vehicle. This project has advanced the company's existing prototype battery results by building, testing, and demonstrating a production-ready battery pack to automotive manufacturers.

Objectives:

Produce and demonstrate pre-commercial Li-ion battery packs operating in personal vehicles. Specific project objectives included:

- Develop and demonstrate an advanced "intelligent" battery management system to control individual cell charging and discharging, cell balancing, and state of charge calculation.
- Develop and demonstrate a thermal management system to keep the cells at a safe operating temperature.
- Create a robust production design to allow eight to ten years of operation.
- Effectively integrate the battery pack operation with the vehicle's fuel management system.
- Improve fuel efficiency by at least 10% using Li-ion battery packs compared to NiMH battery packs.

Results:

- Successfully developed and demonstrated the battery pack prototype for the Ford Escape and both pre-commercial HEV and PHEV battery packs.
- A 7 kWh battery was developed and tested successfully for 400v military grade long-range all-electric vehicles (clandestine electronic reconnaissance vehicles – CERV) with acceptable results in track and desert conditions.
- It is estimated that the cycle life of the cells will be approximately 2,400 cycles to 20% capacity loss which is sufficient for eight to ten years of typical PHEV use.
- PHEV10 (10 mile range) Ford Escapes were shown to be 15-20% more efficient than conventional hybrid Ford Escapes on urban cycles.
- The PHEV50 (50 mile range) prototype pack was extensively tested on a high end four door sport roadster achieving over 1,000 miles in all-electric mode providing confirmation that the batteries are capable of achieving 52 miles of electric-only range on urban cycles.

Project Impacts:

- During the project, ALP battery sizes of PHEV40 (40 mile range) or less used in mid-sized personal vehicles resulted in GHG emission reductions of 0.122 t CO₂e/kWh battery capacity/yr.

Path to Market:

- Advanced Lithium will not be pursuing commercialization. Any future market distribution will be through the new IP owners, GigaWatt Corporation of Vancouver BC.

Market Impact:

- The company has ceased operations therefore there are no market impacts to report.

Lignol Innovations Ltd.

Round 4 2003B

Sector:

Forestry, Wood Products and Pulp and Paper Products

Project Delivery Completion:

May 2009

Market Impact Report Due:

May 2011

Total Project Value:

\$20,325,922

SDTC Funding:

\$6,240,816

Leveraged Funding:

\$14,085,106

Consortium Members:

Lignol Innovations Ltd.
University of British Columbia,
Faculty of Forestry
Ainsworth Lumber
West Fraser Timber Co. Ltd.
Suncor Energy Products Inc.

Environmental Benefits

(primary benefit bolded):

Climate Change

Clean Air

Project Title:

Lignol Biomass Conversion Technology

Project Description:

Lignol Innovations has demonstrated its unique and economical integrated process technology for biorefining abundant and renewable ligno-cellulosic biomass feedstocks into ethanol (fuel alcohol), pure lignin and other valuable co-products. Lignol's unique de-lignification pre-treatment Organosolv process fractionates or separates woody biomass into its components of cellulose, hemi-cellulose and lignin. The cellulose and hemi-cellulose are enzymatically hydrolysed into sugars, which are then fermented into ethanol which can be distilled and dehydrated to fuel-grade ethanol. The high purity lignin can be processed into a great variety of high value products. This innovation is a key solution for producing ethanol and high value products from low-value feedstocks, while providing an alternative to reliance on fossil fuels.

Objectives:

Design, construct and operate a functional plant to demonstrate the feasibility of future lignin biorefineries, including optimal operating conditions and cost parameters. Specific project objectives included:

- Reduce technical risks and better define production and handling of secondary products.
- Design and integrate an enzyme recycling module into the pilot plant to reduce ethanol production costs.
- Establish optimal operating parameters for producing marketable lignin and ethanol at economically attractive prices.
- Identify the optimal operating conditions and cost data together with the capital and project costs of a continuous, counter current Lignol biorefinery.

Results:

- Developed a fully functional, end to end, integrated pilot plant that modeled every major process step of a commercial biorefinery in Burnaby, BC, with a 73% uptime since commissioning.
- Confirmed key design parameters such as extraction liquor to wood ratio, ethanol yield, lignin yield and quality, solvent loss, heat recovery and enzyme dosage.
- Completed the Design Document for the next scale-up demonstration plant.
- Implemented collaborative arrangements with a number of companies slated to be first users of the lignin materials for testing and feedback with potential early adopters.
- Demonstrated significantly reduced enzyme consumption during ethanol production.

Project Impacts:

- The project produced GHG emission reductions of 3.9 kg CO₂e/l ethanol produced using beetle kill pine feedstock.

Path to Market:

- Based on targeted scale-up efficiencies, range of feedstocks being processed, and an assumed 300 litre ethanol/tonne biomass yield, an emission reduction intensity of 2.4 kg CO₂e/l ethanol produced is expected for this Generation 1 Lignol technology.

Market Impact:

- Lignol is currently undertaking a second project with SDTC for demonstration of their Generation 2 Biomass Conversion technology. Market impacts will be reported following completion of the SDTC Lignol II project (2008B-1513).

Sacré-Davey Innovations Inc.

Round 4 2003B

Sector:
Energy Exploration & Production

Project Delivery Completion:
May 2009

Market Impact Report Due:
May 2011

Total Project Value:
\$17,681,710

SDTC Funding:
\$5,727,711

Leveraged Funding:
\$11,953,999

Consortium Members:

Sacré-Davey Innovations Inc.
 Westport Research Inc.
 Sacré-Davey Engineering

Environmental Benefits

(primary benefit bolded):

Climate Change
Clean Air

Project Title:

Integrated Waste Hydrogen Utilization Project (IWHUP)

Project Description:

Sacré-Davey Innovations Inc. demonstrated a hydrogen fuel refining, storage and distribution infrastructure – a critical component to maintaining Canada's leadership in the Hydrogen Economy. By capturing waste hydrogen – which is being vented to the atmosphere every day by more than a dozen of Canada's sodium chlorate manufacturing plants – Sacré-Davey is able to put this waste to good use in power generation and heavy and light duty hydrogen vehicles. Further, this project assisted in lowering the production and distribution cost of hydrogen – a critical step in overcoming the barrier to fuel cell vehicles.

Objectives:

- Capture, purify and compress waste hydrogen from a sodium chlorate manufacturing plant.
- Create a demand for hydrogen refueling and distribution infrastructure coupled to end-use applications.
- Use hydrogen instead of gasoline to fuel pickup trucks, and use a blend of 20% hydrogen and 80% natural gas (HCNG) to replace compressed natural gas in buses as a demonstration of the successful integration of the full hydrogen capture, distribution and use cycle.

Results:

- Successfully captured, purified and compressed waste hydrogen from an industrial source meeting specifications required for fuel cells.
- Demonstrated the long term operability of the hydrogen supply model, including the hydrogen delivery infrastructure which has been a key impediment to the development of the hydrogen economy.
- The HCNG buses were the most successful application and this component of the project is ready for commercialization.
- 19,650 kg of hydrogen was produced and used during the project.

Project Impacts:

- During the five-year span of the project, hydrogen was delivered in a distribution network fuelling operational vehicles.
- Project vehicle usage reduced total GHG emissions by 272 t CO₂e.

Path to Market:

- The technology has been demonstrated to be technically feasible, however, for broad market adoption, an expanded distribution network will be required in order to achieve economic viability.
- The end target for the technology is to supply hydrogen in a variety of areas including: vehicles and fuel cells, upgrading and desulphurization of non-refined products, production of bio-feedstocks, and generally to service a range of conventional merchant hydrogen markets.

Market Impact:

- Hydrogen Technology and Energy Corporation (HTEC) is a Sacré-Davey spin-off company which is focused on developing and delivering many of the hydrogen related technologies associated with this project.
- Sacré-Davey as part of HTEC, is currently involved in a second SDTC project (2009A) to demonstrate a larger scale system which includes hydrogen liquefaction and use in BC Transit fuel cell buses.
- HTEC has a contract to provide hydrogen and refueling infrastructure services to three hydrogen vehicle fueling stations in North Vancouver.
- Market impact related to the Sacré-Davey technologies will be reported following completion of the HTEC project.

Atlantic Hydrogen Inc.

Round 5 2004A

Sector:
Energy Exploration & Production

Project Delivery Completion:
May 2009

Market Impact Report Due:
May 2011

Total Project Value:
\$6,893,548

SDTC Funding:
\$2,096,948

Leveraged Funding:
\$4,796,600

Consortium Members:

Atlantic Hydrogen Inc.
 Hydrogen Engine Center
 PrecisionH2 Power Inc.
 University of New Brunswick
 Energy Reactions Inc. (McGill University)
 Enbridge Canada
 Agriculture and Agri-Food Canada

Environmental Benefits

(primary benefit bolded):

Climate Change

Clean Air

Project Title:

Atlantic Hydrogen: CarbonSaver™ HENG Production

Project Description:

Atlantic Hydrogen Inc.'s technology, the CarbonSaver™, feeds hydrogen-enriched natural gas (HENG) as fuel for internal combustion engines (ICE) for power generation or other applications. At the same time, this innovation removes the carbon in solid form rather than returning it to the atmosphere as carbon dioxide. The new technology demonstrated during this three-year project is of particular importance for its efficacy in stationary combustion engine applications linked to the existing natural gas distribution grid.

Objectives:

- Demonstrate the emission reductions of the CarbonSaver™ technology in a pre-commercial environment.
- Operate a 60 Nm³/hour capacity alpha scale plant to provide HENG containing 5 to 20% hydrogen for use in a 75 kW Tecogen combined heat and power internal combustion engine.
- Demonstrate steady-state operation (eight hours) of CarbonSaver™ as a 20 to 26 m³/hr source of low pressure HENG fuel (10% hydrogen by volume) for a Tecogen 75 kW internal combustion engine, stationary, Combined Heat and Power (CHP) generator set.

Results:

- The CarbonSaver™ alpha prototype dissociated natural gas, freeing solid carbon and returning hydrogen to the natural gas stream in the range of 8 to 14% by volume.
- A Tecogen 75 kW CHP unit was successfully operated using HENG as fuel under steady-state operational conditions for eight hours at a flow rate of 26 m³/hr.
- The nano-scale CarbonSaver™ carbon produced in the process was shown to blend successfully with other high-quality carbons.
- The CarbonSaver™ demonstrated the ability to produce HENG at up to 20% by volume.

Project Impacts:

- GHG emission reductions during the project were 15 kg CO₂e.

Path to Market:

- Atlantic Hydrogen plans to scale up the technology for fuelling ICEs with HENG at natural gas compressor stations, ranging from 50 to 500 kW.
- Initial commercialization is expected to occur with the combined heat and power markets.
- Emission reduction intensities for the market rollout are projected at 150 g CO₂e/Nm³ HENG (10% H₂) in Canada and 160 g CO₂e/Nm³ HENG (10% H₂) in the rest of the world.

Market Impact:

- Atlantic Hydrogen is in the early stages of commercializing CarbonSaver through strategic alliances and collaborative partnerships.

Blue-Zone Technologies Ltd.

Round 3-2003A

Sector:
Energy Utilization

Project Delivery Completion:
December 2008*

Market Impact Report Due:
December 2010

Total Project Value:
\$8,335,521

SDTC Funding:
\$2,700,000

Leveraged Funding:
\$5,635,521

Consortium Members:

Blue-Zone Technologies Inc.
 University Health Network
 Canadian Centre for Pollution Prevention
 Jayne Industries Inc.
 University of Toronto, Faculty of Medicine
 Ontario Centre for Environmental
 Technology Advancement
 Exova Canada Ltd.
 Highland Equipment Ltd.
 SANI-FLO Welding Ltd.
 GMP Engineering Ltd.

Environmental Benefits
 (primary benefit bolded):

Climate Change

*Project related activities were completed in December 2008. However, final project reporting was completed in 2009.

Project Title:

Pre-Commercial Demonstration Project for the Capture, Reclamation and Purification of Halogenated Anaesthetic Greenhouse Gases in Hospitals

Project Description:

Blue-Zone Technologies Ltd. has demonstrated a technology to capture, reclaim and purify halogenated inhalation anaesthetic gases used in hospital operating rooms, much of which escapes during medical application. These are very aggressive GHGs, some having global warming potential up to 1,900 times that of carbon dioxide. The Blue-Zone technology, broadly called Delta™, can capture and reconstitute these vented gases. The anaesthetic can be re-used 10 to 20 times. This offers hospitals significant savings in their expenditures on anaesthetic gas while preventing harmful GHG emissions.

Objectives:

- Engage hospitals across Canada for participation in an operating room (OR) anaesthetic gas collection demonstration project to avoid venting of anaesthetic gases to the atmosphere.
- Capture anaesthetic gases using proprietary Deltasorb™ canisters attached to existing operating room air scavenging systems.
- Design, construct, commission and operate a pilot plant to reclaim, reconstitute and purify the captured anaesthetic gases.

Results:

- Successful operation of Deltasorb™ canisters over a 4½ year period in 143 operating rooms located in 13 Canadian hospitals.
- Capture of ~400 litres (~0.6 l/OR/y) of GHG emissions from vented anaesthetic gases.
- Construction, commissioning and operation of a 46 litre pilot anaesthetic gas reconstitution plant in Markham, Ontario where desflurane (334 kg), sevoflurane (211 kg), and isoflurane (53 kg) were recovered from Deltasorb™ canisters and purified.

Project Impacts:

- The demonstration project resulted in net emission reductions of 489 t CO₂e, an average of 0.8 t CO₂e per operating room per year.

Path to Market:

- Blue-Zone provides anaesthetic gas capture and collection services to ORs using a monthly fee for service model. As of 2009, 200 Canadian ORs were subscribed to this service. The gases captured are distilled and reclaimed at the Blue-Zone facility in Markham, Ontario.
- In the North American market, Blue-Zone is working to form strategic partnerships with major suppliers of inhalation anaesthetic. For markets in developing countries where this quality of anaesthetic is not available, Blue-Zone plans to market the product under a generic brand for direct sale.
- Blue-Zone has entered into a joint marketing agreement with Mazzetti NBL, a leading US Hospital Engineering company, to provide gas collection services to their US clients.

Market Impact:

- Blue-Zone is beta testing a new Central Collection System in 100 ORs at the Cleveland Clinic in the US. Once operational, this hospital will provide GHG emission reductions of 2.72 kt CO₂e/yr.
- In Canada, 48 new ORs have implemented the Blue-Zone gas collection service since 2009, increasing total Canadian hospital GHG emission reductions to 171 t CO₂e/yr.
- Blue-Zone is about to implement gas collection services in South Africa, Australia and China.

University of New Brunswick

Round 2-2002B

Sector:
Power Generation

Project Delivery Completion:
September 2008*

Market Impact Report Due:
September 2010

Total Project Value:
\$725,511

SDTC Funding:
\$257,826

Leveraged Funding:
\$467,685

Consortium Members:

University of New Brunswick
Eoletech Inc.
NB Power
Village of Dorchester
Briggs & Little Woolen Mills Ltd.
Turbowinds Canada Inc.
Université de Moncton
Wind Energy Institute of Canada
Natural Resources Canada
Custom Research Ltd.

Environmental Benefits

(primary benefit bolded):

Climate Change

Clean Air

*Project related activities were completed in September of 2008. However final project reporting was completed in 2009.

Project Title:

Development and Pre-Commercial Demonstration of Interconnection Technologies Based on Power Electric Converters for Wind and Small Hydro Distributed Power Generation

Project Description:

The University of New Brunswick (UNB) demonstrated high performance interconnection technologies based on power electronic converters for small wind turbine and hydro-electric distributed power generation systems. The efficient converter enables cost-effective distributed power generation for small locations such as local communities and industrial settings.

Objectives:

- Demonstrate cost effective interconnection technologies based on power electronic converters which meet the new international and Canadian standards. In addition, the converters were to be scalable for variable speed wind and small hydro applications of various power capacities.
- Demonstrate a 30kW insulated gate bipolar transistor (IGBT) inverter for variable speed wind turbines based on Wenvor Technologies' 30 kW wind turbine for net-metering applications. The power electronic converter was to accomplish the wind turbine control, maximum power extraction and power conversion, and meet the interconnection standard requirements.
- Using the 30 kW IGBT inverter, increase the energy output of the turbine by 10%.
- Demonstrate a 300 kW power converter for variable speed small hydro systems by implementing generator control and power conversion to expand the developed technologies into higher power markets.

Results:

The project successfully demonstrated the following:

- Power converters for a 30 kW variable speed wind turbine, a 25 kW variable speed small hydro unit, and a 300kW variable speed small hydro unit.
- Interconnection technology on the 30 kW Wenvor wind turbine in PEI and on three 10 kW turbines in Saskatchewan.
- The 10 kW Ventera wind turbines in Saskatchewan are all in full operation under the net-metering program. Energy production data is continuously monitored by the SaskPower revenue meters on site.
- The small hydro power converter was successful at the 100 kW capacity, although for logistical reasons it was not demonstrated at full capacity.

Project Impacts:

- During the project the turbine installations in Saskatchewan generated 8.8 MWh of electricity.
- Turbine installations reduced GHG emissions by an estimated 0.75 t CO₂e in Saskatchewan.

Path to Market:

- Early adopters are expected to be small wind energy technology and small hydro companies who need to introduce energy into the grid at specific, controlled flows.
- In order to further validate a 10% increase in energy output, UNB is implementing a monitoring plan for more accurately determining the impact of their technology in the future.

Market Impact:

- Market development is being accomplished by the companies with UNB inverter licenses.
- Six licencing agreements have been signed to implement and market various customized versions of the 10 kW, 100 kW, 250 kW, and 500 kW UNB IGBT Inverter Design in both wind and solar power generating systems.
- Implementation of the technology has the potential for emissions reductions of 0.327 t CO₂e/kW/yr in Canada and 0.2 t CO₂e/kW/yr in the rest of the world.
- The 12 kW wind-solar power converters for net-metering programs are marketed by Ventera Energy. In Canada and the US 130 units have been installed by Ventera Energy.
- The UNB inverter technology has been customized to operate in underwater turbines, expanding Canada's ability to further develop hydro-electric production capacity.

Maritime Innovation (IMAR)

Round 8-2005B

Sector:
Transportation

Project Delivery Completion:
June 2008

Market Impact Report Due:
June 2010

Total Project Value:
\$2,543,757

SDTC Funding:
\$979,800

Leveraged Funding:
\$1,563,957

Consortium Members:

Maritime Innovation
Degussa Canada Inc.
Fisheries and Oceans Canada's
Maurice Lamontagne Institute
Institut des Sciences de la mer
Institut Maritime du Québec
Kinetrics Inc.
Marine Biotechnology Research Centre
MD Technologies Ltd.
Université du Québec à Rimouski

Environmental Benefits
(primary benefit bolded):

Clean Water

Project Title:

No Invasive Species On-Board (NISOB) Project

Project Description:

Maritime Innovation with the "No Invasive Species Onboard Project" (NISOB) aimed to contribute to the preservation of the biological integrity and quality of Canadian waters by reducing the risk of introducing aquatic invasive species through the ballast water and sediments carried by commercial vessels in their ballast tanks. NISOB is a ballast water technology demonstration program that proposed to enhance two treatment technologies (biological de-oxygenation and chemical treatment) and to develop a new application for a filtration unit that could be used as a pre-treatment for ships' ballast water and sediments.

Objectives:

To test and demonstrate a combination of three technologies that can be used to treat ships' ballast water in order to reduce the risk of introduction and spread of aquatic invasive species to Canadian waters.

Results:

- A filtration system with a nominal mesh size of 53 µm was tested and proven effective against large organisms such as zooplankton and phytoplankton. Some soft-bodied organisms are still susceptible to permeating the filter screen.
- The combination of the two chemical treatments did not achieve a significant reduction for all the organisms and the microbes as dictated by the International Maritime Organization guidelines.
- Filter effectiveness is limited by the morphological characteristics of the organisms as larger organisms can pass through the mesh if properly oriented.
- Further investigation of the methodologies is recommended to ensure accuracy and consistency of the results.

Project Impacts:

Although some of the objectives were not realized, the following key learnings for this and future projects are outlined below:

- Filter meshes should be reduced in size to ensure that soft-bodied organisms don't permeate as a result of high water flow. Backwash systems must be designed to run in an automated fashion to ensure a consistent and acceptable flow rate.
- Marine applications pose a unique set of engineering challenges that must be considered:
 - Price elasticity of space on cargo ships for treatment systems (non-payload)
 - Scheduling challenges and ship access
 - Ship design and operation constraints

Path to Market:

- The penetration of an effective ballast water treatment system into the marine transport market will be dependent on the technology meeting national and international standards, consider ship design and space limitations, operate reliably and economically, and not adversely impact ship safety.

Market Impact:

- The Maritime Innovations technology has not been commercialized therefore no market impact has been achieved in 2010 post project reporting.

Angstrom Power Inc.

Round 6-2004B

Sector:
Power Generation

Project Delivery Completion:
June 2008

Market Impact Report Due:
June 2010

Total Project Value:
\$1,263,271

SDTC Funding:
\$169,752

Leveraged Funding:
\$1,093,519

Consortium Members:

Angstrom Power Inc.
BOC Group
Powertech Labs Inc.
University of Victoria
Doctors at the BC Children's Hospital
City of Vancouver, Urban Search and
Rescue, Canada Task Force 1
Vancouver International Airport Authority
HTEC Hydrogen Technology
& Energy Corp.

Environmental Benefits
(primary benefit bolded):

Climate Change
Clean Air

Project Title:

Remote Field Hydrogen Fuel Cell System

Project Description:

Angstrom developed and demonstrated a complete hydrogen systems power solution for remote field operations by integrating Angstrom's fuel cell and hydrogen storage technology into portable devices such as flashlights and cellular phones powered by their prototype micro fuel cell technology fuelled by hydrogen. This compact refillable hydrogen powered energy source has the potential to replace batteries in portable devices while providing a higher power output than comparably sized Li-ion batteries.

Objectives:

Angstrom Power Inc.'s goal was to develop a hydrogen fuel cell system to provide an energy source for small portable electric applications. Specific objectives of the project included:

- Demonstrate hydrogen powered portable electronic devices in end-user environments.
- Develop and demonstrate hydrogen powered task lighting, navigation and communications.

Results:

- Successful demonstration of the Micro Hydrogen™ technology in compact lighting, navigation, and mobile communications applications.
- Ten hydrogen fuel bicycle headlights were tested and very satisfactory performance was reported from the users.
- Eighteen devices with fuel cell powered flash lights and battery chargers were tested as part of a navigation sector application. During trial periods, satisfactory performance was reported for some of the devices, while others did not perform well. However, Angstrom's design team was able to fix trial devices and made design changes for future production runs.
- Fully integrated fuel cell powered cell phone handsets were successfully demonstrated for the communication sector.

Project Impacts:

- As anticipated, a small net increase in GHG emissions resulted from the demonstration project, with the majority of emissions resulting from the transportation of stored hydrogen (over 4,000 km) to get to the customer).
- Angstrom is expecting that these emissions will be lower in the future with the expansion of hydrogen distribution infrastructure and hydrogen production from renewable energy sources.
- This technology is expected to replace batteries for small portable electronic applications. Landfilling batteries instead of recycling causes soil and water contamination due to leakage of heavy metals such as nickel, cadmium, and lithium. This hydrogen fuel cell system is expected to reduce this contamination.

Path to Market:

- Regulations on uses and transportation of hydrogen must be advanced to accommodate the technological advancements in portable fuel cell development to support commercial deployments of this technology in consumer applications.

Market Impact:

- A multi-year Joint Development Agreement was signed with a leading battery manufacturer in 2008, and is now entering its third year of operation.
- Sanyo Japan has purchased a non-exclusive licence for the Angstrom technology.
- Angstrom has determined that there is a gap between technology capabilities and applications needs. In response, Angstrom is developing a 5W fuel cell layer creating the key component required produce high performance *MicroHydrogen*™ fuel cell products.

Clean Current Power Systems Inc.

Round 6-2004B

Sector:
Power Generation

Project Delivery Completion:
June 2008

Market Impact Report Due:
June 2010

Total Project Value:
\$4,795,500

SDTC Funding:
\$1,582,000

Leveraged Funding:
\$3,213,500

Consortium Members:

Clean Current Power Systems Inc.
EnCana Corp.

Environmental Benefits
(primary benefit bolded):

Climate Change
Clean Air

Project Title:

Tidal Turbine Generator – 65kW Field Demonstration

Project Description:

Clean Current has demonstrated Canada's first free-stream tidal power project, a 65kW turbine, installed at a British Columbia Ecological Reserve located 10 nautical miles southwest of Victoria, BC. The project enabled the marine park to convert tidal stream energy to electric power – replacing power supplied to the island by two diesel generators – beginning in 2006. It was the first sustained field testing of a new electricity-generating technology in Canada's harsh marine environment – opening the doors to the vast tidal energy resources throughout Canada's coastlines.

Objectives:

In partnership with the Pearson College of the Pacific, the EnCana Environmental Innovation Fund and SDTC, Clean Current Power Systems Inc.'s goal was to demonstrate tidal power at Race Rocks Island.

Specific objectives included:

- Eliminating two diesel generators and reducing GHG emissions by approximately 100 t CO₂e/yr.
- Demonstrating the efficiency, reliability, and power-conditioning capability of the tidal generator, as well as maintenance and safety processes.
- Demonstrating the ability to install the system in an extreme tidal environment and the performance of the support structure during operation.

Results:

- Designed, manufactured, and operated the world's first ducted turbine in a challenging tidal environment. Achieved nine months of continuous tidal turbine immersion in sea water.
- Operated and extracted power in tidal velocities up to 7.35 knots and in surface storm conditions with wind speeds of up to 154 km/hr.

Project Impacts:

- Less power was supplied during the project than originally anticipated due to prolonged maintenance periods and technical issues.
- The project generated 1,495 kWh of electricity in place of diesel generated electricity.
- The project demonstrated the technical merits of the technology and facilitated the licensing of the technology to the world's largest hydroelectricity company.

Path to Market:

- The company licensed its tidal energy technology to Alstom Hydro. Alstom will complete the commercialization of the technology.

Market Impact:

- In April of 2009 Clean Current entered into an exclusive worldwide licensing agreement with Alstom Hydro for their tidal turbine technology. The first Alstom Hydro demonstration is a 1 MW commercial scale unit in the Bay of Fundy in 2012, an SDTC funded project (Round 2007B). Market impact results for the technology will be available when the follow on project is completed.

Fifth Light Technology Ltd.

Round 4-2003B

Sector:

Energy Utilization

Project Delivery Completion:
June 2008

Market Impact Report Due:
June 2010

Total Project Value:
\$9,200,000

SDTC Funding:
\$3,036,000

Leveraged Funding:
\$6,164,000

Consortium Members:

Fifth Light Technology Ltd.
New Orbit Technologies Inc.
Toronto Hydro Energy Services Inc.
Lindsay Electronics
Great West Life Realty Advisors Inc.

Environmental Benefits
(primary benefit bolded):

Climate Change

Project Title:

Microprocessor Based Dimmer Technology for Fluorescent Lights Driven by Magnetic Ballasts

Project Description:

Fifth Light Technology Ltd. (FLT) has demonstrated a technology which utilizes a unique, patented controller system that allows fluorescent lighting systems using magnetic ballasts to be dimmed – a function previously only possible with electronic ballasts. Approximately 80% of commercial lighting uses magnetic ballasts. Fifth Light's technology allows for the individual, automated control of each lighting fixture in a building, in step with lighting needs and the time of day. In addition to reduced energy consumption and related cost savings, the technology's benefits include reduced greenhouse gas emissions, an average payback of two and a half years for installation costs, improved light quality through elimination of over-lighting, doubling the life of fluorescent bulbs and ballasts (and associated landfill avoidance), and a reduction in maintenance and capital costs and occupant comfort (lower eye strain, reduced flicker or hum).

Objectives:

The objectives of the project were to:

- Perform all of the required activities to complete technology development by engaging large commercial building operators and end-users to refine the technology architecture and feature set.
- Examine current industry adoption barriers in North America, which has impeded the sales of electronic ballast dimmer systems and devise strategies to successfully overcome these barriers.
- Deliver a turnkey lighting control system into the commercial lighting market.

Results:

- Successful demonstration of the dimmer in 6,625 lighting fixtures at three demonstration sites that were rugged and immune to degraded electrical systems in older buildings.
- Development of a general turnkey platform and dimmable ballast architecture that can effectively dim the majority of industrial lighting fixtures.
- Independently verified average energy savings of at least 50% were realized across all dimmer controlled fixtures.

Project Impacts:

Combined emissions reduction of 1353.9 t CO₂e, 1327.6 t CO₂e, and 9.3 t CO₂e at the three demonstration sites; combined reduction of CO, NO_x and VOCs for all three sites of 451.6, 1248.7, and 17.8 kg respectively.

Path to Market:

- The target market for the FLT dimmers is the retrofit and new building construction market in Canada and the US.

Market Impact:

- Magnetic ballasts capable of being dimmed through a technology such as Fifth Light are highly efficient and are now exempt from legislation prohibiting their installation post 2010 in North America.
- As of 2010, Fifth Light has implemented over 120,000 dimmable magnetic ballast fixtures in existing buildings, reducing GHG emissions by 6.4 kt CO₂e/yr. Fifth Light continues to offer these systems to the retrofit market.
- Annual GHG emissions reductions from FLT, within Canada, could reach 25 kt CO₂e/yr and 12 kt CO₂e/yr outside of Canada by 2014.
- The new construction market has shifted to electronic ballast use and has become an area where Fifth Light is successfully marketing their follow on product, LMS II.

Quantiam Technologies Inc.

Round 3-2003A

Sector:
Energy Utilization

Project Delivery Completion:
June 2008

Market Impact Report Due:
June 2010

Total Project Value:
\$9,844,819

SDTC Funding:
\$1,450,000

Leveraged Funding:
\$8,394,819

Consortium Members:

Quantiam Technologies Inc.
NOVA Chemicals Corp.
NOVA Research & Technology Corp.

Environmental Benefits
(primary benefit bolded):

Climate Change
Clean Air

Project Title:

Catalyzed-assisted Manufacture of Olefins and Hydrogen

Project Description:

Quantiam Technologies has developed a surface catalyst coating for furnace coils inside olefin crackers used in the petrochemical industry, which dramatically reduces the significant energy and maintenance required. These crackers typically operate at about 1,100°C and are very energy intensive. Quantiam's technology would allow lower operating temperatures (by 50–100°C) thereby reducing operating expense. Furthermore it is retrofittable to existing furnaces, thereby minimizing capital investment and providing a viable near-term solution.

Objectives:

Quantiam Technologies Inc. and NOVA Chemicals Corp. developed novel coating materials systems and manufacturing technologies to achieve catalyzed-assisted manufacture of olefins (CAMOL). Objectives of the project included:

- Demonstrate the coating at high temperatures, with heavy and light feedstocks.
- Reduce the energy demand for ethylene production by reducing required operating temperature and volume of steam required while increasing the amount of time between de-coking operations.

Results:

- CAMOL coating successfully installed at two facilities between 2006 and 2008 at NOVA Chemicals Joffre and Corruna sites.
- Energy demand for ethylene production is reduced by between 2.5 and 3.5 GJ/t ethylene for light feedstocks and between 3 and 5 GJ/t ethylene for heavy feedstocks, representing an average fuel savings of 12% and 13.3% respectively.

Project Impacts:

- Technology can lead to an increased furnace productivity of 10% through the elimination of approximately three days/month of downtime.
- Total emission reductions from the two facilities between 2006 and 2008 were approximately 11.6 kt CO₂e.

Path to Market:

- In 2010, a European customer placed an order for one complete furnace and a US customer placed an order for one partial furnace.
- Quantiam is advancing its coatings with five of the world's largest petrochemical companies.

Market Impact:

- In 2010, installed Quantiam technology reduced GHG emissions by 28.4 kt CO₂e/yr.
- Based on positive results from the first BASF trial, a second furnace with a broader, more aggressive selection of catalyst coatings was ordered in July 2010 representing CAMOL's first commercial sale. The second furnace is scheduled for start-up in June 2012. Additionally, Quantiam completed its first US CAMOL sale in 2011, and has completed construction of its CAMOL advanced manufacturing facility in Edmonton, Alberta.
- Quantiam is launching a new advanced manufacturing facility in 2011 with a coating launch capacity of 3M in²/yr. Planned expansion at the new facility on the same site will result in total production capacity of 12M in²/yr. The production capacity of 3M in² represents coatings for approximately 0.8% of worldwide olefin furnaces.

Ensyn Technologies Inc.

Round 2-2002B

Sector:

Waste Management

Project Delivery Completion:
March 2008

Market Impact Report Due:
March 2010

Total Project Value:
\$8,895,871

SDTC Funding:
\$2,000,000

Leveraged Funding:
\$6,895,871

Consortium Members:

Ensyn Technologies Inc.
Renfrew Industrial Commission
Opeongo Forest Service

Environmental Benefits
(primary benefit bolded):

Climate Change
Clean Air

Project Title:

Industrial Demonstration of the Ensyn RTP™ Bio-Refinery

Project Description:

Ensyn Technologies Inc. demonstrated an industrial integrated biomass refinery concept which uses a Rapid Thermal Processing (RTP) process to produce biofuel and other valuable chemical products from what would otherwise be a waste source such as sawmill waste.

Objectives:

Ensyn Technology Inc.'s goal was to produce bio-oil and related products from wood and/or other biomass by the RTP conversion process. Specific objectives of the project included:

- Production of liquid smoke (a food additive), natural resin (natural chemical) and electricity from wood and/or other biomass waste.
- Commercialization of a bio-oil production facility in Canada.

Results:

- Successful demonstration of the RTP process in Renfrew, Ontario with a capacity of 35,000 tonnes of wet wood residue (42% w/w) processed per year.
- Production of natural resin and liquid smoke from the waste source.
- Electricity was not generated due to a current lack of appropriate technology to economically produce electricity from bio-oil.
- Higher emission reductions were achieved in the demonstration project than expected due to the relatively high conventional liquid smoke and natural resin production emissions as compared to Canadian average grid electricity generation emissions.

Project Impacts:

- Emissions intensity: reduction of 1.69 t CO₂e per ton of dry wood waste processed, or 580 t CO₂e over the course of the project for the 344 dry tonnes of wood waste processed.
- 50% of the GHG emission reductions achieved were due to avoided landfilling of lesser quality wood residues. Avoidance of conventional natural resin and liquid smoke production accounted for 28% and 10% respectively.
- Production intensity: 295 tonnes of liquid smoke and 34 tonnes of natural resin were produced during the demonstration period representing 857 kg and 99 kg per dry tonne of waste respectively.

Path to Market:

- The RTP process can deliver commercially valuable organic chemicals from wood waste with fewer emissions than conventional production techniques as well as bio-oil for energy production or as a reliable chemical feedstock.
- The integration of a polymer unit within the Bio-Refinery is expected to enable broad market deployment of the polymer products produced.

Market Impact:

- Ensyn in partnership with Tolko Industries Ltd. are building a plant capable of processing 400 dry tonnes of biomass per day into 85 million litres of pyrolysis oil (PyOil) annually in High Level Alberta.
- Ensyn has had successful PyOil combustion trials at the Tolko plant in The Pas Manitoba which included testing of Ensyn's mobile fuel delivery system capable of supplying an industrial boiler of up to 10 megawatts in thermal capacity.
- Ensyn also has a partnership with Premium Renewable Energy (Malaysia) for PyOil plants throughout Malaysia with an annual production of 1.1 million tonnes and 3.8 million tonnes of PyOil respectively.
- Assuming that electricity is also generated, emissions reductions of 1.32 t CO₂e/t dry wood waste are expected. In Canada implementation of five RPT technology plants could create annual GHG emissions reductions of 134 kt CO₂e/yr.

Ostara Nutrient Recovery Technologies Inc.

Round 8-2005B

Sector:

Waste Management

Project Delivery Completion:

January 2008

Market Impact Report Due:

January 2010

Total Project Value:

\$1,777,628

SDTC Funding:

\$375,760

Leveraged Funding:

\$1,401,868

Consortium Members:

Ostara Nutrient Recovery Technologies Inc.
City of Edmonton

British Columbia Ministry of Environment

Environmental Benefits

(primary benefit bolded):

Climate Change

Clean Air

Clean Water

Clean Soil

Project Title:

Struvite Recovery Commercial Demonstration Project

Project Description:

Ostara Nutrient Recovery Technologies Inc. and its consortium have developed technologies to recover nutrients from liquid sewage and then produce environmentally safe, slow release fertilizer. In addition to reducing the amount of pollutants released into the environment, the solution also produces revenue from the sale of fertilizer. Ostara has demonstrated its technology at the City of Edmonton's Gold Bar Wastewater Treatment Plant, and tested the purity and effectiveness of its fertilizer through the BC Ministry of Environment stream enrichment programs for Steelhead recovery.

Objectives:

To develop struvite recovery technology on a commercial scale and to reduce nutrient discharge and operational problems of wastewater treatment plants by recovering phosphate and ammonia from sludge lagoon supernatant in the form of struvite fertilizer (Crystal Green™).

Results:

- Successful commercial scale demonstration of the technology at the City of Edmonton Gold Bar Wastewater Treatment Plant.
- Reclamation and recycling of 20 tonnes of struvite fertilizer (Crystal Green™) from wastewater throughout the project commissioning period.
- The plant is currently processing 300 l/minute from a total potential of 360 l/minute of sludge lagoon supernatant due to limitations imposed by the City of Edmonton on the flow.

Project Impacts:

- Emissions intensity: reduction of .65 t CO₂e/t of struvite fertilizer (Crystal Green™) produced.
- The plant achieved an 81% phosphorous recovery, exceeding planned targets by 8%.

Path to Market:

- The target markets of struvite recovery technology are primarily municipal utilities (wastewater treatment plants) that are expected to employ Ostara fluidized bed crystallizers and the agricultural/horticultural users of Ostara fertilizer products.
- Struvite fertilizer production through nutrient recovery from wastewater is anticipated to replace chemical fertilizer production.

Market Impact:

- Ostara currently has one commercial nutrient recovery facility in Canada and three in the US. Revenues have covered operating costs borne by each facility so the operations are self-funding.
- These installations each serve between 75,000 and 1.6 million people, remove 80% to 90% of the phosphorus from liquid waste streams of between 500,000 and 136 million litres per day, and produce up to 500 tonnes of Crystal Green™ fertilizer annually.
- Ostara implementations are cost-effectively meeting stricter discharge regulations and managing nutrient loading in surrounding watersheds.
- Annual GHG emissions reductions from Ostara technology within Canada could reach 5.19 kt CO₂e/yr assuming an installed base of 63 plants by 2016 based on current market rollout forecasts.
- Ostara, in partnership with Thames Water, is constructing its first European commercial facility to recover phosphorus from wastewater in the UK.
- Ostara, in partnership with the Madison Metropolitan Sewerage District, is building a commercial facility in Wisconsin which will recover phosphorus and produce 1,300 tonnes of Crystal Green™ annually.
- Ostara, in partnership with Clean Water Services in Portland, Oregon, will build a nutrient recovery facility at the utility's Rock Creek Wastewater Plant. This is the second commercial installation of Ostara's technology for Clean Water Services. The facility will be the largest of its kind, reducing costs and further protecting the region's sensitive Tualatin Watershed.

BIOX Canada Ltd.**Round 4-2003B**

Sector:
Energy Exploration and Production

Project Delivery Completion:
December 2007

Market Impact Report Date:
December 2009

Total Project Value:
\$34,504,071

SDTC Funding:
\$5,000,000

Leveraged Funding:
\$29,504,071

Consortium Members:

BIOX Canada Ltd.
 Dynex Capital Ltd. Partnership
 Weatons Holdings Ltd.
 CS Investment Capital Ltd.
 Notae Investments Ltd.
 Cotyledon Capital Inc.
 Bi-Pro Marketing Ltd.
 BIOX Corp.
 FCC Ventures

Environmental Benefits
(primary benefit bolded):

Climate Change
Clean Air

Project Title:

New Atmospheric Technology for Biodiesel Production

Project Description:

BIOX Canada Ltd. has demonstrated a technology to convert agricultural seed oil, cooking oils/grease, animal tallows and fats into biodiesel at atmospheric pressure and near-ambient temperatures. It can also convert oils and fats to biodiesel faster than competing processes, and avoids using valuable vegetable oils. BIOX believes these advantages will result in considerably lower production costs, making biodiesel competitive with petroleum diesel.

Objectives:

To design, construct, commission and operate a 67 million litres/year (nameplate capacity) biodiesel manufacturing facility near Hamilton, Ontario consisting of two parallel production trains and capable of using multiple low-cost feedstocks including animal fats or tallows and other recovered vegetable oils.

Results:

- Successfully completed construction and commissioning of demonstration facility in 2007 after initial delays to correct design deficiencies.
- Produced the first million litres of biodiesel meeting ASTM D6751-6b standards in 2007 with clarity acceptable for diesel engine applications.
- Plant gradually achieving stable operations – produced over 18 million litres of biodiesel by the end of February 2008.

Project Impacts:

- The BIOX process achieved an estimated GHG emission reduction intensity of 2.96 kg CO₂/l conventional diesel displaced.

Path to Market:

- BIOX has entered into off-take agreements with customers for a portion of the plant's output with the remaining portion available for the spot market to take advantage of higher price opportunities.
- With the experience gained from the Hamilton facility, BIOX expects to proceed with the construction of up to four more plants at strategic locations in North America.
- BIOX has established a US subsidiary and established a blending facility in New Jersey to facilitate sale to the US market.

Market Impact:

- During the first two years following the SDTC project a total of 48.4 million litres of biodiesel were produced replacing petroleum diesel and resulting in GHG emissions reductions of 125 kt CO₂e.
- Production of ethanol was 14.7 million litres in Q1 of 2011 as compared to 11.9 million litres in Q1 of 2010.
- BIOX Canada is now in the process of defining rollout of commercial projects in Canada as well as in the US.

ZENON Environmental Inc.

Round 2-2002B

Sector:
Energy Utilization

Project Delivery Completion:
December 2007

Market Impact Report Date:
December 2009

Total Project Value:
\$5,334,000

SDTC Funding:
\$1,760,000

Leveraged Funding:
\$3,574,000

Consortium Members:

Zenon Environmental Inc.
Ryerson University, Department of Applied
Chemical and Biological Sciences
McMaster University
Environmental Technology
Advancement Directorate

Environmental Benefits
(primary benefit bolded):

Climate Change
Clean Air
Clean Water

Project Title:

Zeelung™ Process for Industrial Wastewater Treatment

Project Description:

ZENON Environmental Inc. has demonstrated a new technology which will reduce the energy required to treat wastewater in municipal, industrial and private systems. ZENON's membrane-supported biofilm reactor eliminates air emissions from the aerated bio-reactor typical of most applications, and reduces the energy required to break down and process wastewater by efficiently directing oxygen to the microorganisms in the system. By lowering the energy requirements, wastewater operators are able to lower their energy bills and the associated environmental impacts. This also allows municipalities to process more wastewater without having to upgrade their treatment facilities – an important consideration for any growing community.

Objectives:

To undertake pilot scale testing followed by the construction a ZeeLung™ MSBR demonstration facility and to validate commercial scale performance in terms of high oxygen transfer efficiency, low net sludge yield and high volumetric loading rate in different types of wastewater.

Results:

- Successfully completed pilot scale testing on 1.5 m long ZeeLung™ MSBR units and discharge met or was below all municipal sewer use by-law limits for contaminants.
- Built demonstration plant for testing 8 m long commercial scale units.
- Completed testing of the commercial scale 8 m long ZeeLung™ units but were not able to achieve the necessary performance due to difficulties in producing 8 m long fibers of consistent quality and related manufacturing difficulties.
- ZENON achieved the design of a successful 2 m long ZeeLung™ unit and will retain the capability to produce these units.

Project Impacts:

The Pilot scale 1.5 m units achieved energy uses as low as 10 kWh/m³ compared to conventional MBR operating at 19 kWh/m³, achieving the target of oxygen transfer > 60% and reducing sludge production to 50% of the MBR plant.

Path to Market:

- ZENON has concluded that due to manufacturing issues with the larger 8 m units, it will focus on developing markets for the smaller 2 m units where its technology can provide significant economic and environmental benefits to smaller sized waste water treatment plants.
- ZENON, with its parent company GE, is seeking partnerships with other industrial leading edge companies to support market introduction.

Market Impact:

- Following the purchase by GE, Zenon became a division of GE Water & Process Technologies (GEWTC).
- GEWTC is targeting the ZeeLung technology to high value industrial specialized applications such a gas-permeable membrane, and to produce ethanol at a lower price compared to the conventional distilled extraction method.

Science Applications International Corp. Canada (SAIC Canada)

Round 6-2004B

Sector:

Energy Utilization

Project Delivery Completion:
November 2007

Market Impact Report Date:
November 2009

Total Project Value:
\$4,846,556

SDTC Funding:
\$1,009,589

Leveraged Funding:
\$3,836,967

Consortium Members:

Science Applications International Corp.
Town of Okotoks
ATCO Gas and Pipelines Ltd.
United Acquisition II Corp.
(United Communities)
Sterling Homes Ltd.
Natural Resources Canada – CANMET
Energy Technology Centre
Climate Change Central / Energy
Solutions Alberta

Environmental Benefits
(primary benefit bolded):

Climate Change
Clean Air

Project Title:

Demonstration of Borehole Thermal Energy Storage System (BTES)

Project Description:

SAIC Canada demonstrated an innovative Underground Thermal Energy Storage (UTES) system, and would be the first one of its kind in North America utilizing UTES technology integrated with a solar thermal energy application. The concept of UTES is simple: store the energy (cold or heat) underground when it is available and use it when the stored cold or heat is needed in the next season. By utilizing the energy contained in natural seasonal cycles, SAIC and its partners are able to dramatically offset the economic and environmental impacts associated with heating and cooling homes and commercial buildings. This project involved using a Borehole Thermal Energy Storage (BTES) system for seasonal heating application at a demonstration site near Okotoks, Alberta.

Objectives:

To demonstrate the technical feasibility of seasonal storage of solar energy in Canada in order to deliver up to 90% of the space heating requirements for residential buildings in the winter months through thermal energy stored underground in boreholes during the summer months.

Results:

- The BTES was successfully installed, commissioned and put in operations at the Drake Landing Solar Community consisting of 52 single dwelling R-2000 homes in the town of Okotoks, Alberta. 798 solar thermal collectors were installed on the roof of garages to collect thermal energy during the summer months and used to charge the BTES system.
- Four months of performance data (1st heating season) was extensively collected (at 10-minute intervals) and used to calibrate a simulation model (TRNSYS)² to predict the full system energy flows and impact. This was necessary as the full charging of the BTES will take five years which will take the project duration to beyond the time limit of a SDTC funded project. The results from the model indicated that the BTES is on track to meeting its year 5 targets.

Project Impacts:

- 4.7 t CO₂e/yr/house (74% reduction) by year 5 based on model projections.

Path to Market:

- The SAIC thermal district heating system can be applied primarily to new residential communities, with market penetration dependent on energy costs as well as multiple stakeholder buy-in.

Market Impact:

- SAIC's first project, the Drake Landing Solar community, has resulted in emissions reduction of 245 t CO₂e/yr (between 2007 and 2009).
- A high degree of market awareness of BTES technology and its application has been achieved by SAIC. The organization has received numerous expressions of interest, including several prospects in Canada where they are currently working to develop the project financing and finalize technical details.

²TRNSYS is developed by Thermal Energy System Specialists, a recognized leader in energy system simulations who have successfully applied the model to other similar applications.

Bio-Terre Systems Inc.

Round 1-2002A

Sector:
Agriculture

Project Delivery Completion:
September 2007

Market Impact Report Date:
September 2009

Total Project Value:
\$2,305,000

SDTC Funding:
\$864,375

Leveraged Funding:
\$1,440,625

Consortium Members:

Bio-Terre Systems Inc.
Ferme porcine S.E.N.C. St-Hilaire
Enviro-Access Inc.
Ferme Richard Péloquin
Hydro-Québec
Université de Sherbrooke, Groupe de
Recherche sur les Technologies et
Procédés de Conversion
Agriculture and Agri-Food Canada

Environmental Benefits
(primary benefit bolded):

Climate Change
Clean Air
Clean Water
Clean Soil

Project Title:

Low Temperature Anaerobic Digestion and Co-Generation System for Hog Manure Management

Project Description:

Bio-Terre Systems Inc. has demonstrated a complete process chain designed to produce energy from hog manure and to manage nutrients from intensive pig farming in a sustainable fashion. The process was designed to capture and treat methane gas and then convert it into usable energy in accordance with site specific energy demand – enabling hog farmers to be energy self-sufficient while at the same time enabling the reduction of costly environmental buffer zones around their operations.

Objectives:

To demonstrate that the low-temperature anaerobic digestion system for porcine manure results in reductions of GHG emissions during manure storage and spreading (through the reduction of up to 80% of baseline synthetic fertilizer use) and replacement of the heating fuel and/or grid electricity use through on-site generation of heat and/or electricity.

Results:

- Complete process integration and operations were successfully implemented and demonstrated at a hog farm in Quebec. Reductions in GHG emissions from avoided manure storage and fertilizer manufacture as well as from manure spreading were achieved.
- Synthetic fertilizer use was reduced by between 75-90% depending on the crop grown (corn or hay).
- The cogeneration unit successfully produced electricity from treated biogas. The actual electricity displaced was limited due to delay in securing suitable equipment and the need for extensive gas treatment (to remove hydrogen sulphide). Analysis undertaken by Bio-Terre suggests that better incentives for renewable energy are required to make cogeneration economical.

Project Impacts:

- The range of GHG emission reductions was between 0.12 and 0.127 t CO₂e/m³ of manure, or 956 t CO₂e/yr/10,000 head hog farm.
- 12,000 kWh of electricity was produced by the cogeneration unit during a trial period of 450 hours.

Path to Market:

- The target market is intensive porcine farming operations.
- Early demonstration efforts have focused on emission reductions from avoided manure storage and fertilizer manufacture as well as from manure spreading. Future potential for this technology includes heat generation, cogeneration or electricity generation given appropriate economic incentives for “green energy”.

Market Impact:

- Bio-Terre has implemented their systems in three large Canadian hog operations, two in Quebec and one in Manitoba. These operations managing a total of 33,000 hogs, have the capacity to produce 150 kW of electricity and 300 kW of thermal energy and biogas boiler generating capacity of 1,500,000 BTU/hr, resulting in GHG emission reductions of approximately 4 kt CO₂e/yr.
- Currently Bio-Terre is promoting similar systems for dairy farms and as a solution for agro-food waste valorization.
- Bio-Terre has secured a license contract for the deployment of 80 farm digesters in the U.S. in the next five years. As of the end of 2010, the first system has been commissioned in Oregon, a second is under construction and 10 more are planned for dairy and hog farms located in Oregon and North Carolina. The total investment represents more than US \$100 million.

Sunarc of Canada Inc.**Round 6-2004B**

Sector:

Energy Utilization

Project Delivery Completion:

August 2007

Market Impact Report Date:

August 2009

Total Project Value:

\$1,819,222

SDTC Funding:

\$545,357

Leveraged Funding:

\$1,273,865**Consortium Members:**

Sunarc of Canada Inc.

Union Gas Ltd.

Harrow (Greenhouse and Processing

Crops Research Centre)

Les Jardiniers du Chef

Pyramid Farms Ltd.

Cedarline Greenhouses

Environmental Benefits

(primary benefit bolded):

Climate Change

Clean Air

Project Title:

Removable Foam Installation System for Green Houses

Project Description:

Sunarc of Canada Inc. has demonstrated on-demand removable foam insulation systems for greenhouses and other solar-receptive buildings, reducing the use of fossil fuels for heating by up to 50%. The computer-controlled system mechanically generates and circulates foam through the wall and roof cavities, and automatically dissipates and recovers the foam when weather conditions warrant. Sunarc's technology, which can be installed in both new and existing greenhouses, will contribute to efficient and competitive horticulture – extending the growing season and avoiding expensive and environmentally-unfriendly trucking of products to consumers in northern climates.

Objectives:

To demonstrate GHG reductions through lowering the winter heating demands of greenhouses equipped with the Sunarc technology and to increase the output of saleable products due to shading provided by the foam in the hot months.

Results:

- The Sunarc system was tested at five sites in Ontario and Quebec.
- Having five demonstration sites allowed Sunarc to determine the applicability for various greenhouse designs and ultimately resulted in three successful installations.
- Monitored data was obtained from the remaining three test sites under various conditions and heat sources (oil, natural gas and partial biomass heating).

Project Impacts:

- The aggregated GHG reductions at the three sites based on 95 total days of monitored data was 5.2 kg CO₂e/m² greenhouse. This corresponds to an approximate GHG reduction of 36% over the baseline during winter night-time operation.
- Use of the Sunarc system for shading resulted in reduced incident of blossom end rot and increase in saleable yield of 5% to 63% (crop dependent) vs. control plots and higher grade produce resulting in a 7% improvement in profitability.

Path to Market:

- Sunarc has been pursuing a sale of the intellectual property to an established firm in the agricultural or alternative energy industry sector.

Market Impact:

- The company operations are on hold and as such there are no market impacts to report.

Nanox Inc.

Round 4-2003B

Sector:
Transportation

Project Delivery Completion:
August 2007

Market Impact Report Date:
August 2009

Total Project Value:
\$4,437,796

SDTC Funding:
\$1,774,548

Leveraged Funding:
\$2,663,248

Consortium Members:

Nanox inc.
Université Laval
Pangaea Ventures
Business Development Bank of Canada
The Solidarity Fund QFL
Hydro-Québec CapiTech inc.
Sovar s.e.c.
Government of Quebec

Environmental Benefits

(primary benefit bolded):

Clean Air

Project Title:

Nanox Inc. Phase 1: Diesel Oxidation Catalyst (DOC), Three-Way Catalyst (TWC) and Scale-Up

Project Description:

This project involved the development and demonstration of a low-temperature catalyst powder that claims to significantly reduce the quantity of platinum group metals (PGMs) required as the coating on catalytic converters for diesel automobiles. This new catalyst is capable of converting carbon monoxide, volatile organic compounds (VOCs) and methane from engine exhaust into water and carbon dioxide at lower temperatures than PGMs (which only catalyze pollutants when the converter is hot). In conventional PGM catalytic converters, there is a significant period between cold start-up and optimum temperature when little or no catalysis is taking place. During this period, the pollutants may be exhausted directly into the atmosphere.

Objectives:

To demonstrate the viability of replacing platinum with Nanox Perovskite in a catalytic converter by developing and selecting the optimum formulation for DOC and TWC products; designing and constructing a 18t/yr pilot manufacturing facility and to commercially qualify the catalysts through laboratory testing followed by acceptance testing by catalyst manufacturers.

Results:

- The Nanox Perovskite synthesis technology was successfully scaled up using high energy ball milling in two steps.
- Based on the optimized process parameters, a pilot plant with 18 t/yr capacity was designed, built and operated to produce sufficient catalyst material for testing purpose only in order to minimize cost and waste.
- Testing of the catalyst in various formulations was performed in a laboratory under static conditions.

Project Impacts:

- Up to 20% increased conversion rate of CO and up to 60% increased conversion rate of Nitrogen Oxides (NO_x) compared to PGM catalysts was achieved based on limited testing and under cold-starting conditions in a laboratory setting.

Path to Market:

- The replacement of PGMs with Nanox perovskite in catalytic converters represents a potentially significant reduction in upstream GHG emissions (associated with the mining and processing of raw materials) of approximately 748 t CO₂e/kg Pt.

Market Impact:

- The company has ceased operations and as such there are no market impacts to report.

Plug Power Canada

Round 3-2003A

Sector:
Transportation

Project Delivery Completion:
April 2007

Market Impact Report Date:
April 2009

Total Project Value:
\$9,026,000

SDTC Funding:
\$2,000,000

Leveraged Funding:
\$7,026,000

Consortium Members:

Plug Power Canada Inc.
Fuel Cells Canada
Arpac Storage Systems Corp.

Environmental Benefits
(primary benefit bolded):

Clean Air

Project Title:

Fuel Cell Power Unit for Industrial Vehicles

Project Description:

Plug Power Canada Inc. has developed and demonstrated hydrogen fuel cells to replace industrial lead acid batteries and Internal Combustion Engines (ICE) in Class 3 forklift trucks, also referred to as industrial rider pallet trucks. The customer base for Class 3 forklifts is large warehouse operations typically found in food distribution, general merchandising retailing, and third party logistics suppliers. The result will be superior performing forklift trucks that increase productivity, provide cost savings for customers and lower harmful air emissions. Fuel cell products have zero emissions and consequently significantly mitigate greenhouse gas emissions as well as harmful airborne contaminants.

Objectives:

To assemble and test prototype (alpha) fuel cell systems for use in lift trucks and to demonstrate and validate performance in actual field trials.

Results:

- After an initial delay due to performance issues associated with the original fuel cell stack selected, Plug Power successfully designed, assembled and tested fuel cell systems for use in Class 3 forklift trucks.
- The fuel cell systems were incorporated into 6 lift trucks for in-house testing (two) and field trials (four).
- Field trials were undertaken at the distribution centres of London Drugs in Richmond, BC and of Wal-Mart in Harrisonville, MO. In both cases, performance exceeded expectations in terms of reliability (99% uptime), power availability during shift (no drop off vs. 8% to 10% drop off in lead-acid battery powered lift trucks), ease of use and safety (no incidents with operations or fueling).

Project Impacts:

- Compared to Class 3 lift trucks powered using ICE fueled by propane, the GHG emission reduction intensity is estimated to be 0.61 kg CO₂e/kWh and 0.024 kg CAC/kWh using North American average emission factors for grid electricity generation. Based on the average power demand and annual operating hours of this class of lift trucks, the intensity factors translate into annual GHG reductions of 4.3 t/truck and CAC reductions of 0.17 t/truck.
- Compared to battery powered lift trucks, there is no net benefit or slight increase in GHG emission intensity depending on the source of the hydrogen supply, along with minor CAC reduction intensities.

Path to Market:

- The successful demonstration resulted in Wal-Mart placing an order for an undisclosed number of fuel cell powered lift trucks to be supplied by Plug Power Canada Inc.
- Plug Power launched its commercial fuel cells product (CX-P150) for Class 3 lift trucks in early 2008, followed by progressive development and launching of fuel cell systems for larger size lift trucks.
- The application of H₂ fuel cells to the forklift industry furthers the adoption of fuel cells by creating immediate volume and driving down manufacturing cost.

Market Impact:

- Plug Power has signed agreements to supply fuel cell power units with the largest North American manufacturer of electric forklift trucks as well as a number of other major distributors.
- As of 2009, Plug Power reported purchase orders for more than of 400 of its GenDrive™ fuel cell power units across North America with customers in the supply chain, warehouse management, and retail sectors.

M.A. Turbo/Engine Ltd.

Round 5-2004A

Sector:
Transportation

Project Delivery Completion:
December 2006

Market Impact Report Date:
December 2008

Total Project Value:
\$332,604

SDTC Funding:
\$152,844

Leveraged Funding:
\$179,760

Consortium members:

M.A. Turbo/Engine Ltd.
Neptune Bulk Terminals (Canada) Ltd.
Rival Technologies Inc.

Environmental Benefits
(primary benefit bolded):

Clean Air

Project Title:

Reduction of Diesel Engines Exhaust Gas Emissions by Water Injection

Project Description:

M.A. Turbo/Engine Ltd. has demonstrated a water-injection system for diesel engines which is designed to achieve significant reductions of Nitrogen Oxides (NO_x) and particulate emissions in this engine type, while simultaneously lowering fuel consumption. The project has demonstrated the technology in maritime port equipment such as yard tractors, forklifts and gantry cranes. This new technology offers significant cost savings and environmental improvements in highly sensitive areas such as shipping ports.

Objectives:

- To demonstrate that the project's Continuous Water Injection (CWI) system, which relies on injection of water into the intake combustion air stream of diesel engines, results in reductions of: NO_x, GHG and PM emissions; fuel consumption; and engine wear.
- To develop a 'bolt-on' CWI kit that can be installed in target applications by any trained mechanic.

Results:

- The CWI system was successfully demonstrated in two diesel engine applications: a 5.9 litre, turbocharged diesel pickup truck, and a 1050 hp four-stroke rail locomotive.
- In both test cases, reductions in NO_x, fuel consumption, and related GHG emissions were observed. PM, only measured in the locomotive case, was also reduced. CO emissions vary depending on the level of NO_x reductions.
- The testing has verified that the technology can be tuned to achieve a desired range of emission reduction profiles (NO_x, PM, CO₂ and CO).
- Testing was completed consistent with Environmental Protection Agency protocols for specific test cycles.

Project Impacts:

Truck impacts:

- City driving cycle: NO_x: 0.8 g/km (18%) reduction; CO₂: 6.1 g/km (1.5%) reduction; Fuel Consumption: 0.2 l/100 km (1.5%) reduction; CO: 0.1 g/km (16%) increase
- Highway driving cycle: NO_x: 1.1 g/km (22%) reduction; CO₂: 7.3 g/km (1.8%) reduction; Fuel Consumption: 0.34 l/100 km (2.5%) reduction; CO: 0.0 g/km
- Locomotive impacts (all reductions): NO_x: 18 g/MWh (25%); PM: 0.11 g/MWh (11%); CO: 7.3 g/MWh (3%); CO₂: 12 g/MWh (1.5%); Fuel Consumption: 4.0 l/MWh (1.5%).

Path to Market:

- M.A. Turbo/Engine's CWI technology can be applied to a wide range of applications, and is well-suited for retrofitting of existing engines during maintenance overhauls as well as new installations. While initially developed for use in marine engines, future markets include a range of stationary, on-road and off-road diesel applications.

Market Impact:

- A CWI system for one locomotive was sold in 2006. In 2008 the company sold 20 CWI systems for installation on diesel generators on 10 vessels operated by APL Pte Co in Singapore.
- As of 2010 M.A. Turbo/Engine Ltd reported contracting in place to provide CWI on three vessels for the company Frøyanes AS in Norway. Emissions with the following results: On main engines weighed specific NO_x emission reductions (g NO_x/kg fuel) were 26.5% with maximum reductions of 31.5% on 75% load. On the gensets the weighted specific NO_x reduction factor was 27.9%
- The company renewed its marketing arrangements to continue to promote CWI System and turbocharger modifications within European countries.

Westport Research Inc.

Round 1-2002A

Sector:
Transportation

Project Delivery Completion:
August 2006

Market Impact Report Date:
August 2008

Total Project Value:
\$3,115,376

SDTC Funding:
\$1,000,000

Leveraged Funding:
\$2,115,376

Consortium Members:

Westport Research Inc.
Enbridge Gas Distribution Inc.
Challenger Motor Freight Inc.
Natural Resources Canada
Transport Canada

Environmental Benefits

(primary benefit bolded):

Clean Air

Project Title:

Demonstration of Use of Liquefied Natural Gas (LNG) and Westport Fuel Injector Technology in Heavy Duty Trucks

Project Description:

Westport Research Inc. has demonstrated a novel fuel injector technology which will prove the economic viability of operating heavy-duty (Class 8) trucks in a line-haul application using liquefied natural gas (LNG) as the primary fuel instead of pure diesel. By using LNG, truck operators will be able to meet the upcoming low-emissions standards while achieving significant cost reductions through the use of cleaner, less expensive natural gas.

Objectives:

- Demonstrate the technical and economic feasibility of operating heavy-duty (Class 8) trucks in a linehaul application using liquefied natural gas (LNG) as the primary fuel instead of diesel by operating five trucks with High-Pressure Direct Injection (HPDI) fuel systems for a period of one year in commercial operation along the 401 highway corridor in Southern Ontario.
- Demonstrate that Westport's proprietary HPDI technology can result in significant reductions of Nitrogen Oxides (NO_x), Particulate Matter (PM) and GHG emissions.

Results:

Westport's HPDI technology demonstrated:

- Significant reduction in NO_x, PM and carbon monoxide (CO) emissions compared to traditional diesel systems.
- Reduction in carbonyl compound and selected toxic hydrocarbon emissions over the diesel baseline.
- Potential for reduced GHG emissions.³

Project Impacts:

The project demonstrated tank-to-wheel contaminant emissions reductions compared to the diesel baseline of:

- 40% for NO_x;
- 85% for particulate matter (PM);
- 95% for CO;
- 85% for carbonyl compounds; and
- 95% for selected toxic hydrocarbons

Path to Market:

- The target market for the Westport HPDI technology is expected to be transport truck fleets operating in high traffic trucking corridors.
- Although any market penetration of this technology will lead to significant reductions of NO_x, PM, CO and other contaminant air emissions, the extent of GHG emission reductions will depend on the development of an efficient and well distributed LNG fueling infrastructure.

Market Impact:

- Since project completion, Westport has sold over 300 units and has logged orders for over 600 additional units in the United States, Canada and Australia. Westport expects increased market adoption in the US and the rest of the world where LNG infrastructure is in place.
- These HPDI installations are estimated to have reduced over 11 kt CO₂e between project completion and Q4 2010.
- Assuming that Westport increases HPDI engine system sales annually by 20%, annual worldwide GHG emission reductions resulting from this project could reach 66 kt CO₂e/yr by 2015.

³This assumes: transport trucks in which HPDI systems are installed travel distances of roughly 150,000 km/yr with emission reductions of 347 g CO₂e/km.

CO₂ Solution Inc.

Round 1-2002A

Sector:

Energy Exploration and Production

Project Delivery Completion:

June 2006

Market Impact Report Date:

June 2008

Total Project Value:

\$5,881,558

SDTC Funding:

\$1,000,000

Leveraged Funding:

\$4,881,558

Consortium Members:

CO₂ Solution Inc.

Aluminum Association of Canada

Centre intégré de fonderie et de
métallurgie

Elkem Metal Canada

Fonderie industrielle Laforo inc.

Ville de Québec – Service de
l'environnement

Place Bonaventure

Federation of Canadian Municipalities
(Green Municipal Investment Fund)

Environmental Benefits

(primary benefit bolded):

Climate Change

Project Title:

CO₂ Capture, Sequestration & Recycle

Project Description:

CO₂ Solution Inc. has developed a proprietary bio-technological platform for the efficient capture of carbon dioxide (CO₂), the most important greenhouse gas (GHG), from power plants and other large stationary sources of emissions. The Company's technology platform exploits the natural power of a bio-catalyst (enzyme), carbonic anhydrase, which functions within humans and other mammals to manage CO₂ during respiration. CO₂ Solution has successfully adapted the enzyme to function within an industrial environment, and thus has taken advantage of a biomimetic approach to CO₂ capture. The Company is commercializing its technology for coal fired power generation, the oil sands and other CO₂-intensive industries where a low-cost capture solution is key to meeting climate change objectives in a cost effective manner.

Objectives:

CO₂ Solution has developed a process for removing CO₂ from CO₂-containing exhaust streams using a novel enzymatic approach for converting CO₂ dissolved in an aqueous solution into aqueous bicarbonate. The objectives of the SDTC funded project were:

- To develop a scaled-up, first generation, portable prototype based on this process to demonstrate its ability to absorb CO₂ from industrial scale waste process gas streams, in this case a municipal solid waste incinerator exhaust stream.
- To demonstrate that once converted to bicarbonate, the CO₂ could be precipitated and potentially sequestered through the formation of mineral-carbonates.

Results:

- The project successfully demonstrated the ability to remove up to 36% of the CO₂ content in a municipal solid waste incinerator exhaust stream.
- The project also demonstrated that the removed CO₂ once converted to aqueous bicarbonate, can be precipitated into a useful mineral-carbonate (calcium carbonate-CaCO₃) through a reaction of the aqueous bicarbonate with hydrated lime.
- Since significant GHG emissions are associated with production of the hydrated lime precipitating agent, the project itself did not result in a net emission reduction. However, it is expected that alternative mineral sources with fewer associated emissions such as sodium chloride (NaCl) or other lower impact means for sequestering the CO₂ absorbed by the CO₂ Solution process will lead to a significant net emission reduction process that can be applied to a wide variety of industrial exhaust streams in the future.

Project Impacts:

- The demonstrated fraction of CO₂ absorbed from the municipal solid waste incinerator exhaust stream was in the range of 23% to 36%, depending on process conditions.
- The result is significant given that such processes typically vent 100% of the CO₂.

Path to Market:

- The target market for the CO₂ Solution process technology comprises large stationary sources of emissions such as coal, natural gas and oil fired plants, oil sands operations, the cement industry, and iron and steel production.
- Since the SDTC project completion, CO₂ Solution has been working to optimize its technology platform towards the evolving needs of large emitters for a solution for the capture and production of purified CO₂ for underground sequestration rather than transformation to a mineral product.
- In addition, the Company has been working to improve the industrial life of the enzyme to meet the needs of electric utilities and other future customers for infrequent replacement of the enzymatic packing material. This work has included further engineering of the enzyme to be more resistant to higher temperatures and to improve the enzyme immobilization process.

Market Impact:

- CO₂ Solution is positioning its technology as an enabling product that can be deployed within conventional absorption/desorption systems to reduce operating and capital costs. The company is targeting 2013 for commercial launch of its technology platform through one or more major strategic partners.

Paradigm Environmental Technologies Inc.

Round 3-2003A

Sector:
Waste Management

Project Delivery Completion:
October 2005

Market Impact Report Date:
October 2007

Total Project Value:
\$1,208,804

SDTC Funding:
\$250,000

Leveraged Funding:
\$958,804

Consortium Members:

Paradigm Environmental Technologies Inc.
Chilliwack Waste Water Treatment
Powertech Labs Inc.
Natural Resources Canada – CANMET
Energy Technology Centre
CH2M HILL
National Research Council

Environmental Benefits

(primary benefit bolded):

Climate Change

Clean Air
Clean Water

Project Title:

MicroSludge™ Prototype Development Project

Project Description:

Paradigm Environmental Technologies Inc. has demonstrated a novel technology for lowering the biosolids output from conventional wastewater treatment process by 60%, increasing the waste conversion effectiveness 10-fold, and producing electricity from the resultant methane gas. By efficiently pre-treating and breaking down biological wastewater sludge, municipalities can save a significant portion of their wastewater treatment operating budget.

Objectives:

To demonstrate the effectiveness of Paradigm's MicroSludge™ process for the reduction of volatile solids in municipal wastewater treatment plants.

Results:

- Over 90% reduction in volatile solids were realized when Waste Activated Sludge (WAS) was treated with the MicroSludge™ process – considered an exceptional result for the industry.
- Increased generation of biogas.
- Reduction in GHGs and Criteria Air Contaminants (CACs) emitted during waste transport and GHG emissions once solid residuals are applied to land.
- Reduction in land use requirements.

Project Impacts:

- Emissions Intensity (avoided landfill): reduction of 3,000 t CO₂e/1,000 t WAS.
- Emissions Intensity (waste-to-energy): reduction of 8,500 t CO₂e/1,000 t WAS.

Path to Market:

- Increased biogas production can be used to generate additional renewable electricity and heat energy, reducing GHG and CAC emissions associated with the combustion of fossil fuels it would displace. The demonstration project did not include conversion of biogas to electricity, but power generation would be expected at facilities during market roll out.
- The successful Paradigm demonstration project has led to significant interest in North America and abroad for the technology, including the delivery of an evaluation system to a potential customer in Los Angeles, CA.

Market Impact:

- Paradigm has made a number of improvements to make the technology more robust, simpler and more compact. The resulting MicroSludge™ System 25 was demonstrated at the Joint Water Pollution Control Plant in Los Angeles County for one year starting in October 2005. While there were a number of lessons learned as part of the demonstration, the JWPCP is not expected to adopt MicroSludge™ until the unit is proven with WAS only digestion at another facility.
- In 2007 Paradigm began operation of a third, full-scale trial at the Des Moines Metropolitan Wastewater Reclamation Facility which produces approximately 5,500 dry tonnes of WAS annually at about 7.1% total solids. The MicroSludge™ System 25 will process approximately half of the WAS generated at the plant.
- The customer base has long sales cycles and requires multiple reference installations before committing to adoption.

Hydrogenics Corp.

Round 3-2003A

Sector:

Transportation

Project Delivery Completion:

September 2005

Market Impact Report Date:

September 2007

Total Project Value:

\$3,069,135

SDTC Funding:

\$1,350,419

Leveraged Funding:

\$1,718,716

Consortium Members:

Hydrogenics Corp.

Deere and Company Inc.

Federal Express Canada Ltd.

General Motors of Canada Ltd.

NACCO Materials Handling Group Inc.

Natural Resources Canada –

Canadian Transport Fuel Cell Alliance

Environmental Benefits

(primary benefit bolded):

Clean Air

Project Title:

Integration and Demonstration of Fuel Cell Powered Material Handling Equipment

Project Description:

Hydrogenics Corp. has demonstrated its fuel cell technology in the forklift industry – an early market with real business needs that are not being met with today's battery and propane-operated forklifts. In today's high-volume warehouses, the safe and efficient movement of product is paramount. Hydrogenics' solution – currently being demonstrated at General Motors and FedEx – helps these customers avoid inefficiencies and safety hazards associated with recharging batteries and managing power when lifting stock. Another technological challenge Hydrogenics hoped to overcome was to reduce refueling time – currently a major cost to warehouse operations.

Objectives:

To reduce the costs of fuel cell technology in transportation applications using an early niche market with viable economics. This approach was intended to provide a pathway to the larger transportation market.

Results:

- Significant technology milestones were achieved by Hydrogenics during their demonstration project, including their first-ever deployment of fuel cell forklift power packs. Over 1,000 hours of operational time were logged in the field with minimal maintenance and reliability issues and high driver satisfaction.
- The project showed its intended value as a cost-reduction step in moving to a hydrogen economy.

Project Impacts:

- Emissions intensity (propane forklift replacement): reduction of 9 t CO₂e/yr/vehicle; reduction of CO, NO_x, and VOCs by 1.5, 0.23, and 0.18 t/yr/vehicle, respectively.
- Emissions intensity (battery forklift replacement): increase of 5 t CO₂e/yr per vehicle
- The emissions benefits of hydrogen-powered vehicles are substantially reduced in this project based on the inclusion of electrolysis-generated hydrogen, which accounts for approximately 0.5 t CO₂e/MWh.

Path to Market:

- Further development and demonstration is required to achieve broader operating parameters prior to market entry.

Market Impact:

- This initial project validated the concept and prototype fuel cell power packs. A follow-on project (Round 8-2005B) was completed in 2011 and concluded that the Hydrogenics technology requires further development and demonstrations iterations prior to commercialization in forklift applications. The company expects that manufacturing volumes will be driven from other markets such as telecom backup power, where economies of scale can then be leveraged and applied to the forklift market.

Highmark Renewables Inc.

Round 2-2002B

Sector:
Agriculture

Project Delivery Completion:
June 2005

Market Impact Report Date:
June 2007

Total Project Value:
\$7,056,245

SDTC Funding:
\$1,000,000

Leveraged Funding:
\$6,056,245

Consortium Members:

Highmark Renewables Inc.
Highland Feeders Alberta Agriculture Food
& Rural Development
Alberta Research Council
Alberta Agricultural Research Institute
Climate Change Central
Canadian Environmental Technology
Advancement Centre – West
Federation of Canadian Municipalities
(Green Municipal Investment Fund)
Greenhouse Gas Mitigation Program
for Canadian Agriculture
Agriculture and Agri-Food Canada

Environmental Benefits

(primary benefit bolded):

Climate Change

Clean Air
Clean Water
Clean Soil

Project Title:

Integrated Manure Utilization System (IMUS)

Project Description:

Highmark Renewables Inc. has demonstrated an Integrated Manure Utilization System (IMUS) which assists large cattle feedlots in managing their manure waste. An anaerobic digestion system which utilizes cattle manure to produce energy, bio-based fertilizer and reusable water, this system avoids land-spreading of raw manure – where harmful e-coli bacteria can enter the water system – and generates valuable energy, bio-based fertilizer, and reusable water as a result.

Objectives:

To utilize the Alberta Research Council's IMUS system to generate electricity and heat from manure-derived biogas. A further objective was to test the system in field operations on one of Canada's largest cattle feedlots.

Results:

- Successful demonstration of the IMUS technology and the production of biogas that was consistent with quantity & quality expected from lab scale process.
- Reduction in emissions of methane, nitrous oxide and dust typically generated by unprocessed manure when it is piled and spread.
- Avoidance of GHG and CAC emissions that would have been created by the combustion of fossil fuel to generate electricity and heat/steam. Further reductions of GHGs and CAC emissions resulted by eliminating the need to transport and spread manure.
- Lower surface and ground water contamination by removing excess nitrogen, phosphorous, soluble salts and pathogens.
- Production of stabilized organic fertilizer – thereby offsetting the need for chemical fertilizers and associated emissions to manufacture such products.

Project Impacts:

- Emissions intensity: reduction of 1.28 t CO₂e/ head of cattle.
- Tonnes of land application avoided: 3000 t (3.5 kg/head/day).
- Avoided surface water contamination (pathogen removal).

Path to Market:

- Highmark has reviewed its business plan and is integrating the IMUS technology with a number of other technologies to build an integrated biorefinery which is being demonstrated as part of SDTC project in Round 12- 2007B).

Market Impact:

- Operation of the demonstration facility has increased the knowledge of the biology, mechanics and economics of the facility. The IMUS and the knowledge associated with it will be a critical component in future biorefineries.
- The facility is estimated to have reduced GHG by 6.4 kt CO₂e and avoided land application of 15,000 tonnes of manure annually since 2007.

Mikro-Tek Inc.

Round 2-2002B

Sector:
**Forestry, Wood Products and
 Pulp and Paper Products**

Project Delivery Completion:
June 2005

Market Impact Report Date:
June 2007

Total Project Value:
\$3,483,350

SDTC Funding:
\$500,400

Leveraged Funding:
\$2,982,950

Consortium Members:

Mikro-Tek Inc.
 North Sun Nurseries Inc.
 Woodrising Consulting Inc.
 IBK Capital
 TransCanada Pipelines Ltd.
 Noranda Inc. / Falconbridge Ltd.

Environmental Benefits
 (primary benefit bolded):

Climate Change
 Clean Soil

Project Title:

Soil Carbon Sequestration using Mycorrhizal Management Technologies in Agricultural Crops Reclamation Grasses

Project Description:

Mikro-Tek Inc. has demonstrated a technology which enables grasslands and forests which have been damaged by industrial development to be reclaimed. To promote growth on these lands, Mikro-Tek has harnessed a naturally occurring soil fungi called mycorrhizae and has developed a method to inoculate seedlings and plant roots. The increased growth rates enables these plants to capture harmful climate change gases and assists gas pipeline and mining companies to cost-effectively reduce their environmental and social impact.

Objectives:

To demonstrate enhanced grass-species biomass growth using mycorrhizal fungi inoculation to improve soil organic carbon (SOC) levels.

Results:

- Improved retention of soil nutrients, and reduced nutrient run-off into nearby watercourses and groundwater.
- Better uptake of a range of nutrients (including phosphorous) by plants, which can have benefits in terms of disease resistance, crop quality, etc.
- More rapid growth of reclamation grasses on poor quality soils.
- Identification of gaps in the industry's ability to measure and monitor SOC levels.
- Improved yields attained in the laboratory-based inoculum production process to the point where the more time-consuming and costly field production method (growing the microorganism on plant roots in the field) could be completely replaced by the lab method. The lab method avoids the need for agricultural inputs (fertilizer, etc.) and related environmental impacts.
- Ability to produce the inoculum in a pure form which facilitates the licensing of the organism to other companies.

Project Impacts:

- Given the complexity of the project and difficulties of measurement, conclusive GHG benefits for the demonstration project and for the market roll-out have not yet been determined. Further work has been proposed to develop an industry practice for soil organic carbon sequestration from grasslands to ensure conclusive results.

Path to Market:

- The project may lead to quantifiable GHG benefits in the future if increased growth rate properties of the technology are used to grow higher yield biomass fuel crops (thus resulting in increased amount of displaced fossil fuel) and grassland-based GHG emissions reduction protocols are developed.
- Development of reliable technology to measure SOC may be a significant opportunity for the sector by allowing accurate quantification of increases in SOC resulting from the use of technologies such as those demonstrated in the project. This could lead to enhanced economic returns through more certain access to carbon trading markets.

Market Impact:

- Mikro-Tek negotiated a contract with a publicly-traded energy company operating three large biomass co-generation facilities in Northern Ontario. This agreement will result in the planting of a dedicated biomass feedstock for their facilities utilizing Mycorrhizal inoculation technology.
- Sequestration projects have been initiated with landowners in Chile and approximately 3 million seedlings have been inoculated to date, to afforest approximately 2,400 hectares of under-productive grazing land. Mikro-Tek is registering these projects to bring them to the international CDM Executive Board for registration as Certified Emission Reductions (CERs).

West Lorne Bio-Oil Co-Generation Ltd. Partnership

Round 2-2002B

Sector:

Power Generation

Project Delivery Completion:

June 2005

Market Impact Report Date:

June 2007

Total Project Value:

\$12,215,947

SDTC Funding:

\$5,000,000

Leveraged Funding:

\$7,215,947

Consortium Members:

West Lorne Bio-Oil Co-Generation Ltd.
Partnership

Ontario Power Generation Inc.

Orenda – Division of Magellan
Aerospace Corp.

UMA Engineering Ltd.

Erie Flooring and Wood Products

Environmental Benefits

(primary benefit bolded):

Climate Change

Clean Air

Project Title:

Erie Flooring BioOil Cogeneration Plant

Project Description:

West Lorne Bio-Oil Co-Generation Ltd. Partnership is demonstrating its combined fast pyrolysis technology called BioTherm for the production of liquid fuels (bio-oil) from forest and agricultural residues (ie. wood, bark and straw) in an integration platform with a 2.5 MW gas turbine developed specifically to run on bio-oil. Unlike fossil fuels, bio-oil is renewable, clean burning, low in emissions and is greenhouse gas neutral.

Objectives:

To demonstrate that biomass-to-energy conversion using pyrolysis can be achieved economically and technically at a scale of production which would enable subsequent deployment.

Results:

- West Lorne Bio-Oil Co-Generation Ltd. Partnership's pyrolysis process was used to generate BioOil and subsequently fuel an Orenda turbine to generate electricity. When compared to a baseline using fossil fuels, primary benefits included: reduction of GHGs, Sulfur Oxide (SO_x), Nitrogen Oxide (NO_x) and associated criteria air contaminants (CACs) such as heavy metals and particulates.
- Secondary benefits included the reduction of methane emissions (i.e. landfill gas) and leachate contaminants by diverting biomass destined for landfill disposal.
- For turbine operation using BioOil, CAC emissions are significantly lower than fossil fuel emissions, according to tests conducted for TerraChoice Environmental certification.

Project Impacts:

- Emissions intensity: reduction of ~ 212 kg CO₂e/t biomass.
- Emissions intensity: 7.6 kg /MWh reduction of NO₂; 19.4 kg /MWh reduction of SO₂.

BioOil electrical generation was reported to be 0.85 kg CO, 1.60 kg NO₂, 0.057 kg SO₂ and 0.09 kg PM. Canada average fossil-based electricity generation (NO_x = 9.2 kg/MWh; SO_x = 19.5 kg/MWh) {Reference: Statistics Canada. Electricity Generation and GHG Emissions in Canada (1990-2001)}

Path to Market:

- Once fully operational each plant is expected to reduce GHG emissions by 7 kt CO₂e/yr. A cumulative reduction of 140,000 t CO₂e is expected over each plant's expected 20-year lifetime.

Market Impact:

West Lorne has reported the following Market impacts:

- Construction of the Guelph pyrolysis plant was completed using modules that minimize on-site activities and allow for rapid deployment. It consists of eight fully assembled modules, and when fully operational will process 66,000 dry tonnes of biomass per year with an energy output equivalent to 130,000 barrels of oil.
- Dynamotive has also been successful attracting attention for their technology internationally, entering into a contract in 2007 for the construction of five plants in Argentina.
- First Resources Corp. was created in 2007, a subsidiary developed to explore possibilities in developing Fast Pyrolysis plants in First Nations Territories in Canada.
- In 2008 the West Lorne demonstration plant was upgraded and more sustained runs were achieved and shipments of BioOil and BioChare were completed.
- Research into refining BioOil to create synthetic mobile fuels proceeded into 2009 successfully developing UBA and UBB class fuels.
- Operations were expanded in Latvia and Ukraine through master licenses granted to Rika Ltd. Another master license was granted to Renewable Oil Corp. (ROC) to develop markets in Australia.

Enerkem Technologies Inc.

Round 2-2002B

Sector:

Waste Management

Project Delivery Completion:
January 2005

Market Impact Report Date:
January 2007

Total Project Value:
\$2,253,418

SDTC Funding:
\$720,573

Leveraged Funding:
\$1,532,845

Consortium Members:

Enerkem Technologies Inc.
SOQUIP Énergie Inc.
Government of Quebec
Enviro-Access Inc.
Université de Sherbrooke, Groupe de
recherche sur les technologies et
procédés de conversion

Environmental Benefits

(primary benefit bolded):

Climate Change

Clean Air
Clean Soil

Project Title:

Valorization of Municipal Solid Residues via Sorting, Gasification and Conversion to Energy Products

Project Description:

Enerkem Technologies Inc. is demonstrating a complete technology platform for the production of alcohol biofuels derived from complex wastes, using municipal solid waste as the initial feedstock. These biofuels can be used to generate electricity from landfill waste, or can be further refined to valuable liquid commodities such as ethanol and methanol.

Objectives:

To reduce GHG emission relative to a benchmark land filling case by synthesizing mixed alcohols (methanol and ethanol) from municipal solid waste (MSW). One of the key objectives was to make gasification more affordable to smaller municipalities by creating higher-value end products.

Results:

- The project resulted in the successful integration, at a pilot scale, of Enerkem's existing waste sorting and gasification processes with an alcohol synthesis process, resulting in the production of methanol from biomass versus conventional methanol production using natural gas. This project has positioned the company to produce higher-value product streams from MSW feedstocks.
- Other environmental benefits to air (e.g. reduced landfill gas emissions), water and soil (e.g. lower quantities of leachate contaminants, reduced land use) associated with diverting waste from landfill would also be expected.

Project Impacts:

- Emissions intensity: reduction of 1.3 t CO₂e/t dry MSW processed, when compared with a benchmark landfilling case involving 50% landfill gas capture.
- Over 90% of these benefits are attributed to displacement of landfill gas emissions from conventional waste disposal practices (a benefit of Enerkem's pre existing waste sorting and gasification processes), with relatively low remaining benefits due to alcohol synthesis.

Path to Market:

- Enerkem considers the project to be one of a number of steps along the way to producing high-value products from waste, which could enable additional environmental and economic benefits.

Market Impact:

- A follow-on project has been initiated supported by funding from SDTC (Round 9 – 2006A) to continue the development of the Enerkem technology by reforming methanol in order to complete the synthesis step for ethanol production. As such, market impact results for both projects will be provided following the completion of the follow-on project.

Carmanah Technologies Inc.

Round 1-2002A

Sector:

Energy Utilization

Project Delivery Completion:

January 2005

Market Impact Report Date:

January 2007

Total Project Value:

\$2,035,062

SDTC Funding:

\$466,167

Leveraged Funding:

\$1,568,895

Consortium Members:

Carmanah Technologies Inc.

BC Hydro

British Columbia Institute of Technology

Environmental Benefits

(primary benefit bolded):

Climate Change

Clean Air

Project Title:

Edge-lit LED Lighting Project

Project Description:

Carmanah Technologies Inc. has demonstrated an adaptation of solar-powered LED technology to edge-lit lighting and signage, which will lead to the development of a more diverse and robust solar industry. This project was expected to enable solar-powered lighting to enter mainstream applications and provide enhanced safety and security to Canada's roads and public transit systems.

Objectives:

Carmanah's technology uses renewable solar energy and a Light Emitting Diode lighting system which is intended to remove the need for grid electricity. Further, the project aims to demonstrate safer environments at night (such as in public transit bus stops) where grid connection is not feasible. A key objective of the project is to establish an early niche market for photovoltaic lighting which will assist in lowering the costs of PV-based electricity generation. Emissions reductions are expected over the longer term.

Results:

The project produced sufficient units for demonstration purpose. In fact, SDTC funding of Carmanah appears to have catalyzed market roll-out and led to significant sales (greater than projected for market rollout) being realized by the company immediately after completion of project delivery. Carmanah executives noted that *"the economic return to date from the \$500,000 investment from SDTC has been approximately \$8 million in sales of LED edge-lighting in the first year after completion of the project (e.g. sold 2,700 bus signs and 200 traffic signs in 2005), with total employment in sales, engineering and production of approximately 40 staff, and the creation of two manufacturing facilities, one in Calgary and one in Victoria."*

Project Impacts:

When compared to signs lit by conventional lighting systems, the following GHG emission reductions were achieved during the project:

- Emissions intensity (address signs): reduction of 0.013 t CO₂e/unit/yr
- Emissions intensity (traffic signs): reduction of 0.0967 kg CO₂e/unit/yr
- Emissions intensity (bus shelter signs): reduction of 0.129 t CO₂e/unit/yr
- Based on displacement of fossil fuel-generated electricity associated with running conventional light bulbs.

Path to Market:

- Two product lines using the SDTC supported technology have entered the market: solar bus stop signs and edge lit solar street signs.

Market Impact:

- Significant environmental benefits could be realized during market roll-out when the technology is compared to signs lit by conventional lighting systems. It is estimated that if 60,000 units were operational in Canada. It could result in a cumulative reduction of up to 21 kt CO₂e/yr depending on a number of variables including location of installation, timing, and type and final number of units sold.
- Total sales of over 2,100 units in Canada valued at \$3M have been achieved.

CC = climate change, CA = clean air, CW = clean water, CS = clean soil

SDTC Portfolio Approved Project Funding Summary

Active Projects

Lead Organization	Approved SDTC Funding	% of Eligible Project Costs	Eligible Recipient Funding Contribution	% of Eligible Project Costs	Other Government Funding	% of Total Eligible Project Costs	Total Eligible Project Costs	Environmental Benefits (Primary Benefits Bolded)
Round 19 2011A								
* Project is contracted								
Pure Technologies Ltd.*	\$1,000,000	33.3%	\$1,710,000	57.0%	\$290,000	9.7%	\$3,000,000	CC CW
Vision Ecoproducts Limited	\$3,252,342	33.0%	\$6,603,239	67.0%	\$0	0.0%	\$9,855,581	CC CA CS
Accelerated Systems Inc.	\$1,400,000	34.5%	\$2,156,175	53.2%	\$500,000	12.3%	\$4,056,175	CC CA
RSW-RER Ltd.	\$6,000,000	23.2%	\$12,348,464	47.8%	\$7,500,000	29.0%	\$25,848,464	CC
EcoSynthetix Corporation	\$2,100,000	33.2%	\$1,979,198	31.3%	\$2,250,000	35.5%	\$6,329,198	CC CA CW
CVTCORP Transmission	\$1,027,887	33.1%	\$959,738	31.0%	\$1,113,237	35.9%	\$3,100,862	CC CA
Hydrostor Inc.	\$2,551,309	34.5%	\$2,648,480	35.8%	\$2,198,209	29.7%	\$7,397,998	CC CA
TISEC Inc.	\$440,000	47.2%	\$492,760	52.8%	\$0	0.0%	\$932,760	CC CA CW CS
Round 18 2010B								
Bluewater Biochemicals Inc.*	\$7,513,650	33.9%	\$9,278,113	41.8%	\$5,400,000	24.3%	\$22,191,763	CC
Shipstone Energy Corporation*	\$2,513,498	47.5%	\$2,780,976	52.5%	\$0	0.0%	\$5,294,474	CC CA
Rail-Veyor Technologies Inc.	\$1,525,000	30.0%	\$1,561,293	30.7%	\$2,000,000	39.3%	\$5,086,293	CC CA CW
Azule Fuel Inc.	\$1,631,657	30.5%	\$3,363,315	62.9%	\$350,000	6.5%	\$5,344,972	CC CW
Nova Green Inc.	\$1,838,152	32.0%	\$3,910,183	68.0%	\$0	0.0%	\$5,748,335	CC CS
Logistik Unicorn	\$1,100,565	33.2%	\$1,600,753	48.3%	\$613,200	18.5%	\$3,314,518	CC CA CS
N-Solv Corporation	\$10,000,000	37.0%	\$12,398,407	45.9%	\$4,602,000	17.0%	\$27,000,407	CC CA CW
LaCima Corporation	\$1,203,349	33.0%	\$2,444,396	67.0%	\$0	0.0%	\$3,647,745	CC CA
Solantro Semiconductor Corp.*	\$2,049,234	28.8%	\$4,932,430	69.4%	\$125,000	1.8%	\$7,106,664	CC CA
TM4 inc.	\$3,135,370	20.6%	\$3,806,758	25.0%	\$8,284,902	54.4%	\$15,227,030	CC CA
Paradigm Shift Technologies, Inc.	\$1,955,250	33.0%	\$3,969,750	67.0%	\$0	0.0%	\$5,925,000	CC CA
Namgis First Nation	\$2,650,000	25.0%	\$6,675,812	63.0%	\$1,264,000	11.9%	\$10,589,812	CW
PAVAC Industries Inc.*	\$3,549,865	33.7%	\$6,976,755	66.3%	\$0	0.0%	\$10,526,620	CC CA
Carbon Cure Technologies Inc.*	\$1,192,000	31.6%	\$1,968,691	52.1%	\$615,140	16.3%	\$3,775,831	CC CA CW

CC = climate change, CA = clean air, CW = clean water, CS = clean soil

Lead Organization	Approved SDTC Funding	% of Eligible Project Costs	Eligible Recipient Funding Contribution	% of Eligible Project Costs	Other Government Funding	% of Total Eligible Project Costs	Total Eligible Project Costs	Environmental Benefits (Primary Benefits Bolded)			
								CC	CA	CW	CS
Northex Environnement Inc.	\$1,552,354	38.8%	\$1,588,720	39.7%	\$857,175	21.4%	\$3,998,249			CW	CS
Linnaeus Plant Sciences Inc.	\$1,534,300	30.7%	\$1,641,000	32.8%	\$1,823,200	36.5%	\$4,998,500	CC		CW	CS
CoolEdge Lighting Ltd.*	\$2,249,931	37.3%	\$2,529,683	42.0%	\$1,250,000	20.7%	\$6,029,614	CC	CA	CW	CS
Round 17 2010A											
Temporal Power Ltd.*	\$2,748,616	32.3%	\$5,749,130	67.7%	\$0	0.0%	\$8,497,746	CC	CA		
eCAMION Inc.*	\$5,435,749	33.3%	\$10,871,499	66.7%	\$0	0.0%	\$16,307,248	CC	CA		
CRB Innovations Inc.	\$5,362,500	33.0%	\$7,887,500	48.5%	\$3,000,000	18.5%	\$16,250,000	CC	CA		
Mining Technologies International Inc.*	\$613,261	33.2%	\$1,236,648	66.8%	\$0	0.0%	\$1,849,909	CC	CA		
Westport Power Inc.*	\$2,302,834	14.1%	\$14,083,421	85.9%	\$0	0.0%	\$16,386,255	CC	CA		
Ballard Power Systems Inc.*	\$7,004,367	33.0%	\$14,229,563	67.0%	\$0	0.0%	\$21,233,930	CC	CA		
Fabgroups Technologies Inc.	\$2,981,000	32.8%	\$6,110,200	67.2%	\$0	0.0%	\$9,091,200	CC	CA	CW	CS
Corvus Energy Ltd.	\$1,238,984	33.0%	\$1,471,575	39.2%	\$1,043,938	27.8%	\$3,754,497	CC	CA		
FibraCast*	\$1,399,124	32.2%	\$1,649,014	38.0%	\$1,291,633	29.8%	\$4,339,771	CC		CW	
SWITCH Materials Inc.*	\$2,363,621	32.1%	\$3,411,550	46.3%	\$1,594,045	21.6%	\$7,369,216	CC	CA		
Tyne Engineering Inc.*	\$1,534,097	31.1%	\$2,190,344	44.4%	\$1,210,508	24.5%	\$4,934,949		CA	CW	CS
NIMTech Inc.	\$726,173	36.7%	\$1,252,346	63.3%	\$0	0.0%	\$1,978,519	CC		CW	
Echologics Engineering Inc.	\$751,926	33.0%	\$1,162,044	51.0%	\$364,594	16.0%	\$2,278,564	CC		CW	CS
Silinov Technologies	\$1,776,938	33.0%	\$2,607,724	48.4%	\$1,000,000	18.6%	\$5,384,662	CC	CA		CS
S2G Biochemicals Inc.*	\$1,425,952	33.1%	\$1,975,219	45.8%	\$906,938	21.1%	\$4,308,109	CC		CW	
Woodland Biofuels Inc.*	\$4,275,000	33.1%	\$4,625,000	35.9%	\$4,000,000	31.0%	\$12,900,000	CC		CW	CS

CC = climate change, CA = clean air, CW = clean water, CS = clean soil

Lead Organization	Approved SDTC Funding	% of Eligible Project Costs	Eligible Recipient Funding Contribution	% of Eligible Project Costs	Other Government Funding	% of Total Eligible Project Costs	Total Eligible Project Costs	Environmental Benefits (Primary Benefits Bolded)
Round 16 2009B								
InvenTyS Thermal Technologies Inc.	\$1,999,611	33.3%	\$2,699,222	45.0%	\$1,300,000	21.7%	\$5,998,833	CC
InvoDane Engineering Ltd.*	\$1,482,125	33.3%	\$2,968,701	66.7%	\$0	0.0%	\$4,450,826	CC
Gestion TechnoCap Inc, SpaceWatts Division*	\$840,000	31.2%	\$1,854,308	68.8%	\$0	0.0%	\$2,694,308	CC CA
MPT Mustard Products & Technologies Inc.*	\$2,217,949	38.6%	\$3,428,325	59.7%	\$94,957	1.7%	\$5,741,231	CA CW CS
Available Energy Corp.*	\$720,000	36.4%	\$1,038,017	52.4%	\$222,595	11.2%	\$1,980,612	CC CA CW
EnenMotion Inc.	\$1,100,000	33.3%	\$1,500,000	45.5%	\$700,000	21.2%	\$3,300,000	CC CA
Etalim Inc.*	\$2,191,530	35.0%	\$2,681,746	42.8%	\$1,387,257	22.2%	\$6,260,533	CC CA CW CS
Ocean Nutrition Canada Ltd.	\$8,291,728	33.0%	\$16,834,720	67.0%	\$0	0.0%	\$25,126,448	CC CA CW CS
Spartan Bioscience Inc.*	\$1,896,774	29.8%	\$4,058,028	63.9%	\$400,000	6.3%	\$6,354,802	CW CS
Phostech Lithium Inc.*	\$4,700,508	32.7%	\$9,676,487	67.3%	\$0	0.0%	\$14,376,995	CC CA
Tenova Goodfellow Inc.*	\$1,522,513	33.1%	\$3,078,758	66.9%	\$0	0.0%	\$4,601,270	CC
Lakeshore EMPC Two L.P.*	\$1,076,044	41.6%	\$1,511,144	58.4%	\$0	0.0%	\$2,587,188	CC CW CS
3XR Inc.*	\$593,000	33.2%	\$1,194,568	66.8%	\$0	0.0%	\$1,787,568	CC CW
Purifics ES Inc.	\$1,421,000	33.3%	\$2,842,000	66.7%	\$0	0.0%	\$4,263,000	CC CW
Quadrogen Power Systems, Inc.	\$2,610,145	33.0%	\$2,715,384	34.3%	\$2,584,000	32.7%	\$7,909,529	CC CA
6574262 Canada Inc. (ICUS)	\$400,000	36.0%	\$712,500	64.0%	\$0	0.0%	\$1,112,500	CC CW CS
Round 15 2009A								
Ballard Power Systems Inc.*	\$4,796,120	21.3%	\$503,295	2.2%	\$17,195,250	76.4%	\$22,494,665	CC CA
Electrovaya Corp.*	\$5,065,500	32.9%	\$8,039,298	52.1%	\$2,312,611	15.0%	\$15,417,409	CC CA

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Lead Organization	Approved SDTC Funding	% of Eligible Project Costs	Eligible Recipient Funding Contribution	% of Eligible Project Costs	Other Government Funding	% of Total Eligible Project Costs	Total Eligible Project Costs	Environmental Benefits (Primary Benefits Bolded)			
SBI BioEnergy Inc.*	\$1,875,495	30.4%	\$3,123,737	50.7%	\$1,162,339	18.9%	\$6,161,571	CC	CA	CW	CS
Entropex a partnership of Unitec Inc. and 629728 Ontario Limited*	\$6,330,000	25.9%	\$14,149,877	57.8%	\$4,000,000	16.3%	\$24,479,877	CC	CA	CW	CS
Automotive Fuel Cell Cooperation Corp.*	\$10,000,000	20.9%	\$37,831,775	79.1%	\$0	0.0%	\$47,831,775	CC	CA		
MacDonald, Dettwiler and Associates Inc.	\$965,253	33.0%	\$1,959,757	67.0%	\$0	0.0%	\$2,925,010	CC		CW	CS
Terragon Environmental Technologies Inc.*	\$2,874,000	39.1%	\$3,304,747	44.9%	\$1,178,000	16.0%	\$7,356,747			CW	CS
HTEC Hydrogen Technology & Energy Corp.*	\$4,014,212	36.0%	\$6,921,429	62.1%	\$214,947	1.9%	\$11,150,588	CC	CA		
Agrisoma Biosciences Inc.*	\$2,500,000	30.5%	\$5,708,883	69.5%	\$0	0.0%	\$8,208,883	CC	CA	CW	CS
Morgan Solar Inc.*	\$2,351,580	32.7%	\$4,224,619	58.7%	\$619,138	8.6%	\$7,195,336	CC	CA		
Ferme Olivier Lépine Inc.	\$7,509,000	33.0%	\$15,246,000	67.0%	\$0	0.0%	\$22,755,000	CC	CA	CW	CS
Pulse Energy Inc.*	\$2,556,801	31.8%	\$3,519,228	43.8%	\$1,962,868	24.4%	\$8,038,897	CC	CA		
Exro Technologies Inc.	\$605,093	33.0%	\$1,228,523	67.0%	\$0	0.0%	\$1,833,616	CC	CA		
NutraCanada*	\$1,900,000	19.2%	\$5,970,622	60.2%	\$2,050,000	20.7%	\$9,920,622	CC		CW	CS
Round 14 2008B											
Soane Energy (Canada) Inc.*	\$3,032,434	26.5%	\$8,410,714	73.5%	\$0	0.0%	\$11,443,149	CC		CW	
Sunwell Technologies Inc.*	\$2,800,000	43.0%	\$3,674,367	56.4%	\$41,827	0.6%	\$6,516,193	CC	CA		
Canadian Pallet Council*	\$1,070,967	43.6%	\$1,385,380	56.4%	\$0	0.0%	\$2,456,347	CC	CA		
MEG Energy Corp.*	\$4,270,000	31.6%	\$7,846,606	58.1%	\$1,400,000	10.4%	\$13,516,606	CC			
Thermalfrost Inc.*	\$3,943,931	33.0%	\$6,114,131	51.1%	\$1,902,769	15.9%	\$11,960,831	CC	CA		
SunSelect Produce (Delta) Inc.*	\$1,072,425	30.3%	\$1,954,159	55.3%	\$508,555	14.4%	\$3,535,139	CC	CA		

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Lead Organization	Approved SDTC Funding	% of Eligible Project Costs	Eligible Recipient Funding Contribution	% of Eligible Project Costs	Other Government Funding	% of Total Eligible Project Costs	Total Eligible Project Costs	Environmental Benefits (Primary Benefits Bolded)
Duropar Technologies Inc.*	\$2,100,000	40.7%	\$1,456,619	28.2%	\$1,600,000	31.0%	\$5,156,619	CA CW CS
Xogen Technologies Inc.*	\$1,974,104	30.0%	\$2,541,419	38.6%	\$2,064,825	31.4%	\$6,580,348	CW CS
Statoil Hydro Canada Ltd.*	\$6,000,000	15.5%	\$32,791,337	84.5%	\$0	0.0%	\$38,791,337	CC CW
Lignol Innovations Ltd.*	\$6,871,685	33.3%	\$7,965,229	38.6%	\$5,795,086	28.1%	\$20,632,000	CC CA CS
Saltworks Technologies Inc.*	\$2,612,638	33.1%	\$4,859,349	61.5%	\$426,000	5.4%	\$7,897,987	CC CW
Imtex Membranes Corp.*	\$2,753,948	31.5%	\$5,909,930	67.7%	\$71,500	0.8%	\$8,735,378	CC CA
Titanium Corp. Inc.*	\$6,292,636	31.1%	\$12,169,920	60.1%	\$1,795,970	8.9%	\$20,258,526	CC CW CS
Eco-Ag Initiatives*	\$1,948,000	33.6%	\$3,455,615	59.7%	\$388,000	6.7%	\$5,791,615	CC CA CW CS
Deane and Co Inc.*	\$595,000	39.7%	\$904,904	60.3%	\$0	0.0%	\$1,499,904	CW CS
Round 13 2008A								
Alterna Energy Inc.*	\$1,254,317	14.1%	\$4,872,803	54.8%	\$2,763,972	31.1%	\$8,891,092	CC CA CW
EcoSynthetix Corp.*	\$1,679,331	33.0%	\$1,612,596	31.7%	\$1,796,955	35.3%	\$5,088,882	CC CA
dPoint Technologies Inc.*	\$1,531,394	42.7%	\$2,051,568	57.3%	\$0	0.0%	\$3,582,961	CC CA
Innoventé Inc.*	\$2,730,526	37.9%	\$2,094,131	29.1%	\$2,375,386	33.0%	\$7,200,042	CC CW CS
General Fusion Inc.*	\$13,897,455	21.9%	\$49,590,730	78.0%	\$60,000	0.1%	\$63,548,185	CC CA
GreenField Ethanol Inc.*	\$13,000,000	30.3%	\$21,449,808	50.0%	\$8,470,654	19.7%	\$42,920,462	CC CA CW CS
Integran Technologies, Inc.*	\$1,500,000	33.2%	\$2,387,114	52.8%	\$633,350	14.0%	\$4,520,464	CC CA CW
Vive Crop Protection Inc.*	\$3,954,706	35.1%	\$3,547,198	31.4%	\$3,780,000	33.5%	\$11,281,904	CC CA CW CS
Nexterra Energy Corp.*	\$5,518,777	31.4%	\$8,215,067	46.8%	\$3,830,000	21.8%	\$17,563,845	CC CA
SunCentral Inc.*	\$2,045,208	32.5%	\$1,863,218	29.6%	\$2,384,522	37.9%	\$6,292,949	CC CA
A.U.G. Signals Ltd.*	\$1,746,522	33.0%	\$3,545,968	67.0%	\$0	0.0%	\$5,292,490	CC CA CW

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Lead Organization	Approved SDTC Funding	% of Eligible Project Costs	Eligible Recipient Funding Contribution	% of Eligible Project Costs	Other Government Funding	% of Total Eligible Project Costs	Total Eligible Project Costs	Environmental Benefits (Primary Benefits Bolded)
Round 12 2007B								
Atlantec BioEnergy Corporation*	\$1,833,482	33.0%	\$3,728,274	67.0%	\$0	0.0%	\$5,561,756	CC CA CW CS
Taransys Inc.	\$1,500,000	33.3%	\$3,000,000	66.7%	\$0	0.0%	\$4,500,000	CC CA
Integran Technologies Inc.*	\$5,616,635	32.7%	\$11,411,024	66.4%	\$170,000	1.0%	\$17,197,659	CC CA
BioDiesel Reactor Technologies Inc.*	\$3,448,000	43.6%	\$1,739,263	22.0%	\$2,720,769	34.4%	\$7,908,032	CC CA CW CS
Aboriginal Cogeneration Corporation*	\$2,738,708	33.1%	\$5,532,624	66.9%	\$0	0.0%	\$8,271,332	CC CA CW CS
Pure Technologies Ltd.*	\$795,000	32.1%	\$1,099,393	44.4%	\$580,000	23.4%	\$2,474,393	CC CA CW
Petroleum Technology Research Centre*	\$5,000,000	20.0%	\$20,006,000	80.0%	\$0	0.0%	\$25,006,000	CC
Verdant Power Canada ULC*	\$1,150,000	30.5%	\$1,020,696	27.1%	\$1,597,715	42.4%	\$3,768,411	CC CA
Marine Exhaust Solutions	\$1,973,865	33.0%	\$4,007,545	67.0%	\$0	0.0%	\$5,981,410	CC CA
MemPore Corporation	\$493,876	42.5%	\$667,757	57.5%	\$0	0.0%	\$1,161,633	CC CA CW CS
Himark bioGas Inc.*	\$3,331,976	32.3%	\$6,971,081	67.7%	\$0	0.0%	\$10,303,057	CC CW CS
Alstom Hydro Canada Inc.*	\$5,099,325	33.0%	\$8,164,917	52.8%	\$2,200,000	14.2%	\$15,464,242	CC CA
Pathogen Detection Systems*	\$2,671,627	33.6%	\$2,740,599	34.5%	\$2,539,045	31.9%	\$7,951,272	CW
Western Hydrogen Limited*	\$4,162,653	33.0%	\$8,451,447	67.0%	\$0	0.0%	\$12,614,100	CC CA
Round 11 2007A								
Fuseforward International Inc.*	\$400,000	26.2%	\$679,343	44.6%	\$444,578	29.2%	\$1,523,921	CA CW CS
TM4 Inc. Auto*	\$3,818,787	31.4%	\$7,823,311	64.3%	\$516,364	4.2%	\$12,158,461	CC CA
MSR Innovations Inc.*	\$399,518	34.6%	\$377,762	32.7%	\$377,763	32.7%	\$1,155,043	CC CA
St-Jean Photochemicals*	\$1,673,424	32.9%	\$1,590,522	31.3%	\$1,825,520	35.9%	\$5,089,466	CC CA CW CS

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Lead Organization	Approved SDTC Funding	% of Eligible Project Costs	Eligible Recipient Funding Contribution	% of Eligible Project Costs	Other Government Funding	% of Total Eligible Project Costs	Total Eligible Project Costs	Environmental Benefits (Primary Benefits Bolded)			
								CC	CA	CW	CS
Elementa Group Inc.	\$3,302,500	25.3%	\$9,730,766	74.7%	\$0	0.0%	\$13,033,266	CC	CA	CW	CS
Corporation HET - Horizon Environment Technologies*	\$1,509,807	27.6%	\$3,468,447	63.3%	\$500,000	9.1%	\$5,478,254	CC		CW	CS
bstNRG.com Inc.*	\$1,651,169	45.0%	\$2,018,095	55.0%	\$0	0.0%	\$3,669,264	CC	CA		CS
Ferrinov Inc.*	\$1,864,334	34.3%	\$3,028,390	55.7%	\$542,251	10.0%	\$5,434,975	CC	CA		CS
Développement Effenco Inc.*	\$774,955	44.0%	\$703,524	40.0%	\$282,305	16.0%	\$1,760,784	CC	CA		
General Electric Canada*	\$4,212,670	33.3%	\$8,437,991	66.7%	\$0	0.0%	\$12,650,661	CC	CA		
Round 10 2006B											
Middle Bay Sustainable Aquaculture Institute*	\$5,768,999	33.7%	\$11,360,822	66.3%	\$0	0.0%	\$17,129,821			CW	CS
SIREM ULC*	\$356,437	32.8%	\$730,261	67.2%	\$0	0.0%	\$1,086,698	CC		CW	CS
Turbo Trac Systems ULC Inc.*	\$1,032,379	24.6%	\$3,169,243	75.4%	\$0	0.0%	\$4,201,622	CC	CA		
CVTCORP Transmission Inc.*	\$2,131,950	27.9%	\$3,892,915	50.9%	\$1,625,000	21.2%	\$7,649,865	CC	CA		
TM4 Inc. Wind*	\$2,187,756	18.6%	\$6,796,534	57.7%	\$2,788,618	23.7%	\$11,772,908	CC	CA		
Round 9 2006A											
Dynamic Systems Incorporated*	\$4,259,800	21.2%	\$15,825,210	78.8%	\$0	0.0%	\$20,085,010	CC	CA		
General Electric Canada*	\$2,485,395	33.3%	\$4,970,788	66.7%	\$0	0.0%	\$7,456,183	CC	CA	CW	CS
Enerkem Technologies Inc.*	\$2,660,476	35.6%	\$2,894,910	38.7%	\$1,925,000	25.7%	\$7,480,386	CC	CA		
Milligan Bio- Tech Inc.*	\$7,004,493	29.8%	\$16,492,489	70.1%	\$30,764	0.1%	\$23,527,746	CC	CA		
MinMiner Oilsands Inc.*	\$4,302,673	33.0%	\$8,035,730	61.6%	\$700,000	5.4%	\$13,038,403	CC	CA	CW	CS

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Lead Organization	Approved SDTC Funding	% of Eligible Project Costs	Eligible Recipient Funding Contribution	% of Eligible Project Costs	Other Government Funding	% of Total Eligible Project Costs	Total Eligible Project Costs	Environmental Benefits (Primary Benefits Bolded)
Round 8 2005B								
Tantalus Systems Corp.*	\$2,981,310	29.5%	\$7,121,213	70.5%	\$0	0.0%	\$10,102,523	CC CA
Wind Smart Inc.*	\$1,219,075	40.2%	\$1,329,993	43.9%	\$481,803	15.9%	\$3,030,871	CC CA
BESTECH (Boudreau-Espley-Pitre Corporation)*	\$1,448,000	38.6%	\$2,306,933	61.4%	\$0	0.0%	\$3,754,933	CC CA
EcoVu Analytics Inc.*	\$1,035,555	32.3%	\$1,988,190	62.0%	\$182,086	5.7%	\$3,205,831	CW
Nutriloc Ingredients Corporation*	\$847,319	35.2%	\$822,782	34.2%	\$734,393	30.5%	\$2,404,493	CC CA
Power Measurement Ltd.*	\$2,960,871	33.0%	\$5,651,064	63.0%	\$360,400	4.0%	\$8,972,335	CC CA
New Energy Corporation Inc.*	\$2,000,000	31.4%	\$1,633,467	25.6%	\$2,741,058	43.0%	\$6,374,525	CC CA
Mechtronix Systems Inc.*	\$1,933,987	32.5%	\$1,783,422	30.0%	\$2,233,320	37.5%	\$5,950,729	CW CS
Pure Technologies Ltd.*	\$2,200,000	32.4%	\$3,816,398	56.1%	\$782,138	11.5%	\$6,798,536	CA CW
Unicell Ltd.*	\$2,110,000	21.3%	\$5,861,890	59.2%	\$1,936,207	19.5%	\$9,908,097	CC CA
Round 7 2005A								
Power Diagnostic Technologies Ltd.*	\$1,035,400	32.5%	\$2,064,600	64.9%	\$81,000	2.5%	\$3,181,000	CC CA
Round 6 2004B								
University of British Columbia*	\$2,408,702	33.0%	\$3,776,993	51.7%	\$1,113,403	15.3%	\$7,299,098	CC CA
Pratt & Whitney Canada Corporation*	\$5,624,850	32.0%	\$11,940,725	68.0%	\$0	0.0%	\$17,565,575	CC CA
Round 5 2004A								
Great Northern Power Corp.*	\$2,063,403	28.4%	\$5,077,138	69.9%	\$125,000	1.7%	\$7,265,541	CC CA
Round 4 2003B								
Whitefox Technologies Canada Ltd.*	\$2,608,545	38.5%	\$4,167,923	61.5%	\$0	0.0%	\$6,776,468	CC CA
Total	\$413,597,526	29.9%	\$803,943,848	58.1%	\$167,057,552	12.1%	\$1,384,598,923	

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Completed Projects

Lead Organization	Approved SDTC Funding	% of Eligible Project Costs	Eligible Recipient Funding Contribution	% of Eligible Project Costs	Other Government Funding	% of Total Eligible Project Costs	Total Eligible Project Costs	Environmental Benefits (Primary Benefits Bolded)
*Amounts are based on actual disbursements at project completion								
Round 15 2009A								
RSW-RER Lée.	\$2,760,000	14.0%	\$14,322,725	72.4%	\$2,700,000	13.6%	\$19,782,725	CC CA
Round 14 2008B								
Alcoa Ltd.	\$228,600	38.1%	\$371,245	61.9%	\$0	0.0%	\$599,845	CC CA CW CS
Round 13 2008A								
Paragon Soil and Environmental Consulting Inc.	\$231,151	43.8%	\$296,592	56.2%	\$0	0.0%	\$527,743	CC CA CW CS
Round 10 2006B								
Fifth Light Technology Ltd.	\$3,911,300	30.5%	\$7,225,340	56.3%	\$1,700,000	13.2%	\$12,836,640	CC CA
Calisolar Inc.	\$4,074,505	26.0%	\$10,022,872	64.0%	\$1,559,432	10.0%	\$15,656,809	CC CA
Advanced Lithium Power Inc.	\$1,400,000	25.3%	\$3,734,876	67.5%	\$400,000	7.2%	\$5,534,876	CC CA
Terragon Environmental Technologies Inc.	\$1,592,500	38.9%	\$1,787,094	43.6%	\$718,190	17.5%	\$4,097,783	CC CA CW CS
Round 8 2005B								
Maritime Innovation (IMAR)	\$979,800	38.5%	\$1,128,392	44.4%	\$435,565	17.1%	\$2,543,757	CW
ARISE Technologies Corporation	\$6,439,037	32.8%	\$13,192,174	67.2%	\$0	0.0%	\$19,631,211	CC CA
Ostara Nutrient Recovery Technologies Inc.	\$375,760	21.1%	\$682,959	38.4%	\$718,910	40.4%	\$1,777,628	CC CA CW CS
Hydrogenics Corporation	\$2,248,493	28.4%	\$5,668,736	71.6%	\$0	0.0%	\$7,917,229	CC CA
Chinook Mobile Heating and De-icing Inc.	\$3,063,766	41.5%	\$3,078,016	41.7%	\$1,236,500	16.8%	\$7,378,282	CC CA CW CS
Round 7 2005A								
N-Solv Corporation	\$5,404,672	29.4%	\$12,994,254	70.6%	\$0	0.0%	\$18,398,926	CC CA

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Lead Organization	Approved SDTC Funding	% of Eligible Project Costs	Eligible Recipient Funding Contribution	% of Eligible Project Costs	Other Government Funding	% of Total Eligible Project Costs	Total Eligible Project Costs	Environmental Benefits (Primary Benefits Bolded)	
								CC	CW
Plasco Trail Road Inc.	\$9,494,466	13.3%	\$53,077,190	74.6%	\$8,572,538	12.0%	\$71,144,194	CC	CA CW
Petroleum Technology Research Centre	\$3,168,990	33.0%	\$5,854,010	61.0%	\$580,000	6.0%	\$9,603,000	CC	CA
Vaperma Inc.	\$5,049,958	33.3%	\$8,169,915	53.9%	\$1,930,000	12.7%	\$15,149,873	CC	CA
EcoSmart Foundation Inc.	\$1,866,630	48.8%	\$1,818,232	47.5%	\$144,000	3.8%	\$3,828,862	CC	CA
Round 6 2004B									
Angstrom Power Incorporated	\$169,752	13.4%	\$863,519	68.4%	\$230,000	18.2%	\$1,263,271	CC	CA
Science Applications International Corporation (SAIC Canada)	\$1,009,589	20.8%	\$2,049,009	42.3%	\$1,787,958	36.9%	\$4,846,556	CC	CA
Sunarc of Canada Inc.	\$545,357	30.0%	\$730,538	40.2%	\$543,327	29.9%	\$1,819,222	CC	CA
Clean Current Power Systems Incorporated	\$1,582,000	33.0%	\$3,213,500	67.0%	\$0	0.0%	\$4,795,500	CC	CA
Electrovaya Corp.	\$1,859,530	33.0%	\$3,775,410	67.0%	\$0	0.0%	\$5,634,940	CC	CA
Prairie Pulp and Paper Inc.	\$1,250,141	33.8%	\$2,379,641	64.3%	\$70,000	1.9%	\$3,699,782	CC	CA CS
Group IV Semi Conductor Inc.	\$3,724,663	31.0%	\$3,805,821	31.7%	\$4,486,251	37.3%	\$12,016,734	CC	CA
Round 5 2004A									
M.A. Turbo/Engine Ltd.	\$152,844	46.0%	\$179,760	54.0%	\$0	0.0%	\$332,604	CA	
Atlantic Packaging Products Ltd.	\$2,268,430	28.5%	\$5,690,974	71.5%	\$0	0.0%	\$7,959,404	CC	CA CS
Atlantic Hydrogen Inc.	\$2,096,948	30.4%	\$3,220,266	46.7%	\$1,576,334	22.9%	\$6,893,548	CC	CA
Tenova Goodfellow Inc.	\$3,322,441	30.0%	\$6,517,230	58.8%	\$1,237,878	11.2%	\$11,077,549	CC	CA
Round 4 2003B									
Synodon Inc.	\$1,056,790	23.1%	\$2,748,328	60.1%	\$767,752	16.8%	\$4,572,871	CC	
BIOX Canada Limited	\$5,000,000	14.5%	\$25,504,071	73.9%	\$4,000,000	11.6%	\$34,504,071	CC	CA
Fifth Light Technology Ltd.	\$3,036,000	33.0%	\$3,914,000	42.5%	\$2,250,000	24.5%	\$9,200,000	CC	
Nanox Inc.	\$1,774,548	40.0%	\$1,249,748	28.2%	\$1,413,500	31.9%	\$4,437,796	CA	
Lignol Innovations Ltd.	\$6,240,816	30.7%	\$9,369,986	46.1%	\$4,715,120	23.2%	\$20,325,922	CC	CA
Sacré-Davey Innovations	\$5,727,711	32.4%	\$4,596,140	26.0%	\$7,357,859	41.6%	\$17,681,710	CC	CA

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Lead Organization	Approved SDTC Funding	% of Eligible Project Costs	Eligible Recipient Funding Contribution	% of Eligible Project Costs	Other Government Funding	% of Total Eligible Project Costs	Total Eligible Project Costs	Environmental Benefits (Primary Benefits Bolded)
Round 3 2003A								
Hydrogenics Corporation	\$1,350,419	44.0%	\$1,327,716	43.3%	\$391,000	12.7%	\$3,069,135	CA
Blue-Zone Technologies Ltd.	\$2,700,000	32.4%	\$3,851,540	46.2%	\$1,783,981	21.4%	\$8,335,521	CC
Quantium Technologies Inc.	\$1,450,000	14.7%	\$5,487,819	55.7%	\$2,907,000	29.5%	\$9,844,819	CA
Saskatchewan Power Corporation (SaskPower)	\$2,682,900	24.1%	\$8,446,708	75.8%	\$20,000	0.2%	\$11,149,608	CA
Paradigm Environmental Technologies Inc.	\$250,000	20.7%	\$653,804	54.1%	\$305,000	25.2%	\$1,208,804	CA CW
PlugPower Canada Inc.	\$2,000,000	22.2%	\$6,026,000	66.8%	\$1,000,000	11.1%	\$9,026,000	CA
Round 2 2002B								
West Lorne Bio-Oil Co-Generation Limited Partnership	\$5,000,000	40.9%	\$7,215,947	59.1%	\$0	0.0%	\$12,215,947	CC CA
Ensyn Technologies Inc.	\$2,000,000	22.5%	\$3,295,871	37.0%	\$3,600,000	40.5%	\$8,895,871	CC CA
Enerkem Technologies Inc.	\$720,573	32.0%	\$1,316,047	58.4%	\$216,798	9.6%	\$2,253,418	CC CA CS
ZENON Environmental Inc.	\$1,760,000	33.0%	\$3,574,000	67.0%	\$0	0.0%	\$5,334,000	CC CA CW
Radiant Technologies Inc.	\$1,000,000	39.6%	\$1,278,144	50.6%	\$250,000	9.9%	\$2,528,144	CC CA
Mikro-Tek Inc.	\$500,400	14.4%	\$2,982,950	85.6%	\$0	0.0%	\$3,483,350	CC CS
University of New Brunswick	\$257,826	35.5%	\$325,228	44.8%	\$142,457	19.6%	\$725,511	CC CA
Himark bioGas Inc.	\$1,000,000	14.2%	\$3,801,570	53.9%	\$2,254,675	32.0%	\$7,056,245	CC CA CW CS
Round 1 2002A								
Westport Innovations Inc.	\$1,000,000	32.1%	\$1,565,376	50.2%	\$550,000	17.7%	\$3,115,376	CA
Bio-Terre Systems Inc.	\$864,375	37.5%	\$800,974	34.7%	\$639,651	27.8%	\$2,305,000	CC CA CW CS
Carmanah Technologies Inc.	\$466,167	22.9%	\$1,568,895	77.1%	\$0	0.0%	\$2,035,062	CC CA
CO ₂ Solution Inc.	\$1,000,000	17.0%	\$1,614,557	27.5%	\$3,267,001	55.5%	\$5,881,558	CC
Total	\$119,109,848	25.6%	\$278,365,709	59.7%	\$68,458,677	14.7%	\$465,934,232	

CC = climate change, CA = clean air, CW = clean water, CS = clean soil

Early Termination Projects

A total of thirty (30) projects were terminated early due to technology issues, financial problems, consortium challenges or change in strategic direction for the lead consortia member.

Lead Organization	Approved SDTC Funding	% of Eligible Project Costs	Eligible Recipient Funding Contribution	% of Eligible Project Costs	Other Government Funding	% of Total Eligible Project Costs	Total Eligible Project Costs	Environmental Benefits (Primary Benefits Bolded)
*Amounts are based on actual disbursement prior to termination								
Round 13 2008A								
Performance Plants Inc.	\$526,645	37.3%	\$885,576	62.7%	\$0	0.0%	\$1,412,221	CC CW CS
Round 12 2007B								
SIXtron Advanced Materials	\$1,331,823	20.6%	\$5,132,979	79.4%	\$0	0.0%	\$6,464,802	CC CA
Lancaster Wind Systems Inc.	\$566,194	34.6%	\$1,071,006	65.4%	\$0	0.0%	\$1,637,200	CC CA
Round 11 2007A								
Biothermica Technologies Inc.	\$80,713	36.0%	\$79,031	35.2%	\$64,458	28.7%	\$224,202	CC
Envirtower Inc.	\$300,000	32.0%	\$637,500	68.0%	\$0	0.0%	\$937,500	CC CW
Round 10 2006B								
NxtGen Emission Controls Inc.	\$2,516,882	25.5%	\$7,360,025	74.5%	\$0	0.0%	\$9,876,907	CC CA
HTC Hydrogen Technologies Corp.	\$635,414	45.3%	\$767,751	54.7%	\$0	0.0%	\$1,403,165	CC CA
Nova Scotia Power Inc.	\$4,650,000	48.4%	\$4,514,705	46.9%	\$452,000	4.7%	\$9,616,705	CC CA CW
Biogénie S.R.D.C. Inc.	\$230,137	30.7%	\$518,367	69.3%	\$0	0.0%	\$748,504	CC CA CS
Early Warning Inc.	\$2,068,041	31.0%	\$3,607,587	54.0%	\$1,000,000	15.0%	\$6,675,628	CC CA CW CS
Round 9 2006A								
Biothermica Technologies Inc.	\$200,487	33.4%	\$400,000	66.6%	\$0	0.0%	\$600,487	CC CA CS
Zenon Membrane Solutions	\$665,540	37.5%	\$1,111,128	62.5%	\$0	0.0%	\$1,776,668	CC CW
Magenn Power Inc.	\$691,019	12.7%	\$4,205,462	77.4%	\$539,000	9.9%	\$5,435,481	CC CA
Round 8 2005B								
Cerestech Inc.	\$751,627	32.3%	\$1,575,391	67.7%	\$0	0.0%	\$2,327,017	CC CW
Bio Vision Technology Inc.	\$3,000,000	14.9%	\$16,023,445	79.3%	\$1,175,745	5.8%	\$20,199,190	CC CA

CC = climate change, CA = clean air, CW = clean water, CS = clean soil

Lead Organization	Approved SDTC Funding	% of Eligible Project Costs	Eligible Recipient Funding Contribution	% of Eligible Project Costs	Other Government Funding	% of Total Eligible Project Costs	Total Eligible Project Costs	Environmental Benefits (Primary Benefits Bolded)
Round 7 2005A								
Envirogain Inc.	\$957,623	43.3%	\$1,252,582	56.7%	\$0	0.0%	\$2,210,205	CC CA CW CS
Netistix Technologies Corporation	\$471,199	38.3%	\$504,561	41.0%	\$255,000	20.7%	\$1,230,760	CC CA
Dépôt Rive-Nord Inc.	\$0	50.0%	\$0	50.0%	\$0	0.0%	\$0	CC CA
Nexterra Energy Corp.	\$1,159,518	33.0%	\$1,052,280	29.9%	\$1,301,893	37.1%	\$3,513,692	CC CA
AirScience Technologies Inc.	\$417,661	30.4%	\$956,224	69.6%	\$0	0.0%	\$1,373,885	CC CA
Maratek Environmental	\$915,205	28.1%	\$1,240,905	38.1%	\$1,100,000	33.8%	\$3,256,110	CC CA CW
Round 5 2004A								
Alternative Green Energy Systems Inc.	\$517,041	29.3%	\$1,244,887	70.7%	\$0	0.0%	\$1,761,928	CC CA CS
Xantrex Technology Inc.	\$1,213,614	33.0%	\$2,464,004	67.0%	\$0	0.0%	\$3,677,618	CC CA
Round 4 2003B								
DeCloet Greenhouse Manufacturing Ltd.	\$176,434	31.7%	\$325,387	58.4%	\$55,000	9.9%	\$556,821	CC
NxtPhase T&D Corporation	\$887,598	24.6%	\$2,727,097	75.4%	\$0	0.0%	\$3,614,695	CC
Round 3 2003A								
RailPower Technologies Corp.	\$584,079	35.7%	\$800,521	49.0%	\$250,000	15.3%	\$1,634,600	CA
Round 2 2002B								
IBC Technologies Inc.	\$183,150	20.9%	\$677,580	77.2%	\$16,420	1.9%	\$877,150	CC CA
Round 1 2002A								
Suncor Energy Inc.	\$889,132	25.0%	\$1,800,000	50.6%	\$866,537	24.4%	\$3,555,669	CC
Mabarex Inc.	\$225,000	40.9%	\$300,000	54.5%	\$25,000	4.5%	\$550,000	CC CA
NOVA Chemicals Corporation	\$320,000	33.5%	\$636,575	66.5%	\$0	0.0%	\$956,575	CC CA
Total	\$27,131,776	27.7%	\$63,872,556	65.1%	\$7,101,053	7.2%	\$98,105,385	

SD Tech Fund™ Project Classification

SDTC Approved Funding in Hydrogen Economy, Clean Fossil Fuels, Clean Water and Clean Soil Projects (as of December 31, 2011)

Hydrogen Economy Projects			
Round	Lead Consortia Partner	Total Eligible Project Costs	SDTC Approved Funding
Round 17 - 2010A	Ballard Power Systems Inc.	\$ 21,233,930	\$ 7,004,367
Round 16 - 2009B	Available Energy Corporation	\$ 1,980,612	\$ 550,000
	Quadrogen Power Systems, Inc.*	\$ 7,909,529	\$ 2,610,145
Round 15 - 2009A	Automotive Fuel Cell Cooperation Corp.	\$ 47,831,775	\$ 10,000,000
	Ballard Power Systems Inc.	\$ 22,494,665	\$ 4,796,120
	HTEC Hydrogen Technology & Energy Corp.	\$ 11,150,588	\$ 2,058,537
Round 12 - 2007B	Western Hydrogen Ltd.	\$ 12,614,100	\$ 4,162,653
Round 10 - 2006B	HTC Hydrogen Technologies Corp.	\$ 1,403,165	\$ 417,661
Round 8 - 2005B	Hydrogenics Corp.	\$ 7,917,229	\$ 2,248,493
Round 7 - 2005A	AirScience Technologies Inc.	\$ 1,373,885	\$ 417,661
Round 6 - 2004B	Angstrom Power Inc.	\$ 1,263,271	\$ 2,000,000
Round 5 - 2004A	Atlantic Hydrogen Inc.	\$ 6,893,548	\$ 2,096,948
Round 4 - 2003B	Sacre-Davey Innovations Inc.	\$ 17,681,710	\$ 1,421,000
Round 3 - 2003A	Hydrogenics Corporation	\$ 3,069,135	\$ 1,350,419
	Plug Power Canada Inc.	\$ 9,026,000	\$ 2,000,000
15 Projects		\$ 173,843,142	\$ 47,953,895

Clean Fossil Fuel Projects			
Round	Lead Consortia Partner	Total Eligible Project Costs	SDTC Approved Funding
Round 18 - 2010B	N-Solv Corporation*	\$ 27,000,407	\$ 10,000,000
Round 16 - 2009B	InvenTyS Thermal Technologies Inc.*	\$ 5,998,833	\$ 1,999,611
	InvoDane Engineering Ltd.	\$ 4,450,826	\$ 1,482,125
	Purifics ES Inc.*	\$ 4,263,000	\$ 1,421,000
Round 14 - 2008B	MEG Energy Corp.	\$ 13,516,606	\$ 4,270,000
	Soane Energy (Canada) Inc.	\$ 11,443,149	\$ 3,032,434
	Statoil Hydro Canada Ltd.	\$ 38,791,337	\$ 6,000,000
	Titanium Corporation Inc.	\$ 20,258,526	\$ 6,292,636
Round 13 - 2008A	Paragon Soil and Environmental Consulting Inc.	\$ 527,743	\$ 231,151
Round 12 - 2007B	Petroleum Technology Research Centre	\$ 25,006,000	\$ 5,000,000
	Western Hydrogen Limited	\$ 12,614,100	\$ 4,162,653
Round 10 - 2006B	Turbo Trac Systems ULC Inc.	\$ 4,201,622	\$ 1,032,379

* Project is contracted

Section 5 – SD Tech Fund™ Project Classification

Clean Fossil Fuel Projects			
Round	Lead Consortia Partner	Total Eligible Project Costs	SDTC Approved Funding
Round 9 - 2006A	MinMiner Oilsands Inc.	\$ 13,038,403	\$ 4,302,673
Round 7 - 2005A	N-Solv Corp.	\$ 18,398,926	\$ 5,404,672
	Petroleum Technology Research Centre	\$ 9,603,000	\$ 3,168,990
	Power Diagnostic Technologies Ltd.	\$ 3,181,000	\$ 1,035,400
Round 4 - 2003B	Synodon Inc.	\$ 4,572,871	\$ 1,056,790
Round 1 - 2002A	Suncor Energy Inc.	\$ 3,555,669	\$ 889,132
	CO ₂ Solution Inc.	\$ 5,881,558	\$ 1,000,000
19 Projects		\$ 226,303,576	\$ 61,781,646

Clean Water / Clean Soil Projects			
Round	Lead Consortia Partner	Total Eligible Project Costs	SDTC Approved Funding
Round 19 - 2011A	Pure Technologies Ltd.	\$3,000,000	\$1,000,000
	TISEC Inc.*	\$932,760	\$440,000
Round 18 - 2010B	Linnaeus Plant Sciences Inc.*	\$4,998,500	\$1,534,300
	'Namgis First Nation	\$10,589,812	\$2,650,000
	Northex Environnement Inc.*	\$3,998,249	\$1,552,354
Round 17 - 2010A	Echologics Engineering Inc.*	\$2,278,564	\$751,926
	Fabgroups Technologies Inc*	\$9,091,200	\$2,981,000
	FibraCast	\$4,339,771	\$1,399,124
	Silinov Technologies*	\$5,384,662	\$1,776,938
	Tyne Engineering Inc.	\$4,934,949	\$1,534,097
Round 16 - 2009B	3XR Inc.	\$1,787,568	\$593,000
	6574262 Canada Inc. (ICUS) *	\$1,112,500	\$400,000
	Available Energy Corporation	\$1,980,612	\$720,000
	Lakeshore EMPC Two L.P.	\$2,587,188	\$1,076,044
	MPT Mustard Products & Technologies Inc.	\$5,741,231	\$2,217,949
	Purifics ES Inc.*	\$4,263,000	\$1,421,000
	Spartan Bioscience	\$6,354,802	\$1,896,774
Round 15 - 2009A	Agrisoma Biosciences Inc.	\$8,208,883	\$2,500,000
	Entropex a partnership of Unitec Inc. and 629728 Ontario Ltd.	\$24,479,877	\$6,330,000
	Ferme Olivier Lepine Inc.*	\$22,755,000	\$7,509,000
	MacDonald, Dettwiler and Associates Inc.*	\$2,925,010	\$965,253
	NutraCanada	\$9,920,622	\$1,900,000
	SBI BioEnergy Inc.	\$6,161,571	\$1,875,495
	Terragon Environmental Technologies Inc.	\$7,356,747	\$2,874,000

Clean Water / Clean Soil Projects			
Round	Lead Consortia Partner	Total Eligible Project Costs	SDTC Approved Funding
Round 14 - 2008B	Deane Ltée.	\$1,499,904	\$595,000
	Duopar Technologies Inc.	\$5,156,619	\$2,100,000
	Eco-Ag Initiatives	\$5,791,615	\$1,948,000
	Statoil Hydro Canada Ltd.	\$38,791,337	\$6,000,000
	Saltworks Technologies Inc.	\$7,897,987	\$2,612,638
	Soane Energy (Canada) Inc.	\$11,443,149	\$3,032,434
	Titanium Corporation Inc.	\$20,258,526	\$6,292,636
	Xogen Technologies Inc.	\$6,580,348	\$1,974,104
Round 13 - 2008A	A.U.G. Signals Ltd.	\$5,292,490	\$1,746,522
	Innoventé Inc.	\$7,200,042	\$2,730,526
	Paragon Soil and Environmental Consulting Inc.	\$527,743	\$231,151
	Performance Plants Inc.	\$1,412,221	\$526,645
	Vive Crop Protection Inc.	\$11,281,904	\$3,954,706
Round 12 - 2007B	Aboriginal Cogeneration Corp.	\$8,271,332	\$2,738,708
	Atlantec BioEnergy Corp.	\$5,561,756	\$1,833,482
	BioDiesel Reactor Technologies Inc.	\$7,908,032	\$3,448,000
	Himark bioGas Inc.	\$10,303,057	\$3,331,976
	MemPore Corp.*	\$1,161,633	\$493,876
	Pathogen Detection Systems Inc.	\$7,951,272	\$2,671,627
	Pure Technologies Ltd.	\$2,474,393	\$795,000
Round 11 - 2007A	Fuseforward International Inc.	\$1,523,921	\$400,000
	Corporation HET - Horizon Environnement Technologies	\$5,478,254	\$1,509,807
	Envirotower Inc.	\$937,500	\$300,000
	Ferrinov Inc.	\$5,434,975	\$1,864,334
Round 10 - 2006B	Biogénie S.R.D.C. Inc.	\$748,504	\$230,137
	Early Warning Inc.	\$6,675,628	\$2,068,041
	Middle Bay Sustainable Aquaculture Institute	\$17,129,821	\$5,768,999
	SiREM Canada	\$1,086,698	\$356,437
	Terragon Environmental Technologies Inc.	\$4,097,783	\$1,592,500
Round 9 - 2006A	MinMiner Oilsands Inc.	\$13,038,403	\$4,302,673
	Zenon Membrane Solutions	\$1,776,668	\$665,540
Round 8 - 2005B	Chinook Mobile Heating & Deicing Corp.	\$7,378,282	\$3,063,766
	EcoVu Analytics	\$3,205,831	\$1,035,555
	Maritime Innovation (IMAR)	\$2,543,757	\$979,800
	Ostara Nutrient Recovery Technologies Inc.	\$1,777,628	\$375,760
	Pure Technologies Ltd.	\$6,798,536	\$2,200,000
60 Projects		\$401,580,627	\$123,668,634

*Amounts are based on approved project value – contracting to be finalized.

Classification of Environmental Benefits

Of the SD Tech Fund's total value of \$590M, an amount of \$440M is to be allocated to projects that have an environmental benefit that relates primarily to climate change and clean air (with a targeted allocation ratio of 80% to climate change and 20% to clean air.) The remaining \$150M is to be allocated to clean soil and clean water projects.

To date, SDTC has approved \$436M in funding to projects that address climate change and clean air where:

- 85% has been allocated to projects that address primarily climate change; and 15% has been allocated to projects that address primarily clean air.

Since 2006, SDTC has allocated \$124M to projects that primarily address water and soil environmental benefits.

While projects are classified in a primary benefit category, multiple benefits are encouraged. The attribution to a specific primary environmental impact needs to be interpreted in conjunction with the following. Of the total portfolio of two hundred and twenty eight (228) funded projects:

- 90% of SDTC-funded projects have climate change benefits;
- 76% have clean air benefits;
- 44% have soil or water benefits and,
- 89% of all SDTC projects have more than one environmental benefit.

SDTC Portfolio Environmental Impact Quantification

Clean technologies provide environmental benefits in a way that supports productivity and economic growth. SDTC portfolio projects are aimed at generating positive impacts related to clean air, clean water, clean land and climate change, with close to 90% of the projects generating multiple benefits. As the portfolio matures, SDTC has been exploring ways to quantify and report these impacts in a way that will more clearly illustrate the benefits derived from SDTC investments.

SDTC is required to report on environmental benefits (climate change, clean air, soil and water). Based on the evolution of the climate change industry, sophisticated practices for GHG quantification and reporting have been established and SDTC leverages these to estimate potential benefits of its investments based on actual and forecasted market roll out. However, similar estimating methodologies and practices for communicating project results on a common unit basis (e.g. CO₂e) are not currently available or used for Clean Air, Soil and Water projects, either domestically or internationally.

Consequently, SDTC has worked to establish approaches for quantifying and reporting the benefits of Clean Air, Soil and Water projects over the past few years that will more clearly illustrate the value of SDTC investments in these areas as further described below.

GHG REDUCTION

The estimated total annual GHG reduction by 2015, attributable to the 228 projects in SDTC's portfolio, is projected to be between 7 and 17 Megatonnes. These figures include adjustments for the uncertainty of projections by applying a discounting factor to individual projects of between 80% and 93.5%¹.

Of the sixty-three (63) projects completed prior to 2011, fifty-four had climate change benefits and have reported actual annual greenhouse gases emissions reductions of approximately 0.8 Megatonnes in 2011.

¹GHG emission reduction projections are inherently forward-looking statements. They involve risks and uncertainties that could cause actual results to differ materially from those contemplated. SDTC believes it has a reasonable basis for making such forward-looking statements by:

- Requiring every applicant to estimate future GHG emission reductions using a prescribed methodology based on accepted ISO and IPCC practices.
- Reviewing the reasonableness of projected GHG emissions reductions reported by applicants and, as new information is reported, adjusting projections and excluding projects on hold.
- Applying a discount rate of between 80% and 93.5% to account for the technology GHG intensity performance and the likelihood to meet sales projections.

CLEAN AIR

More than 25 projects in the SDTC portfolio have clean air as the primary benefit and all combustion displacing climate change projects also have clean air co-benefit (this represents a large share of SDTC's climate change investments.) Assessing the clean air benefits of projects is usually more complex and less straight-forward than evaluating GHG benefits, as proponents quantify total CAC emissions reductions in tonne(CAC) /year and these are reported as potential benefits.

However, the actual environmental and human health impacts of CACs depend on population density and air shed concentrations in areas where they are emitted. For example, the impact of a tonne of NO_x emitted in an urban, high-density area is far worse than a tonne of NO_x emitted in low-density area. Therefore, presenting the net emission CAC reductions in a “tonnes of X” reduced does not give a clear and tangible representation of the actual benefits from SDTC Clean Air projects.

Using input and validation from external experts, SDTC has worked to establish a defensible and conservative methodology for presenting the benefits from clean air projects in a way that takes into account regional and industrial variations in impacts.

The majority of the costs associated with CAC emissions are related to health impacts on human populations in high smog index airsheds. The identified methodology translates project level CAC emissions reductions to health benefits associated to reduced smog in sensitive Canadian airsheds. This methodology is based on Environment Canada's regional airshed concentration measurements and modeling and Health Canada's model (AQBAT), which allows a determination of the risk of health incidents in populations based on airshed concentration exposure. A similar approach is used by the US EPA to quantify the benefits of certain clean air policies. Using industry sub-sector specific parameters, the change in smog exposure risk that would result from changes in emissions reductions achieved through the deployment of SDTC clean air technologies can be estimated and translated to a change in likely health related cost impacts.

Based on the above, SDTC has modeled the market rollout impacts of 59 projects completed and progressing projects in Surface Transportation and Power Generation applications. The results indicate that the avoided health impacts, or cost, for these SDTC would enable a discounted² avoided health related cost over \$1 billion by 2025³. In progressing towards these results, these 59 projects are expected to lead to the following specific annual emissions reductions within Canada by 2015.

Total cumulative (discounted) projected environmental impacts for the Sample Clean Air projects by 2015

Contaminant	2015 (tonne CAC per year)
PM	318
NO _x	3,839
SO _x	2,913
VOCs	479

²Consistently with SDTC discounting methodologies, these amounts have been discounted by 93.5%.

³The year 2025 is selected as a forecast year to capture the fact that these investments are in vehicle technologies (transport trucks, locomotives etc.) and power generation and energy efficiency systems that would have operational lifetimes as high as 20 years.

SOIL / WATER

Impact quantification in soil and water are very diverse and depend on a wide range of factors which make the quantification of environmental benefits for clean water or soil projects more complex than evaluating GHG benefits and even CACs. SDTC requests that proponents identify total water conservation, contaminant removal, land conservation etc. as part of their application, and SDTC compiles and tracks these as potential water and soil benefits.

However, the actual environmental and human health benefits/impacts and value to society of water and soil projects depend on the watershed, type of contaminant, location, existing use of land etc. For example, water conservation projects have significantly different impact/benefit vector and value to society than removal of a specific contaminant(s) from ground water or an industrial waste water output etc. Therefore, simply presenting the net water conservation, contaminant removal etc. does not provide a clear and tangible representation of the actual benefits to society.

Working with external experts this area, SDTC has developed methodologies that can be used to quantify and report the benefits from SDTC’s investments in water technologies over the past few years. This exercise identified an approach for estimating the avoided costs from the displaced environmental impacts.

Using these methodologies, SDTC has estimated the benefits of 20 funded clean water projects that are completed or in progress based on the avoided costs associated to water conservation in various application sectors (municipal, agricultural, manufacturing etc.) and reduced nitrogen and phosphorus loading in water systems. It is estimated that these projects will lead to an avoided water treatment or use cost of at least \$60M⁴ by 2025. In progressing towards these benefits, the 20 water projects reviewed are expected to have the following benefits by 2015.

Total cumulative (discounted) projected environmental impacts for three Clean Water projects by 2015

Benefits	
Water Conservation (m ³)	2,750,000
Nitrogen Release Avoided (tonnes)	121
Phosphorus Release Avoided (tonnes)	27

⁴The year 2025 is selected as a forecast year to capture the fact that these investments are in water treatment, leak detection systems, of industrial process facilities that would have operational lifetimes or enduring benefits in a typical range of 20 years. This value is discounted by a maximum internal rate of 93.5%.

SDTC Tech Fund™ Portfolio by Region

Lead Organization	Province	SDTC Funds	Total Project Costs
Atlantic Canada			
University of New Brunswick	New Brunswick	\$257,826	\$725,511
Atlantic Hydrogen Inc.	New Brunswick	\$2,096,948	\$6,893,548
Bio Vision Technology Inc.	Nova Scotia	\$3,000,000	\$20,199,190
Nova Scotia Power Inc.	Nova Scotia	\$4,650,000	\$9,616,705
Marine Exhaust Solutions	Prince Edward Island	\$1,973,865	\$5,981,410
Atlantec BioEnergy Corporation	Nova Scotia	\$1,833,482	\$5,561,756
6574262 Canada Inc. (ICUS)	Newfoundland	\$400,000	\$1,112,500
Ocean Nutrition Canada Limited	Nova Scotia	\$8,291,728	\$25,126,448
Carbon Sense Solutions Inc.	Nova Scotia	\$1,192,000	\$3,775,831
Total	9	\$23,695,849	\$78,992,899
Quebec			
CO ₂ Solution Inc.	Quebec	\$1,000,000	\$5,881,558
Bio-Terre Systems Inc.	Quebec	\$864,375	\$2,305,000
Mabarex Inc.	Quebec	\$225,000	\$550,000
Enerkem Technologies Inc.	Quebec	\$720,573	\$2,253,418
Nanox Inc.	Quebec	\$1,774,548	\$4,437,796
Alternative Green Energy Systems Inc.	Quebec	\$517,041	\$1,761,928
Sunarc of Canada Inc.	Quebec	\$545,357	\$1,819,222
Vaperma Inc.	Quebec	\$5,049,958	\$15,149,873
AirScience Technologies Inc.	Quebec	\$417,661	\$1,373,885
Dépôt Rive-Nord Inc.	Quebec	\$0	\$0
Envirogain Inc.	Quebec	\$957,623	\$2,210,205
Cerestech Inc.	Quebec	\$751,627	\$2,327,017
Mechtronix Systems Inc.	Quebec	\$1,933,987	\$5,950,729
Maritime Innovation (IMAR)	Quebec	\$979,800	\$2,543,757
Enerkem Technologies Inc.	Quebec	\$2,660,476	\$7,480,386
Biothermica Technologies Inc.	Quebec	\$200,487	\$600,487
Terragon Environmental Technologies Inc.	Quebec	\$1,592,500	\$4,097,783

Lead Organization	Province	SDTC Funds	Total Project Costs
Quebec			
Early Warning Inc.	Quebec	\$2,068,041	\$6,675,628
Biogénie S.R.D.C.Inc.	Quebec	\$230,137	\$748,504
TM4 Inc. Wind	Quebec	\$2,187,756	\$11,772,908
CVTCORP Transmission Inc.	Quebec	\$2,131,950	\$7,649,865
Turbo Trac Systems ULC Inc.	Quebec	\$1,032,379	\$4,201,622
Développement Effenco Inc.	Quebec	\$774,955	\$1,760,784
Ferrinov Inc.	Quebec	\$1,864,334	\$5,434,975
Corporation HET - Horizon Environnement Technologies	Quebec	\$1,509,807	\$5,478,254
St-Jean Photochemicals	Quebec	\$1,673,424	\$5,089,466
Biothermica Technologies Inc.	Quebec	\$80,713	\$224,202
TM4 Inc. Auto	Quebec	\$3,818,787	\$12,158,461
Alstom Hydro Canada Inc.	Quebec	\$5,099,325	\$15,464,242
SiXtron Advanced Materials	Quebec	\$1,331,823	\$6,464,802
Innovente Inc.	Quebec	\$2,730,526	\$7,200,042
Deane and Co Inc.	Quebec	\$595,000	\$1,499,904
Alcoa Ltd.	Quebec	\$228,600	\$599,845
NutraCanada	Quebec	\$1,900,000	\$9,920,622
Ferme Olivier Lépine Inc.	Quebec	\$7,509,000	\$22,755,000
Terragon Environmental Technologies Inc.	Quebec	\$2,874,000	\$7,356,747
RSW RER Ltée.	Quebec	\$2,760,000	\$19,782,725
Phostech Lithium Inc.	Quebec	\$4,700,508	\$14,376,995
Gestion TechnoCap Inc, SpaceWatts Division	Quebec	\$840,000	\$2,694,308
Silinov Technologies	Quebec	\$1,776,938	\$5,384,662
Fabgroups Technologies Inc.	Quebec	\$2,981,000	\$9,091,200
CRB Innovations Inc.	Quebec	\$5,362,500	\$16,250,000
Northex Environnement Inc.	Quebec	\$1,552,354	\$3,998,249
TM4 Inc.	Quebec	\$3,135,370	\$15,227,030
Logistik Unicorp	Quebec	\$1,100,565	\$3,314,518
Bluewater Biochemicals Inc.	Quebec	\$7,513,650	\$22,191,763

Lead Organization	Province	SDTC Funds	Total Project Costs
Quebec			
TISEC Inc.	Quebec	\$440,000	\$932,760
CVTCORP Transmission	Quebec	\$1,027,887	\$3,100,862
RSW-RER Ltd.	Quebec	\$6,000,000	\$25,848,464
Total	49	\$99,022,342	\$335,392,453
Ontario			
Mikro-Tek Inc.	Ontario	\$500,400	\$3,483,350
ZENON Environmental Inc.	Ontario	\$1,760,000	\$5,334,000
Ensyn Technologies Inc.	Ontario	\$2,000,000	\$8,895,871
Blue-Zone Technologies Ltd.	Ontario	\$2,700,000	\$8,335,521
Hydrogenics Corporation	Ontario	\$1,350,419	\$3,069,135
Fifth Light Technology Ltd.	Ontario	\$3,036,000	\$9,200,000
BIOX Canada Limited	Ontario	\$5,000,000	\$34,504,071
DeCloet Greenhouse Manufacturing Ltd.	Ontario	\$176,434	\$556,821
Tenova Goodfellow Inc.	Ontario	\$3,322,441	\$11,077,549
Atlantic Packaging Products Ltd.	Ontario	\$2,268,430	\$7,959,404
Group IV Semi Conductor Inc.	Ontario	\$3,724,663	\$12,016,734
Electrovaya Corp.	Ontario	\$1,859,530	\$5,634,940
Pratt & Whitney Canada Corporation	Ontario	\$5,624,850	\$17,565,575
Science Applications International Corporation (SAIC Canada)	Ontario	\$1,009,589	\$4,846,556
Maratek Environmental	Ontario	\$915,205	\$3,256,110
Netistix Technologies Corporation	Ontario	\$471,199	\$1,230,760
Plasco Trail Road Inc.	Ontario	\$9,494,466	\$71,144,194
Unicell Ltd.	Ontario	\$2,110,000	\$9,908,097
Chinook Mobile Heating and De-icing Inc.	Ontario	\$3,063,766	\$7,378,282
EcoVu Analytics Inc.	Ontario	\$1,035,555	\$3,205,831
BESTECH (Boudreau-Espley-Pitre Corporation)	Ontario	\$1,448,000	\$3,754,933
Hydrogenics Corporation	Ontario	\$2,248,493	\$7,917,229
ARISE Technologies Corporation	Ontario	\$6,439,037	\$19,631,211
General Electric Canada (Microgrid)	Ontario	\$2,485,395	\$7,456,183
Magenn Power Inc.	Ontario	\$691,019	\$5,435,481

Lead Organization	Province	SDTC Funds	Total Project Costs
Ontario			
Zenon Membrane Solutions	Ontario	\$665,540	\$1,776,668
Dynamic Systems Incorporated	Ontario	\$4,259,800	\$20,085,010
Calisolar Inc.	Ontario	\$4,074,505	\$15,656,809
SiREM ULC	Ontario	\$356,437	\$1,086,698
Fifth Light Technology Ltd.	Ontario	\$3,911,300	\$12,836,640
General Electric Canada (Locomotive)	Ontario	\$4,212,670	\$12,650,661
Envirotower Inc.	Ontario	\$300,000	\$937,500
Elementa Group Inc.	Ontario	\$3,302,500	\$13,033,266
Pathogen Detection Systems	Ontario	\$2,671,627	\$7,951,272
MemPore Corporation	Ontario	\$493,876	\$1,161,633
Verdant Power Canada ULC	Ontario	\$1,150,000	\$3,768,411
BioDiesel Reactor Technologies Inc.	Ontario	\$3,448,000	\$7,908,032
Integran Technologies Inc. (Morph)	Ontario	\$5,616,635	\$17,197,659
Taransys Inc.	Ontario	\$1,500,000	\$4,500,000
A.U.G. Signals Ltd.	Ontario	\$1,746,522	\$5,292,490
Vive Crop Protection Inc.	Ontario	\$3,954,706	\$11,281,904
Integran Technologies, Inc.	Ontario	\$1,500,000	\$4,520,464
GreenField Ethanol Inc	Ontario	\$13,000,000	\$42,920,462
Performance Plants Inc.	Ontario	\$526,645	\$1,412,221
Ecosynthetix Corporation	Ontario	\$1,679,331	\$5,088,882
Imtex Membranes Corp.	Ontario	\$2,753,948	\$8,735,378
Xogen Technologies Inc.	Ontario	\$1,974,104	\$6,580,348
Duropar Technologies Inc.	Ontario	\$2,100,000	\$5,156,619
Thermalfrost Inc.	Ontario	\$3,943,931	\$11,960,831
Canadian Pallet Council	Ontario	\$1,070,967	\$2,456,347
Sunwell Technologies Inc.	Ontario	\$2,800,000	\$6,516,193
Morgan Solar Inc.	Ontario	\$2,351,580	\$7,195,336
Agrisoma Biosciences Inc.	Ontario	\$2,500,000	\$8,208,883
MacDonald, Dettwiler and Associates Inc.	Ontario	\$965,253	\$2,925,010
Entropex a partnership of Unitec Inc. and 629728 Ontario Limited	Ontario	\$6,330,000	\$24,479,877

Lead Organization	Province	SDTC Funds	Total Project Costs
Ontario			
Electrovaya Corp.	Ontario	\$5,065,500	\$15,417,409
Purifics ES Inc.	Ontario	\$1,421,000	\$4,263,000
3XR Inc.	Ontario	\$593,000	\$1,787,568
Lakeshore EMPC Two L.P.	Ontario	\$1,076,044	\$2,587,188
Tenova Goodfellow Inc.	Ontario	\$1,522,513	\$4,601,270
Spartan Bioscience Inc.	Ontario	\$1,896,774	\$6,354,802
EnerMotion Inc.	Ontario	\$1,100,000	\$3,300,000
Available Energy Corporation	Ontario	\$720,000	\$1,980,612
InvoDane Engineering Ltd.	Ontario	\$1,482,125	\$4,450,826
Woodland Biofuels Inc.	Ontario	\$4,275,000	\$12,900,000
Echologics Engineering Inc.	Ontario	\$751,926	\$2,278,564
NIMTech Inc.	Ontario	\$726,173	\$1,978,519
Tyne Engineering Inc.	Ontario	\$1,534,097	\$4,934,949
FibraCast	Ontario	\$1,399,124	\$4,339,771
Mining Technologies International Inc.	Ontario	\$613,261	\$1,849,909
eCAMION Inc.	Ontario	\$5,435,749	\$16,307,248
Temporal Power Ltd.	Ontario	\$2,748,616	\$8,497,746
Paradigm Shift Technologies Inc.	Ontario	\$1,955,250	\$5,925,000
Solantra Semiconductor Corp.	Ontario	\$2,049,234	\$7,106,664
Azule Fuel Inc.	Ontario	\$1,631,657	\$5,344,972
Rail-Veyor Technologies Inc.	Ontario	\$1,525,000	\$5,086,293
Hydrostor Inc.	Ontario	\$2,551,309	\$7,397,998
EcoSynthetix Corporation	Ontario	\$2,100,000	\$6,329,198
Accelerated Systems Inc.	Ontario	\$1,400,000	\$4,056,175
Vision Ecoproducts Limited	Ontario	\$3,252,342	\$9,855,581
Total	80	\$198,720,462	\$697,010,604
Praries			
NOVA Chemicals Corporation	Alberta	\$320,000	\$956,575
Suncor Energy Inc.	Alberta	\$889,132	\$3,555,669
Highmark Renewables Inc.	Alberta	\$1,000,000	\$7,056,245

Lead Organization	Province	SDTC Funds	Total Project Costs
Praries			
Saskatchewan Power Corporation (SaskPower)	Saskatchewan	\$2,682,900	\$11,149,608
Quantium Technologies Inc.	Alberta	\$1,450,000	\$9,844,819
Whitefox Technologies Canada Ltd.	Alberta	\$2,608,545	\$6,776,468
Synodon Inc.	Alberta	\$1,056,790	\$4,572,871
Great Northern Power Corp.	Alberta	\$2,063,403	\$7,265,541
Prairie Pulp and Paper Inc.	Manitoba	\$1,250,141	\$3,699,782
Petroleum Technology Research Centre (JIVE)	Saskatchewan	\$3,168,990	\$9,603,000
N-Solv Corporation	Alberta	\$5,404,672	\$18,398,926
Pure Technologies Ltd.	Alberta	\$2,200,000	\$6,798,536
New Energy Corporation Inc.	Alberta	\$2,000,000	\$6,374,525
Wind Smart Inc.	Alberta	\$1,219,075	\$3,030,871
MinMiner Oilsands Inc.	Alberta	\$4,302,673	\$13,038,403
Milligan Bio-Tech Inc.	Saskatchewan	\$7,004,493	\$23,527,746
HTC Hydrogen Technologies Corp.	Saskatchewan	\$635,414	\$1,403,165
bstNRG.com Inc. (formerly Vidir Biomass Inc)	Manitoba	\$1,651,169	\$3,669,264
Western Hydrogen Limited	Alberta	\$4,162,653	\$12,614,100
Highmark Renewables Research L.P.	Alberta	\$3,331,976	\$10,303,057
Pure Technologies Ltd.	Alberta	\$795,000	\$2,474,393
Petroleum Technology Research Centre (Aquistore)	Saskatchewan	\$5,000,000	\$25,006,000
Lancaster Wind Systems Inc.	Alberta	\$566,194	\$1,637,200
Aboriginal Cogeneration Corporation	Manitoba	\$2,738,708	\$8,271,332
Paragon Soil and Environmental Consulting Inc.	Alberta	\$231,151	\$527,743
Eco-Ag Initiatives	Alberta	\$1,948,000	\$5,791,615
Titanium Corporation Inc.	Alberta	\$6,292,636	\$20,258,526
Statoil Hydro Canada Ltd.	Alberta	\$6,000,000	\$38,791,337
MEG Energy Corp.	Alberta	\$4,270,000	\$13,516,606
Soane Energy (Canada) Inc.	Alberta	\$3,032,434	\$11,443,149
SBI BioEnergy Inc.	Alberta	\$1,875,495	\$6,161,571
MPT Mustard Products & Technologies Inc.	Saskatchewan	\$2,217,949	\$5,741,231
N-Solv Corporation	Alberta	\$10,000,000	\$27,000,407

Lead Organization	Province	SDTC Funds	Total Project Costs
Praries			
Nova Green Inc.	Alberta	\$1,838,152	\$5,748,335
Pure Technologies Ltd.	Alberta	\$1,000,000	\$3,000,000
Total	35	\$96,207,745	\$339,008,616
British Columbia			
Carmanah Technologies Inc.	British Columbia	\$466,167	\$2,035,062
Westport Innovations Inc.	British Columbia	\$1,000,000	\$3,115,376
IBC Technologies Inc.	British Columbia	\$183,150	\$877,150
Radiant Technologies Inc.	British Columbia	\$1,000,000	\$2,528,144
West Lorne Bio-Oil Co-Generation Limited Partnership	British Columbia	\$5,000,000	\$12,215,947
PlugPower Canada Inc.	British Columbia	\$2,000,000	\$9,026,000
Paradigm Environmental Technologies Inc.	British Columbia	\$250,000	\$1,208,804
RailPower Technologies Corp.	British Columbia	\$584,079	\$1,634,600
Sacré-Davey Innovations	British Columbia	\$5,727,711	\$17,681,710
Lignol Innovations Ltd.	British Columbia	\$6,240,816	\$20,325,922
NxtPhase T&D Corporation	British Columbia	\$887,598	\$3,614,695
Xantrex Technology Inc.	British Columbia	\$1,213,614	\$3,677,618
M.A. Turbo/Engine Ltd.	British Columbia	\$152,844	\$332,604
Clean Current Power Systems Incorporated	British Columbia	\$1,582,000	\$4,795,500
Angstrom Power Incorporated	British Columbia	\$169,752	\$1,263,271
University of British Columbia	British Columbia	\$2,408,702	\$7,299,098
EcoSmart Foundation Inc.	British Columbia	\$1,866,630	\$3,828,862
Power Diagnostic Technologies Ltd.	British Columbia	\$1,035,400	\$3,181,000
Nexterra Energy Corp.	British Columbia	\$1,159,518	\$3,513,692
Ostara Nutrient Recovery Technologies Inc.	British Columbia	\$375,760	\$1,777,628
Nutriloc Ingredients Corporation	British Columbia	\$847,319	\$2,404,493
Power Measurement Ltd.	British Columbia	\$2,960,871	\$8,972,335
Tantalus Systems Corp.	British Columbia	\$2,981,310	\$10,102,523
Advanced Lithium Power Inc.	British Columbia	\$1,400,000	\$5,534,876
Middle Bay Sustainable Aquaculture Institute	British Columbia	\$5,768,999	\$17,129,821
NxtGen Emission Controls Inc.	British Columbia	\$2,516,882	\$9,876,907

Lead Organization	Province	SDTC Funds	Total Project Costs
British Columbia			
MSR Innovations Inc.	British Columbia	\$399,518	\$1,155,043
Fuseforward International Inc.	British Columbia	\$400,000	\$1,523,921
SunCentral Inc.	British Columbia	\$2,045,208	\$6,292,949
Nexterra Energy Corp.	British Columbia	\$5,518,777	\$17,563,845
General Fusion Inc.	British Columbia	\$13,897,455	\$63,548,185
dpoint Technologies Inc.	British Columbia	\$1,531,394	\$3,582,961
Alterna Energy Inc.	British Columbia	\$1,254,317	\$8,891,092
SunSelect Produce (Delta) Inc.	British Columbia	\$1,072,425	\$3,535,139
Saltworks Technologies Inc.	British Columbia	\$2,612,638	\$7,897,987
Lignol Innovations Ltd.	British Columbia	\$6,871,685	\$20,632,000
Exro Technologies Inc.	British Columbia	\$605,093	\$1,833,616
Pulse Energy Inc.	British Columbia	\$2,556,801	\$8,038,897
HTEC Hydrogen Technology & Energy Corp.	British Columbia	\$4,014,212	\$11,150,588
Automotive Fuel Cell Cooperation Corp.	British Columbia	\$10,000,000	\$47,831,775
Ballard Power Systems Inc.	British Columbia	\$4,796,120	\$22,494,665
Quadrogen Power Systems Inc.	British Columbia	\$2,610,145	\$7,909,529
Etalim Inc.	British Columbia	\$2,191,530	\$6,260,533
InvenTyS Thermal Technologies Inc.	British Columbia	\$1,999,611	\$5,998,833
S2G Biochemicals Inc.	British Columbia	\$1,425,952	\$4,308,109
SWITCH Materials Inc.	British Columbia	\$2,363,621	\$7,369,216
Corvus Energy Ltd.	British Columbia	\$1,238,984	\$3,754,497
Ballard Power Systems Inc.	British Columbia	\$7,004,367	\$21,233,930
Westport Power Inc.	British Columbia	\$2,302,834	\$16,386,255
CoolEdge Lighting Ltd.	British Columbia	\$2,249,931	\$6,029,614
Linnaeus Plant Sciences Inc.	British Columbia	\$1,534,300	\$4,998,500
PAVAC Industries Inc.	British Columbia	\$3,549,865	\$10,526,620
'Namgis First Nation	British Columbia	\$2,650,000	\$10,589,812
LaCima Corporation	British Columbia	\$1,203,349	\$3,647,745
Shipstone Energy Corporation	British Columbia	\$2,513,498	\$5,294,474
Total	55	\$142,192,752	\$498,233,968

SD Tech Fund™ Portfolio Project Descriptions

This Section of the report provides a brief description for each active project approved for funding by SDTC's Board of Directors for all rounds since the commencement of the Foundation's activities in 2001. As such, it includes an update of funded projects' budgets and related consortium members as of December 31, 2011 (Rounds 1 - 2002A to 19 - 2011A). The funds specifically approved in 2011 are Rounds 18 - 2010B and 19 - 2011A). Information on the completed projects can be found in Section 2 of this report.

To obtain a different sort of the information by geographical location, economic sector, environmental impact or consortium member, please refer to the SDTC website at http://www.sdtec.ca/sdtec_projects_index_en.htm.

Round 19 – Board Approval November 2011

Accelerated Systems Inc.

Round 19 2011A

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 4,056,175
 SDTC Funding:
\$ 1,400,000
 Leveraged Funding:
\$ 2,656,175

Off-Road Vehicle Hybrid Drive Train Demonstration

Traditional off-road vehicles are facing stricter emissions standards, with manufacturers of traditional gas engines experiencing significant hurdles in reaching these targets. In order to meet these requirements and consumers' growing demand for quieter, safer, more environmentally friendly and more fuel efficient equipment, Accelerated Systems Inc. (ASI) is proposing to develop a 50kW hybrid electric drive train which will power a product line of off-road transportation applications, specifically subcompact tractors (50hp range), Amphibious Terrain Vehicles (ATV) and Utility Task Vehicles (UTV). The new system is based on an existing successfully commercialized 2kW drive train. ASI expects to reduce the system cost per kW by 50% over the present 2kW system. ASI's technology has a novel motor magnetic structure, which improves the peak torque capacity of the motor and also reduces motor material (steel, copper, and magnets) over competitive designs.

Consortium Members

Accelerated Systems Inc.
 MTD Products Inc.
 Phoenix Specialty Solutions
 Ontario Drive and Gear

CVTCORP Transmission Inc.

Round 19 2011A

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 3,100,862
 SDTC Funding:
\$ 1,027,887
 Leveraged Funding:
\$ 2,072,975

Variable Speed Fan Drive

In North America large combustion engines consume 950 million liters of fuel annually to run the cooling systems on natural gas compressor stations. The current engine cooling system is designed to move enough air to cool the engine under maximum load in a worst case scenario of 40°C ambient temperatures. This consumes 5-10% of the engine's raw power when most of the time less than 1% would suffice. CVTCORP Transmission (CVT) is proposing a variable speed fan drive system that adjusts engine cooling fan speed as required, avoiding excessive consumption of fuel related to the fan cooling system. Compared with the incumbent system on a 1400 hp engine operation, CVT's fan drive system is expected to reduce yearly fuel consumption by at least 90,000 litres. This would result in significant fuel savings and an ROI of less than three months.

Consortium Members

CVTCORP Transmission Inc.
 Encana Corporation
 Cenovus Energy

EcoSynthetix Corp.

Round 19 2011A

Environmental Benefits: Climate Change / Clean Air / Clean Water

Total Project Value:
\$ 6,329,198
 SDTC Funding:
\$ 2,100,000
 Leveraged Funding:
\$ 4,229,198

EcoMer Technology Pilot Plant and Demonstration Centre
 The chemical industry is experiencing regulatory pressures to use materials that reduce GHG's, toxins and VOC's while using less energy, generating fewer by-products and are biodegradable. With the continuing escalation of the price of oil, bio-based macromers have offered a solution to displacing petro-based monomers and are potentially cost competitive in the polymer market. Building on the experience from the existing SDTC project EcoSphere (a starch-based Biolatex), EcoSynthetix's bio-based EcoMer technology is enabling the creation of a new family of monomers and polymers that are suitable for inks and toners, adhesives, paints and coatings, and surfactants that are derived from renewable resources (such as dextrose). The EcoMer technology platform intends to deliver functional benefits equal to or exceeding those derived from petrochemical-based technologies at a lower total system cost. This project will develop and validate the more continuous process and scale up to full-scale production volume to enable a cost and performance competitive product.

Consortium Members
 Ecosynthetix Corporation
 Schwartz Chemical Corporation
 Ortec Incorporated

Hydrostor Inc.

Round 19 2011A

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 7,397,998
 SDTC Funding:
\$ 2,551,309
 Leveraged Funding:
\$ 4,846,689

Underwater Compressed Air Energy Storage Demonstration
 Large-scale energy storage is essential to eliminate the intermittent nature of renewable energy as the primary barrier to its widespread adoption. Hydrostor Inc. has developed a novel energy storage system using compressed air stored underwater. The Underwater Compressed Air Electrical Storage system (UWCAES) is a technology that allows for grid scale electricity to be stored in the form of compressed air 50-500m below the surface in a body of water with over 70% round-trip efficiencies and without the addition of supplemental heat. Excess or cheap off-peak electricity is mechanically converted to compressed air and piped to flexible accumulators located at the bottom of the lake. When demand is high (on-peak) the air is returned to the surface and converted back into electricity. The approach is well suited for the storage of 10 to 1000 MWh of energy: e.g. for renewable power firming, or for peak shaving and time-of-use arbitrage. The Hydrostor design is expected to be more efficient and cost less than existing underground compressed air energy storage systems, and has less restrictive siting criteria. The Hydrostor systems are expected to store energy for 20-50% less cost than grid scale battery storage options and last up to 3 times longer.

Consortium Members
 Hydrostor Inc.
 Toronto Hydro Electric System Ltd..
 McNally's Construction Inc.
 Baird Engineering
 University of Windsor
 Virelec Ltd.

Pure Technologies Ltd.**Round 19 2011A****Environmental Benefits: Climate Change / Clean Water**

Total Project Value:
\$ 3,000,000
 SDTC Funding:
\$ 1,000,000
 Leveraged Funding:
\$ 2,000,000

Extra High Resolution MFL for Water Pipelines

Canada's water pipe infrastructure, which is primarily made of metallic materials, is aging and in a state of decay. While the risk of pipe failure is low, failures can be catastrophic with interruptions to the water supply as well as damage to adjacent infrastructure. The larger the pipe diameter, the higher value per kilometer and the more severe the consequences from failure. Pure Technologies Ltd. and its consortium will develop and demonstrate extra high-resolution magnetic flux leakage (XHR-MFL) tools for in-line inspection of large (36" to 78" diameter) metallic water pipes. Conventional MFL is a well-established technique for inspecting oil and gas metallic pipelines; however, the internal cement mortar lining and access limitations (i.e. lack of launcher and receiver, in-line obstructions) common in water pipelines have always created challenges. This XHR-MFL technology intends to overcome these challenges and enable the identification of defects in metallic water pipes, enabling water utilities to minimize operational risks, optimize their investment, and extend the safe and economic life of their pipelines.

Consortium Members

Pure Technologies Ltd.
 Region of Peel
 City of Calgary

RSW-RER Ltd.**Round 19 2011A****Environmental Benefits: Climate Change**

Total Project Value:
\$ 25,848,464
 SDTC Funding:
\$ 6,000,000
 Leveraged Funding:
\$ 19,848,464

TREK II Pilot Demonstration Farm

An estimated 25 GW of accessible baseload hydrokinetic electricity production capacity exists in Canada's major rivers. Conventional hydro power technology cannot address this significant resource. Renewable Energy Research (RER) has proven the viability of the core TREK Hydrokinetic turbine design through four seasons of operation in the St. Lawrence River at full-scale as part of its first SDTC project. In order to reach its full commercial potential, this project will address five key technology and multi-unit integration risks. These include a part count reduction to reduce potential failure points and ease assembly; the development of installation techniques and equipment; the development of power conditioning technologies to allow the blending of the power from multiple units; development of specialized sub-sea cabling; and resource assessment tools to maximize use of the resource at a given site. The long term viability of a multi-turbine installation must also be validated. The proposed project will see the development and installation of a first of a kind 20-unit (5MW nameplate) TREK II hydrokinetic power farm. This 20 TREK small farm demonstration project is the last pre-condition to full scale worldwide marketing and rollout.

Consortium Members

RSW-RER Ltd.
 Northland Power Inc.

TISEC Inc.

Round 19 2011A

Environmental Benefits: Climate Change / Clean Air / Clean Water / Clean Soil

Total Project Value:

\$ 932,760

SDTC Funding:

\$ 440,000

Leveraged Funding:

\$ 492,760

Early Detection and Prevention of Potential Oil and Gas Pipeline Failure

The cost of leaks in aging oil and gas pipelines averages \$500M/yr in the US alone. Pipeline operators want to prioritize replacement based on the risk of rupture. TISEC Inc. has updated classical acoustic emission (AE) monitoring to adapt it to cost-effective assessment of pipeline condition. Unlike other methods, AE does not interfere with normal operations, provides continuous real-time data and identifies the sites of potential leaks before they happen. The AE system proposed in this application incorporates an advanced data compression method with low-cost wireless communication between monitoring points that allows conventional AE testing to be extended cost-effectively to the pipeline application for the first time. TISEC has also developed automated feature recognition software that classifies AE events by defect type and severity. The SDTC project will see TISEC's system installed at the Pipe Flow Technology Center at the Saskatchewan Research Council followed by field testing at an oil pipeline site operated by Cenovus and a gas pipeline site operated by SaskEnergy.

Consortium Members

TISEC Inc.

Saskatchewan Research Council

Cenovus

SaskEnergy

Vision Ecoproducts Limited

Round 19 2011A

Environmental Benefits: Climate Change / Clean Air / Clean Soil

Total Project Value:

\$ 9,855,581

SDTC Funding:

\$ 3,252,342

Leveraged Funding:

\$ 6,603,239

Bio-Composite Applications in Building Products

Increasing attempts to reduce the environmental footprint of buildings is driving demand for construction materials that reduce the amount of energy expended during all phases of a building's life. Vision Ecoproducts (VEP) is developing one such material. VEP seeks to replace polyvinyl chloride (PVC) plastic and aluminum in the manufacture of window frames and doors with a low cost bio-composite made from post consumer recycled plastic and rice hulls, an agricultural waste product. The energy cost of producing the VEP bio-composite is estimated to be 35% of the energy cost of producing the equivalent amount of PVC and less than 6% of the energy costs of an equivalent amount of aluminum. The VEP bio-composite can be used to build higher R-value windows and doors which will reduce energy consumption in the buildings in which they are used. The material is itself readily recyclable and its use will reduce the amount of PVC plastic currently ending up in landfills.

Consortium Members

Vision Ecoproducts Limited

Vision Extrusion Limited

Masonite Corp.

Harvey Building Products

Sunview Patio Doors Ltd.

Round 18 – Board Approval June 2011

Azule Fuel Inc.

Round 18 2010B

Environmental Benefits: Climate Change / Clean Water

Total Project Value:
\$ 5,344,972
 SDTC Funding:
\$ 1,631,657
 Leveraged Funding:
\$ 3,713,315

Biodiesel Refinery

Existing biodiesel technologies require feedstock containing minimum amounts of free fatty acid (FFA), leading to the use of primarily food based agricultural crops as process inputs. In addition, most traditional technologies are operated in batch mode, which is associated with higher CAPEX costs. Azule Fuel is a 2nd-generation biorefinery that seeks to demonstrate commercial feasibility and acceptance of biodiesel production utilizing feedstocks that are non-competitive with consumer food chains. Its patented catalytic technology is a continuous flow, fixed-bed reactor using a solid acid catalyst for the production of biodiesel and pure glycerin, and production trains capable for bio-lubricants, green solvents and fuel oxygenates. In addition, the novel introduction of electrostatic separation technologies eliminates the need for water and yields higher quality off-takes. Azule and its consortium partners anticipate that its next generation bio-refinery is expected to yield significant CAPEX and OPEX savings vis-à-vis incumbent technologies leading to a long-term improvement in the economic viability of the industry.

Consortium Members

Azule Fuel Inc.
 Benefuel Inc.
 REO Energy Group

Bluewater Biochemicals Inc.

Round 18 2010B

Environmental Benefits: Climate Change

Total Project Value:
\$ 22,191,763
 SDTC Funding:
\$ 7,513,650
 Leveraged Funding:
\$ 14,678,113

Succinic Acid Downstream Purification Demonstration

Succinic acid is a chemical building block widely used to produce a range of products, from polybutylsuccinate (PBS), an innovative biodegradable plastic, to more traditional polymers such as polyesters, polyurethanes and nylons. Currently, the production of succinic acid is derived from petroleum based chemicals. Bluewater Biochemicals Inc., the Canadian subsidiary of BioAmber, has developed a novel bio-based technology which ferments glucose into succinic acid, making it significantly less expensive than traditional petroleum-based succinic acid and more environmentally sustainable. BioAmber intends to build a large demonstration plant in Sarnia, Ontario that will merge previously validated upstream fermentation technologies from its plant in France with promising downstream purification technologies currently under development in the US.

Consortium Members

Bluewater Biochemicals Inc.
 BioAmber Inc.
 Bioamber Canada Inc.
 Mitsui & Co. Ltd.
 Bioamber International S.a.r.l

Carbon Cure Technologies Inc.

Round 18 2010B

Environmental Benefits: Climate Change / Clean Air / Clean Water

Total Project Value:
\$ 3,775,831
SDTC Funding:
\$ 1,192,000
Leveraged Funding:
\$ 2,583,831

Concrete Carbonation Curing Technology Demonstration

Typically, the process of producing precast concrete blocks uses both energy-and-cost-intensive steamcuring and cement to achieve quality benchmarks. In response, Halifax-based CarbonCure Technologies has developed a universal retrofit equipment component that uses waste CO₂ to reduce steam curing energy by 38%, cement content by 10% and defect rates by 20% while maintaining or exceeding quality standards. The CO₂ is permanently stored in the block as solid limestone attributing to a reduction in lifecycle greenhouse gas intensity of 17% for every block produced. The project aims to validate the performance of the technology through two full-scale industrial demonstrations.

Consortium Members

Carbon Sense Solutions Inc.
Air Liquide
The Shaw Group Ltd.
Basalite Concrete Products

CoolEdge Lighting Ltd.

Round 18 2010B

Environmental Benefits: Climate Change / Clean Air / Clean Water / Clean Soil

Total Project Value:
\$ 6,029,614
SDTC Funding:
\$ 2,249,931
Leveraged Funding:
\$ 3,779,683

MicroLED Lighting System Demonstration

Commercial buildings in Canada are the largest consumers of broad area lighting, which accounts for 10% of that sector's total energy demand. Unfortunately, an estimated 60% of the energy spent on lighting in commercial buildings is wasted, primarily on illuminating unoccupied areas or areas which already receive enough natural light. Cooledge aims to replace the conventional fluorescent fixtures used for broad area lighting in commercial buildings with cost competitive MicroLED luminaires that are more energy efficient, mercury free and can provide better quality lighting and new design possibilities. The result is a standard 2'x2' luminaire that, by the end of the process development within the SDTC project, will match the cost and performance of the fluorescent based equivalent and will incorporate simple autonomous controls based on ambient light and occupancy sensing.

Consortium Members

CoolEdge Lighting Ltd.
British Columbia Hydro
and Power Authority
The Governors of the University
of British Columbia

LaCima Corporation**Round 18 2010B****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 3,647,745
 SDTC Funding:
\$ 1,203,349
 Leveraged Funding:
\$ 2,444,396

Ultracapacitor / Lithium Battery Hybrid for Electric Vehicles

It is expected that the adoption rate of Electric Vehicles (EV) will be largely driven by vehicle range and cost. To address these issues, LaCima Corp. is designing a new type of Energy Storage System (ESS) which consists of a lithium-ion (Li-ion) battery with an integrated ultracapacitor. By supplying short bursts of power needed for rapid acceleration, torque-assistance, hill climbing and engine starts and absorbing energy more quickly to facilitate regenerative braking, this technology has the potential to maintain or extend driving range while reducing the size of the battery. The prismatic cells that LaCima will be using in the ultracapacitor are also more compact than the conventional cylindrical format and their manufacture can be more easily automated, leading to reduced cost for high volume production. The SDTC project will focus on increasing the capacitance of LaCima's prismatic cell ultracapacitor and increasing its voltage to better match the cell voltage of the Li-ion battery. The aim is to further augment the energy density and to simplify the integration of an ultracapacitor and a Li-ion battery into an ESS and in doing so, provide an efficient means to meet the performance and cost requirements for EVs. The consortium plans to field trial their ultracapacitor ESS technology in a hybrid electric Fiat 500.

Consortium Members

LaCima Corporation
 E-One Moli Energy
 Fiat Central Research
 Entek International LLC
 Arcotronics Industries

Linnaeus Plant Sciences Inc.**Round 18 2010B****Environmental Benefits: Climate Change / Clean Water / Clean Soil**

Total Project Value:
\$ 4,998,500
 SDTC Funding:
\$ 1,534,300
 Leveraged Funding:
\$ 3,464,200

Low Impact Industrial Oil Seed Development as Petroleum Substitutes

The global renewable chemicals market is growing rapidly and is estimated to reach US\$59B by 2014. Linnaeus proposes to develop and demonstrate an integrated process to produce value-added, renewable, biodegradable industrial oils and feedstock from camelina and safflower, for use in the lubricant and polymer feedstock production. The goal of the project is to give farmers a new valuable crop that is a cost-effective bio-based source of feedstock for lubricants and polymers used for foams and coatings. Camelina and safflower have short growing seasons (less than 100 days) and can therefore be grown in a crop rotation to replace summer fallow. They are pest resistant and do well in semi-arid regions, allowing them to be grown on marginal land without irrigation. The development of this technology is expected to bring millions of acres of drought prone or marginal agricultural land into production, while reducing soil and nitrogen loss and GHG emissions.

Consortium Members

Linnaeus Plant Sciences Inc.
 SemBioSys Genetics Inc.
 Woodbridge Foam Corporation
 University of Alberta
 Dupont Agriculture & Nutrition
 Arkema
 Elevance Renewable Sciences
 Bio-Industrial Tech Div Alberta
 Agriculture and Rural Development
 AAFC Research Scientist Breeding
 Cathay Industrial Biotech

Logistik Unicorp

Round 18 2010B

Environmental Benefits: Climate Change / Clean Air / Clean Soil

Total Project Value:
\$ 33,14,518
 SDTC Funding:
\$ 1,100,565
 Leveraged Funding:
\$ 2,213,953

Cleaner Air and Soil Through Textile Fibres

The heavy use of cotton – which represents nearly 40% of all textiles used worldwide – is an environmental concern as a result of the intense use of pesticides needed during its cultivation. To overcome this growing environmental concern, Logistik Unicorp and its consortium partners have identified a novel technology that can process hemp and flax fibres, each known to be strong, into a quality textile-grade fibre which could partly displace both cotton and polyester fibres. The proposed technology demonstration is an enzyme treatment that would address the current challenge of separating the fibre from the inner bark of the plant and reduce the time needed for this process from several days to less than 20 hours, while producing a consistent quality textile fibre with a softness approaching cotton. Furthermore, herbicides and fungicides are not required for the cultivation of hemp or flax crops, resulting in a significant reduction in the use of these chemicals in Canada.

Consortium Members

Logistik Unicorp
 Victor Group

'Namgis First Nation

Round 18 2010B

Environmental Benefits: Clean Water

Total Project Value:
\$ 10,589,812
 SDTC Funding:
\$ 2,650,000
 Leveraged Funding:
\$ 7,939,812

'Namgis Land-Based Atlantic Salmon Recirculating Aquaculture System Pilot Project

The Food and Agriculture Organization estimates that human fish consumption will reach 183 million metric tonnes by 2030, two thirds of which will come from aquaculture. The demand for increased production of aquatic products and the vulnerability of farmed fish like salmon to disease and poor water quality has driven the development of innovative salmon rearing technologies to control the environment and reduce the potential for the spread of disease. The 'Namgis First Nation will demonstrate a land-based Recirculating Aquaculture System (RAS) for food production of Atlantic salmon at a pilot facility on Vancouver Island. The facility isolates the salmon rearing process from the marine environment, while allowing optimum conditions for salmon growth and demonstrating an alternative to the current net-cage practices that are the focus of environmental concern. The optimized growing environment and the environmental isolation are predicted to produce salmon that can result in a sustainable business, while reducing the environmental impacts on oceans. The RAS technology benefits the environment by reducing the risk of disease and parasite transmission and treating both the solid and liquid waste resulting from salmon rearing.

Consortium Members

'Namgis First Nation
 Tides Canada Salmon
 Aquaculture Innovation Fund
 The SOS Marine Conservation
 Foundation

Northex Environnement Inc.**Round 18 2010B****Environmental Benefits: Clean Water / Clean Soil**

Total Project Value:
\$ 3,998,249
 SDTC Funding:
\$ 1,552,354
 Leveraged Funding:
\$ 2,445,895

Treatment of Metal Contaminated Soils

In Canada, there are over 19,000 federal contaminated sites, in addition to the many registered and unregistered sites managed by private entities. Roughly half of them are contaminated with inorganic compounds. There is significant and increasing pressure to clean up these sites, as they are being targeted by new regulations, appear as major liabilities on company balance sheets, present risks to Canadian populations and are often ideal sites for urban expansion. Currently, no broadly viable options exist to decontaminate sites with inorganic compounds such as metals beyond “digging and dumping” in specialized landfill sites. This is becoming more costly as landfill operators face increasingly strong regulations themselves and increasing tariffs. Northex is proposing to develop and demonstrate a commercially-viable, fully integrated 80 tonne/hour process for ex-situ remediation of soils contaminated with inorganic compounds that will be less costly than the “dig and dump” alternative. Northex treatment operations will allow the reutilization of at least 65% of the decontaminated soil annually in engineering projects, earthwork and agriculture.

Consortium Members

Northex Environnement Inc.
 Centre National en Électrochimie et en
 Technologies environnementales
 Hydro Québec
 Laboratoire Exova
 Infrastructure Rive-Sud

Nova Green Inc.**Round 18 2010B****Environmental Benefits: Climate Change / Clean Soil**

Total Project Value:
\$ 5,748,335
 SDTC Funding:
\$ 1,838,152
 Leveraged Funding:
\$ 3,910,183

Demonstration of Concurrent Biochar, Inulin, and Xylitol Production from Biomass via Nova Green VERT-TEC Process

Food production companies worldwide seek sugar alternatives and substances that naturally enhance digestion and promote health in both humans and animals. Xylitol, a natural sweetener, and Inulin, a prebiotic and source of dietary fibre, represent high demand examples of this trend in healthy food products. However, there are no reliable sources of Xylitol in North America, and Inulin is currently primarily produced from chicory grown in warm climates. Nova Green and its consortium partners have identified Jerusalem artichoke (Jart) stalks as an alternative source of both Xylitol and Inulin. Jart, which is drought and pest resistant and can be grown and harvested using existing methods, could produce up to 10 times more biomass per hectare than conventional seed crops and can fit into normal crop rotation cycles. The consortium has developed an integrated process that can extract the Inulin and Xylitol from Jart, while processing the residual biomass into a biochar for use as a soil enhancer and to sequester carbon. The Nova Green project intends to demonstrate the cultivation of Jart and the processing of Jart into Xylitol, Inulin and biochar at a pilot-scale facility in Eastern Alberta.

Consortium Members

Nova Green Inc.
 ConocoPhillips Canada
 Alberta Innovates - Technology Futures
 Maple Leaf Foods

N-Solv Corp.

Round 18 2010B

Environmental Benefits: Climate Change / Clean Air / Clean Water

Total Project Value:
\$ 27,000,407
 SDTC Funding:
\$ 10,000,000
 Leveraged Funding:
\$ 17,000,407

BEST (Bitumen Extraction Solvent Technology) Field Pilot Plant

Canada has 170 billion barrels of recoverable crude oil stored in the oilsands. Of these remaining established reserves in Alberta, 80% are too deep to be mined and are currently recovered using in situ processes such as Steam Assisted Gravity Drainage (SAGD), which is water and energy intensive. Through this project, N-Solv will demonstrate its Bitumen Extraction Solvent Technology (BEST), a low temperature, primary, in-situ production technology for bitumen reserves using a pure, condensing solvent. The N-Solv technology is targeted to produce 85% less GHG than SAGD and will reduce the consumption of process water to zero. The N-Solv process is expected to have lower operating and capital costs than SAGD with fewer restrictions on the reservoir conditions under which it can operate. As the final step to prove the performance of the pure solvent under actual reservoir conditions, N-Solv will drill and complete a 300 metre producer and injector well pair and complete final engineering and construction of a supporting 500 barrel per day surface facility near Fort MacKay, Alberta.

Consortium Members

N-Solv Corporation
 Suncor Energy Inc.
 Nenniger Engineering Inc.
 Berry Y&V Industrial Contracting ULC
 Enbridge Inc.
 Hatch Ltd.

Paradigm Shift Technologies Inc.

Round 18 2010B

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 5,925,000
 SDTC Funding:
\$ 1,955,250
 Leveraged Funding:
\$ 3,969,750

Advanced Surface Manufacture for Gas Heated Reforming

Over \$100B worth of ethylene is produced each year by the petrochemical industry, via energy intensive “steam cracking” of hydrocarbon gases at high temperatures. During the manufacture of ethylene, coke builds up on the innerwall surface of the reforming equipment, significantly lowering the energy efficiency of the process and resulting in frequent shutdowns for “de-coking” cycles. Paradigm Shift Technologies Inc. will demonstrate a unique surface coating treatment using its proprietary Electromagnetically-enhanced Physical Vapour Deposition (EPVD®) process that would reduce the rate of coking by up to 70%, while enabling higher operating temperature of the reforming equipment. The expected result is an increase in the ethylene yield and a reduction of up to 18% in energy intensity, with corresponding reductions in GHG and air contaminant emissions.

Consortium Members

Paradigm Shift Technologies Inc.
 MCEP - Major Canadian Ethylene
 Producer
 Manoir Industries

PAVAC Industries Inc.**Round 18 2010B****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:

\$ 10,526,620

SDTC Funding:

\$ 3,549,865

Leveraged Funding:

\$ 6,976,755**PAVAC-EBFGT (Electron Beam Flue Gas Treatment)**

Utilities with coal fired power stations are actively seeking alternative solutions to meet upcoming air emissions' regulations. This project will demonstrate PAVAC Industries Inc.'s electron beam flue gas treatment (EBFGT) technology to remove SO_x and NO_x emissions from coal-fired power generation and convert them into valuable fertilizer at SaskPower's Emission Control Research Facility. The EBFGT technology is expected to be superior in many ways to the incumbent combination of flue gas desulphurization and selective catalytic reduction. It would have a lower parasitic load, a smaller footprint, and the ability to achieve higher removal rates than incumbent technologies. The capital costs are expected to be lower and the operation will be profitable, based on the sale of fertilizer by-products. Due to its scalability, EBFGT technology could also meet the needs of other industrial applications such as oil extraction and refining facilities.

Consortium Members

PAVAC Industries Inc.

Saskatchewan Power Corporation

Rail-Veyor Technologies Inc.**Round 18 2010B****Environmental Benefits: Climate Change / Clean Air / Clean Water**

Total Project Value:

\$ 5,086,293

SDTC Funding:

\$ 1,525,000

Leveraged Funding:

\$ 3,561,293**Surface Demonstration Site**

Up to now, the mining, aggregates and energy sectors have relied heavily on trucks, rail, and conveyors to haul raw products from mine and development sites to processing plants, which has not only had negative impacts on the environment, but also added significant cost to operations. Rail-Veyor Technologies Global Inc. has developed Rail-Veyor®, an environmentally friendly, electrically powered rail haulage system with a flexible lightweight design to reduce environmental scaring while using less energy with no direct air emissions. The Rail-Veyor® cars travel at speeds of up to 32 km/h as they climb grades of 20% and negotiate complex turns within a 30 metre radius. The SDTC project will aim to further develop the technology, as well as conduct testing of surface applications. The expected Rail-Veyor® GHG emissions will be 1%, of current truck, 40% of conveyor and 21% of heavy rail alternatives.

Consortium Members

Rail-Veyor

Technologies Inc.

Centre for Excellence in

Mining Innovation

Laamanen Group Holdings Limited

Northern Centre for Advanced

Technologies Inc.

Vale Canada Inc.

Shipstone Energy Corp.**Round 18 2010B****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:

\$ 5,294,474

SDTC Funding:

\$ 2,513,498

Leveraged Funding:

\$ 2,780,976**High Efficiency Energy Storage for Electrical Utility Regulation/Peaking**

Globally, power generation and transmission systems are currently constrained by limited capacity, and, at peak loading, suffer from significant inefficiencies. This is driving strong demand for efficient and cost-effective storage solutions that are flexible and scalable. Shipstone is proposing to develop and demonstrate a highly flexible, modular, scalable, fast response and efficient compression technology useful for both short duration and low capacity (>20 kW for >5 minutes) and long duration and high capacity (10's to 100's of MW for hours) energy storage applications. Shipstone's technology offers a very simple approach to compression that maximizes rapid heat exchange, and hence efficiency. Shipstone uses low cost off-the-shelf and widely available components, which means the technology can be rolled out rapidly at mass scale. Furthermore, the Shipstone technology is pressure reservoir agnostic and can be used with tube trailers, pressure vessels, compressed gas bottles, and geologic formations, depending on the storage capacity needed and the application. Based on results to date and engineering analysis, Shipstone expects its technology to compare favorably in cost and performance relative to existing and emerging alternatives such as other compression technologies, flow batteries and lithium ion batteries.

Consortium Members

Shipstone Energy Corp.

TransAlta Corp.

Cowessess First Nation

Solantro Semiconductor Corp.**Round 18 2010B****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:

\$ 7,106,664

SDTC Funding:

\$ 2,049,234

Leveraged Funding:

\$ 5,057,430**Nano-inverter Chipset Development and Demonstration of AC-BIPV Architectures**

Building Integrated Photovoltaic (BIPV) is a rapidly growing segment of the global solar energy market, finding application in both the residential and commercial sectors. The standard practice for building a BIPV system is to arrange the individual modules in series connected strings and to use a central inverter to convert the DC power to grid-compatible AC power. However, the series string configuration has a number of drawbacks: the power output from the string is disproportionately degraded if one or more of its modules are partially shaded; a breakdown in any one BIPV module cuts off the power flow from the entire string; and the central inverter is a single point of failure for the whole system. Solantro Semiconductor Corp. has developed an AC-grid approach for interconnecting BIPV modules based on its patented nano-inverter. The SDTC project will see the implementation of the nano-inverter design in an integrated circuit-based format and will compare the performance of AC-BIPV systems to conventional DC-BIPV systems in a number of different geographical locations, each with unique grid-tie requirements. This approach has the potential to increase solar energy harvest by up to 30%, reduce the cost and time of installation by 50%, enhance safety and eliminate certain restrictions on site suitability.

Consortium Members

Solantro Semiconductor Corp.

National Research Council - Canadian

Centre for Housing Technology

nv Wienerberger sa

System Photonics S.p.A.

BIPV Inc.

Tecta Solar

Solarcentury Holdings Limited

Bosch Solar CISTech Gmb

Captelia SAS

TM4 Inc.**Round 18 2010B****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 15,227,030
 SDTC Funding:
\$ 3,135,370
 Leveraged Funding:
\$ 12,091,660

Electric Propulsion System

On road transportation represents almost one fifth of Canada's total GHG emissions and continues to grow. Electric vehicles have been identified as a key technology to contribute to significant net emissions reductions from the transportation sector. In order for electric drive train (battery electric and fuel cell electric) passenger vehicles to achieve their full potential for displacing fossil fuel based transportation, significant advances are required to reduce the cost, enhance performance and minimize the weight balance of electric drive trains. TM4 Inc. will develop a mid-sized, 200 kW drivetrain and NEURΦ™ control system that builds on its current technology. This new drivetrain will have almost twice the energy density of current incumbent induction-based motors, while having the potential to be cost competitive with any leading induction or permanent magnet motor alternatives. The project will specifically demonstrate TM4's technology in an all-electric bus being developed by a consortium of companies led by Nova Bus (Volvo). The project also aims to develop a prototype pilot production line for the automated assembly of such systems.

Consortium Members

TM4 Inc.
 Nova Bus Inc.

Round 17 – Board Approval November 2010**Ballard Power Systems Inc.****Round 17 2010A****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 21,233,930
 SDTC Funding:
\$ 7,004,367
 Leveraged Funding:
\$ 14,229,563

Zero Emission Fuel Cell Running on By-product Hydrogen

The global grid-connected electricity market grows by roughly 100 GW capacity per year. Ballard Power Systems is developing a MW-scale stationary fuel cell power generation platform that can be used for grid-connected or remote baseload, load following or peak shaving applications. Waste heat created by the fuel cell system can be used for district heating applications. These fuel cells will primarily be targeted at large available hydrogen sources and existing hydrogen pipelines. This technology is expected to be able to deliver electricity at approximately the cost of installing new transmission. The proposed 6 MW baseload fuel cell facility is expected to lead to greenhouse gas emissions reductions of roughly 9 kt CO₂e per year, starting in 2013. Significant emissions reduction of NO_x, SO_x, PM and mercury would also result from the displacement of fossil fuel combustion for electricity production realized from this technology. In addition, the technology can be utilized in remote communities where power is currently provided by way of diesel generator using fuel shipped from metropolitan areas are very high rates. Mated with a renewable source, Ballard fuel cells can deliver base and peak power to such communities at significantly less cost and remove emission from these communities.

Consortium Members

Ballard Power Systems Inc.
 British Columbia Power
 and Hydro Authority
 ERCO Worldwide
 Fortis BC
 Toyota Motor Sales, U.S.A., Inc.

Corvus Energy Ltd.

Round 17 2010A

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 3,754,497
 SDTC Funding:
\$ 1,238,984
 Leveraged Funding:
\$ 2,515,513

Hybrid Harbour Tug Boat

Tug and port operators worldwide will have to comply with emerging emission reduction regulations for marine diesel engines. Corvus Energy Ltd. is developing novel hybrid electric marine propulsion systems for large power applications, powered by their high energy lithium ion battery systems, that will significantly improve air emissions in major ports. The project will retrofit and field trial one harbour tug boat, which will be put into daily operation. With this technology, the size of diesel engines for marine coastal vessels could be reduced by up to 33% resulting in 30% reduction in fuel consumption and significant emission reductions.

Consortium Members

Corvus Energy Ltd.
 Techsol
 Ocean Group

CRB Innovations Inc.

Round 17 2010A

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 16,250,000
 SDTC Funding:
\$ 5,362,500
 Leveraged Funding:
\$ 10,887,500

Integrated Biorefinery

An integrated and energy self-sufficient biorefinery will be built and put into operation for the production of cellulosic ethanol and co-products. The sequential fractionation process will be complemented with a novel non-enzymatic technology to hydrolyze, in high yields, cellulose into a C6 sugar solution. The demonstration project will treat 2,400 tonnes of lignocellulosic material per year and will produce about 682,000 litres of ethanol from C6 sugars and 245,000 litres of non-ethanolic biofuel derived from C5 sugars. It is expected that the success of the demonstration will be followed by implementing commercial networks, each comprising several satellite plants converting about 50,000 tonnes of biomass per year into specific intermediates which will then be upgraded in dedicated centers. The raw materials for the demonstration will comprise quasi-homogeneous biomass from forest residues, from agricultural crops and from agro-forestry plantations. Process residues will be used for the generation of heat and power to satisfy the needs of the biorefinery.

Consortium Members

CRB Innovations Inc.
 Éthanol Greenfield Québec Inc.
 Enerkem
 Groupe Orvert Ltée.
 La Coop Fédérée
 Institut de recherche – HydroQuébec
 Université de Sherbrooke
 Grappe agroénergétique des Coteaux

eCAMION Inc.**Round 17 2010A****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 16,307,248
 SDTC Funding:
\$ 5,435,749
 Leveraged Funding:
\$ 10,871,499

Smart Grid Community Lithium-Ion Battery Solution for Utility Energy Storage Project

Electricity distribution is currently facing two main challenges: increased adoption of intermittent renewable power generation, and increased demand which will soon include plug-in hybrid and electric vehicle recharging. Embedding storage in the distribution network, at the community level, represents the most economical solution to addressing these issues while meeting the rapidly evolving demands on the grid. This project aims to integrate eCamion's light-weight, high energy density 750kWh Li-ion battery energy storage system using Dow Kokam's proven lithium ion technology into Toronto Hydro's existing electricity power grid. Two innovations will be demonstrated in the project: eCAMION's battery pack design, deploying advanced lithium ion battery technology, and CAPE's Control, Protection and Power Management system, which will control in real time the transfer of power across multiple battery storage units to and from the grid, improving power availability and reliability while supporting microFIT renewable electricity installations. The system will be tested at Toronto Hydro's Smart Grid Community in North York.

Consortium Members

eCAMION Inc
 Dow Kokam
 Toronto Hydro-Electric Ltd.
 University of Toronto

Echologics Engineering Inc.**Round 17 2010A****Environmental Benefits: Climate Change / Clean Water / Clean Soil**

Total Project Value:
\$ 2,278,564
 SDTC Funding:
\$ 751,926
 Leveraged Funding:
\$ 1,526,638

Smart Automated Leak Detection System

According to Environment Canada, up to 30% of the total water entering the country's supply-line systems is lost to leaking pipes. This water represents not only a loss of revenue for the utility but also a loss of treated, quality assured and potable water. Echologics Engineering Inc. proposes to develop and demonstrate an integrated, non-intrusive acoustic leak detection system called LeakSenseRT. This system will detect leaks in any type or size of commonly used potable water pipes. Radio transmitters using Advanced Metering Infrastructure/Automated Meter Reading (AMI/AMR) technology send acoustic sensor data to central or local sites. The technology also has the advantage of being able to detect leaks in difficult locations such as noisy urban areas, or at critical locations such as railways or major highways. It can be automated to turn on during the night when there is the least amount of ambient noise, thus allowing detection of even the quietest leaks that are either currently undetectable or too costly to pursue.

Consortium Members

Echologics Engineering Inc.
 Mueller Systems
 American Water
 City of Ottawa

Fabgroups Technologies Inc.

Round 17 2010A

Environmental Benefits: Climate Change / Clean Air / Clean Water / Clean Soil

Total Project Value:
\$ 9,091,200
 SDTC Funding:
\$ 2,981,000
 Leveraged Funding:
\$ 6,110,200

Processing of Slaughter-house Waste Using PASO with Conversion to Value-added Fertilizer

Safe and sustainable disposal of residual animal waste is a growing issue in Canada as a result of challenges like high costs and strict government regulations. Fabgroups Technologies Inc. (FTI) will demonstrate a high efficiency Plasma-Assisted Sludge Oxidation (PASO) technology to effectively destroy animal waste and sludge, carcasses and specified risk material. PASO is based on a rotary kiln operating at slightly below atmospheric pressure and equipped with an air plasma non-transferred arc torch. The process will destroy the animal waste and also produce an inert ash that meets the Canadian Food Inspection Agency's regulations for fertilizer, while at the same time recycling the thermal energy it produces, resulting in substantial energy savings. FTI's intent is to build regional plants, avoid land filling and be cost competitive with current disposal methods.

Consortium Members

Fabgroups Technologies Inc.
 Centre de traitement de biomasse de
 Monteregie Inc. (CTBM)

FibraCast

Round 17 2010A

Environmental Benefits: Climate Change / Clean Water

Total Project Value:
\$ 4,339,771
 SDTC Funding:
\$ 1,399,124
 Leveraged Funding:
\$ 2,940,647

FibraCast

The use of membrane technology for water treatment, although it has evolved considerably since the 1960's, continues to be limited by cost, efficiency (packing density) and operational challenges (cleaning). FibraCast Inc. has developed a membrane manufacturing technology that creates tubular membrane panels which combine the high packing density and back-washable characteristics of hollow fibres with the high strength and low manufacturing cost aspects of flat sheets in a novel membrane element. It also achieves the strength and reliability of reinforced membranes at a lower cost than unreinforced hollow fibres. The FibraCast membrane panel is expected to have higher permeability, be 100 times stronger than typical hollow fibre membranes, have several times the packing density, cost less to manufacturers than the current state-of-the-art hollow fibre cassettes. This technology is expected to increase the market for membrane treatment and allow for the first commercial immersed nanofiltration product, resulting in improved efficiency and effectiveness of both domestic and international water treatment.

Consortium Members

FibraCast
 Alpha Plan
 ANAERGIA

Mining Technologies International Inc.**Round 17 2010A****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 1,849,909
 SDTC Funding:
\$ 613,261
 Leveraged Funding:
\$ 1,236,648

Hybrid Underground Loader

Canada's mining industry is currently experiencing a number of challenges related to declining reserves, environmental issues, safety and international protectionism. The industry is increasingly focusing on green and safe technologies and requires equipment that will improve economics as well as safety conditions by reducing ventilation requirements, particularly in deeper mines. Building on previous developments, Mining Technologies International Inc. proposes to demonstrate a diesel electric hybrid technology in a medium size underground loader, and incorporate an advanced propulsion system to maximize efficiency and energy recovery with minimal exhaust emissions and reduced fuel consumption. The system will use advanced battery technology with high energy and power capabilities combined with a high efficiency drivetrain to minimize losses in the transfer of power to the wheels. This is expected to result in reduced operating costs, improved health and safety, decreased greenhouse gas emissions, improved environmental sustainability, while creating a market-leading product for a Canadian-owned mining equipment manufacturer.

Consortium Members

Mining Technologies International Inc.
 Institut du transport avancé du Québec
 SOREDEM
 National Resources Canada-CANMET/
 MMSL

NIMTech Inc.**Round 17 2010A****Environmental Benefits: Climate Change / Clean Water**

Total Project Value:
\$ 1,978,519
 SDTC Funding:
\$ 726,173
 Leveraged Funding:
\$ 1,252,346

Optimization, Monitoring and Control of Ethanol Production using SonicGauge™ System and Multivariate Data Analysis Technologies

In the biofuel ethanol production process, measurement of the quality and characteristics of the mash, sugars, and ethanol against quality assurance classification references is an important step in the production process. The existing methods suffer from a lack of real time analytics, significant time lags (four to seven hours), intermittent sampling rates and a lack of exacting quality assurance capabilities. NIMTech Inc. has developed the SonicGauge™ System, which can accurately and more efficiently classify the "chemical fingerprint" of the ethanol fermentation state and track the process non-invasively through the pipeline or container. The SonicGauge™ System monitors in real-time overcoming current time lags and observability gaps that cause productivity losses and poor yields. It is projected that the savings for a retrofitted ethanol plant will be approximately 15% in energy savings, 5% in fresh water reduction savings, 5% in GHG equivalent emission net reductions, and \$1.1M in operating savings (based on an average 140 ML/yr ethanol plant). This approach can also be applied to other manufacturing industries like oil and gas, water treatment, quality control, pharmaceutical and chemical.

Consortium Members

NIMTech Inc.
 GreenField Ethanol Inc.
 Prosensus Inc.

S2G Biochemicals Inc.

Round 17 2010A

Environmental Benefits: Climate Change / Clean Water

Total Project Value:
\$ 4,308,109
 SDTC Funding:
\$ 1,425,952
 Leveraged Funding:
\$ 2,882,157

Bio-Glycol Pre-commercial Plant

Over \$15 billion worth of glycols are used each year globally in a wide array of industrial and consumer products such as antifreeze, polyester fibres, PET plastic drink containers, cosmetics and detergents. The project led by S2G Biochemicals Inc. will demonstrate “bio-glycol” production using low-cost renewable byproducts of the biofuel, agriculture and forest industries as feedstock instead of fossil fuels. Byproduct sugars from next-generation biofuels are of particular interest as a growing source of feedstock – these include crude glycerine byproduct from biodiesel production and C5/C6 sugars byproduct from cellulosic ethanol production. The project will also incorporate industrial waste hydrogen in the conversion process. S2G’s “Sugar-to-Glycol” process will result in lower feedstock costs, will provide equal or better margins, and will be less sensitive to feedstock price fluctuations than both fossil-based glycols and corn-based bio-glycols. The approach will improve the economics of biofuel production and the utilization of biomass resources, as well as reduce the lifecycle GHG emissions of glycols. With this technology, S2G aims to help shift the industrial chemical industry from its traditional dependence on fossil fuels to a sustainable future based on renewable organic feedstocks.

Consortium Members

S2G Biochemicals Inc.
 International Polyol Chemical Incorporated
 HTEC Hydrogen Technology & Energy Corporation
 Lignol Innovations Ltd.
 University of Washington
 GreenField Ethanol Inc
 Sacre-Davey Engineering Ltd.

Silinov Technologies

Round 17 2010A

Environmental Benefits: Climate Change / Clean Air / Clean Soil

Total Project Value:
\$ 5,384,662
 SDTC Funding:
\$ 1,776,938
 Leveraged Funding:
\$ 3,607,724

Silinov Project

According to the CRU Group, over the last two years, the worldwide fibre optic cable market has grown by 22%, now reaching a production of 171 million kilometres per year. There are currently no known processes to recycle fibre optic cables and fibre optic production residues. Silinov Technologies has demonstrated a disruptive one-step process to recover material from defective optical fibre preforms and end of life optical cables. The process converts the glassy residues into high purity materials (SiCl₄ and GeCl₄) that are in significant demand in the semiconductor industry. The process uses a lower temperature than existing SiCl₄ GeCl₄ production processes requiring 60% less energy, 75% shorter processing time and smaller capitalization costs. This project entails scaling up 100 times from the current 50gr/hr prototype. Production trials at the pilot plant scale aim to validate the design and economics of a 500t/y industrial automated plant.

Consortium Members

Silinov Technologies
 INRS
 Phytronix technologies
 Institut National d’Optique
 Ministère du Développement économique de l’innovation et exportation

SWITCH Materials Inc.**Round 17 2010A****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 7,369,216
 SDTC Funding:
\$ 2,363,621
 Leveraged Funding:
\$ 5,005,595

Hybrid Electrochromic / Photochromic Smart Windows
 Commercial and residential buildings in Canada are responsible for 31% of total electricity usage. SWITCH Materials developed a patented hybrid photochromic/electrochromic film for smart windows that automatically darkens when exposed to sunlight and lightens in response to an applied electric charge. This novel approach reduces heat and glare from sunlight automatically to improve comfort, while offering occupants the flexibility to reverse the tinting at will, reducing cooling loads in buildings by as much as 27%. The project will demonstrate expansion from lab-scale manual production to pilot-scale continuous manufacturing of a roll-to-roll film that can be integrated into architectural and automotive windows. A pilot run of the film process will validate manufacturing costs, assembly procedure into Insulated Glass Units and, through demonstrations in two separate buildings, provide data to confirm performance and film durability targets.

Consortium Members
 SWITCH Materials Inc.
 Bing Thom Architects
 Light House Sustainable Building Centre
 4D Labs
 PFG Glass
 British Columbia Institute of Technology

Temporal Power Ltd.**Round 17 2010A****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 8,497,746
 SDTC Funding:
\$ 2,748,616
 Leveraged Funding:
\$ 5,749,130

Distributed Grid-Scale Energy Storage
 Fast changes in power output from a wind farm can add megawatts of power in a matter of seconds and induce significant voltage spikes and sags. These rapid fluctuations lead to challenges in regulating voltage on distribution lines. Temporal Power Ltd. and Hydro One Networks are working to demonstrate how an innovative Canadian flywheel electricity storage technology can improve the way wind power is connected to the electricity grid. The flywheel based storage solution developed by Temporal Power will be located on the Hydro One distribution network to mitigate challenges caused by the intermittent output of power from wind farms. Temporal will use a novel low loss flywheel generator combination to deliver a 500kW power rating per unit in an array of up to 10 flywheels (i.e., up to 5 MW) that has the capacity to absorb real power for up to two minutes, and release it back to the Hydro One distribution network for the same duration. The demonstration represents one of the world's largest wind integration projects utilizing flywheel storage technology. Temporal Powers flywheel storage technology is expected to significantly reduce GHG emissions in Canada and in the rest of the world by 2020 by enabling further renewable projects.

Consortium Members
 Temporal Power Ltd.
 Hydro One

Tyne Engineering Inc.

Round 17 2010A

Environmental Benefits: Clean Air / Clean Water / Clean Soil

Total Project Value:
\$ 4,934,949
 SDTC Funding:
\$ 1,534,097
 Leveraged Funding:
\$ 3,400,852

CECE Electrolyzer

Tyne Engineering and Atomic Energy Canada Ltd. (AECL) are collaborating on developing a next generation electrolyser for the nuclear industry. This electrolyser, when combined with AECL's proprietary catalyst technology, will increase the efficiency and economics of the current technologies used to separate hydrogen isotopes. For CANDU reactors, this means improved upgrading and tritium removal processes for the heavy water used in the heat transport and moderator systems. The technology also has applications for tritium removal from light water in other reactor systems. In all cases, more effective isotope separation will add to the level of protection of the operator and the public by reducing tritium inventory. Although CECE technology (Combined Electrolysis Catalytic Exchange) is well demonstrated, the improvement that Tyne and AECL bring is the introduction of a non-corrosive non-alkali-based electrolyser. The unit brings other advantages too, such as reduced complexity, and a smaller, less expensive tritium extraction process. These qualities will reduce the overall cost and improve the effectiveness of safety systems in nuclear reactors, particularly CANDU reactors.

Consortium Members

Tyne Engineering Inc.
 Atomic Energy of Canada Ltd.

Westport Power Inc.

Round 17 2010A

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 16,386,255
 SDTC Funding:
\$ 2,302,834
 Leveraged Funding:
\$ 14,083,421

Natural Gas Locomotive Demonstration

Roughly one fifth of Canada's energy related greenhouse gas emissions result from industrial freight transportation and emissions from this sector are increasing by roughly 13% per year. Westport is proposing to significantly improve the cost structure of rail operations while achieving criteria air contaminants emissions regulation compliance and reducing greenhouse gas emissions by up to 25% through the development of natural gas high-pressure direct injection and/or natural gas/diesel dual-fuel locomotives. Liquefied natural gas can already be delivered at a cost significantly less than diesel with targeted payback times of less than five years. Fuel accounts for approximately 20% of the operating expenses in the railway industry. Such a decrease in cost would significantly enhance margins and cost structures for rail operators while offering greenhouse gas reductions of up to 500 tonnes per year for each natural gas locomotive relative to diesel locomotives.

Consortium Members

Westport Power Inc.
 EMD – Electro-Motive Diesel Inc.
 Canadian National Railway Company
 Corporation
 Gaz Metro

Woodland Biofuels Inc.**Round 17 2010A****Environmental Benefits: Climate Change / Clean Water / Clean Soil**

Total Project Value:
\$ 12,900,000
 SDTC Funding:
\$ 4,275,000
 Leveraged Funding:
\$ 8,625,000

Biomass to Ethanol Demonstration Plant

Woodland Biofuels Inc. proposes to demonstrate a fully integrated, non-enzymatic process that will convert biomass into fuel grade cellulosic ethanol using its proprietary catalytic technology. Through this project, Woodland aims to demonstrate that its technology is more cost effective than fermentation based and thermo-chemical Fisher-Tropsch (F-T) based technologies for the production of cellulosic ethanol. Using a broad range of renewable biomass materials, Woodland's technology can produce high yields of cellulosic ethanol at a lower cost than competing technologies. The technology is expected to provide reductions in GHG, soil improvements and a significant reduction in fresh water use when compared to corn based fermentation technologies.

Consortium Members

Woodland Biofuels Inc.
 Bioindustrial Innovation Centre

Round 16 – Board Approval June 2010**3XR Inc.****Round 16 2009B****Environmental Benefits: Climate Change / Clean Water**

Total Project Value:
\$ 1,787,568
 SDTC Funding:
\$ 593,000
 Leveraged Funding:
\$ 1,194,568

AmRHEX Technology Development and Demonstration

As a result of growing concern about water quality, wastewater treatment plants are increasingly required to reduce nitrogen discharges. 3XR has developed a technology that strips nitrogen in the form of ammonia from wastewater and combines it with sulphuric acid to form ammonium sulphate fertilizer. 3XR and its partners will demonstrate the AmRHEX™ technology in a project treating wastewater generated from biogas-producing digesters handling source separated organic waste. The currently recognized ammonia treatment requires large capital expenditure and space for tanks. The 3XR process expects to achieve 60% to 90% ammonia removal using 80% to 90% less energy, one tenth of the space and one half of the cost of the incumbent technology.

Consortium Members

3XR Inc.
 CCI-TBN Toronto Inc.
 City of Toronto

6574262 Canada Inc. (ICUS)

Round 16 2009B

Environmental Benefits: Climate Change / Clean Water / Clean Soil

Total Project Value:
\$ 1,112,500
 SDTC Funding:
\$ 400,000
 Leveraged Funding:
\$ 712,500

Microencapsulated Biological Inoculant to Reduce Nitrogen Fertilizer Use in Wheat Production

Fertilizer is one of the highest input costs in agriculture. Nitrogen-based fertilizer increases crop yield, but even when applied at optimal levels, only around 50% of the nitrogen is actually taken up and used by the plants. The remaining nitrogen is washed away by surface drainage into water courses, leaches into ground water or decomposes and is released to the air as nitrous oxide, contributing to greenhouse gas emissions. Some may also remain in the soil as a nitrogen-based contaminant. ICUS proposes to demonstrate the pre-commercial production and use of a new patented strain of *Trichoderma* fungi (10TC) that, when applied to wheat seeds, has the potential to decrease chemical fertilizer nitrogen use by 25-40%. 10TC attaches to plant roots and stimulates the release of chemicals that increases the plants ability to efficiently acquire and use available soil nitrogen leading to faster growth, increased plant mass and higher stress tolerance. The improved efficiency of fertilizer use is expected to reduce costs to the farmer by up to \$22/hectare – which would nearly double the farmer's margin based on recent market prices for wheat and fertilizer – while reducing water, soil and air emissions. The treatment also could increase wheat yields by 5-10% depending on nitrogen application rates used in conjunction with 10TC.

Consortium Members

6574262 Canada Inc. (ICUS)
 Advanced Biological Marketing (ABM)
 Viterra Inc.

Available Energy Corporation

Round 16 2009B

Environmental Benefits: Climate Change / Clean Air / Clean Water

Total Project Value:
\$ 1,980,612
 SDTC Funding:
\$ 720,000
 Leveraged Funding:
\$ 1,260,612

Hydrogen and Heavy Water Production

Heavy water is used as a coolant and moderator in nuclear reactors, in particular the CANDU technology developed in Canada. The traditional means of producing heavy water, the "Girdler-Sulphide" process (G-S), requires very large amounts of water, is extremely energy intensive, and uses a toxic chemical (H₂S) that is partly released in water and air. Available Energy Corp. proposes to demonstrate a unique process – called D2XTM – for the co-production of heavy water and hydrogen from water electrolysis that is economically and environmentally superior. The D2XTM process "piggy backs" on existing chemical plants to achieve stable, secure and long-term production of heavy water — at attractive cost compared to the G-S process. It is expected to reduce by close to 99% the water requirements and emissions associated with the G-S process.

Consortium Members

Available Energy Corp.
 Air Liquide Canada Ltd.
 Atomic Energy of Canada Ltd.
 Isowater Corp.
 Canexus Chemicals Canada Ltd.

EnerMotion Inc.**Round 16 2009B****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:

\$ 3,300,000

SDTC Funding:

\$ 1,100,000

Leveraged Funding:

\$ 2,200,000**Hybrid Auxiliary Power Unit Development and Demonstration**

Heavy trucking is involved in almost every part of the Canadian industrial and commercial value chain. It also represents about 10% of total Canadian energy related GHG emissions. On average, heavy freight trucks sit idle six hours per day but engines still run to provide heat, cooling and electrical power to the cab, which translates to 12 per cent of the annual fuel consumed and significant GHG and CAC emissions. To address these issues, EnerMotion has developed the Hybrid Auxiliary Power Unit (HAPU™) which captures waste exhaust heat, solar energy and braking energy, stores it and converts it to useful cooling, heating and electricity that can be used to provide all energy requirements for truck cabs for extended idling times. The HAPU is projected to have a payback period of less than one year for typical long haul trucking.

Consortium Members

EnerMotion Inc.

J.D. Smith & Sons Ltd.

Etalim Inc.**Round 16 2009B****Environmental Benefits: Climate Change / Clean Air / Clean Water / Clean Soil**

Total Project Value:

\$ 6,260,533

SDTC Funding:

\$ 2,191,530

Leveraged Funding:

\$ 4,069,003**Etalim Thermoacoustic-Stirling Micro Cogeneration Demonstration**

Etalim is developing a new class of small scale (1.5-3 kW) energy conversion device based on thermo-acoustic principles, the Thermal Electric Generator (TEG), which is expected to have electrical conversion efficiency of up to 48% with low equipment cost. The TEG can be fuelled using virtually any high temperature heat source (e.g. concentrated solar, waste process heat, etc.) or combustion fuel (biomass, biogas, syngas, natural gas etc.) The TEG has a simple design, has virtually no moving parts and is made primarily of steel components, lending itself to mass manufacturing techniques, leveraging economies of scale and low maintenance costs. The TEG technology is applicable to a broad range of applications and is planning to be initially demonstrated in micro-combined heat and power applications.

Consortium Members

Etalim Inc.

IBC Technologies Inc.

Gestion TechnoCap Inc., SpaceWatts Division

Round 16 2009B

Environmental Benefits: Climate Change / Clean Air

Total Project Value:

\$ 2,694,308

SDTC Funding:

\$ 840,000

Leveraged Funding:

\$ 1,854,308

SpaceWatts Utility Scale Grid Parity Solar Energy Project

Concentrating Photovoltaic (CPV) is a critical enabler for utilities who wish to deploy solar electricity generating systems with efficiencies above 25% as compared to low cost un-concentrated thin film PV, which currently achieves 11% efficiencies. Key to the uptake of CPV technology is getting the costs to a competitive level through efficiency and manufacturing improvements. SpaceWatts has developed a utility scale CPV solution that addresses both of these issues through a highly efficient CPV design which marries volume manufacturing techniques with readily available materials and supply chain logistics. SpaceWatts plans to build the first 35kW instrumented unit in Bromont, QC. This will be followed by the demonstration of a 125 kW pilot at Hydro Quebec's Research Institute (IREQ) in Varennes, QC and comparative testing of each unit under Quebec's wide range of weather conditions.

Consortium Members

Gestion TechnoCap Inc.,
SpaceWatts Division
Arch Aluminum & Glass Co. Inc.
Research Institute of Hydro-Quebec
Université de Sherbrooke
Richard Norman

InvenTyS Thermal Technologies Inc.

Round 16 2009B

Environmental Benefits: Climate Change

Total Project Value:

\$ 5,998,833

SDTC Funding:

\$ 1,999,611

Leveraged Funding:

\$ 3,999,222

VeloxoTherm Gas Separation Process

Carbon Capture and Storage (CCS) is a leading strategy to combat climate change which involves separating carbon dioxide from the gases produced by the combustion of fossil fuels (flue gases). A barrier preventing the widespread adoption of CCS is the economic separation of CO₂ from the flue gases. The VeloxoTherm™ process developed by InvenTyS is a post-combustion capture and separation technology which utilizes a patented process design and adsorbent architecture which greatly reduces CO₂ separation cost. The VeloxoTherm™ process is capable of separating CO₂ from flue gases at 1/3rd of the cost of the leading separation technology for post combustion capture of CO₂ from industrial flue gas streams.

Consortium Members

InvenTyS Thermal Technologies Inc.
EnCana Corporation
Mast Carbon International
Suncor Energy Inc.
Doosan Babcock Energy
BP, Plc.
Alberta Innovates - Energy
and Environment Solutions

InvoDane Engineering Ltd.**Round 16 2009B****Environmental Benefits: Climate Change**

Total Project Value:
\$ 4,450,826
 SDTC Funding:
\$ 1,482,125
 Leveraged Funding:
\$ 2,968,701

Unpiggable Pipeline Inspection

Current inspection methods for unnavigable natural gas pipelines require the pipeline to be shut down and the gas vented to the atmosphere. InvoDane is demonstrating a technology designed to detect anomalies or weaknesses while the unpiggable pipeline is in service, allowing the pipeline operator to determine the pipe condition and schedule repairs so interruption of the gas service is minimized and venting is avoided. The technology, called Transmission Inspection of Gas mains via Robotic Explorer (TIGRE), consists of robotic linked sections that are self propelled, reversible and use magnetic flux leakage (MFL) sensors to detect anomalies. TIGRE can be launched at any accessible location while the pipeline is under pressure and the robot can change shape to negotiate pipeline features. The technology aims to reduce the number of gas pipeline failures and the associated cost, environmental impact and risk to human safety.

Consortium Members

InvoDane Engineering Ltd.
 The Northeast Gas Association
 Enbridge Gas Distribution Inc.

Lakeshore EMPC Two L.P.**Round 16 2009B****Environmental Benefits: Climate Change / Clean Water / Clean Soil**

Total Project Value:
\$ 2,587,188
 SDTC Funding:
\$ 1,076,044
 Leveraged Funding:
\$ 1,511,144

First Full-Scale Application of ZVI-Clay Technology in Canada to a cVOC-impacted Brownfield Property

Many sites on which chlorinated organic solvents have been used – typically former industrial and dry cleaning sites – have residual soil and ground water contaminant issues which are currently difficult to deal with at source locations and which impede future redevelopment. The lack of effective and proven remedial technologies for this source contamination has resulted in the favoured use of the “Dig-and-Haul” approach in Canada, with contaminated soil hauled off-site for landfill disposal. This project will demonstrate the first commercial-scale brownfield remediation application of ZVI-Clay in situ treatment, which involves mixing both zero valent iron (ZVI) and clay into soil and ground water contaminated with chlorinated volatile organic compounds (cVOCs) to treat source locations. On-site treatment and material re-use are more sustainable remedial approaches than traditional landfill disposal and clean soil importation. ZVI-Clay will be used to facilitate the remediation of the 10.6-acre brownfield property in Toronto with extensive cVOC contamination in both soil and ground water. Once remediated, this former industrial property will be redeveloped for residential use in conformance with the City of Toronto’s Official Plan. This project intends to demonstrate to the Canadian marketplace and regulators that this technology can effectively address cVOC source contamination and thus enable remediation and site redevelopment on other affected brownfield sites across Canada while promoting more sustainable methods of remediation.

Consortium Members

Lakeshore EMPC Two L.P.
 WNUF Lakeshore Limited Partnership
 EnviroMetal Technologies Inc. (ETI)

MPT Mustard Products & Technologies Inc.

Round 16 2009B

Environmental Benefits: Clean Air / Clean Water / Clean Soil

Total Project Value:
\$ 5,741,231
 SDTC Funding:
\$ 2,217,949
 Leveraged Funding:
\$ 3,523,282

Development & Demonstration of MPT's Mustard Based Biofumigant

Treatment of turf, vegetables and small fruit crops with synthetic pesticides to improve cosmetic appearance and yield is common practice. However, usage and application of synthetic pesticides can have serious negative environmental impacts. Mustard Products & Technologies Inc. (MPT) aims to design, build and commission Canada's first full-scale manufacturing line for bio-pesticide produced from mustard. MPT's goal is to develop and manufacture biological-based solutions that are natural, renewable and safe to use in managing key pests. The MPT bio-fumigant is anticipated to be an effective biological solution for managing key pests in the initial, high-value turf niche market with application primarily to golf courses, as well as for high value food crops such as strawberries and tomatoes. By developing and demonstrating this sustainable biofumigation technology, MPT is seeking to create a niche market for renewable mustard meal beyond its traditional uses as a condiment or ingredient for the food industry.

Consortium Members

Mustard Products & Technologies Inc.
 Peacock Industries Inc.
 Ag-West Bio Inc.

Ocean Nutrition Canada Ltd.

Round 16 2009B

Environmental Benefits: Climate Change / Clean Air / Clean Water / Clean Soil

Total Project Value:
\$ 25,126,448
 SDTC Funding:
\$ 8,291,728
 Leveraged Funding:
\$ 16,834,720

Demonstration of ONC T 18 B for Biofuel

Aviation fuels represent 12% of the fuel consumption in transportation, and jet fuel use is doubling every ten years. In the search for sustainable alternatives to fossil fuels, algae-based biofuel has shown great promise. Ocean Nutrition Canada (ONC) has discovered a heterotrophic algae – called ONC T 18B – with 60 times the productivity of other algae which can be grown on elemental carbon in closed reactors, without sunshine. ONC intends to build a demonstration fermentation production site to produce algal feedstock oil for biofuels in a meaningful scale and competitive cost. Trials will be conducted to demonstrate that ONC T 18B can be direct replacements for aerospace (biojet) and land transportation (biodiesel) liquid fuels.

Consortium Members

Ocean Nutrition Canada Ltd.
 National Research Council of Canada
 Aerospace
 Pratt & Whitney Canada
 UOP LLC, Honeywell Company

Phostech Lithium Inc.**Round 16 2009B****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:

\$ 14,376,995

SDTC Funding:

\$ 4,700,508

Leveraged Funding:

\$ 9,676,487**Phostech Lithium P2**

The automotive industry is investing heavily in Lithium-Ion battery technologies for Hybrid Electric Vehicle (HEV) applications. Presently, the cathode material used in these batteries is a significant limiting factor in cell performance. While there are several lithium-ion cathode chemistries available, none adequately address thermal management and long operating cycle requirements. Lithium-ion/Iron Phosphate (LFP) is the leading choice in cathode material for batteries intended for electric vehicles. Phostech Lithium Inc. created a high power density carbon nano-coated LFP cathode material that addresses the safety, cost and charge cycling issues for next generation electric car batteries. The project will focus on a 24 times scale-up from a 100t/y batch pilot plant to a continuous and fully integrated 2,400t/y plant; on producing a consistent quality material from a larger “first of its kind” wet chemical processing unit, and on meeting battery manufacturers’ specifications and price points.

Consortium Members

Phostech Lithium Inc.
 Université de Montréal
 Gaïa Akkumulatorenwerke GmbH (Gaïa)
 K2 Energy

Purifics ES Inc.**Round 16 2009B****Environmental Benefits: Climate Change / Clean Water**

Total Project Value:

\$ 4,263,000

SDTC Funding:

\$ 1,421,000

Leveraged Funding:

\$ 2,842,000**SAGD Water Purification for Boiler Feedwater**

Steam Assisted Gravity Drainage (SAGD) is the dominant extraction method used for in-situ extraction of bitumen from oil sands. The SAGD process injects steam into underground oil sands deposits, allowing the bitumen to drain out of the sand where it is collected and sent for upgrading. The water from the SAGD operation is contaminated, posing significant technical challenges to maximizing water recycle. Purifics proposes to demonstrate an integrated process using its proven Photo-Cat® technology in a new application on the treatment of SAGD produced water. The process involves ceramic membrane filtration, photo-catalytic oxidation and reverse osmosis to remove suspended solids, dissolved solids and free oil while treating hydrogen sulphide and high molecular weight organics. The result is the more efficient recycling of water to a higher standard, creating the opportunity for more efficient steam production. The technology has the potential to significantly reduce energy use and to increase the overall water recycling rate to greater than 95% using non evaporative technology. It is intended that field piloting will be conducted at Suncor’s Firebag facility near Fort McMurray Alberta.

Consortium Members

Purifics ES Inc.
 Suncor Energy Oil Sands L.P.

Quadrogen Power Systems Inc.

Round 16 2009B

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 7,909,529
 SDTC Funding:
\$ 2,610,145
 Leveraged Funding:
\$ 5,299,384

Co-production of Renewable Electricity, Heat and Hydrogen using
 Quadrogen Power Systems Inc. and its consortium partners will demonstrate the technical and commercial viability of Canada's first renewably-fuelled combined heat, hydrogen and power system, where onsite anaerobic digesters will supply renewable biogas from a dairy farm's manure stream. This project will demonstrate Quadrogen's high performance Integrated Biogas Pre-treatment System and H2 Booster technologies integrated with an internal reforming fuel cell power plant. It aims to generate up to 300 kW of renewable electricity, 150 kW of heat, 150 kg/day of high purity hydrogen, and have the ability to directly supply greenhouses with clean and high concentration CO₂ exhaust from the fuel cell system. The project aims to demonstrate class-leading efficiency, ultra-low emissions, and a cost-effective distributed generation model that also helps build the hydrogen infrastructure of tomorrow's sustainable energy sector.

Consortium Members

Quadrogen Power Systems Inc.
 Nata Farms Inc.
 National Research Council
 Institute for Fuel Cell Innovation
 FuelCell Energy Inc.
 Colin O'Leary

Spartan Bioscience Inc.

Round 16 2009B

Environmental Benefits: Clean Water / Clean Soil

Total Project Value:
\$ 6,354,802
 SDTC Funding:
\$ 1,896,774
 Leveraged Funding:
\$ 4,458,028

Spartan DX-12
 Bacterial pathogens have been linked to over 11 million food borne illnesses in Canada. Dangerous levels of undetected pathogens can lead to outbreaks, recalls and treatment of contaminated food and water. Spartan Bioscience and its partners are developing and demonstrating an integrated genetic analyser capable of detecting pathogens in food and water. Combining Polymerase Chain Reaction with Bacteriophages (human-friendly virus that infect bacteria) and enabling their detection in the same portable instrument will greatly enhance the detection capabilities in food processing (wash water), ground water and ultimately water treatment applications. The integrated unit will be demonstrated in the detection of Listeria, E. coli and Legionella, with expected reductions in time to results from 96 hours to 8 hours. The anticipated benefits include water and soil environmental improvements and better public health from safer processed food, water wells and public water supplies. The portable automated analysis and reporting characteristics make the technology suitable for integration into plant operations (for example wash water in food processing or water treatment), source water field testing and ground water systems in remote and aboriginal communities.

Consortium Members

Spartan Bioscience Inc.
 L-D Tool & Die
 InnovaPrep

Tenova Goodfellow Inc.**Round 16 2009B****Environmental Benefits: Climate Change**

Total Project Value:
\$ 4,601,271
 SDTC Funding:
\$ 1,522,513
 Leveraged Funding:
\$ 3,078,758

NextGen Energy Efficiency Breakthrough Technology for EAF Steelmaking

The Electric Arc Furnace (EAF) is a highly energy intensive, scrap metal melting process currently producing about one third of the world's steel with a total energy consumption of almost 385 million megawatt hours per annum worldwide. The EAF remains one of the least automated, energy intensive heavy industrial processes largely due to the harsh operating environment that makes sensor reliability and related process monitoring and control extremely difficult. Built on the process modeling developments of a previous SDTC project involving Basic Oxygen Furnace steelmaking, this project aims to demonstrate a comprehensive real-time monitoring and process control system where the EAF is paced according to the total electrical and chemical energy input adjusted for energy losses. The objective is to use an array of advanced sensors and process models to manage the EAF mass and energy balance online. The primary goal of the NEXT GEN EAF is to make a step change of approximately 24% (36 kWh/ton of steel) reduction in EAF energy use and related GHG emissions.

Consortium Members

Tenova Goodfellow Inc.
 University of Toronto
 ArcelorMittal Dofasco Inc. (AMD)
 Tenova SpA
 Tenova Re Energy GmbH

Round 15 – Board Approval November 2009**Agrisoma Biosciences Inc.****Round 15 2009A****Environmental Benefits: Climate Change / Clean Air / Clean Water / Clean Soil**

Total Project Value:
\$ 8,208,883
 SDTC Funding:
\$ 2,500,000
 Leveraged Funding:
\$ 5,708,883

ETL Oilseed

Biotechnology has an important role to play in increasing the economic and environmental performance of renewable fuels. Agrisoma's unique, proprietary crop genetic engineering system, ETL (Engineered Trait Loci), will be used to rapidly develop an improved Brassica carinata, a non-food oilseed of the mustard family. Agrisoma will modify the contents of the crop so that it can be used to produce a premium biodiesel with a lower cloud point (-18°C) and improved stability, suitable for Canada's climate. The process will also allow the addition of traits to improve drought resistance, weather tolerance and agronomic robustness, which will enable these high-yield oilseeds to be able to grow on marginal land. The result of these improvements will be up to a 50% reduction in feedstock costs to biodiesel producers, significant greenhouse gas and clean air benefits from increased biofuels usage and soil benefits from the cultivation of a feedstock crop that doesn't need superior land and other inputs normally required for oilseeds for food production.

Consortium Members

Agrisoma BioSciences Inc.
 National Research Council –
 Plant Biotechnology Institute

Automotive Fuel Cell Cooperation Corp.**Round 15 2009A****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 47,831,775
 SDTC Funding:
\$ 10,000,000
 Leveraged Funding:
\$ 37,831,775

Advanced Automotive Fuel Cell Development

On-road transportation is one of the largest contributors to greenhouse gas emissions (145 Mt CO₂-eq per year) and smog in Canada. Fuel cells are expected to be a key technology in allowing zero emissions vehicles (ZEVs) to have fully comparable functionality to today's gasoline vehicles and to reach market adoption. The remaining major challenges for fuel cell technology development are related to cost of production and volume manufacturability, as it currently involves the use of exotic and expensive materials such as platinum. The Automotive Fuel Cell Cooperation (AFCC) project aims to develop and demonstrate AFCC's Gen 3 fuel cell stack that is to go into market launch with Daimler's 2014 model year Mercedes Class B fuel cell vehicles. The project aims to reduce the cost of AFCC's fuel cell stack by 85% by changing the stack design architecture to facilitate volume manufacturing while reducing the need for exotic and expensive materials.

Consortium Members

Automotive Fuel Cell Cooperation (AFCC)
 Ford Motor Company
 Daimler AG Group – Research and Mercedes-Benz Car Development

Ballard Power Systems Inc.**Round 15 2009A****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 22,494,665
 SDTC Funding:
\$ 4,796,120
 Leveraged Funding:
\$ 17,698,545

Fuel Cell Module and Electric Drive Development Program

Heavy duty diesel vehicles contribute to almost half of Canada's road transportation GHG emissions and are one of the most material contributors to smog within the road vehicle fleet. This is of particular concern for public transit authorities, whose predominant use of diesel buses exposes them to environmental liabilities and escalating fossil fuel prices. Ballard Power Systems and BC Transit are facilitating the commercialization of fuel cell hybrid buses through the development of critical new technology for the hybrid power train. Ballard will design, assemble, and test key sub-components for the fuel cell module and hybrid electric drive aimed at driving down vehicle cost, improving the durability of select sub-systems, and improving the overall performance of the bus. These design changes will be implemented on ten test buses to be operated by BC Transit and fuelled using waste hydrogen from a sodium chlorate production plant in North Vancouver, British Columbia. The Ballard drive train platform will completely eliminate all emissions from bus tailpipes while meeting the demands of range and duty cycle for virtually any bus route.

Consortium Members

Ballard Power Systems Inc.
 BC Transit

Electrovaya Inc.**Round 15 2009A****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 15,417,409
 SDTC Funding:
\$ 5,065,500
 Leveraged Funding:
\$ 10,351,909

Advanced Battery System for Plug-In Hybrid Electric Vehicles

High energy and power density batteries are currently viewed as the key to enabling the broad deployment of lower emission and zero emission vehicles. Lithium ion based batteries are generally seen as the most promising battery technology platform for achieving an electric vehicle alternative. Electrovaya is proposing to develop and demonstrate its advanced, high energy density Lithium Ion Super-Polymer® battery packs for applications in a test fleet of plug-in hybrid electric vehicle (PHEV) versions of the Ram 1500 pickup from Chrysler Group's Ram Truck Brand. Electrovaya's battery packs have demonstrated the ability to provide greater energy density than competitors using a unique zero-emission cell manufacturing production process with no toxic solvents. The project builds on Electrovaya's previously-funded SDTC project and includes the development of advanced cells and battery modules, the development of a higher throughput battery cell and module production line, and the lifetime performance validation of battery packs to establish the commercial value of spent automotive packs.

Consortium Members

Electrovaya Inc.
 Chrysler LLC
 Province of Ontario

Entropex a partnership of Unitec Inc. and 629728 Ontario Limited**Round 15 2009A****Environmental Benefits: Climate Change / Clean Air / Clean Water / Clean Soil**

Total Project Value:
\$ 24,479,877
 SDTC Funding:
\$ 6,330,000
 Leveraged Funding:
\$ 18,149,877

Mixed-Rigid Plastics Recovery Demonstration Facility

Canada generates an estimated 345,000 tonnes of "other" recyclable residential plastics each year. This excludes Polyethylene terephthalate (PET) and High Density Polyethylene (HDPE). Much of this plastic is typically landfilled due to contamination and co-mingling. To address this issue, Entropex will develop and demonstrate an innovative mixed rigid plastic processing plant using near-infrared light to differentiate plastic types along with enhanced washing technology. The plastics are sorted and blended to produce high-quality plastic resin for consumer products that is cost competitive with resin produced directly from petro-chemical sources. The resulting increase in plastic recycling will put less stress on our limited landfill space. The high-quality plastic resin displaces new production, resulting in processing water conservation and GHG emissions reductions.

Consortium Members

Entropex
 Procter & Gamble Company (P&G)
 Klockner-Pentaplast of Canada Inc.
 Ideal Pipe Partnership
 Stewardship Ontario
 City of Guelph
 The University of Western Ontario

Exro Technologies Inc.

Round 15 2009A

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 1,833,616
 SDTC Funding:
\$ 605,093
 Leveraged Funding:
\$ 1,228,523

Exro

Current electric generator technology is hardwired to be most efficient at a specific speed and torque. Once generators drift away from their ideal design speed and torque set points, conversion efficiency diminishes drastically. The variability of wind power leads to continuously changing mechanical loads, leading to reduced conversion efficiency. In order to be less dependant on wind variations, Exro's patented Variable Input Electric Generator (VIEG) takes the approach of continuously "right-sizing" and "right-configuring" the generator to match the prevailing wind load, eliminating the use of gearboxes. The VIEG is expected to be at least 10% less expensive than conventional generators, will lower wind turbine cost by up to 12% largely by eliminating the need for a gearbox, and will increase revenue generation by over 10% through higher net power output for a given wind regime. The SDTC project will demonstrate a 65 kW VIEG unit in a wind turbine at the Canadian Wind Energy Institute of Canada in Prince Edward Island.

Consortium Members

Exro Technologies Inc.
 Endurance Wind Power Inc.

Ferme Olivier Lépine Inc.

Round 15 2009A

Environmental Benefits: Climate Change / Clean Air / Clean Water / Clean Soil

Total Project Value:
\$ 22,755,000
 SDTC Funding:
\$ 7,509,000
 Leveraged Funding:
\$ 15,246,000

Ferme Olivier Lépine, together with its consortium partners, have developed a unique integration of processes from other industries to produce ethanol and important co-products from otherwise unused agricultural waste materials. The consortium will build a 12 million litre per year pilot plant and demonstrate innovative processes and equipment to harvest, pretreat and hydrolyse crop residues, improve fermentation, produce enzymes on-site and produce cellulosic ethanol. The generated co-products will support local agriculture while reducing water and energy consumption. The mid-size scale of the facility and the integration of this unique process with agricultural operations within a local farm community will contribute to the sustainability of the Canadian agricultural sector while offering a biofuel option from non-food feedstocks without the use of additional land.

Consortium Members

Ferme Olivier Lépine Inc.
 Ferme Sébastien Lépine inc.
 Coopérative Profid'Or
 Agriculture et Agri-food Canada
 Danisco USA, Genencor Division
 Humblet Technologies Inc.
 Production Grandeur Nature Inc.

Hydrogen Technology & Energy Corp. (HTEC)**Round 15 2009A****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 11,150,588
 SDTC Funding:
\$ 4,014,212
 Leveraged Funding:
\$ 7,136,376

Hydrogen Infrastructure Technology for Transportation (HITT)
 The current environmental footprint, cost, and overall practicality of existing hydrogen production and delivery practices are all barriers to the broader uptake of “zero emission” hydrogen and fuel cell powered vehicles. HTEC’s Hydrogen Infrastructure Technologies for Transportation (HITT) project will help overcome these challenges by developing low-carbon, cost competitive and practical hydrogen energy infrastructure solutions. The HITT project will: build on a previous SDTC project led by Sacré-Davey by scaling up HTEC’s proprietary by-product hydrogen purification technology to commercial scale, and develop a smaller scale by-product hydrogen liquefaction facility in North Vancouver. The hydrogen will then be used to fuel hydrogen powered buses and trucks. This will add to British Columbia’s Hydrogen Highway initiative and improve the economics and practicality of using locally vented hydrogen as a fuel to reduce the carbon intensity and air contaminants of the transportation sector.

Consortium Members
 Hydrogen Technology & Energy Corp.
 (HTEC)
 Powertech Labs Inc.

MacDonald, Dettwiler and Associates Inc.**Round 15 2009A****Environmental Benefits: Climate Change / Clean Water / Clean Soil**

Total Project Value:
\$ 2,925,010
 SDTC Funding:
\$ 965,253
 Leveraged Funding:
\$ 1,959,757

Ice Camera
 Ice on aircraft surfaces at take-off is a flight safety risk. In response, aircrafts are de-iced using Aircraft De-icing Fluids (ADF) containing ethylene or propylene glycols and additives. Studies have shown that de-icing personnel cannot consistently detect ice on aircraft surfaces. To mitigate this safety risk, operators overspray fluid by a significant amount. It is estimated that 18% of the glycol used in de-icing is released to land and subsequently water courses. MacDonald Dettwiler and Associates Inc. intend to develop and demonstrate an Ice Camera that will meet industry regulatory standards to detect ice on any surface and beneath layers of water or glycol which will be tested by Servisair at Pearson International Airport. This patented method measures the difference in the near infrared optical reflectance of ice and water in specific optical wavelength bands. Commercializing the Ice Camera will provide significant Environmental Benefits: create exports, improve flight safety and reduce aviation operating costs.

Consortium Members
 MacDonald Dettwiler and Associates Inc.
 Servisair Inc.

Morgan Solar Inc.

Round 15 2009A

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 7,195,336
 SDTC Funding:
\$ 2,351,580
 Leveraged Funding:
\$ 4,843,756

Concentrated Photovoltaic Systems

High Concentrating Photovoltaic (CPV) is recognized as being a viable way to deploy solar electricity generating systems with efficiencies (above 25%) greatly superior than other kinds of photovoltaics (typically 14% to 16%). To date, virtually all CPV companies concentrate the sun using a Fresnel lens or curved mirror. As a result of bulky and expensive concentrator optics and support structures, CPV cells have struggled to compete on installed cost (\$/W and \$/kWh) with PV cells. Morgan Solar has developed a patented Light-Guide Solar Optic (LSO) technology which concentrates solar energy in a fraction of the space of competing CPV solutions. This enables system wide cost reductions as a result of the thin, lightweight, and fully sealed acrylic optics that use less complex manufacturing techniques. A 50% reduction in \$/W of installed costs (reaching less than \$3/W for a fully installed system) can potentially shorten the economic payback period for large-scale solar farms by several years.

Consortium Members

Morgan Solar Inc.
 Upper Canada Solar
 Generation Ltd. (UCSG)
 University of Ottawa, SUNLab
 Port Dover Farms Inc.

NutraCanada

Round 15 2009A

Environmental Benefits: Climate Change / Clean Water / Clean Soil

Total Project Value:
\$ 9,920,622
 SDTC Funding:
\$ 1,900,000
 Leveraged Funding:
\$ 8,020,622

Demonstration on an Innovative and Efficient Extraction Process for the Production of High Quality Vegetable Powders and Extracts

In Canada, up to 50% of fruits and vegetables produced are wasted at various stages of production, harvesting, transport and storage. A significant portion of these fruits and vegetables currently ends up in landfills. Meanwhile, the multi-billion dollar functional food and health food market relies on expensive extraction processes for nutrients, requiring Grade 1 fruits and vegetables grown in premium soil conditions. Nutra Canada is proposing an economically and environmentally superior nutrient extraction process to serve this growing global demand. This process is different from the current extraction methods because it works on fruit and vegetable residues rather than on the fruit themselves, providing better margins than conventional approaches due to much lower feedstock and energy costs. It also allows better preservation of active ingredients than competing technologies. By avoiding the use of land to grow fruits and vegetables strictly for the production of functional and health food, Nutra Canada improves the yield of prime quality soils and conserves water that would otherwise be needed for irrigation. Nutra Canada plans to build a pilot plant near an existing landfill.

Consortium Members

NutraCanada
 Onipro
 Vert Nature
 Atrium-Innovation
 Fruit d'Or
 Biscuits Leclerc
 Agence de l'efficacité de Quebec
 (AEEQ) - Technoclimat

Pulse Energy Inc.**Round 15 2009A****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 8,038,897
 SDTC Funding:
\$ 2,556,801
 Leveraged Funding:
\$ 5,482,096

Energy Management Software Development and Implementation

Emerging climate change regulations, volatile energy prices, peak electricity shortages and the evolution of the smart grid are driving the need in Canada and abroad for improved management of energy use in buildings and communities. Pulse Energy is developing an intelligent energy management platform called Pulse™ that can provide building owners and occupants with accurate and user friendly building energy and resource consumption information. This data can highlight inefficiencies in real time and enable operators to identify and correct the source of the problem, resulting in annual energy savings of up to 25%. Working with its consortium partners, Pulse Energy intends to develop and demonstrate the second generation of its Pulse software platform. This technology will provide Automated Intelligent Troubleshooting which will identify the source of the problem when a building is consuming energy outside of its normal energy use patterns.

Consortium Members

Pulse Energy Inc.
 Brookfield LePage Johnson Controls (BLJC)
 Cisco Systems Canada Co.
 University of British Columbia
 Hartley Bay Village
 Grouse Mountain Resorts
 Department of Western Economic Diversification

SBI BioEnergy Inc.**Round 15 2009A****Environmental Benefits: Climate Change / Clean Air / Clean Water / Clean Soil**

Total Project Value:
\$ 6,161,571
 SDTC Funding:
\$ 1,875,495
 Leveraged Funding:
\$ 4,286,076

Novel Heterogeneous Catalyst-Based Continuous Biodiesel Production Technology

A key challenge in current biodiesel production is the complex and capital-intensive chemical processes. SBI BioEnergy's innovative single-step biodiesel reactor is a modular and scalable technology designed to eliminate 62% of the capital costs and 12% of the operating costs compared to current biodiesel production. This is achieved by replacing the current aqueous consumable chemical catalysts and water requirements with a combination of reaction-specific solid catalysts that are not consumed, do not require additional water, are durable and can be regenerated if necessary. The process is more cost effective and energy efficient, while drastically reducing consumption of water and other chemicals. The single-step continuous process also eliminates 90% of the footprint, making it ideal for retrofitting and upgrading existing biodiesel facilities.

Consortium Members

SBI BioEnergy Inc.
 CanGen Energy Corp.
 Olds College School of Innovation
 novaNAIT
 Alfa Laval Inc.
 Spartan Controls
 AVAC Ltd.
 Alberta Energy
 SBI Fine Chemicals Inc.

Terragon Environmental Technologies Inc.

Round 15 2009A

Environmental Benefits: Clean Water / Clean Soil

Total Project Value:
\$ 7,356,747
 SDTC Funding:
\$ 2,874,000
 Leveraged Funding:
\$ 4,482,747

Demonstration of Wastewater Electrochemical Treatment Technology (WETT)

Isolated communities that have no municipal wastewater treatment systems face a tremendous challenge if they wish to safely discharge their wastewaters. Two factors hamper the environmentally sound treatment and discharge (or re-use) of these wastewaters: a lack of simple-to-use technologies and the difficulty of obtaining required supplies. Terragon's Wastewater Electrochemical Treatment Technology (WETT) system has been conceived for these communities. The WETT operates on electricity, does not use chemicals or biological treatment and does not require specially-trained personnel. The system is compact, robust and capable of intermittent operation. It can be adjusted to handle almost any type of wastewater and can provide tertiary treatment. WETT effectively treats organic and inorganic contaminants (suspended or dissolved), persistent organic pollutants such as pharmaceutical residues, and pathogens. Terragon will demonstrate the WETT technology in a Canadian Coast Guard vessel, a merchant marine vessel, a remote resort, a private home, as well as at its own facilities.

Consortium Members

Terragon Environmental Technologies Inc.
 Transport Desgagnés
 Jouvence Base de Plein Air Inc.
 Canadian Coast Guard
 Sawmill Creek Lumber Ltd.

Round 14 – Board Approval June 2009

Canadian Pallet Council

Round 14 2008B

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 2,456,347
 SDTC Funding:
\$ 1,070,967
 Leveraged Funding:
\$ 1,385,380

CTSWEB – ECT Electronic Container Transfer

Millions of pallets and other returnable assets are used across Canada to ship goods every year. Every kilometer traveled to collect and return these to their source, often in less than full loads, is a cost and generates emissions from transport truck engines. To address this, the Canadian Pallet Council (CPC) is planning to demonstrate an enabling software and multi-party trading system to track and electronically reconcile pallet ownership with the intent to minimize transportation and handling costs while alleviating road traffic and reducing diesel engine pollution. It accomplishes this by virtually reconciling balances of pallets owing between multiple locations, with the result being a smaller number of shorter-distance physical exchanges. The opportunity extends to other returnable container assets such as cages, totes, plastic pallets, thermal covers, milk crates and bread trays. The proposed pallet exchange system aims to reduce the transportation of empty returnable containers, reducing transportation costs and associated greenhouse gas emissions.

Consortium Members

Canadian Pallet Council
 iLogic Inc.

Deane and Co. Inc.**Round 14 2008B****Environmental Benefits: Clean Water / Clean Soil**

Total Project Value:
\$ 1,499,904
 SDTC Funding:
\$ 595,000
 Leveraged Funding:
\$ 904,904

ENU-BioDechlor XL

In Canada, there are over 3,000 sites contaminated by chlorinated solvents that limit the land use and potentially threaten public health. The current practice is to leave the solvents in situ and clean contaminated sites via expensive excavation or apply treatments that only work in saturated conditions. Deane, a leading solvent provider, and Enutech, a technology developer, have formed a partnership to develop “EnuBioDechlor XL”. In combination with special bacteria, this new technology converts chlorinated solvents on contaminated sites into non-toxic and environmentally harmless volatile compounds in-situ. This technology also minimizes the upheaval for the treated lands and can even be used on occupied lands. This technology intends to reduce remediation costs considerably compared to the current methods, while increasing the number of sites where decontamination will be feasible. “EnuBioDechlor XL” thus will allow a greater number of existing business and property owners to assume their environmental responsibilities.

Consortium Members

Deane and Co. Inc.
 Enutech Inc.
 Université du Québec à Montréal
 (UQAM)
 Les Forages Liégeois Inc.

Duopar Technologies Inc.**Round 14 2008B****Environmental Benefits: Clean Air / Clean Water / Clean Soil**

Total Project Value:
\$ 5,156,619
 SDTC Funding:
\$ 2,100,000
 Leveraged Funding:
\$ 3,056,619

Composite Railway Infrastructure Products

Soil and run off water pollution from the decomposition of creosote covered rail ties and railway crossings is a 200 year legacy problem in Canada. Duopar Technologies Inc. has developed 100% waste-based composite rail infrastructure products from difficult to recycle plastic and asphalt wastes. Their use alleviates leaching of toxic creosote chemicals into the surface soil and waterways while meeting railway specifications. Over 20 million railway ties are consumed in North American every year, and each tie leaches up to 15kg of creosote over its lifetime. Duopar’s technology aims to eliminate this problem with an environmentally friendly and economical alternative.

Consortium Members

Duopar Technologies Inc.
 Canadian Imperial Railway
 Vox Clamantis
 Sheridan Institute of Technology
 and Advanced Learning

Eco-Ag Initiatives Inc.

Round 14 2008B

Environmental Benefits: Climate Change / Clean Air / Clean Water / Clean Soil

Total Project Value:
\$ 5,791,615
 SDTC Funding:
\$ 1,948,000
 Leveraged Funding:
\$ 3,843,615

Optimizing Nutrient Flows

Eco Ag Initiatives Inc. in combination with their consortium partners has developed a process that integrates several basic technologies to transform wastes into available nutrients for crop production or horticultural use. The technology continuously hydrolyzes organics to achieve maximum biogas production while simultaneously eliminating potential pathogens such as prions, bacteria and viruses. The plant design will recover available nutrients from waste streams with zero effluent discharge. Nutrients recycled from wastes will help supply the global demand for nutrients required for sustainable plant growth and for soil amendments in areas requiring reclamation.

Consortium Members

Eco-Ag Initiatives Inc.
 Alberta Agriculture and Rural
 Development (AARD)
 Interactive Management Group

Imtex Membranes Corp.

Round 14 2008B

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 8,735,378
 SDTC Funding:
\$ 2,753,948
 Leveraged Funding:
\$ 5,981,430

Membrane Technology for Olefin-Paraffin Separation

Olefin (ethylene/propylene) production is a \$100 billion, energy-intensive industry and the current method for separating olefins and paraffin is the most energy-consuming step in the production process. Imtex intends to develop and demonstrate a membrane technology made of composite material that is permeable to the targeted olefins while restricting paraffin and other gases. The Imtex membrane technology is designed to be 30-90% more energy efficient than the incumbent cryogenic distillation for separating olefin and paraffin in the petrochemicals industry depending on the mode of application. If successful, this technology could reduce GHG/NOx emissions by up to 90% for the separation stage.

Consortium Members

Imtex Membranes Corp.
 Monteco Ltd.
 Shaw Canada L.P.

Lignol Innovations Ltd.

Round 14 2008B

Environmental Benefits: Climate Change / Clean Air / Clean Soil

Total Project Value:
\$ 20,632,000
 SDTC Funding:
\$ 6,871,685
 Leveraged Funding:
\$ 13,760,315

Lignol's Generation 2 Biorefinery Technology

The successful commercialization of next-generation biofuels will be enhanced by the development of bio-refineries with the ability to generate multiple co-products and handle diverse feedstocks, including agricultural residues and long dead, beetle killed, Lodgepole pine. Building on the successes of its current pilot-scale bio-refinery, Lignol Innovations intends to develop and demonstrate new innovative technologies that will make greater utilization of the hemilcellulose derived sugars by conversion to an additional yield of ethanol and other sugar platform chemicals such as glycols. The project also aims to demonstrate higher value applications for lignin including application to various high quality resin blends. If successful, this project will further improve the environmental and economic benefits of cellulosic ethanol facilities.

Consortium Members

Lignol Innovations Ltd.
 Hydrogen Technology & Energy Corp.
 (HTEC)
 HA International LLC
 British Columbia Timber Sales
 S2G Biochemicals Inc
 BC Liquid Fuel From Biomass Initiative
 BC Bioenergy Network (BCBN)
 Ethanol BC

MEG Energy Corp.**Round 14 2008B****Environmental Benefits: Climate Change**

Total Project Value:
\$ 13,516,606
 SDTC Funding:
\$ 4,270,000
 Leveraged Funding:
\$ 9,246,606

MEG Field Upgrading Process

Bitumen extracted from the oil sands requires upgrading to remove asphaltenes and other residuals before it can be fed to a conventional refinery for final processing into end products. This upgrading is an energy and capital intensive process. Additionally, the transportation of bitumen via pipeline to a central upgrader or refinery also requires the use of diluent to reduce viscosity and facilitate bitumen flow. This diluent is the largest component of bitumen production and transportation costs. MEG proposes to demonstrate a field upgrading technology which can negate the need for diluent in transportation while reducing the energy intensity of the upgrading by more than 20%. This results in lower greenhouse gas emissions, higher netbacks from the reduced bitumen price differential, elimination of diluent and enhanced access to downstream markets. In addition, the upgrading by-products (asphaltene) can be used as feedstock for a clean energy technology, which can convert asphaltenes into produce pipeline quality synthetic natural gas, syngas, or hydrogen or as fuel for steam generation with integrated carbon capture.

Consortium Members

MEG Energy Corp.
 Western Research Institute
 Alberta Innovates - Energy and
 Environment Solutions

Saltworks Technologies Inc.**Round 14 2008B****Environmental Benefits: Climate Change / Clean Water**

Total Project Value:
\$ 7,897,987
 SDTC Funding:
\$ 2,612,638
 Leveraged Funding:
\$ 5,285,349

Low-Energy Desalination Demonstration

Access to clean water is a global issue, with current estimates that approximately 2.8 billion people will be living in water scarce areas by 2025. Saltworks Technologies Inc. is developing a desalination system that reduces electrical energy requirements by up to 80%, thereby improving the affordability and accessibility of clean water. The system is powered by an innovative and inexpensive low temperature thermal energy conversion system that can use solar energy or process heat to reduce electricity consumption. The Saltworks' technology has two distinct applications: salt water treatment and oil sands brackish water processing. The project involves building and testing a 1,000 liter/day transportable pilot plant for seawater treatment and a 50,000 liter/day small scale commercial hybrid plant, combined with reverse osmosis, to treat brackish water from SAGD operations. This novel desalination technology is expected to operate without chemicals while avoiding the harmful salt loading that is often associated with other desalination approaches.

Consortium Members

Saltworks Technologies Inc.
 Powertech Labs Inc.

Soane Energy (Canada) Inc.

Round 14 2008B

Environmental Benefits: Climate Change / Clean Water

Total Project Value:
\$ 11,443,149
 SDTC Funding:
\$ 3,032,434
 Leveraged Funding:
\$ 8,410,714

Innovative Oil Sands Tailings Treatment Technology

According to the Alberta Energy Resources Conservation Board (ERCB), tailings ponds arising from oil sands surface mining operations currently cover an area of over 130 M square metres with some 720 M cubic metres of fine tailings (FT) collected. ERCB recently issued Directive 074 which requires oil sands operators to reduce the amount of FT going into liquid tailings by 50% by 2013 and to turn captured FT into stackable deposits ready for reclamation. Soane Energy has developed a novel process based on using polymers to attach the fine clay particles to heavier sand particles in tailings to facilitate separation and settling. The resultant aggregate is a solid material with high stability that meets the ERCB Directive requirements. Soane's technology can directly treat tailings from the extraction plant and therefore potentially eliminate the need for tailings ponds, enabling immediate water recycling and heat recovery.

Consortium Members

Soane Energy (Canada) Inc.
 Soane Energy LLC
 Syncrude Canada Ltd.

Statoil Hydro Canada Ltd.

Round 14 2008B

Environmental Benefits: Climate Change / Clean Water

Total Project Value:
\$ 38,791,337
 SDTC Funding:
\$ 6,000,000
 Leveraged Funding:
\$ 32,791,337

SOLVE

The SOLVE project seeks to improve the current dominant method for in-situ oil sands recovery, steam-assisted gravity drainage (SAGD), by adding solvents to the injected steam. The steam/solvent co-injection technology (SCI) takes advantage of the properties of solvents to enhance bitumen mobility and facilitate extraction with reduced steam use. The result is up to 25% lower energy input and water consumption compared to conventional SAGD. A 20% increase in bitumen production is also possible due to the ability of solvents to penetrate deeper into the bitumen bearing zone. StatoilHydro plans to develop, build and operate the pilot facility, contributing technical and financial resources to develop the technology to commercial use, and the PTRC will design and manage the technology development.

Consortium Members

Statoil Hydro Canada Ltd.
 Schlumberger
 Alberta Innovates - Technology Futures

SunSelect Produce (Delta) Inc.**Round 14 2008B****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 3,535,139
 SDTC Funding:
\$ 1,072,425
 Leveraged Funding:
\$ 2,462,714

Wood Fired Heat and CO₂ Recovery Plant

Greenhouses typically burn fossil fuels for heating and combust natural gas or use bottled gas for CO₂ enrichment to accelerate photosynthesis. The SunSelect system aims to avoid fossil-based heating and CO₂ production by using biomass-based combustion with gas cleaning and CO₂ storage. When heat is required (on cool nights and during cold seasons), they will capture, clean, and store CO₂ using a novel storage technique. The CO₂ will be used the next day to promote plant growth when the sun shines. The system aims to eliminate natural gas combustion, increase heat recovery by 20%, reduce particulate matter, increase plant growth, reduce costs and generate GHG credits.

Consortium Members

SunSelect Produce (Delta) Inc.
 Procede Gas Treating BV
 Natural Resources Canada - CANMET
 (NRCan - CANMET)
 Svensk Rokgasenergi AB
 Vyncke Energietechnik NV

Sunwell Technologies Inc.**Round 14 2008B****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 6,516,193
 SDTC Funding:
\$ 2,800,000
 Leveraged Funding:
\$ 3,716,193

Deepchill Thermo Battery Refrigerated Transportation System

Presently, all perishable products are transported by refrigerated containers, trucks and railroad cars cooled with expensive, highly inefficient portable diesel refrigeration units. They are then stored in refrigerated warehouses and stores cooled by mechanical refrigeration systems that require a continual power supply and circulation of hazardous gases. Sunwell is developing a new Thermo Battery system for transportation applications to work in conjunction with its existing commercial Deepchill technology that will greatly reduce the cost and environmental footprint of industrial refrigeration. Thermo Batteries are versatile rechargeable panels containing ice slurry which can be used to meet the entire refrigeration needs of grocers and food distributors from warehouse storage, to transportation for distribution, to store shelf cooling. The project aims to develop and demonstrate the Deepchill-Thermo Battery systems for the transportation refrigeration of perishable products in truck containers, rail containers and trolleys. The Thermo Batteries will allow the elimination of diesel gensets, dedicated fuel tanks and cooling coils filled with environmentally hazardous gases from the existing refrigerated transport fleet.

Consortium Members

Sunwell Technologies Inc.
 Loblaw's Inc.
 Burnac Produce Ltd.
 CANMET Energy Varennes
 Etablissements Franz Colruyt

Thermalfrost Inc.

Round 14 2008B

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 11,960,831
 SDTC Funding:
\$ 3,943,931
 Leveraged Funding:
\$ 8,016,900

Environmental Refrigeration

Fuel for refrigeration consumes up to 30% of the diesel fuel volume on ocean going fishing ships that clean, process and freeze their catch while staying days or even weeks at sea. By harnessing waste heat from conventional diesel ship engines, Thermalfrost's Double Mechanism Sorptive Refrigeration (DMSR) thermal compressor could eliminate much of the fuel consumed for cooling and freezing systems. This novel technology, as a new or retrofitted system, intends to achieve sub zero refrigeration temperatures (-28C) from relatively low temperature waste heat (115C) exchanged from engine coolants or from flue gas recovery. The environmental benefits include a source reduction of combustion emissions leading to cleaner air and lower climate change impact. Implementation of this technology could lead to more time at sea, higher productivity from fishing activities, as well as reduced safety risks from travel or fishing in unsafe conditions due to fuel/time constraints.

Consortium Members

Thermalfrost Inc.
 Clearwater Seafood
 Carleton University
 Puerto de Celeiro
 Ariema
 Centro Tecnológico de la Pesca

Titanium Corp. Inc.

Round 14 2008B

Environmental Benefits: Climate Change / Clean Water / Clean Soil

Total Project Value:
\$ 20,258,526
 SDTC Funding:
\$ 6,292,636
 Leveraged Funding:
\$ 13,965,890

Creating Value and Reducing Emissions by the Recovery of Valuable Products from Oil Sand Tailings

The Canadian oil sands mining industry is heavily reliant on water. Titanium Corporation is developing a process that adapts technologies from bitumen and mineral extraction to reduce the use of fresh water, increase water recycling and recover valuable products from oil sand tailings. The process uses cyclone separation, solvent washing, flotation, boiling point differences and flocculation to separate valuable products, prepare water for recycling and prepare residual tailings for disposal. The process is expected to reduce the amount of fresh water used by oil sands mining operations by over 10% and reduce the volume of water going to tailings ponds.

Consortium Members

Titanium Corp. Inc.
 Government of Alberta -
 Department of Energy
 Syncrude Canada Ltd.
 Sojitz Corp.
 Canadian Natural Resources Ltd.
 Suncor Energy Oil Sands L.P.

Xogen Technologies Inc.**Round 14 2008B****Environmental Benefits: Clean Water / Clean Soil**

Total Project Value:
\$ 6,580,348
 SDTC Funding:
\$ 1,974,104
 Leveraged Funding:
\$ 4,606,244

Xogen's Pilot Plant

In Canada, most municipalities use a biological treatment process for wastewater treatment that has high capital and operating costs, requires large areas of urban land, and produces a mostly organic waste that can be a disposal challenge. Xogen proposes to develop and demonstrate an electro-chemical wastewater treatment process that degrades organic waste contaminants commonly found in waste water, and has the potential to treat emerging contaminants such as pharmaceuticals and personal care products. Unlike conventional activated sludge treatment, the Xogen process does not produce residual biosolids which require additional treatment and disposal. The technology is expected to result in improved efficiency and effectiveness of municipal wastewater treatment while significantly reducing the land requirements for wastewater treatment plants.

Consortium Members

Xogen Technologies Inc.
 Town of Orangeville
 University of Toronto
 Orangeville Hydro Limited
 Linde Canada Ltd..

Round 13 – Board Approval November 2008**A.U.G. Signals Ltd.****Round 13 2008A****Environmental Benefits: Climate Change / Clean Air / Clean Water**

Total Project Value:
\$ 5,292,490
 SDTC Funding:
\$ 1,746,522
 Leveraged Funding:
\$ 3,545,968

Intelligent Drinking Water Monitoring System

A.U.G Signals Ltd.. will develop and demonstrate the Intelligent Drinking Water Monitoring System (IDWMS), an early warning digital signal processing software system with associated sensor sites. The IDWMS enables the improved detection of contaminants and leaks in municipal drinking water distribution networks. The project will use the Edmonton water system to demonstrate improved monitoring and management of a water distribution network resulting in anticipated reduction of potential water loss, contamination and risks to public health.

Consortium Members

A.U.G. Signals Ltd.
 EPCOR Water Services Inc.
 Communications Research
 Centre Canada
 National Water Research Institute
 University of Toronto
 Fuseforward International Inc.
 University of Calgary
 Dr. George Lampropoulos
 & GEOMAR Properties

Alterna Energy Inc.

Round 13 2008A

Environmental Benefits: Climate Change / Clean Air / Clean Water

Total Project Value:
\$ 8,891,092
 SDTC Funding:
\$ 1,254,317
 Leveraged Funding:
\$ 7,636,775

Scale Up to Commercial Plant

Alterna Energy Inc. will build and demonstrate a multi-module biocarbon production facility that will convert 110,000 tonnes of green wood residues (bark, forest waste including pine-beetle infested wood, hog fuel and sawmill residues) annually into 25,000 tonnes of biocarbon. The process can cost effectively carbonize and pelletize almost any form of biomass with virtually no external energy inputs. The biomass to biocarbon conversion process is extremely fast (1.5 hours versus the traditional 2-5 days) with high yields (80% to 90% on a carbon basis) and the biocarbon product can be pelletized and used as a more efficient alternative to wood pellets. Since the physical and chemical properties of biocarbon are similar to coal, the product can be utilized in existing coal-fired generating stations with limited modifications.

Consortium Members

Alterna Energy Inc.
 National Research Council - Institute for Fuel Cell Innovation
 All Wood Fibre Ltd.

dPoint Technologies Inc.

Round 13 2008A

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 3,582,961
 SDTC Funding:
\$ 1,531,394
 Leveraged Funding:
\$ 2,051,568

Commercialization of High Efficiency ERV Core

dpoint Technologies Inc. will demonstrate a low cost, high performance polymer membrane used to recover sensible (heat) and latent (moisture) energy in residential and small commercial units. Building on its previous work developing heat and humidity exchangers for the fuel cell industry, dpoint has produced an Energy Recovery Ventilator (ERV) “cartridge” using a patented pleating technique. With a total effectiveness of up to 65% (using counter cross flow core) for both cooling and heating, it will add another 10% in building energy savings while increasing the quality of the air, and will not freeze in winter like current ERV's. This three-year project will focus on improving smaller decentralized Heating, Ventilating, and Air Conditioning (HVAC) systems at low and medium ventilation rates and measure heating and cooling load reduction.

Consortium Members

dPoint Technologies Inc.
 Ecologix Heating Technologies
 Windmill Development Group
 Tridel Corporation

EcoSynthetix Corp.

Round 13 2008A

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 5,088,882
 SDTC Funding:
\$ 1,679,331
 Leveraged Funding:
\$ 3,409,551

Replacement of Petroleum Based Latex Binder in Coated Recycled Box Board

EcoSynthetix Corp. in conjunction with its consortium partner Cascades will demonstrate its proprietary high tech biolatex binder, a latex produced from renewable feedstocks, as an alternative to petrochemical products used as binders in coated recycled paper-board manufacturing processes. The high cost of oil and the need for improved Environmental Benefits: have forced manufacturers to find an appropriate and competitive alternative to these products. With performance capabilities equal to or greater than the standard oil based products at a lower price, the use of biolatex binder will result in multiple Environmental Benefits: including significant greenhouse gas emission reductions and higher usage of recycled paper, as well as reduced production costs.

Consortium Members

EcoSynthetix Corp.
 Cascades Canada Inc.

General Fusion Inc.**Round 13 2008A****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 63,548,185
 SDTC Funding:
\$ 13,897,455
 Leveraged Funding:
\$ 49,650,730

Acoustically Driven Magnetized Target Fusion

To date, attempts at fusion reactions with the objective of producing power have been extremely complex and expensive. General Fusion Inc. is developing fusion technology which uses acoustic waves to create a fusion reaction, thereby generating inexpensive and plentiful electricity without greenhouse gas emissions, pollution, or long lived radioactive waste streams. General Fusion is embarking on the second phase of its technology development which involves the construction of the core components and the assembly of a full scale engine to demonstrate attractive conversion efficiencies. The project will verify the technical and economic viability of General Fusion's Acoustically Driven Magnetized Target Fusion technology. General Fusion's engine, when commercialized, has the potential to displace traditional fossil fuel energy sources, greatly reducing greenhouse gas emissions. General Fusion's demonstration will produce 600MJ of thermal energy per cycle.

Consortium Members

General Fusion Inc.
 Los Alamos National Laboratory

GreenField Ethanol Inc.**Round 13 2008A****Environmental Benefits: Climate Change / Clean Air / Clean Water / Clean Soil**

Total Project Value:
\$ 42,920,462
 SDTC Funding:
\$ 13,000,000
 Leveraged Funding:
\$ 29,920,462

GFE-Biochemical Lignocellulosic Ethanol Demonstration Project

GreenField Ethanol Inc. (GFE) proposes to demonstrate a biochemical technology process for lignocellulosic ethanol production which addresses many of the issues producers are currently facing, including the costs of feedstock supply and pretreatment processes, the efficiency of conversion processes, the high cost of enzymes for hydrolysis, the cost of concentration and purification and the value of co-products. This process will be integrated into an existing ethanol facility on a pre-commercial, pilot scale using corn cobs – the non-food residuals from harvesting corn – as the feedstock. The consortium has developed improved pretreatment and enzymatic hydrolysis processes that could be applied to first generation ethanol facilities so they can be retrofitted to second generation facilities. If successful, GFE estimates conservatively the ability to produce 70 million litres per year of ethanol, based solely on corn cobs, at commercial scale by 2015.

Consortium Members

GreenField Ethanol Inc.
 Andritz Ltd.
 Natural Resources Canada (NRCan)

Innoventé Inc.

Round 13 2008A

Environmental Benefits: Climate Change / Clean Water / Clean Soil

Total Project Value:
\$ 7,200,042
 SDTC Funding:
\$ 2,730,526
 Leveraged Funding:
\$ 4,469,517

Innoventé St-Patrice

Innoventé and its partners will further develop and demonstrate the SHOC™ (Drying and Sanitization by Controlled Oxidation) technology, a drying process used to transform organic residues like manures, municipal sewage, food processing wastes and pulp and paper mill sludges, into a bio-energy material called BEFOR (BioEnergy From Organic Residues). BEFOR is a dry, odourless, aseptic product with a high calorific value which is ideal as a green renewable energy source. Most organic residues have to be dried in order to have value for energy applications. The SHOC™ technology uses the heat recovered from composting and other sources of renewable energy to finish drying the granular biomass and to produce a bio-energy material. The SHOC™ technology uses up to six times less energy than conventional drying methods, thus greatly limiting adverse environmental impacts. BEFOR has a high energy content and can alleviate the supply shortage of biofuels, substitute fossil fuels or be used as a soil nutrient.

Consortium Members

Innoventé Inc.
 Institut de Recherche et de Développement en Agroenvironnement inc. (IRDA)
 F. Menard inc.
 Kruger Inc.
 Biodryer Manufacturer
 Agence de l'efficacité énergétique du Québec (AEEQ)

Integran Technologies Inc.

Round 13 2008A

Environmental Benefits: Climate Change / Clean Air / Clean Water

Total Project Value:
\$ 4,520,464
 SDTC Funding:
\$ 1,500,000
 Leveraged Funding:
\$ 3,020,464

Environmental Alternative for Hard Chrome Plating

Integran Technologies Inc. will demonstrate the use of Nanovate™ CR nanometal coating in aerospace, automotive shock, and industrial valve applications. This technology can be used to manufacture functional coatings that have exceptional sliding wear and corrosion protection. The coating properties make it an excellent alternative for hard chrome in a wide variety of applications. Existing hard chrome plating processes are a workplace concern given the associated health impacts from exposure such as lung cancer and nasal septum and skin ulcerations. The highly efficient coating process to be demonstrated in this project is expected to avoid these health issues, as well as reduce greenhouse gas emissions and water pollution from the coating process.

Consortium Members

Integran Technologies Inc.
 Morph Technologies Inc.
 Pratt & Whitney Canada Corporation
 University of Toronto

Nexterra Energy Corp.**Round 13 2008A****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 17,563,845
 SDTC Funding:
\$ 5,518,777
 Leveraged Funding:
\$ 12,045,067

IC Engine Demo

Nexterra Energy Corp. will demonstrate an innovative biomass gasification-to-internal combustion engine (BG-ICE) system for small-scale (2-20MWe), distributed power generation. The system – the first to allow direct firing of an ICE using syngas – is expected to set a new standard for converting biomass to electricity, with simple-cycle efficiencies of more than 20% over conventional steam-based power. The system works by gasifying biomass residue using Nexterra's patented up-draft gasification technology to produce a clean synthesis gas (syngas). The syngas is then treated in a proprietary conditioning system prior to directly firing the syngas into a high-efficiency internal combustion engine.

Consortium Members

Nexterra Energy Corp.
 General Electric Energy (GE)
 University of British Columbia

Performance Plants Inc.**Round 13 2008A****Environmental Benefits: Climate Change / Clean Water / Clean Soil**

Total Project Value:
\$ 1,412,221
 SDTC Funding:
\$ 526,645
 Leveraged Funding:
\$ 885,576

Improved Cellulosic Conversion

The ability to efficiently convert cellulosic feedstocks to ethanol is essential to the success of next-generation ethanol initiatives. Performance Plants Inc. (PPI) will use its advanced trait development methodology to modify the cell wall structure of cellulose fibres which will make it easier to release useable sugars that can then be more easily converted into alcohols. The advantages of easily releasable sugars from the cell wall translate in the ethanol production process by: lowering energy requirements which reduce emissions, lowering enzyme requirements and accelerate processing times, as well as producing additional value added chemicals. PPI will apply its successful trait technology, developed for the agriculture sector, to enhance the yield of dedicated, non-food energy crops.

Consortium Members

Performance Plants Inc.
 Alberta Innovates - Technology Futures
 Agriculture Environment Renewal
 Canada Inc.
 Cennatek Bioanalytical Services

SunCentral Inc.

Round 13 2008A

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 6,292,949
 SDTC Funding:
\$ 2,045,208
 Leveraged Funding:
\$ 4,247,740

Solar Canopy Illumination System Development

The SunCentral Solar Canopy Illumination System provides daylighting to the core of multistory buildings using low cost tracking mirrors and simple light guides in a modular design. The technology consists of two sets of components: one that collects the sunlight on the exterior façade (the solar canopies) and a second one that distributes it up to 20 metres into the building core (the solar light guides). This technology, made of components expected to have a lifetime of more than 30 years, can be easily retrofitted into existing buildings undergoing renovations or included into the design of new buildings. It is expected to cost effectively reduce energy for standard commercial building lighting by at least 25%.

Consortium Members

SunCentral Inc.
 University of British Columbia
 British Columbia Institute of
 Technology (BCIT)
 BC Hydro
 Natural Resources Canada
 3M Canada Company
 Ledalite Architectural Products
 Busby Perkins and Will Architects
 Morrison Hershfield
 York Communications
 Public Works and Government
 Services Canada
 Advanced Glazing Systems Ltd..

Vive Crop Protection Inc.

Round 13 2008A

Environmental Benefits: Climate Change / Clean Air / Clean Water / Clean Soil

Total Project Value:
\$ 11,281,904
 SDTC Funding:
\$ 3,954,706
 Leveraged Funding:
\$ 7,327,198

NANO

Vive Crop Protection Inc. has developed a disruptive nano-technology platform to cost effectively produce nanoformulations of agricultural chemicals and industrial catalysts, leading to economic and Environmental Benefits: for all Canadians. The technology allows for the production of ultra-small nanoparticles that don't agglomerate, thereby reducing the amount of chemical product required for a given application. This allows for the production of agricultural chemicals that will have the benefits of reducing spray water use rates and lowering contaminants in soil, as well as nanoformulations of catalysts that will decrease energy requirements for industrial production. This three-year project will involve constructing a manufacturing pilot plant at approximately half industrial scale, optimization of the nanoformulations and manufacturing processes, production, characterization of the products, and field trials of the end products.

Consortium Members

Vive Crop Protection Inc.
 University of Alberta- Biological Sciences
 NOVA Chemicals Corp.
 Advanced Material Resource
 Technologies Inc. (AMR Technologies)
 University of Western Ontario

Round 12 – Board Approval June 2008

Aboriginal Cogeneration Corporation

Round 12 2007B

Environmental Benefits: Climate Change / Clean Air / Clean Water / Clean Soil

Total Project Value:
\$ 8,271,332
 SDTC Funding:
\$ 2,738,708
 Leveraged Funding:
\$ 5,532,624

Ashcroft Biomass to Energy Demonstration Project

Aboriginal Cogeneration Corp. (ACC) will demonstrate, in a small scale gasifier with new syngas scrubbing technology, that it can safely process waste creosote railway ties, and a wide variety of other biomass waste materials, while cogenerating electricity and process heat. This distributed gasification system reduces environmental emissions to acceptable levels and is an environmentally beneficial alternative to stock piling railway ties along tracks, sending them for incineration or land filling them. This technology will provide a sustainable alternative for railway companies in Canada, faced with the annual disposal of the over 3 million ties and addresses the broader need of 25 million scrap ties to be disposed in all of North America. The technology was developed by the Energy and Environmental Research Center (EERC) in Grand Forks, North Dakota, and was licensed to the AAC by the EERC Foundation.

Consortium Members

Aboriginal Cogeneration Corp.
 Canadian Pacific Railway (CP Rail)

Alstom Hydro Canada Inc.

Round 12 2007B

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 15,464,242
 SDTC Funding:
\$ 5,099,325
 Leveraged Funding:
\$ 10,364,917

2.2 MW Tidal Turbine Demonstration

Alstom Hydro Canada Inc. will demonstrate its novel, highly efficient commercial scale tidal turbine that converts the energy of tidal currents into grid ready electricity. This technology has the potential to reduce greenhouse gas emissions while providing Canada with an opportunity to lead the world in the development of the tidal energy industry. The turbine is one of three technologies selected by the Nova Scotia Department of Energy to showcase at its demonstration site being developed in the Bay of Fundy. SDTC has previously supported the successful testing of a pilot scale unit at Race Rock Ecological Reserve, BC. This follow-on project will fully validate Alstom's technology in a commercial setting (grid connected) and help propel tidal energy into a mainstream renewable energy source.

Consortium Members

Alstom Canada Inc.
 Emerson Electric Canada Limited
 Clean Current
 Alstom Hydro France SA

Atlantec BioEnergy Corporation

Round 12 2007B

Environmental Benefits: Climate Change / Clean Air / Clean Water / Clean Soil

Total Project Value:
\$ 5,561,756
 SDTC Funding:
\$ 1,833,482
 Leveraged Funding:
\$ 3,728,274

Atlantec Ethanol Biorefinery

Atlantec BioEnergy Corp. will build a 300,000 litres per year pilot scale ethanol biorefinery in Atlantic Canada, using locally grown sugar beets as the main feedstock. The plant will feature an integrated anaerobic digester, generator set, and nutrient refinery. This first in the world design configuration will result in a net energy neutral and process water neutral facility, while producing ethanol, electricity, and a liquid fertilizer byproduct specifically optimized for the feedstock growing conditions. This technology will offer additional revenue streams for Maritime farmers – who will be required by the company to rotate traditional potato crops on a 3 to 4 year cycle – while helping the soil retain essential nutrients.

Consortium Members

Atlantec BioEnergy Corp.
 Diversified Metal Engineering Ltd.
 Lancaster Propane Gas
 Betaseed, Inc.
 Krieg & Fischer
 Vincent Corporation

BioDiesel Reactor Technologies Inc.

Round 12 2007B

Environmental Benefits: Climate Change / Clean Air / Clean Water / Clean Soil

Total Project Value:
\$ 7,908,032
 SDTC Funding:
\$ 3,448,000
 Leveraged Funding:
\$ 4,460,032

Biodiesel Membrane Reactor

BDR Technologies and its consortia partners will demonstrate the use of a novel biodiesel membrane reactor using low levels of catalyst to produce high quality biodiesel that meets international quality standards without the need for distillation. The objective of the project is to demonstrate the technology in a 4 M litre/year pilot plant. The project will determine commercial scale reactor design, reaction kinetics, control and safety systems, process integration, operating costs for different feedstocks and the environmental footprint of the technology. This new technology is expected to reduce the production cost of biodiesel thereby improving profitability, provide for more alternative feedstock choices and offer quality assurance to the biodiesel industry, while reducing greenhouse gas emissions, and waste water and solids associated with traditional biodiesel production processes.

Consortium Members

BioDiesel Reactor Technologies Inc.
 University of Ottawa

Himark bioGas Inc.**Round 12 2007B****Environmental Benefits: Climate Change / Clean Water / Clean Soil**

Total Project Value:
\$ 10,303,057
 SDTC Funding:
\$ 3,331,976
 Leveraged Funding:
\$ 6,971,081

The Growing Power Integrated BioRefinery

Himark bioGas will build an integrated grain-based ethanol plant near Vegreville, Alberta. The project consists of a 36,000 head cattle feedlot, a 440 tonne/day anaerobic digestion facility, and a 40,000,000 litres per year fuel ethanol plant. Grain that enters the process will be used once to produce ethanol, then to offset a large portion of the ration fed to cattle, and then again in the form of manure feedstock for the anaerobic digester, which produces the energy to power ethanol production. Waste heat from the ethanol production process will be used to maintain the anaerobic process temperature, largely eliminating the consumption of water for ethanol plant cooling; cattle feed water will be used to absorb additional heat from the process. This will reduce water consumption by 50% compared to conventional ethanol plants.

Consortium Members

Himark bioGas Inc.
 Providence Grain Group Inc.
 Growing Power Limited Partnership

Integran Technologies Inc.**Round 12 2007B****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 17,197,659
 SDTC Funding:
\$ 5,616,635
 Leveraged Funding:
\$ 11,581,024

Reduced Emissions through Lightweight Nanometal/Polymer Hybrid Enabled Automotive Components

Integran Technologies Inc. has developed a nanometal polymer hybrid which offers up to 47% weight reduction in engine and drive train vehicle components over equivalent steel parts. The technology combines the cost advantages and formability of plastics with the mechanical properties of metals by marrying high strength nanometal claddings with lightweight polymers. This combination allows new designs that reduce the weight of the parts produced, resulting in improved fuel economy and reduced air emissions. The project focuses on different technology applications such as: fuel rails (for pressure), valve rockers, transmission spool valves, shift forks (for stiffness and load bearing) or transmission damper skates (for wear). The aim of the project is to select applications through a customer engagement process, identify a part and a specific model year and have at least two successful applications demonstrated before production start.

Consortium Members

Integran Technologies Inc.
 Morph Technologies Inc.
 E.I DuPont Canada
 Schaeffler Technologies
 GmbH & Co. KG

Lancaster Wind Systems Inc.

Round 12 2007B

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 1,637,200
 SDTC Funding:
\$ 566,194
 Leveraged Funding:
\$ 1,071,006

Wind to Hydraulic Energy Conversion and Storage

Lancaster R&D intended to develop a hydraulic wind energy system with high capacity storage capabilities. The technology was designed to draw more power from the wind than conventional turbines through the use of robust equipment from the oilfield drilling industry. The system locally stores wind energy using a hydraulic accumulator in conventional high pressure pipeline storage banks, enabling its use as on-demand peak power. The storage technology was also intended for use in conjunction with conventional turbines in retrofit applications. The project aimed to demonstrate a cost effective 1 Megawatt hydraulic wind turbine with 2 Megawatts of energy storage capacity.

Consortium Members

Lancaster Wind Systems Inc.
 Lancaster R&D Inc.
 M&L Developments Ltd.
 Wind Energy Institute of Canada
 (WEICan)
 University of Alberta

Marine Exhaust Solutions

Round 12 2007B

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 5,981,410
 SDTC Funding:
\$ 1,973,865
 Leveraged Funding:
\$ 4,007,545

Demonstration and Certification of the MES EcoSilencer C3

Marine Exhaust Solution (MES) will demonstrate a scaled-up version of its EcoSilencer® cleaning technology that uses seawater to reduce sulphur (SO_x) and particulate matter (PM) emissions from distilled fuel used by large freighters. Under the new International Marine Organization's (IMO) Sulphur Emission Control Area (SECA) standards, ship owners must use higher grade marine diesel fuel or after-treatment to achieve lower SO_x and PM emissions. Marine Exhaust Solution's technology can reduce SO_x emissions by greater than 98% and PM emissions by 50%, and its operating costs are 1 to 2 % of the annual fuel savings, which makes it a viable long-term solution for ship owners.

Consortium Members

Marine Exhaust Solutions
 Beltship Management Limited

MemPore Corporation**Round 12 2007B****Environmental Benefits: Climate Change / Clean Air / Clean Water / Clean Soil**

Total Project Value:

\$ 1,161,633

SDTC Funding:

\$ 493,876

Leveraged Funding:

\$ 667,757**Recycling Used Lubricating Oil using a Plate and Frame Membrane Process**

MemPore Corp. has developed a novel plate and frame polymeric membrane process for refining used lubricating oil from vehicle engines. A large percentage of used motor oil is currently being disposed of in sewers or landfills, and, where it is recycled, the current distillation method is complex, costly, and produces greenhouse gases. Due to the modular design and low cost of the MemPore process, the technology would allow for a small scale plant to be located with a fleet operator or mounted on a skid and delivered to various locations, thereby addressing the harder to reach markets where land-filling is the only disposal option. MemPore's technology is expected to save 15% of the energy and emissions of the current distillation method, and to increase profits made from the sale of the recycled oil up to 32%.

Consortium Members

MemPore Corp.

Lacombe Waste Services

Pathogen Detection Systems**Round 12 2007B****Environmental Benefits: Clean Water**

Total Project Value:

\$ 7,951,272

SDTC Funding:

\$ 2,671,627

Leveraged Funding:

\$ 5,279,644**Water System Monitor and Control**

Pathogen Detection Systems Inc. will demonstrate a portable, on-site, high-speed, fully automated microbiological water monitoring system to detect E.Coli and Total Coliforms in water. Such automation will replace the current slow, cumbersome methods that require manual visual interpretation, reducing time to results by 50 to 80 %, reducing costs and improving test integrity. This project will integrate this new, automated test technology with sophisticated water treatment optimization software resulting in both water and greenhouse gas Environmental Benefits: by improving water plant performance, reducing energy consumption and decreasing toxic water treatment by-products. This technology will improve treated water, enhance public health and continue Canada's role as a leader in clean water technology.

Consortium Members

Pathogen Detection Systems, Inc.

Hydromantis Inc.

Queen's University

University of Toronto

Petroleum Technology Research Centre Inc.

Round 12 2007B

Environmental Benefits: Climate Change

Total Project Value:
\$ 25,006,000
 SDTC Funding:
\$ 5,000,000
 Leveraged Funding:
\$ 20,006,000

CO₂ Capture, Transport and Storage in Deep Saline Aquifers
 The Petroleum Technology Research Centre and its consortium members will demonstrate the feasibility of storing CO₂ in deep saline aquifers – geological formations with storage capacity over 10 times larger than depleted oil reservoirs – in the Western Canadian Sedimentary Basin. The salty water contained in deep saline aquifers is not suitable for drinking or agriculture, making the geological formations an ideal large-scale storage solution for large stationary industrial CO₂ emitters around the world. The Aquistore Project represents the first large scale (500 tonnes/day of CO₂) application of saline aquifer storage of CO₂ in North America and the second largest in the world.

Consortium Members
 Petroleum Technology
 Research Centre Inc.
 Consumers' Co-operative
 Refineries Ltd.
 Enbridge Inc.
 SaskEnergy Inc.
 Schlumberger Carbon Services

Pure Technologies Ltd.

Round 12 2007B

Environmental Benefits: Climate Change / Clean Air / Clean Water

Total Project Value:
\$ 2,474,393
 SDTC Funding:
\$ 795,000
 Leveraged Funding:
\$ 1,679,393

Advancements to Sahara Leak Detection Technology
 Pure Technologies Limited (formerly The Pressure Pipe Inspection Company) will develop and demonstrate an enhanced version of their licensed "Sahara" water pipe leak detection technology that includes higher pressure deployment, video functionality, sewer application, propulsion for no-flow conditions (for example new pipe installations) and improved quantification algorithms. The demonstration will occur in the municipalities of Calgary, Halifax and Toronto. Improved leak detection will result in lower leakage loss of potable water, less disinfection chemical discharges to the environment and less GHG emissions from reduced pumping energy to replace lost water.

Consortium Members
 Pure Technologies Ltd.
 City of Calgary Water Services
 Halifax Water
 Toronto Water

SiXtron Advanced Materials**Round 12 2007B****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 6,464,802
 SDTC Funding:
\$ 1,331,823
 Leveraged Funding:
\$ 5,132,979

New Si-C front and backside passivation and AR coatings for PV solar cells

SiXtron Advanced Materials Inc. intended to develop photovoltaic (PV) manufacturing process technologies to increase the efficiency of crystalline silicon solar cells while enabling the use of thinner silicon wafers, an important industry cost-reduction strategy. Both cost-reduction and performance improvements are needed to further the widespread adoption of solar cells. The SiXtron process technologies include new anti-reflective (AR) coating processes and a new passivation coating process. When combined, the processes intended to increase the relative efficiency of solar cells by up to 10% compared to present day commercially-manufactured cells. SiXtron's technology also intended to replace the current silane source used for solar coatings with a plug-and-play alternative that uses a polymer powder, a material that is easy to ship, handle and manage. Solar cell manufacturers need to eliminate silane to reduce manufacturing cost through better plant safety and increased manufacturing scale. Silane is an extremely hazardous pyrophoric gas that has caused operator fatalities in solar cell manufacturing.

Consortium Members

SiXtron Advanced Materials Inc.
 CaliSolar Inc.
 Semco Engineering Group
 Roth & Rau
 Suntech

Taransys Inc.**Round 12 2007B****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 4,500,000
 SDTC Funding:
\$ 1,500,000
 Leveraged Funding:
\$ 3,000,000

High Efficiency GaN Systems for Transportation

Taransys Inc. will use a Gallium Nitride (GaN) technology to design a normally-off, switching transistor for Hybrid Electric Vehicles which can handle high voltages, high temperatures and alternating currents with much greater control, reliability and efficiency than those currently used. The project will develop an 80A, 600V vertical transistor and an 80A, 600V ultra-fast Schottky diode on GaN substrate assembled and demonstrated in a 4KW, 600V/12V DC to DC converter. This new approach will improve vehicle efficiency by 4%, eliminate the need for a dedicated cooling system for the high power converter, and eliminate the use of existing 12V lead acid batteries for vehicle on-board auxiliary systems.

Consortium Members

Taransys Inc
 Arkansas Power Electronics
 International Inc.

Verdant Power Canada ULC

Round 12 2007B

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 3,768,411
 SDTC Funding:
\$ 1,150,000
 Leveraged Funding:
\$ 2,618,411

The Cornwall Ontario River Energy (CORE) Project

Verdant Power Canada (VPC) will demonstrate a novel River Kinetic Hydropower System (KHPS) which employs arrays of underwater turbines to generate renewable electricity from large, continuously flowing river systems without the need to divert or impound any part of the river's natural flow. This continuous energy source makes the technology an effective complement to base load power, enhancing commercial viability and potential for replication from major urban areas to remote villages near river systems. The project will be conducted in the St. Lawrence River near Cornwall, Ontario.

Consortium Members

Verdant Power Canada ULC
 Verdant Power, Inc.
 Mohawk Council of Akwesasne
 St. Lawrence College of Applied Arts and Technology
 St. Lawrence River Institute of Environmental Sciences
 Ontario Power Authority (OPA)
 Niagara Region Ventures Fund

Western Hydrogen Limited

Round 12 2007B

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 12,614,100
 SDTC Funding:
\$ 4,162,653
 Leveraged Funding:
\$ 8,451,447

Hydrogen Generation through Alkaline Metal Reforming

Western Hydrogen will build a pilot plant to demonstrate its Alkaline Metal Reforming (AMR) process for the production of large volume, high pressure hydrogen. This process can use multiple low cost feedstocks including glycerol, crop waste and petroleum coke / residuals. AMR is expected to have a 35% unit cost advantage over energy intensive and polluting Steam Methane Reforming (SMR), the only commercial scale technology currently available for large volume hydrogen generation. In addition, the process will produce a concentrated stream (over 90%) of CO₂ at high pressure, which will significantly reduce the purification and compression costs associated with CO₂ capture and storage.

Consortium Members

Western Hydrogen Limited
 Aux Sable Canada Ltd.

Round 11 – Board Approval October 2007

Biothermica Technologies Inc.

Round 11 2007A

Environmental Benefits: Climate Change

Total Project Value:
\$ 224,202
 SDTC Funding:
\$ 80,713
 Leveraged Funding:
\$ 1434,89

Oxidation of Methane in Coal Mine Air Exhaust

Biothermica Technologies Inc. and its partner, Hillsborough Resources Ltd., will demonstrate a technology that can oxidize low levels of methane, contained in the ventilation air of underground coal mines, to carbon dioxide. This process reduces GHG emissions and allows the resulting carbon credits to be sold on the carbon trading market. A 1/10th scale demonstration unit will be installed at Hillsborough Resources Ltd.'s Quinsam coal mine near Campbell River, BC.

Consortium Members

Biothermica Technologies Inc.
 Hillsborough Resources Limited

bstNRG.com Inc.**Round 11 2007A****Environmental Benefits: Climate Change / Clean Air / Clean Soil**

Total Project Value:
\$ 3,669,264
 SDTC Funding:
\$ 1,651,169
 Leveraged Funding:
\$ 2,018,095

Demonstration of Community Combined Heat and Power (CHP) District Heating System Using Standardized Agricultural Solid Bio-fuels

Cost-effective distributed energy systems have been a challenge for most small communities. This project will demonstrate a Biomass Combined Heat and Power system in a rural community which uses a variety of distributed agricultural biomass as an alternative to burning coal and other fossil fuels. bstNRG.com Inc., the lead proponent, is developing a two-stage 2 MWth combustor which vitrifies the high silica content associated with straw. bstNRG.com's partners in the project will further develop a low cost feedstock densification technology (biomass cubing) and also a proprietary thermodynamic power cycle to produce hot water and electrical power to demonstrate a district heating system for rural communities.

Consortium Members

bstNRG.com Inc.
 Prairie Bio Energy Inc.
 Manitoba Hydro
 University of Manitoba

**Corporation HET –
 Horizon Environnement Technologies**

Round 11 2007A**Environmental Benefits: Climate Change / Clean Water / Clean Soil**

Total Project Value:
\$ 5,478,254
 SDTC Funding:
\$ 1,509,807
 Leveraged Funding:
\$ 3,968,447

Demonstration Project for the Valorization of Whey from the Cheese Industry

Unlike large cheese factories, small- and medium-sized cheese factories do not have economic ways to deal with waste from their operations. HET proposes to develop and demonstrate a commercial scale continuous aerobic bioreactor that converts a waste by-product of cheese production (whey) to a valuable product (animal feed). The technology converts 90% of the whey effluent to yeast based biomass and useful heat. The process provides an alternative whey disposal option to existing restrictive land and sewer disposal options that limit the operation and expansion of small and medium-sized cheese factories. The biomass is used as growth factor additive for animal feed without the risk of viral risk contamination considering it is a non-animal protein source.

Consortium Members

Corporation HET - Horizon
 Environnement Technologies
 Fromagerie Perron
 NUTRECO CanadaAgresearch
 Prairie Swine Centre
 Hytek Ltd.

Développement Effenco Inc.

Round 11 2007A

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 1,760,784
 SDTC Funding:
\$ 774,955
 Leveraged Funding:
\$ 985,829

Hybrid Refuse Truck

Développement Effenco and its partners will complete the development and demonstration of a new hybrid hydraulic regenerative braking system dedicated to refuse trucks. Using a hydraulic pump, the system regenerates kinetic energy while the truck is braking. The energy is stored in a hydraulic accumulator to be reused later in the hydraulic operations of the vehicle. This system is more cost effective than hybrid electric solutions, and the project aims to reduce fuel consumption by 20% and improve brake lifespan by a factor of three. The demonstration will validate these performance targets by collecting data from five different trucks operating on waste collection routes.

Consortium Members

Développement Effenco Inc.
 Gaudreau Environnement inc.
 Waste Management Quebec Inc.
 Agence de l'efficacité énergétique
 du Québec

Elementa Group Inc.

Round 11 2007A

Environmental Benefits: Climate Change / Clean Air / Clean Water / Clean Soil

Total Project Value:
\$ 13,033,266
 SDTC Funding:
\$ 3,302,500
 Leveraged Funding:
\$ 9,730,766

Redefining the Relationship between Energy and Waste

Provinces and municipalities are under increasing pressure to provide landfill diversion alternatives and to relieve the strain on the electrical power system. Elementa Group has developed an economic and efficient method to divert municipal solid waste from local landfills and to convert it into clean energy. The consortium led by Elementa Group will use Elementa's proprietary Aqueous Transformation (AqT) technology to demonstrate solutions to the challenges of municipal waste management and renewable energy production. The consortium will construct a 5.8-Megawatt energy-from-waste power plant next to a major greenhouse operation. This plant will process 26,000 tonnes of municipal solid waste per year. The electricity from Elementa Group's power plant will be sold to the electricity grid. Norfolk County will provide the waste input and the greenhouse operator will use the waste heat generated through cogeneration to generate steam and/or hot water. This AqT oxygen deprived gasification process makes it easier to clean the syngas and has near zero generation of dioxin and furans. It has the additional benefit of significantly reducing carbon dioxide per unit of electricity generated.

Consortium Members

Elementa Group Inc.
 University of Toronto
 Clean 16 Technologies Corp.
 Fernlea Flowers Ltd.
 Giffels Associates Limited

Envirotower Inc.**Round 11 2007A****Environmental Benefits: Climate Change / Clean Water**

Total Project Value:
\$ 937,500
 SDTC Funding:
\$ 300,000
 Leveraged Funding:
\$ 637,500

Industrial Cooling Tower Environmental Water Treatment
 Cooling towers are a critical process in many industrial operations. These systems consume a tremendous amount of chemicals which typically are discharged to sewers. Envirotower intended to demonstrate an industrial application of a patented cooling tower water treatment system as a more reliable, effective and economical alternative to traditional chemical water treatment. The technology is an innovative real-time process control system and is the adaptation of existing patented Electrostatic Water Treatment technology. The system intended to enable industrial facilities to reduce cooling tower costs, lower energy and water consumption, reduce the risk of process interruption, improve operator safety, and reduce chemical discharges to sewage systems. Envirotower installed their treatment system on one chiller at Toyota's plant and collected data for one summer.

Consortium Members
 Envirotower Inc.
 Toyota Motor Manufacturing Canada

Ferrinov Inc.**Round 11 2007A****Environmental Benefits: Climate Change / Clean Air / Clean Soil**

Total Project Value:
\$ 5,434,975
 SDTC Funding:
\$ 1,864,334
 Leveraged Funding:
\$ 3,570,641

Hydrometallurgical Separation Process for Steel Mill Electric Arc Furnace (EAF) Dust and Recovery of Pigments
 In North America, electric arc furnaces produce approximately 1.1 tonnes of steel mill dust (EAF dust) annually. 50% of EAF dust is disposed of in landfill; the other 50% is treated by energy intensive processes. Ferrinov has developed a patented hydrometallurgical process for the treatment of EAF dust and the recovery of valuable ferrites and magnetites. These ferrites and magnetites are transformed into anti-corrosion pigments for use in paint manufacturing. Compared to pyrometallurgical treatment of EAF dust, Ferrinov's process represents a reduction in energy intensity of up to 80%. The process consumes only about 15% of the energy input typically required for the production of pigments. Ferrinov is partnering with Dofasco and Mittal Canada, the two major steel manufacturers in Canada, to further develop and demonstrate this technology to provide a more sustainable alternative to EAF dust disposal, with resultant benefits in reduced GHG emissions and minimized use of land fill.

Consortium Members
 Ferrinov Inc.
 Arcelor Mittal Dofasco Inc. (AMD)

Fuseforward International Inc.

Round 11 2007A

Environmental Benefits: Clean Air / Clean Water / Clean Soil

Total Project Value:
\$ 1,523,921
 SDTC Funding:
\$ 400,000
 Leveraged Funding:
\$ 1,123,921

Sustainable Utility Infrastructure

Current practice requires organizations with significant assets, such as municipalities, to undertake expensive studies if they wish to understand how to improve their environmental performance. Fuseforward International proposes to demonstrate enabling technology, using its Infrastructure Asset Intelligence system to interconnect the existing business, operational and generic IT systems to enable better problem resolution and decision making. In many Canadian municipalities, leakage rates from potable water infrastructure can exceed 40%. A pilot project with a specific focus on the water and wastewater infrastructure will be undertaken in the Municipality of Kingston, Ontario before a city-wide implementation is undertaken. A successful demonstration will result in identifying opportunities to reduce water losses, wastewater infiltration and exfiltration, and their related environmental impacts.

Consortium Members

Fuseforward International Inc.
 Utilities Kingston
 Hatch Mott MacDonald
 Fuseforward Inc.

General Electric Canada

Round 11 2007A

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 12,650,661
 SDTC Funding:
\$ 4,212,670
 Leveraged Funding:
\$ 8,437,991

Clean Diesel Locomotive Demonstration

As new emissions standards emerge in Canada, the rail industry is faced with increasing challenges to remain competitive. GE Canada and its partners will develop and demonstrate a retrofit emissions control package for use on diesel locomotives, thereby propelling the Canadian railway industry to the forefront of emissions control. They will incorporate state-of-the-art Diesel Particulate Filtration (DPF) targeted to reduce particulate matter emissions by more than 85% from US EPA Tier 2 emission standards. Innovative Selective Catalytic Reduction technology will also be integrated into the locomotive to reduce NO_x emissions by more than 65%. The project will also utilize biodiesel fuels to demonstrate compatibility with NO_x and PM emissions reduction technology. CN will host the Clean Diesel Locomotive project on its newer GE locomotives used both in Canada and the US. CP will host the project to modernize old Electro-Motive Diesel (EMD) SD40-2 locomotives, expecting to reduce NO_x 24%, Hydrocarbon 29% and GHGs 20%, and to improve fuel and lube oil consumption and improve availability. CP will test the DPF and biodiesel on the modernized EMD locomotives.

Consortium Members

General Electric Canada
 Canadian National Railway
 Company Corp.

MSR Innovations Inc.**Round 11 2007A****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:

\$ 1,155,043

SDTC Funding:

\$ 399,518

Leveraged Funding:

\$ 755,525**SolTrak™ Demonstration**

Improving systems installation of Building Integrated Photovoltaic (BIPV) is a key priority for the solar industry. MSR Innovations and its consortium partners plan to develop and demonstrate a unique solar roofing system which dramatically improves installation of solar PV. The system's extensive design and manufacturing flexibility produces a sustainable product that will reduce the costs of solar power systems, enabling mainstream market entry. Increased access to and availability of renewable energy will create a corresponding reduction of greenhouse gas emissions associated with traditional power generation.

Consortium Members

MSR Innovations Inc.
Century Group Lands Corp.

St-Jean Photochemicals**Round 11 2007A****Environmental Benefits: Climate Change / Clean Air / Clean Soil**

Total Project Value:

\$ 5,089,466

SDTC Funding:

\$ 1,673,424

Leveraged Funding:

\$ 3,416,042**Low Cost Printable Organic Solar Cells**

The high cost of PV cells is a major obstacle for wider adoption of solar power generation, a renewable source of electricity which can provide GHG emission reduction benefits by displacing conventional power generation based on fossil fuels. St-Jean Photochimie has teamed up with Université Laval to produce a new polymer derivative which promises to greatly reduce the cost of solar photovoltaic (PV) cells. This unique polymer has higher material stability and light absorption properties than its nearest competition. The aim of the project is the development of a novel manufacturing process for the fabrication of the polymer at a cost of less than US \$1.00/Wp with a power conversion efficiency of 8%.

Consortium Members

St-Jean Photochemicals
Konarka Technologies Inc.
National Research Council - Institute for
Microstructural Sciences
Université Laval, Département de chimie

TM4 Inc.

Round 11 2007A

Environmental Benefits: Climate Change / Clean Air

Total Project Value:

\$ 12,158,461

SDTC Funding:

\$ 3,818,787

Leveraged Funding:

\$ 8,339,674

TM4 Hybrid Drive System

TM4 will design, develop and demonstrate a new automotive electric powertrain based on TM4's high density permanent magnet motor. TM4 has developed a permanent magnet, outer rotor, electric motor technology, power electronics and control technologies which will enable car manufacturers to offer superior gasoline-electric hybrid technology. Tata AutoComp System will integrate this Electric All Wheel Drive (E AWD) system on existing platform. The E AWD system will use stored electric energy to send torque and power to the rear wheels from standstill through vehicle acceleration and whenever more torque or traction is required. The E AWD system will recharge the battery pack through regenerative braking and during coasting. It will be able to operate in ZEV mode (Zero Emissions Vehicle) under limited load conditions.

Consortium Members

TM4 Inc.
Tata Autocomp System Limited
Hydro-Quebec
Province of Quebec MDEIE
Institut de transport avancé
du Québec (ITAQ)
Centre national de transport avancé

Round 10 – Board Approval June 2007

Biogénie S.R.D.C. Inc.

Round 10 2006B

Environmental Benefits: Climate Change / Clean Air / Clean Soil

Total Project Value:

\$ 748,504

SDTC Funding:

\$ 230,137

Leveraged Funding:

\$ 518,367

Development of a Multi-Technology Soil Treatment Facility (MTSTF)

EnGlobe Corp.'s wholly owned subsidiary Biogénie SRDC Inc. will develop a multi-technology soil treatment facility which will integrate a number of innovative, adapted, and developed processes for the treatment of contaminated soil, sludge, and sediment. This will improve the performance, capacity, and versatility of treatment facilities, allowing them to remediate larger quantities of more diversified and heavily contaminated material, and reduce the use of non-renewable resources.

Consortium Members

Biogénie S.R.D.C. Inc.
Petro-Canada
Solution Eau Air Sol Inc.

CVTCORP Transmission Inc.**Round 10 2006B****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 7,649,865
 SDTC Funding:
\$ 2,131,950
 Leveraged Funding:
\$ 5,517,915

Demonstration of a Pre-Commercial Toroidal-Based CVT on Heavy Agricultural Off-Road Vehicles
 Continuously Variable Transmissions (CVTs), while starting to appear in the automotive market due to improved efficiency over conventional geared transmissions, have not been adopted in heavy duty vehicles to date due to the mechanical strain imposed by the high torque associated with these vehicles. CVT Corp. has developed a high efficiency toroidal CVT suitable for the heavy-duty vehicle market. CVT Corp.'s system will be tested on a combine harvester, and should dramatically reduce fuel consumption (as much as 25%) as well as the amount of air contaminants produced.

Consortium Members
 CVT Corp.
 AGCO Corp
 Case New Holland America LLC
 Natural Resources Canada - Efficiency & Energy Alternative Program (Office of Energy Efficiency)

Early Warning Inc.**Round 10 2006B****Environmental Benefits: Clean Air / Clean Water / Clean Soil**

Total Project Value:
\$ 6,675,628
 SDTC Funding:
\$ 2,068,041
 Leveraged Funding:
\$ 4,607,587

Biothreat Early Warning System
 A key to preventing waterborne outbreaks of dangerous microbial pathogens that cause sickness and death (such as E.coli) is frequent and comprehensive testing. The Biothreat Early Warning System (BEWS) applies a nanotechnology-based biosensor to automatically test for up to 100 specific pathogens in less than 3 hours, anywhere and at anytime without the use of a laboratory, technicians, or expensive equipment. The consortium plans to demonstrate that a fully automated system will enable water agencies, testing firms, food processors, industrial plants, hospitals and tourism establishments to detect and contain pathogens before outbreaks can occur.

Consortium Members
 Early Warning Inc.
 Integrated Explorations
 University of Utah (Dept. Mechanical Engineering)
 University of Waterloo
 Kansas State University

HTC Pureenergy Inc.**Round 10 2006B****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 1,403,165
 SDTC Funding:
\$ 635,414
 Leveraged Funding:
\$ 767,751

Multi-feedstock Pre-commercial Hydrogen Production Demonstration Plant
 Glycerol is a resultant by-product from biodiesel production. As production of biodiesel grows, the amount of glycerol produced is expected to flood the existing commodity markets. HTC plans to build the first multi-feedstock hydrogen production demonstration project to reform bio-feedstock material such as glycerol into hydrogen. The process is designed to be scaleable from very small to very large plants—with an aim to solve the long standing transportation and storage cost barriers to hydrogen market growth.

Consortium Members
 HTC Pureenergy Inc.
 Dumur Industries
 Milligan Bio-Tech Inc.
 Pinnacle Industrial Services
 Pound-Maker AgVentures Ltd..
 University of Regina
 International Test Centre for CO₂ Capture
 Government of Saskatchewan

Middle Bay Sustainable Aquaculture Institute

Round 10 2006B

Environmental Benefits: Clean Water / Clean Soil

Total Project Value:
\$ 17,129,821
 SDTC Funding:
\$ 5,768,999
 Leveraged Funding:
\$ 113,60,822

Floating Solid Wall Containment System

The Middle Bay Sustainable Aquaculture Institute project will further explore and demonstrate the use of commercial-scale solid wall containment systems incorporating waste recovery, for salmon aquaculture. This technology has the potential to increase the rearing capacity of the Canadian and global salmon farming industry, by allowing for sustainable aquaculture growth in coastal communities while minimizing interference with marine environments.

Consortium Members

Middle Bay Sustainable Aquaculture Institute
 Gordon and Betty Moore Foundation
 Middle Bay Ltd. Partnership
 Coast Sustainability Trust

Nova Scotia Power Inc.

Round 10 2006B

Environmental Benefits: Climate Change / Clean Air / Clean Water

Total Project Value:
\$ 9,616,705
 SDTC Funding:
\$ 4,650,000
 Leveraged Funding:
\$ 4,966,705

Nova Scotia In-Stream Tidal Generation Project

The consortium of the Nova Scotia In-Stream Tidal Generation Project succeeded in deploying the first in-stream tidal energy converter in the Bay of Fundy, home to some of the strongest tidal currents in the world. In-stream tidal technology uses the energy present in the tidal currents to turn a turbine to generate electricity. The project conducted comprehensive environmental and oceanographic monitoring, physical and electrical data logging, and operational assessment of a 1 MW tidal turbine. Damage sustained by the turbine shortly after deployment resulted in early retrieval to conduct detailed engineering analysis of the unit and access the data collected by the monitoring equipment installed on the gravity base and turbine. This data will be used by the Consortium to improve future installations planned for the Bay of Fundy.

Consortium Members

Nova Scotia Power Inc.
 Nova Scotia Department of Energy
 OpenHydro Group Ltd.

NxtGen Emission Controls Inc.

Round 10 2006B

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 9,876,907
 SDTC Funding:
\$ 2,516,882
 Leveraged Funding:
\$ 7,360,025

Mobile Diesel Emission Reduction System

NxtGen Emission Controls developed a next generation in diesel emission reduction technology using hydrogen produced from diesel fuel and engine exhaust to reduce particulate matter and Nitrogen Oxides emissions, while enabling engine manufacturers to increase fuel economy. NxtGen's technology can be retrofitted onto existing diesel trucks or factory installed on new vehicles. The project involved retrofitting the emission reduction system onto commercial buses medium and heavy-duty commercial trucks to validate performance and durability in daily over-the-road operation. The technology logged more than 5,500 hours on seven mid-size engine vehicles, two diesel buses, and demonstrated that it meets EPA standards.

Consortium Members

NxtGen Emission Controls Inc.
 Engine Control Systems Inc.

SiREM ULC**Round 10 2006B****Environmental Benefits: Climate Change / Clean Water / Clean Soil**

Total Project Value:
\$ 1,086,698
 SDTC Funding:
\$ 356,437
 Leveraged Funding:
\$ 730,261

Bioaugmentation Demonstration with KB-1

SiREM will demonstrate the first Canadian application of KB-1® for in situ biodegradation of chlorinated solvents in cold groundwater and fractured bedrock conditions. Tetrachloroethene (PCE) and trichloroethene (TCE) are among the most commonly detected soil and groundwater contaminants. To date, other microbial approaches to treating these solvents have had limited success. KB-1® biodegrades these toxic solvents into non-toxic ethene. This demonstration is intended to show that bioaugmentation with KB-1® can be a cost-effective cleanup strategy for PCE and TCE contaminated sites, particularly under Canadian climatic and fractured bedrock site conditions.

Consortium Members

SiREM ULC
 Magellan Aerospace Corporation/Orenda
 Aerospace

TM4 Inc.**Round 10 2006B****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 11,772,908
 SDTC Funding:
\$ 2,187,756
 Leveraged Funding:
\$ 9,585,152

TM4's 3 MW PMG

Two key issues facing the wind industry are managing the power-to-weight ratio as turbine size and tower height rises and the high failure rate of mechanical drive trains. TM4 is applying their existing permanent magnet wheel motor electro-dynamics machine technology to a mid-size Permanent Magnet Generator. They are demonstrating the advantages of their technology, which features high power density and high efficiency over a wide range of operating speeds. The goal is to reduce total generator weight by at least 50% and volume by 30%, compared to conventional double-fed induction generators. This enables taller, less expensive towers and nacelles, resulting in a wind turbine that can deliver a greater power output.

Consortium Members

TM4 Inc.
 Clipper Windpower Inc.
 Marmen Inc.

Turbo Trac Systems ULC Inc.**Round 10 2006B****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 4,201,622
 SDTC Funding:
\$ 1,032,379
 Leveraged Funding:
\$ 3,169,243

Demonstration of CVT System in Industrial Applications

Continuously Variable Transmissions, though available in light vehicle applications, have not been reliable in high torque applications such as oil pumps. Turbo Trac's technology is a mechanical "traction" device consisting of a number of metal cones, discs, and an epicyclic gear set. The device offers a split parallel power path that can handle the high varying torque and power demand of industrial applications and heavy duty commercial vehicles. The project will test the technology on two different models of oil well pumps, first in Alberta and then in Texas.

Consortium Members

Turbo Trac Systems ULC Inc.
 Lufkin Industries Inc.

Round 9 – Board Approval October 2006

Biothermica Technologies Inc.

Round 9 2006A

Environmental Benefits: Climate Change / Clean Air / Clean Soil

Total Project Value:
\$ 600,487
SDTC Funding:
\$ 200,487
Leveraged Funding:
\$ 400,000

Biomass Gasification Unit

Biothermica will develop, build, and operate a pilot plant designed to convert 35,000 tonnes per year of construction, demolition waste, and other urban wood waste to clean synthetic gas. The gas will be used in combination with landfill biogas in the Gazmont 25 MW power plant in Montreal. This demonstration will show the viability of coupling a fluidized bed high pressure gasifier to an industrial steam boiler for use in power generation.

Consortium Members

Biothermica Technologies Inc.
Dynatech services de gestion
de l'énergie inc.
Gestion Gazmont Inc.
SNC Lavalin Inc.

Dynamic Systems Incorporated

Round 9 2006A

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 20,085,010
SDTC Funding:
\$ 4,259,800
Leveraged Funding:
\$ 15,825,210

Transmission-less Hybrid Drive System

Dynamic Systems (DSI) will develop and demonstrate a transmission-less hybrid drive system (THDS) incorporating a Multi-stage Switched Reluctance Motor and energy management system to replace current mechanical transmissions in Class 4-6 and Class 7-8 commercial transport vehicles. The problem of motor vibration has been overcome in the DSI Multi-Stage® design. Use of the DSI THDS technology in combination with hybrid electric power trains has the potential to reduce the consumption of diesel fuel by up to 60%.

Consortium Members

Dynamic Systems Inc.
International Truck and Engine Corp.

Enerkem Technologies Inc.

Round 9 2006A

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 7,480,386
SDTC Funding:
\$ 2,660,476
Leveraged Funding:
\$ 4,819,910

Sustainable Alcohol Facility

A sustainable alcohol facility will be erected in East Angus, QC, using a gasification process to convert biomass such as municipal solid waste, sludge, treated wood waste, and construction and demolition wood into alcohols (methanol and ethanol). The facility will also process residual forest and agricultural biomass. The demonstration plant will treat 12,000 tonnes of biomass-rich residues per year and produce 4 million litres of alcohols per year. It is expected that a successful demonstration will be followed by a commercial plant at the same site producing 50 million litres of alcohols per year.

Consortium Members

Enerkem Technologies Inc.
GreenField Ethanol of Quebec Inc.
Tred'Si Inc.
Le Ministère des Ressources
naturelles et de la Faune du Québec

General Electric Canada**Round 9 2006A****Environmental Benefits: Climate Change / Clean Air / Clean Water / Clean Soil**

Total Project Value:
\$ 7,456,183
 SDTC Funding:
\$ 2,485,395
 Leveraged Funding:
\$ 4,970,788

Hybrid Renewable Energy Systems

Over 300 remote communities in Canada are not connected to power grids or to gas pipelines. Most rely mainly on high-cost diesel fuel for their power. This project will demonstrate Renewable Microgrid Systems (RMS) that will enable remote communities to achieve a high penetration of renewable energy sources. The RMS applications will include local and supervisory controls, protection, coordinated power generation, and energy storage and load management. An electrolyzer to produce hydrogen, hydrogen storage system, power generation via fuel cells and energy storage system are the components to be integrated and incorporated in a microgrid demonstration proposed for Bella Coola, BC.

Consortium Members

General Electric Canada
 BC Hydro
 General Electric Multlin
 Powertech Labs Inc.
 General Electric Energy (GE)

Magenn Power Inc.**Round 9 2006A****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 5,435,481
 SDTC Funding:
\$ 691,019
 Leveraged Funding:
\$ 4,744,462

Magenn Air Rotor Systems (MARS)

Magenn Air Rotor Systems (MARS) are tethered “floating generators” that rotate in response to wind. The mechanical energy is converted into electrical power by generators attached at both ends of the horizontal axis, and transferred down the tether for use on the ground. Helium sustains the Air Rotor, which is placed in the strongest winds, usually between 200 and 1000 feet above ground level. MARS is projected to achieve reduced infrastructure and installation costs compared to current conventional wind turbine technology.

Consortium Members

Magenn Power Inc.
 Donald J. Ross Enterprise Ltd.
 Dale George

Milligan Bio-Tech Inc.**Round 9 2006A****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 23,527,746
 SDTC Funding:
\$ 7,004,493
 Leveraged Funding:
\$ 16,523,253

System for the Valorization of Distressed Seeds

Milligan Bio-Tech and its partners are launching the first hub and spoke demonstration project for the valorization of distressed oil seeds. Technologies such as canola meal valorization, augmented crushing and a more efficient biodiesel production technology will be integrated in a system of spokes (crushing sites) and hubs (biodiesel plant and meal plant) across the Prairies. The project aims to effectively use resources and replace conventional fuels, in this case diesel. The transportation companies will test various concentrations of biodiesel created from a range of distressed oil-seed feedstocks.

Consortium Members

Milligan Bio-Tech Inc.
 Saskatchewan Transportation
 Company (STC)
 Saskatoon Transit (City of Saskatoon)
 O&T Farms

MinMiner Oilsands Inc.

Round 9 2006A

Environmental Benefits: Climate Change / Clean Air / Clean Water / Clean Soil

Total Project Value:
\$ 13,038,403
 SDTC Funding:
\$ 4,302,673
 Leveraged Funding:
\$ 8,735,730

Residual Hydrocarbons Recovery Using Solvent Coated Beads

MinMiner has acquired the Conrad Johnson Process (CJP) rights and enhanced the technology which recovers residual hydrocarbons from oil sand tailings through the use of solvent coated polyethylene beads. The technology will significantly reduce land and water use and can positively impact on key sustainability issues associated with oil sands development. The project will demonstrate the efficacy of CJP in a portable trailer mounted unit designed to handle 325 barrels of tailings per day. This phase could be followed by an in-situ demonstration plant designed to process 65,000 barrels of tailings per day.

Consortium Members

MinMiner Oilsands Inc.
 Suncor Energy Inc.
 Canadian Environmental Technology
 Advancement Corporation -
 West (CETAC - West)
 Kenaco Capital Services Inc.
 Alberta Innovates - Technology Futures

Zenon Membrane Solutions

Round 9 2006A

Environmental Benefits: Climate Change / Clean Water

Total Project Value:
\$ 1,776,668
 SDTC Funding:
\$ 665,540
 Leveraged Funding:
\$ 1,111,128

Gravity Membrane for Sand Filter Retrofit

Zenon Membrane Solutions will develop and demonstrate a low pressure ultrafiltration hollow membrane water treatment technology. This new technology provides increased plant throughput and dramatically improved water quality over conventional sand filtration. The technology is an adaptation of the existing Zenon "ZeeWeed" technology that can be installed in existing potable water treatment plants to improve water purity and to meet increasing demand. The goal is to reduce water treatment plant expansion costs and to avoid expanded use of urban or shoreline land.

Consortium Members

Zenon Membrane Solutions
 Regional Municipality of Peel
 University of Guelph
 Pro Aqua + Shadrack Inc.

Round 8 – Board Approval June 2006

BESTECH (Boudreau-Espley-Pitre Corporation)

Round 8 2005B

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 3,754,933
 SDTC Funding:
\$ 1,448,000
 Leveraged Funding:
\$ 2,306,933

Mines Emissions Reductions Initiative

BESTECH will develop and demonstrate a new ventilation technology, "Dynamic Ventilation on Demand" (DVOD), which provides an automated deep mine ventilation control system. If successful, the technology will lead to significant energy savings as well as climate change and clean air benefits.

Consortium Members

BESTECH
 Vale INCO Ltd.
 Centre of Excellence in Mining
 Innovation (CEMI)
 MIRARCO- Mining Innovation,
 Rehabilitation and Applied
 Research Corp.
 Green Canal Holdings Inc.

Bio Vision Technology Inc.**Round 8 2005B****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 20,199,190
 SDTC Funding:
\$ 3,000,000
 Leveraged Funding:
\$ 17,199,190

Biofuel Production from Biomass

Bio Vision Technology Inc. intended to demonstrate a unique biofuel pilot plant that converts renewable biomass (plant material) into feedstocks that can be processed into fuel ethanol and other value-added, co-generated chemical commodities. Until now, engineering and economic challenges have made it unfeasible to convert woody plant fibres (lignocellulose) into industrially useable sugars on a commercially viable basis. Bio Vision has developed an integrated system with a thermal reactor that uses steam fractionation to hydrolyze lignocellulose. Downstream processes convert the output into marketable products such as fuel ethanol, lignin, furfural and acetic acid. Value-added products such as biodegradable plastics, building materials, specialty chemicals, cosmetics, lubricants, paints, herbicides, and fertilizers can also be produced from the feedstocks. Bio Vision's small scale technology minimizes feedstock transportation costs and makes valuable commodity production possible in rural regions with smaller waste volumes.

Consortium Members

Bio Vision Technology Inc.
 Coles Associates Ltd..
 Groupe Savoie
 Savant Enterprise
 FTC (Food Technology Centre)
 NRC Biotechnology Research Institute

Cerestech Inc.**Round 8 2005B****Environmental Benefits: Climate Change / Clean Water**

Total Project Value:
\$ 2,327,017
 SDTC Funding:
\$ 751,627
 Leveraged Funding:
\$ 1,575,391

Thermoplastic Starch (TPS) Blend Process Scale-up

Cerestech Inc. has a project that involves the full scale, pre-commercial demonstration of an innovative technology that substitutes up to half of synthetic plastic resins with bio-based thermoplastic starch (TPS) in the manufacturing of products such as films, bags and injection-moulded goods. TPS, made from starch and glycerol (a biodiesel production residue), is an inexpensive substance that comes from renewable resources. The process allows for the creation of blends that have similar properties to pure synthetic resin including recycled plastics, but at a lower cost, using less water and heat, and with considerably less depletion of non-renewable resources.

Consortium Members

Cerestech Inc.
 Pitt Plastics - Innovative
 Compounding Solutions
 Leistritz Corporation
 IPL Inc.

EcoVu Analytics Inc.

Round 8 2005B

Environmental Benefits: Clean Water

Total Project Value:

\$ 3,205,831

SDTC Funding:

\$ 1,035,555

Leveraged Funding:

\$ 2,170,276

Ultra-Trace Level Water Contaminant Concentrator

EcoVu Analytics will demonstrate an improved water quality monitoring system utilizing a technology that concentrates contaminants in the monitoring device. The patented concentration process allows for timely, more efficient and reliable detection thereby optimizing the measurement of low-level microbiological and chemical pollutants. The technology is initially targeting voluntary testing for health and safety applications (drinking water treatment plants, in-field surface water sampling, and laboratory analysis). EcoVu's near real-time analysis results can enable water treatment plants to optimize plant operations and reduce chlorine use. In addition to monitoring, EcoVu can also apply the same technology to the remediation of high-value process waters such as heavy water used in the nuclear industry.

Consortium Members

EcoVu Analytics Inc.
 Ontario Ministry of the Environment
 City of Ottawa
 Quinte Conservation Authority
 Carleton University
 HRose Machining Ltd..
 Laser Diagnostic Instruments
 International Inc.
 Canadian Research Institute for Food
 Safety, University of Guelph (CRIFS -
 University of Guelph)

Mechtronix Systems Inc.

Round 8 2005B

Environmental Benefits: Climate Change / Clean Water / Clean Soil

Total Project Value:

\$ 5,950,729

SDTC Funding:

\$ 1,933,987

Leveraged Funding:

\$ 4,016,742

Demonstration of the Valoris™ Sludge Treatment System

Mechtronix Systems Inc. and its partners plan to create fuel by drying municipal bio-solid sludge from wastewater treatment into solids, applying and tailoring an existing European sludge drying technology called Valoris™. The system boils off the water and captures the heat from the water vapour for reuse, and converts the sludge into treated, high-value components such as fuel. The solution will also reduce greenhouse gases released from landfills and helps conserve both landfill space and water. Unlike many other biomass drying projects in development today, which target agricultural, pulp and paper or wood waste, this consortium is focused on the municipal sector.

Consortium Members

Mechtronix Systems Inc.
 City of Edmonton
 Edmonton Waste Management
 Center of Excellence Wastewater
 Research & Training Centre

New Energy Corporation Inc.**Round 8 2005B****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 6,374,525
 SDTC Funding:
\$ 2,000,000
 Leveraged Funding:
\$ 4,374,525

Tidal Power Generation

New Energy Corp. Inc. and its partners have teamed together to demonstrate tidal power generation on British Columbia's west coast. The project consists of installing 2x250 kW vertical axis tidal currents turbines in a narrow channel between Maude Island and Quadra Island, adjacent to Seymour Narrows, near Campbell River, BC. The technology to be demonstrated is New Energy's EnCurrent vertical axis turbine, which employs vanes mounted parallel to a vertical shaft to extract energy from a moving stream of water regardless of its direction.

Consortium Members

New Energy Corp. Inc.
 Canoe Pass Tidal Energy Corp.

Nutriloc Ingredients Corporation**Round 8 2005B****Environmental Benefits: Climate Change / Clean Air / Clean Soil**

Total Project Value:
\$ 2,404,493
 SDTC Funding:
\$ 847,319
 Leveraged Funding:
\$ 1,557,175

Nutriloc Modular Microwave Vacuum Drying Unit

Nutriloc Ingredients Corp. and its consortium partners will demonstrate a technology to dehydrate fruits, vegetables and other products with superior cost efficiency and quality compared with freeze drying – the current industry standard. The benefits of the Nutriloc™ system include not only better dried products in terms of flavour, taste, colour and nutrient value but also lower energy use and reduced greenhouse gas emissions. Nutriloc is currently designing a portable drying unit that can be trucked to farms and food processing plants, eliminating transportation costs associated with hauling "wet" produce to a central factory.

Consortium Members

Nutriloc Ingredients Corp.
 Global Minds Inc.
 Spagnol's Wine and Beer
 Making Supplies Ltd.
 Acom Solution Development
 Services Inc.
 Sun Rich Fresh Foods Inc.

Power Measurement Ltd.

Round 8 2005B

Environmental Benefits: Climate Change / Clean Air / Clean Water

Total Project Value:
\$ 8,972,335
 SDTC Funding:
\$ 2,960,871
 Leveraged Funding:
\$ 6,011,464

Enerprise Energy Management System

Power Measurement Ltd. and its consortium will demonstrate systems consisting of advanced software and energy meters that help commercial and industrial energy consumers improve energy efficiency and reduce energy-related emissions. The “enterprise energy management” platform will provide accurate, real-time data on the consumption of electricity and piped utilities (including water, air, gas, and steam) as well as outflow monitoring for SO₂, NO_x and waste water. These systems will help companies actively manage their energy efficiency programs, monitor their adherence to ISO 14001 or other sustainability goals, and identify best practices. The information can also be used by energy providers to develop utility load management strategies.

Consortium Members

Power Measurement Ltd.
 Brookfield Properties Management Corp.
 British Columbia Institute
 of Technology (BCIT)
 Schneider Electric Ltd.

Pure Technologies Ltd.

Round 8 2005B

Environmental Benefits: Clean Air / Clean Water / Clean Soil

Total Project Value:
\$ 6,798,536
 SDTC Funding:
\$ 2,200,000
 Leveraged Funding:
\$ 4,598,536

Robot Device for Pipe Inspection

Pure Technologies Ltd., and its consortium will develop and demonstrate a suite of “PipeDivers,” robotic devices that inspects small diameter (24” to 48” diameter) and large diameter (60” to 160” in diameter (60” to 160” in diameter) pre-stressed cylindrical concrete pipe (PCCP), and metallic pipes, ranging in diameter from 16” to 66”, used for water transportation. The devices will enable the identification of distressed pipe, enabling water utilities to minimize operational risks, optimize their investment, and extend the safe and economic life of their pipelines – saving themselves, and taxpayers, millions of dollars. Canada’s PCCP and metallic pipe infrastructure is aging, and is starting to decay. While the risk of pipe failure is low, failures can be catastrophic. Such failures result in interruptions to the water supply as well as damage to adjacent pipes and infrastructure.

Consortium Members

Pure Technologies Ltd.
 Hanson Pressure Pipe
 Halifax Regional Water Commission
 City of Calgary Water Services
 City of Hamilton

Tantalus Systems Corp.**Round 8 2005B****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 10,102,523
 SDTC Funding:
\$ 2,981,310
 Leveraged Funding:
\$ 7,121,213

Electricity Conservation and Demand Management

Tantalus Systems Corp. will demonstrate combined technologies in advanced metering, wireless communication, and in-home displays to give consumers a real-time measure of their households' power consumption in units of dollars, carbon dioxide emissions, and/or kilowatt-hours. For the first time, consumers can be alerted whenever prices change or green energy is available as well as gain easy access to usage information needed to curb wasteful habits and save money. It also makes it possible for utilities to manage operations more efficiently, implement opt-in load control initiatives, and offer equitable dynamic pricing programs. By closing the communications loop, power reductions of up to 20% can be achieved.

Consortium Members

Tantalus Systems Corp.
 Chatham-Kent Hydro Inc.
 McMaster University

Unicell Ltd.**Round 8 2005B****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:
\$ 9,908,097
 SDTC Funding:
\$ 2,110,000
 Leveraged Funding:
\$ 7,798,097

Lightweight Electric Urban Delivery Vehicle

Unicell Ltd., and its consortium partners will demonstrate the Environmental Benefits: and operational advantages of an all-electric, lightweight composite monocoque urban delivery vehicle in typical Canadian operating conditions. The demonstration involves putting a small fleet of the vehicles into commercial use with Purolator Courier in Toronto and other cities across the country. These vehicles will replace conventional gasoline-powered delivery vans, eliminating on-street emissions and reducing greenhouse gas emissions by more than 80%. These vehicles will have twice the useful life of conventional vans, leading to further environmental and economic advantages. The project also seeks to demonstrate that couriers using the vehicle will be more productive in their route activities, leading to substantial savings for their operators.

Consortium Members

Unicell Ltd.
 Meritor Heavy Vehicle Systems LLC
 Electrovaya Inc.
 Purolator Courier Ltd.
 Transportation Development Centre

Wind Smart Inc.

Round 8 2005B

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 3,030,871
 SDTC Funding:
\$ 1,219,075
 Leveraged Funding:
\$ 1,811,796

Hydrostatic Drive System for Wind Turbines

Wind Smart Inc. and its consortium are demonstrating a new drive system for wind turbines that will increase power generation compared with gear-driven assemblies while reducing maintenance costs. Unlike conventional models, the motor and generator will be situated at ground level. The system will replace the gearbox presently employed on wind turbines with a hydraulic motor to drive a hydrostatic pump. This will drive a synchronous generator, which in turn will generate power directly into the grid. The system will enable the capture of more wind energy over a wider wind speed range, using the same turbine. A key innovation is the ability to control the hydrostatic drive unit and to prevent over-speeding of the wind turbine. This application is designed for wind turbines up to 1.5 MW with standard off-the-shelf components.

Consortium Members

Wind Smart Inc.
 DTF Inc.
 Tube-Mac Industries

Round 7 – Board Approval October 2005

AirScience Technologies Inc.

Round 7 2005A

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 1,373,885
 SDTC Funding:
\$ 417,661
 Leveraged Funding:
\$ 956,224

Hydrogen Production from Landfill Gas

AirScience Technologies Inc. is demonstrating a new process, Teragas, to economically produce hydrogen from biomass feedstocks such as landfill gas. The project will use two new process technologies under license from Unitel Technologies: one for cleaning landfill gas and the second to convert the clean gas to hydrogen and CO₂. The cleaning process will cost-effectively remove trace contaminants from biogas that would otherwise damage internal combustion engines, turbines or an auto-thermal reforming reactor, without having to dry the gas and/or remove oxygen and CO₂. By focusing on both the gas purification and conversion to hydrogen at a commercial scale, landfill operators can generate up to 6 times the economic value obtained by existing landfill-to-electricity approaches, while lowering the environmental impact of methane from landfills.

Consortium Members

AirScience Technologies Inc.
 Waste Management of Canada Corp.

Dépôt Rive-Nord Inc.**Round 7 2005A****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:

\$ 0

SDTC Funding:

\$ 0

Leveraged Funding:

\$ 0**Industrial Eco-complex for Multisource Energy Recovery with Gas Production**

Dépôt Rive-Nord inc. is demonstrating an end-to-end treatment and transformation process which takes garbage from several sources including municipalities, agriculture, agri-food, and industrial, commercial and institutional (ICI) operations and converts it to pipeline-quality natural gas, recyclable paper and plastic, and organic fertilizers. By going direct-to-pipeline, Dépôt Rive-Nord is able to derive greater economic and environmental benefit from the produced gas.

Consortium Members

Dépôt Rive-Nord Inc.
EBI énergie inc.
EBI Environment Inc.
Gestion Environnementale Econord inc.
Industries Machinex inc.

Envirogain Inc.**Round 7 2005A****Environmental Benefits: Climate Change / Clean Air / Clean Water / Clean Soil**

Total Project Value:

\$ 2,210,205

SDTC Funding:

\$ 957,623

Leveraged Funding:

\$ 1,252,582**FEOS (Dried Organic Fertilizer Manufacturing)**

Envirogain Inc. is demonstrating a fertilizer stabilizing and drying process that re-uses heat from existing hog manure treatment systems. This new, integrated approach converts a cost centre to a revenue centre by taking hog manure that would otherwise require treatment and disposal and converting it into saleable fertilizer, while also reducing emissions of greenhouse gases.

Consortium Members

Envirogain Inc.
F. Ménard inc.
William Houde Ltée.

Maratek Environmental**Round 7 2005A****Environmental Benefits: Climate Change / Clean Air / Clean Water**

Total Project Value:

\$ 3,256,110

SDTC Funding:

\$ 915,205

Leveraged Funding:

\$ 2,340,905**Solvent Recovery from Shop Towels**

A consortium led by Maratek Environmental will build a world's-first demonstration project that will recover and reuse the solvent in soiled print shop towels, thereby eliminating an environmental liability, reducing disposal costs and creating a revenue stream from the recycled solvent. Maratek's process utilizes a volatile organic compound (VOC) removal system that removes over 95 percent of the used solvent from used shop towels and then recycles the towels. The process will incorporate a next-generation solvent distillation system that recovers most of the waste solvent for reuse and enhanced waste water treatment.

Consortium Members

Maratek Environmental Inc.
G&K Services Canada Inc.
Omega Recycling Technologies Inc.
Fuji Hunt USA
Quebecor World Inc

Netistix Technologies Corporation

Round 7 2005A

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 1,230,760
 SDTC Funding:
\$ 471,199
 Leveraged Funding:
\$ 759,561

Netistix Emission Management System™ (NEMS)

Netistix Technologies Corp. is demonstrating a low-cost vehicle monitoring and information system. It targets consumers who wish to reduce emissions, fuel, and lifecycle costs, while improving vehicle reliability and safety. The system analyzes both vehicle and driver behaviour data and provides reporting mechanisms to consumers on their driving history. The system will indicate real situations when driving behaviours are inefficient (such as long periods of idling that result in unnecessary fuel use), or when maintenance is required. By providing a feedback mechanism based on actual vehicle performance, users are able to adapt their behaviour in an environmentally and cost-advantageous way.

Consortium Members

Netistix Technologies Corp.
 Petro Canada Certigard
 Jacques Whitford
 Environmental Limited
 Carleton University
 Automotive Industries
 Association of Canada
 Natural Resources Canada - Efficiency
 & Alternative Energy Program (Office
 of Energy Efficiency) (NRCan - OEE)

Nexterra Energy Corp.

Round 7 2005A

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 3,513,692
 SDTC Funding:
\$ 1,159,518
 Leveraged Funding:
\$ 2,354,174

Lime Kiln Biomass Gasification Project

Nexterra Energy Corp. is demonstrating a full-scale biomass (wood waste) gasification system that will be used to heat existing lime kilns in a conventional pulp mill. The direct firing of the synthetic gas will enable lime kilns to convert their energy source from fossil fuels to the gas produced from their own wood residue, thereby reducing energy costs as well as greenhouse gas emissions.

Consortium Members

Nexterra Energy Corp.
 Pulp & Paper Research Institute of
 Canada (PAPRICAN)
 Natural Resources Canada - Efficiency
 & Alternative Energy Program (Office
 of Energy Efficiency) (NRCan - OEE)
 Ethanol BC
 Weyerhaeuser Company Limited

Power Diagnostic Technologies Ltd.

Round 7 2005A

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 3,181,000
 SDTC Funding:
\$ 1,035,400
 Leveraged Funding:
\$ 2,145,600

Methane Gas Detection and Imaging with Leak Calibration

Power Diagnostic Technologies Ltd. is demonstrating a portable leak detection technology to detect and quantify gas leaks in confined spaces such as refineries and natural gas processing plants. This tool will enable the petrochemical industry to find leaks more efficiently, accurately and cost-effectively than today's manual methods, and will provide a feature to calibrate the leak rates of fugitive emissions such as methane, to comply with environmental regulations.

Consortium Members

Power Diagnostic Technologies Ltd.
 BP Canada Energy Co.
 BP Products North America Inc.
 Controp Precision Technologies Ltd.
 Corona Vacuum Coaters Inc.
 Stereoscopic Image Systems Ltd.
 Acura Embedded Systems Inc.
 Public Works and Government
 Services Canada (PWGSC)

Round 6 – Board Approval June 2005

Pratt & Whitney Canada Corporation

Round 6 2004B

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 17,565,575
 SDTC Funding:
\$ 5,624,850
 Leveraged Funding:
\$ 11,940,725

Low Emission Engine Technology for Air Transportation

Pratt & Whitney is demonstrating an innovative, low-emission technology for gas turbine engines used in aviation. The technology has the potential to simultaneously deliver major reductions of NO_x, CO, VOC and particulates, as well as reduced greenhouse gas emissions – a feat previously thought to be impossible in medium and small jet engines.

Consortium Members

Pratt & Whitney Canada Corp.
 National Research Council
 University of Toronto - Institute
 for Aerospace Studies
 CVRD INCO Ltd.

University of British Columbia

Round 6 2004B

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 7,299,098
 SDTC Funding:
\$ 2,408,702
 Leveraged Funding:
\$ 4,890,396

Advanced High Performance Building Envelope with Integrated Sustainable Energy Components

The University of British Columbia is demonstrating technology that will be installed in the Centre for Interactive Research on Sustainability (CIRS), which will be the world's first state-of-the-art building to achieve a targeted MNECB -86 performance standard. Using a combined set of sustainable technologies, including 90 kW of integrated photovoltaic panels, mechanized solar shading devices, mechanized light-shelves for day-lighting, and natural ventilation components including mechanized operable windows and other energy saving components, coupled with an extensive adaptive sensing, monitoring and controls system, this building will become a "living laboratory" and demonstration centre for environmentally sustainable building design, technologies and operation.

Consortium Members

University of British Columbia
 British Columbia Institute
 of Technology (BCIT)
 Canada Foundation for Innovation (CFI)

Round 5 – Board Approval October 2004

Alternative Green Energy Systems Inc.

Round 5 2004A

Environmental Benefits: Climate Change / Clean Air / Clean Soil

Total Project Value:

\$ 1,761,928

SDTC Funding:

\$ 517,041

Leveraged Funding:

\$ 1,244,887

Thermix/KDS Biomass Combustion System

Alternative Green Energy Systems (AgES) is demonstrating a system which radically lowers the environmental and economic cost of dealing with biomass waste from industrial processes such as those employed by the pulp & paper industry. Using a novel technology, AgES is able to dry waste biomass (pulp & paper sludge, wood chips, livestock waste) – kinetically, without heat, and using less than half the energy of conventional drying systems – to a point where it can be used to generate electricity, heat and other valuable co-products such as the expensive whitening and glossing agents from recycled paper (kaolin and clay, respectively).

Consortium Members

Alternative Green Energy Systems Inc.
Flakeboard Company Ltd.
Thermix Combustion Systems Inc.
First American Scientific Corp.
Capitech Quebec Hydro
University of Toronto, Forestry
Department

Great Northern Power Corp.

Round 5 2004A

Environmental Benefits: Climate Change / Clean Air

Total Project Value:

\$ 7,265,541

SDTC Funding:

\$ 2,063,403

Leveraged Funding:

\$ 5,202,138

Biomass Energy Saving System (BESS)

Great Northern Power will demonstrate a system for economically producing electricity or useful torque from waste heat released by reciprocating engines in natural gas compressor stations. Great Northern Power's technology will recuperate the compressor engines' waste heat and use it to either reduce the amount of gas used to run the engines or displace grid electricity used to power the stations (if grid connected). This will result in a reduction of greenhouse gas emissions by either displacing fossil fuels combusted in the compressor engines or in grid electricity production; both of which will result in substantial energy cost savings for the companies operating the pipelines.

Consortium Members

Great Northern Power Corp.
AltaGas Operating Partnership
Canadian Environmental Technology
Advancement Corporation -
West (CETAC - West)

Xantrex Technology Inc.**Round 5 2004A****Environmental Benefits: Climate Change / Clean Air**

Total Project Value:

\$ 3,677,618

SDTC Funding:

\$ 1,213,614

Leveraged Funding:

\$ 2,464,004**Integrated Power Electronic Controls for Large Wind Turbines**

Xantrex is demonstrating an innovative power inverter technology and state-of-the-art drive train for wind turbine manufacturers around the world. The integrated drive train system will work seamlessly with new wind turbines of the two-megawatt to three-megawatt class, reducing operating costs and boosting overall performance and efficiency. These turbines are expected to be introduced over the next few years, likely overtaking turbines of the 1.5-megawatt-class and further improving wind energy economies of scale, enabling increased adoption of wind power generation, a renewable energy-generation technology that produces no direct greenhouse gases or other air pollution.

Consortium Members

Xantrex Technology Inc.

Loher GmbH

Winergy AG

Round 4 – Board Approval May 2004**DeCloet Greenhouse Manufacturing Ltd.****Round 4 2003B****Environmental Benefits: Climate Change**

Total Project Value:

\$ 556,821

SDTC Funding:

\$ 176,434

Leveraged Funding:

\$ 380,387**Energy Efficient Greenhouse Design**

Technologies for Saving Energy in Commercial Greenhouses - DeCloet Greenhouse Manufacturing Ltd. has developed a variety of technologies, including a novel removable foam insulation technique, to reduce energy consumption in greenhouses by 50 to 75%, with corresponding reductions in operating costs and greenhouse gas emissions. With this level of reduction in energy consumption, it becomes affordable for Canadian greenhouses to operate year-round – avoiding the importing of produce with the associated transportation emissions. Further, Canadians can enjoy fresh produce grown locally year-round. New greenhouse structural designs will include automatic removable foam insulation, heat recovery and storage systems, micro-turbine cogeneration, new energy management process controls, infra-red thermal film, energy curtains, and supplemental lighting system technologies.

Consortium Members

DeCloet Greenhouse Mfg. Ltd.

Enbridge Gas Distribution Inc.

Union Gas, A. Duke Energy Company

Agricultural Adaptation Council (AAC)

CEA Technologies International

Greenhouse Engineering

Quist Engineering and Consulting

Argus Control Systems Ltd.

P.L. Light Systems Canada Inc.

Elliott Energy Systems Inc.

NxtPhase T&D Corp.

Round 4 2003B

Environmental Benefits: Climate Change

Total Project Value:
\$ 3,614,695
 SDTC Funding:
\$ 887,598
 Leveraged Funding:
\$ 2,727,097

Optical Voltage and Current Sensor Cost Reduction and Field Demonstration

NxtPhase T&D Corp. is demonstrating optical current and voltage sensors to control and monitor large-scale electric power grids. It is expected that devices of this type will replace the environmentally harmful (SF6-filled) instrument transformers and circuit breakers currently in use. The optical sensors represent a safe and environmentally friendly solution, with superior performance resulting in enhanced reliability of the grid--reducing the probability of events such as the August 14, 2003 blackout in Ontario and the northern U.S.

Consortium Members

NxtPhase T&D Corp.
 BC Transmission Corp.
 Powertech Labs Inc.

Whitefox Technologies Canada Ltd.

Round 4 2003B

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 6,776,468
 SDTC Funding:
\$ 2,608,545
 Leveraged Funding:
\$ 4,167,923

Efficient Production of Fuel Ethanol to Reduce GHG and CAC

Whitefox Technologies Canada Ltd.'s project will involve the development and demonstration of a membrane technology for dehydration which is believed to reduce the overall cost of ethanol production in any ethanol plant by up to 3.5 cents per litre. In current ethanol production, a grain-based feed is fermented, separated and distilled. Conventional approaches are unreliable and inefficient because they use molecular sieve beds or plate and frame membranes/filters for moisture removal. The Whitefox process is much less energy intensive and has higher reliability – resulting in lower GHG emissions and improved air quality.

Consortium Members

Whitefox Technologies Canada Ltd.
 Virtual Materials Group Inc.
 Pound-Maker Agventures Ltd.
 KATZEN International, Inc.
 University of Calgary

Round 3 – Board Approval October 2004

RailPower Technologies Corp.

Round 3 2003A

Environmental Benefits: Clean Air

Total Project Value:
\$ 1,634,600
 SDTC Funding:
\$ 584,079
 Leveraged Funding:
\$ 1,050,521

Hybrid Switching Locomotive Demonstration Fleet
 RailPowerTechnology Corp. is demonstrating an ultra – energy efficient switcher locomotive. Most railway switcher locomotives incorporate standard diesel-electric configurations which, because they are not built for the very demanding stop-go environment of the railway switching yard, tend to operate inefficiently and generate harmful air emissions such as particulates and NO_x. RailPower's prototypes are powered by custom designed batteries which are kept at full charge by a computer-controlled, smokeless diesel generator.

Consortium Members
 RailPower Technologies Corp.
 Alstom Transport Service
 Transport Canada-Freight Sustainability
 Demonstration Program

Round 2 – Board Approval May 2003

IBC Technologies Inc.

Round 2 2002B

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 877,150
 SDTC Funding:
\$ 183,150
 Leveraged Funding:
\$ 694,000

Enhancement and Pre-Commercialization of a Top Efficiency eKOCOMFORT®. Combined Home Heating and Ventilating System
 IBC Technologies Inc. is demonstrating a new, high efficiency combined ventilation and space/water heating system. This product is significantly more energy-efficient than standard systems and represents a breakthrough for residential applications.

Consortium Members
 IBC Technologies Inc.
 Nutech Energy Systems Inc.
 Dexon Canada Manufacturing Corp.
 GSW Water Heating Company,
 a division of GSW Inc.
 Natural Resources Canada (CANMET
 Energy Technology Centre)
 Mechanical Systems 2000 Inc.

Round 1 – Board Approval November 2002

Mabarex Inc.

Round 1 2002A

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 550,000
 SDTC Funding:
\$ 225,000
 Leveraged Funding:
\$ 325,000

Dry-Rex™

Mabarex Inc. is demonstrating a two-step, integrated wet granular-drying process (Dry-Rex) that uses low vacuum, forced-air stream at temperatures above 5°C as the main driving force to dry paper mill biomass at temperatures much lower than other processes. Paper mill waste is a significant liability that must be shipped wet for disposal. By providing a cost-effective drying technology, Mabarex is able to turn a waste product into a valuable energy source.

Consortium Members

Mabarex Inc.
 Kruger Inc.
 Enviro-Access Inc.
 EM Optimisation Inc.
 Natural Resources Canada (CANMET Energy Technology Centre)

NOVA Chemicals Corporation

Round 1 2002A

Environmental Benefits: Climate Change / Clean Air

Total Project Value:
\$ 956,575
 SDTC Funding:
\$ 320,000
 Leveraged Funding:
\$ 636,575

Development of Polymer Membrane for Olefin-Paraffin Separation

A new membrane technology has been developed that represents a two-orders of magnitude improvement in olefin-paraffin separation efficiency over existing membrane technologies, reducing capital cost of equipment required for separation while minimizing energy consumption and contributing to a reduction in GHG emissions.

Consortium Members

NOVA Chemicals Corp.
 Alberta Innovates - Technology Futures
 University of Waterloo

Suncor Energy Inc.

Round 1 2002A

Environmental Benefits: Climate Change

Total Project Value:
\$ 3,555,669
 SDTC Funding:
\$ 889,132
 Leveraged Funding:
\$ 2,666,537

Carbon Sequestration and Enhanced Methane Production

Suncor Energy Inc. is demonstrating carbon sequestration and enhanced methane production in a closed cycle pilot project designed to capture CO₂ emissions, inject and sequester these emissions into a local subsurface coal reservoir and produce enhanced volumes of coal bed methane as a result.

Consortium Members

Suncor Energy Inc.
 EnCana Corp.
 Natural Resources Canada (NRCan)
 TransCanada Pipelines Ltd.
 Quicksilver Resources Canada Inc.
 Penn West Energy Trust
 Air Liquide Canada Inc.
 University of Calgary
 Alberta Science and Research Authority

NextGen Biofuels Fund™ Introduction

Purpose

The purpose of the NextGen Biofuels Fund™ is to:

- Facilitate the establishment of First-of-Kind Large Demonstration-scale facilities for the production of next-generation renewable fuels and co-products;
- Improve the sustainable development Impacts arising from the production and use of renewable fuels in Canada; and,
- Encourage retention and growth of technology expertise and innovation capacity for the production of next-generation renewable fuels in Canada.

The NextGen Biofuels Fund™ incorporates a requirement that all contractual agreements between SDTC and Eligible Recipients include repayment terms based on free cash flow over a period of 10 years after project completion.

Eligible Projects

A project, to be an Eligible Project, must:

- Be a first-of-kind facility that primarily produces a next-generation renewable fuel at large demonstration-scale;
- Be located in Canada; and
- Use feedstocks that are or could be representative of Canadian biomass.

Funding Criteria

The Foundation will exercise its discretion in the allocation of funding to Eligible Recipients, in accordance with the following criteria:

- The Eligible Recipient's access to the necessary technical, financial and management capacity to successfully undertake the Eligible Project;
- The level of necessary funding required from the Foundation to ensure that the Eligible Project proceeds;
- The potential of the production pathway to deliver sustainable development benefits (social, economic and environmental) by:
 - sustainably expanding renewable fuel production in Canada;
 - improving the environmental benefits arising from the production and use of renewable fuels including the life-cycle fossil energy balance and life-cycle emissions of greenhouse gases;
 - reducing the overall financial costs of Renewable Fuels; and,
 - generating economic benefits for a wide range of communities.

More detail on the funding process can be found in the Funding section of the SDTC website at: www.sdtc.ca

NextGen Biofuels Fund™ Portfolio Project Description

The next generation renewable fuel industry is overcoming technology and financial hurdles and progressing towards commercial roll-out. The technology gap which has slowed down industry over recent years is now closing, namely due to improved process performance and to progress achieved on the pre-commercial demonstration front.

While some IPO events and opportunities were seen in 2011, first-of-kind risk and tight credit markets still require that the next generation renewable fuels industry relies on strategic investors and government financing for initial commercial roll-out.

As of the end of 2011, we have an identified shortlist of 24 project-ready candidates which meet the NGBF eligibility criteria and are favorably benchmarked against target performance criteria. Six consortia are active with four having filed an Application for Funding (AFF) and two Indications of Interest (IOI), which are expected to convert to AFF in 2012. Of these four active AFFs, one NGBF funding decision was made in 2011 for project front-end development.

Projects

Varenes Cellulosic Ethanol L.P.

Total Project

Costs*:

\$97,500,000

Potential SDTC

Contribution*:

\$22,500,000

SDTC Contribution

To Date:

\$130,000

Enerkem Inc. (“Enerkem”), in partnership with Greenfield Ethanol Inc. (“GFE”), intends to implement the Varenes-Generations Project (“VGP”). The \$97.5 M cellulosic ethanol facility will be located in Varenes, QC, on a brown field site where GFE currently operates a corn ethanol plant. VGP will convert 115,000 metric tonnes per year (mtpy) of urban waste into 40 M litres of cellulosic ethanol. The Enerkem thermo-chemical process which is currently being demonstrated in Westbury, QC with support from SDTC’s SD Tech Fund™ includes feedstock preparation, gasification of biomass, syngas conditioning and catalytic synthesis of ethanol. The gasification capacity scale-up factor is eight times from Westbury to VGP.

Partners

Enerkem Inc.
GreenField Ethanol Inc.

* Final project costs and contributions are subject to assessments of project development, implementation achievements and a Final Investment Decision. For NGBF Funding process, see Funding section at www.sdte.ca.