



Government
of Canada

Gouvernement
du Canada

THIRD TEAM
PROGRESS REPORT

2003–2005

CLIMATE CHANGE
SOLUTIONS
FOR CANADA
AND THE WORLD

TECHNOLOGY EARLY ACTION MEASURES (TEAM)
MOVING FORWARD ON CLIMATE CHANGE

Canada

ACKNOWLEDGEMENTS

We would like to acknowledge our appreciation of the many individuals in both the private and public sectors who have been part of the Technology Early Action Measures (TEAM) Program. Without their long-term vision and commitment of time, effort and financial resources, the TEAM program would not be the success it is.

Special thanks are extended to the TEAM Executive Committee, Interdepartmental Review Committee, the TEAM Operations Office staff, and the communications and financial management staff of Natural Resources Canada, Environment Canada and Industry Canada.

This report is available in English and French on the TEAM website at www.team.gc.ca and in hard copy from:

Le présent rapport est disponible en français et en anglais dans le site Web des TEAM à l'adresse www.team.gc.ca, ainsi que sous forme de document imprimé à l'adresse suivante :

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ABOUT THIS REPORT

This report, *Climate Change Solutions for Canada and the World*, provides an update on TEAM progress for the period from 2003 to 2005. This update highlights 20 of the 106 projects funded by TEAM to date, including seven recent projects, and successful outcomes from several other TEAM projects that have been undertaken over the past eight years. The seven recent projects profiled here include:

- Menova Energy Inc.
- CIMCO Refrigeration
- Terra Nova Marine Co., Ltd.
- ATF Advanced Technologies & Fuels Canada (ATFCan)
- Outland Technologies Inc.
- Yava Technologies Inc.
- Nexterra Energy Corp.

There are also 13 additional projects profiled, organized into four key areas:

Energy and Resource Efficiency

- Loblaw Properties Ltd.
- CETAC-WEST
- OCETA
- Conestoga-Rovers & Associates

Enhanced Conventional Energy Production

- Syncrude
- Petroleum Technology Research Centre (PTRC)
- Alberta Research Council

Sustainable Communities

- Visionwall Corporation
- ATS Automation Tooling Systems Inc.
- Town of Okotoks, Alberta

Sustainable Agriculture

- Highmark Renewables
- Envirogain
- Lynn Cattle Company Inc.

In a brief report, there remains a wealth of information that cannot be presented. Please visit the TEAM website at www.team.gc.ca for more detailed information on TEAM and its projects and partners.

Visit TEAM at:

www.team.gc.ca

TECHNOLOGY EARLY ACTION MEASURES (TEAM)

Technology Early Action Measures (TEAM) is a federal interdepartmental technology investment program established in 1998. TEAM is part of the Technology and Innovation component of the Climate Change Plan for Canada. TEAM brings together private and public sector partners to identify, develop and support the most promising environmentally sound technologies that have the greatest potential to reduce greenhouse gases (GHGs). The program serves as a catalyst for innovation, operating under the leadership of Natural Resources Canada, Environment Canada and Industry Canada, with the participation of several other federal government departments.

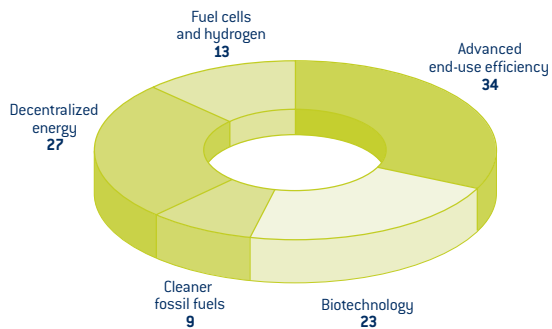
TEAM'S MISSION is to facilitate late-stage technology development and demonstration of technologies that have significant potential to reduce GHG emissions nationally and internationally, while sustaining economic and social development.

While reducing GHG emissions is an environmental challenge, it is also a tremendous economic opportunity that, at the same time, provides the additional benefits of enhanced diversity and security

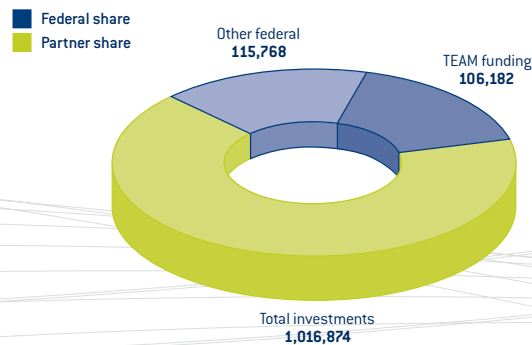
of energy options. TEAM funding is driving the application of Canadian research and development to provide climate change solutions that grow the Canadian economy, create jobs, and offer new international development opportunities.

We invite you to look inside to read more about some of Canada's most innovative technology demonstration initiatives in which TEAM has played a strategic role.

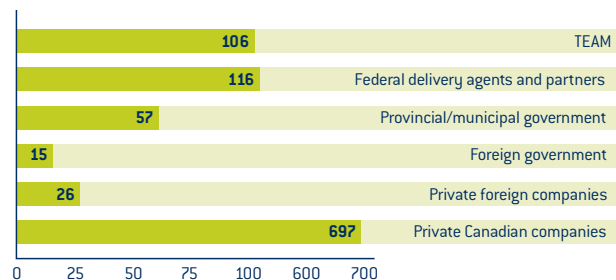
TEAM SECTORS (NUMBER OF PROJECTS)



TEAM FUNDING (\$ MILLIONS)



TEAM PARTNERS (\$ MILLIONS)



PROJECT GREEN — MOVING FORWARD ON CLIMATE CHANGE

The Government of Canada is committed to the transformative, long-term change required to make significant reductions in greenhouse gas (GHG) emissions while ensuring continued economic growth. This change is essential for the protection of the environment, a competitive and sustainable economy, and the quality of life of Canadians.

It makes sense for Canada to take action on climate change. This means aiming to reach short-term goals while putting in place the measures necessary to ensure that longer term climate change objectives are realized. The Government of Canada is committed to the transformation of our economy. The first phase of Project Green provides for Government of Canada investments in the order of \$10 billion between now and 2012 to fully realize the anticipated reductions of about 270 megatonnes.

Canada's 2005 Climate Change Plan for honouring its Kyoto commitment is built on six key elements:

- Competitive and sustainable industries for the 21st century;
- Harnessing market forces;
- Partnership among Canada's governments;
- Engaged citizens;
- Sustainable agricultural and forestry sectors; and
- Sustainable cities and communities.

Encouraging innovation and the development of environmentally sound technologies is a key aspect of the Government's approach to climate change in the longer term. Initiatives are designed to establish Canada as a global leader in the development, deployment and implementation of environmentally sound technologies. New technologies can provide Canadians with the ability to reduce GHGs and other harmful emissions while enjoying the benefits of a competitive economy.

In fulfilling its mandate, TEAM is guided by the five principles which support Canada's Climate Change Plan:

Balance – TEAM's approach looks at both the supply and demand sides of the marketplace, as well as integrated approaches to achieving long-term, sustainable solutions. Investments balance the need for short-term action to protect our natural environment and long-term measures to spur change.

Competitiveness – TEAM investments are helping to establish Canada as a global leader in the development, deployment and implementation of environmentally sound technologies. The TEAM program has significant impact in helping to develop small- and medium-sized enterprises (SMEs) in Canada and their capacity to implement technologies both domestically and internationally.

Partnerships – The TEAM program is a multi-departmental initiative of Natural Resources Canada, Environment Canada and Industry Canada. By taking advantage of existing federal project delivery mechanisms, TEAM taps into a vast network of technology experts that manage project implementation. TEAM's unique approach brings together industry, community, and international partners to encourage additional investment in innovative technology.

Innovation – TEAM encourages innovation in the development of environmentally sound technologies. The TEAM program targets a specific area of the innovation chain, between long-term strategic R&D and market entry. TEAM funding often acts as a catalyst for increased R&D and commercialization activity in technologies to reduce GHG emissions.

Cost Effectiveness – TEAM's investment strategy encourages the implementation of projects that make sense and leverage other resources available for investment. In addition, TEAM's assessment process increases the verifiability of project results in terms of possible future credits and financial benefits.

REPORTING TO CANADA AND THE WORLD

An important and distinctive element of the TEAM program is the commitment to report the technical performance and GHG mitigation potential of all TEAM-funded projects. TEAM's pioneering work in the development of tools and methodologies for measurement and reporting of GHG reductions has resulted in the System of Measurement and Reporting for Technologies (SMART).

The purpose of SMART is to provide the basis to develop and/or evaluate the project proponent's processes and documentation to substantiate the technology performance claim(s) and assess the GHG mitigation potential.

Competitive and Sustainable Industries

SMART benefits the companies working on the projects, as well as the government programs that support them. SMART helps companies to:

- Establish credibility;
- Gain experience and skill in GHG reporting;
- Show leadership;
- Build competitive advantage; and
- Maintain constructive government and public relations.

The growing network of third-party evaluators created under TEAM's leadership are gaining valuable training and experience in preparing for emerging GHG emissions trading markets. The federal government benefits by having the confidence and knowledge that the investments it makes have measurable results, are fiscally responsible, build capacity in the private sector, and reduce the risks associated with GHG emissions.

In implementing its project monitoring and reporting system, TEAM works with several international GHG standard/protocol organizations, including the International Organization for Standardization (ISO), the World Resources Institute (WRI), the World Business Council for Sustainable Development (WBCSD), and the Institute of Electrical and Electronics Engineers (IEEE).

While the emphasis of TEAM projects is technology commercialization and replication, there is an important need for credible, transparent reporting on GHG performance based on a measurable data. The SMART process assists in the reporting of GHG information by TEAM companies, augmenting the effective use of GHG emissions results by a wide range of GHG information users, including:

- Government agencies, for regulatory and international reporting purposes;
- Emissions trading organizations; and
- Technology proponents, for sales and marketing, and sustainability reporting.

The table on pages 13 and 14 summarizes the SMART results of TEAM projects.

TEAM PROJECT MANAGEMENT PROCESS



“TEAM’S APPROACH TO THE INDEPENDENT VALIDATION OF PROJECT RESULTS THROUGH ITS SMART SYSTEM ensures that the reporting of information on GHG emissions reductions is undertaken in a credible and transparent manner. This will be especially important as we move towards international GHG trading and permits.”

Kevin Boehmer, Secretary, Joint ISO/CASCO/TC207 Working Group 6, Canadian Standards Association

RECENT PROJECTS IN THE TEAM PORTFOLIO

TEAM links closely with the principles and goals of Canada's 2005 Climate Change Plan, Project Green, as can be seen in the TEAM project profiles in the following pages. These first seven projects are recent additions to the TEAM portfolio.



MENOVA ENERGY INC. *Solar heat, hot water and electricity generation, storage and distribution*

The Menova Power-Spar® system uses solar energy to generate heat and electrical power, displacing conventional fossil fuels which produce GHG emissions. This modular, scaleable technology is applicable to a wide range of energy consumers – small residences (both on- and off-grid); urban multi-story office buildings; schools, commercial, retail and industrial buildings; and in-city solar co-generation plants.

A third-party validation of Menova installations in Ontario demonstrated that homes that install the Menova system to supplement propane heating can reduce GHGs by 4.3 t CO₂e per year (increasing to 5.2 t CO₂e/year with PV cells generating electricity), and 73 t CO₂e per year for a school using the Menova system to supplement electrical heating in Ontario, rising to 86 tonnes with PV power generation.



CIMCO REFRIGERATION, A DIVISION OF TOROMONT INDUSTRIES *Integrated heating, ventilation, air-conditioning, and refrigeration system for ice rinks and recreation facilities*

This TEAM project will advance the development and demonstration of CIMCO's ECO-CHILL system, an innovative, efficient and environmentally-friendly system for ice rinks and other commercial and industrial refrigeration applications. The main goal is to reduce overall energy consumption by continuously adjusting the condensing temperature, recycling heat from the condensing process, and distributing secondary fluids throughout the building to reduce fuel consumption and electrical

demand for refrigeration, heating and cooling of the entire complex. The system was developed by CIMCO to address the major refrigeration and mechanical system renovation market that is anticipated in Canadian recreational facilities and ice rinks over the next five years. Company projections are for a reduction of 50% in total energy consumption.

The performance of the CIMCO technology was validated by a third party at a new arena in Alberta with 13,000 m² of floor surface, which is expected to reduce emissions by 293 t CO₂e/year. Since the SMART validation, the project has expanded to include two additional sites, one in Manitoba and the other in Quebec.

TERRA NOVA MARINE CO., LTD. *Diesel-electric propulsion system for medium-sized fishing vessels*

The innovative idea behind this project is to develop a commercially viable diesel-electric propulsion system for medium-sized fishing vessels—both traditional fishing vessels and factory-freezer trawlers—and determine how such a system would affect the industry's bottom-line operations and GHG emissions. Electric motors will replace the main diesel propulsion engine so that the power production can be split to several smaller diesel generators. Electric motors are highly efficient over a range of operational speed and power output, while a diesel engine has a clear peak in efficiency.

A third-party validation of this project estimates that the diesel-electric technology for a fishing vessel with an onboard fish processing plant in the 18- to 20-metre size range will have emissions reduced by 962 t CO₂e/year, compared to a similar vessel with conventional propulsion systems. Applying this technology to a conventional fishing vessel of similar size would reduce emissions by 710 t CO₂e/year.



ATF ADVANCED TECHNOLOGIES & FUELS CANADA INC. (ATFCAN) *Natural gas vehicle flagship project in India*

A consortium of companies in the natural gas vehicle industry is using an integrated approach to demonstrate Canadian natural gas vehicle (NGV) technologies designed for the Indian market. The project in Mumbai includes: the introduction of a low-emission natural gas



CARBON DIOXIDE EQUIVALENT (CO₂e) IS A STANDARD MEASUREMENT BY WHICH GHGs OTHER THAN CARBON DIOXIDE ARE CONVERTED TO FACILITATE COMPARISON.

engine to the Indian bus market; the use of lightweight CNG cylinders; the conversion of light-duty commercial fleet vehicles to natural gas; and the demonstration of an advanced, high-volume, fast-fill fueling station. The market for NGV technologies has expanded rapidly in countries with emerging economies because of skyrocketing demand for oil and scarcity of supply, the availability of low-cost and abundant local natural gas reserves, and the recognition by governments that deteriorating urban air quality must be addressed. In addition to reductions in regulated emissions, benefits to India will include local job creation and skills transfer—part of a comprehensive strategy for long-term, sustainable development. This project will also document the feasibility of GHG credit repatriation to help meet Canada's Kyoto commitments.



OUTLAND TECHNOLOGIES INC.

Advanced Power Recovery Generator

Canadian natural gas production, processing and distribution consume large amounts of energy as

the gas makes its way from the well-head to the end-user. The multiple stages of compression and recompression waste significant amounts of energy. Outland's low-speed Positive Displacement power recovery turbine-generator (PRG) is designed to recover the power loss that occurs at pressure let-down stations in the natural gas industry and in plants that produce other gases. This technology can capture the wasted energy and convert it into useful power which can be used on-site or fed into the electrical grid. The PRG generator has the added benefit of offering a more attractive financial payback than conventional high-speed turbine-generator technology.

TEAM's third-party validators calculated that the Power Recovery Generator is capable of reducing emissions by 0.98 t CO₂e per 1000 kWh generated in Alberta.



YAVA TECHNOLOGIES INC.

In-situ leach mining

Yava Technologies Inc. has developed a low-cost, environmentally friendly process to recover value-added minerals from the large sandstone deposit at the

Yava site near Sydney, Nova Scotia. Yava's process employs in-situ leach mining utilizing an environmentally friendly leachant that is injected via a well system into the ore body. The leachant dissolves

“TEAM SPURRED THE ACTIVITY FROM THE BEGINNING, provided suggestions, maintained the interest level, provided logistics, and brought in other participants.”

Steve Whitten, Terra Nova Marine

the targeted minerals that are brought to surface as leachate for on-site recovery as value-added products at a fraction of the cost of conventional hard-rock mining methods. The process, currently applicable to the recovery and processing of certain sulphide-based ores from porous ore bodies and tailings dumps, results in significantly lower GHG emissions than those normally associated with mining and smelting operations.

An independent third-party validation concluded that Yava's mineral recovery technology reduces GHGs by 12,000 t CO₂e per year for a 7,000 tonne-per-year lead production facility on the basis of 20 metric tonnes of lead per day, and 40,000 t CO₂e/year when the valuable by-products are taken into consideration. This accounts for an approximately 85% reduction in GHG emissions compared to conventional mining and pyrometallurgical processes.

NEXTERRA ENERGY CORP.

Biomass gasification in the forest industry

One industry's waste is increasingly becoming its energy source. The demonstration of Nexterra's multi-million dollar gasification



system at Tolko's plywood mill located at Heffley Creek, British Columbia will convert 25,000 tonnes per year of green, bark wood residue produced on-site into clean, renewable thermal energy to produce hot water for log conditioning and heat for drying veneer. As a result of the project, Tolko will realize fuel cost savings of over \$1.5 million annually. The project will also reduce the overall air emissions from the mill by eliminating VOC emissions from one of the mill's fossil-fired veneer dryers. It is expected that the technology will have a wide range of applications in other industries that produce carbon-based waste, such as the pulp and paper, and food processing industries.

Through a third-party validation, it has been estimated that the Nexterra technology will reduce the emissions from the Heffley Creek plywood mill by 13,700 t CO₂e/year by displacing natural gas with hog fuel.

OTHER TEAM HIGHLIGHTS AND SUCCESS STORIES

TEAM projects to reduce GHG emissions also produce multiple and cross-sectoral benefits. In many cases, the involvement of TEAM has had a significant impact on the project outcome. TEAM projects have resulted in additional and ancillary R&D investments – for the continuation of current development, adaptation to other products, or pursuit of new ideas. TEAM funding has often contributed to the development of new companies, the expansion of existing companies, and an increased Canadian presence internationally.

ENERGY AND RESOURCE EFFICIENCY

One of Canada's greatest challenges is optimizing the innovation and commercialization process in an integrated manner across the full spectrum of the industrial economy. Eco-efficiency is essentially a management strategy to create more value with less ecological impact. TEAM has supported several industrial eco-efficiency programs to assist companies in identifying and demonstrating energy and resource-saving opportunities.



LOBLAW PROPERTIES LTD.

Eco-efficiency: saving more than money at the supermarket

Supermarkets are among the most energy-intensive buildings in the commercial sector, and refrigeration represents about 50% of the electrical energy consumption. Loblaw's has become an energy innovation leader by demonstrating a technology that allows heat rejected by the refrigeration system to be recovered for store heating demands while ensuring safe, cold temperatures in the display cases. Heat recovery is so great that the furnace normally used in a conventional supermarket has been completely eliminated – no supplementary heat was required in the Repentigny demonstration store over the winter. The new system allows the reduction of synthetic refrigerant use by 75% and total energy consumption by 18% compared with a typical recent Loblaw's supermarket in Canada.

TEAM's third-party validator determined that, compared to a supermarket with a conventional heating, ventilation, air conditioning and refrigeration (HVAC&R) system in Québec, annual emissions

are reduced by 80 tonnes CO₂e per each 1,000 m² of floor space if both stores use electricity for their HVAC&R systems, and by 99 tonnes CO₂e per 1000 m² compared to a store using electricity and natural gas for its HVAC&R system.

CETAC-WEST

Energy industry eco-efficiency

The CETAC-WEST project involved energy and operational efficiency audits at some of Alberta's natural gas processing plants, and identified substantial benefits in terms of reduced GHGs, cost savings, increased competitiveness and cleaner air. The initiative included a pilot program for integrated gas plant audits, new technologies demonstrations, the development of benchmarking performance indicators to monitor long-term improvement, and eco-efficiency workshops to roll-out the program results. Seventeen integrated audits were conducted, resulting in the identification of over 190 energy and environmental efficiency improvement opportunities. This initiative, originally focussed on large sour-gas plants, evolved to include a broader selection of facilities in the upstream petroleum industry, such as gas-gathering pipeline networks, small to large gas plants, and heavy oil operations. CO₂e reductions ensuing from planned improvements at the audited facilities are estimated to be over 240,000 tonnes per year.

Two technologies demonstrated in this project have undergone SMART assessments. A third-party validation estimates that by lowering the pressure of natural gas used to power actuators on valves at natural gas facilities, the Sirius Emission Reducer reduces emissions by an average of 55 tonnes CO₂e per controller annually. The REMVue® natural gas engine controller improves the control on natural gas engines used to power compressors in the upstream natural gas sector, and was validated by a third party to reduce emissions by 740 tonnes CO₂e/year on an 1100 kW engine.



ONTARIO CENTRE FOR ENVIRONMENTAL TECHNOLOGY ADVANCEMENT (OCETA)

Industries conserving energy, resources and money

The OCETA Eco-Efficiency Innovation Project focused on small- and medium-sized enterprises (SMEs) in Ontario's manufacturing sector to reduce GHG emissions and improve competitiveness through more efficient use of resources and energy. Four industry sectors were selected: automotive parts,



food processing, chemical processing and plastic processing. The project resulted in over 50 audits, with average follow-up capital investments of over \$200,000 per company. Approximately 90% of the audited companies implemented at least one of the recommended energy efficiency measures. TEAM has estimated that the implementation of the retrofits and better management practices identified through these 50 audits alone resulted in GHG emissions reductions of 33,800 tonnes CO₂e/yr. The Eco-Efficiency Project was followed by a second pilot project, expanded in scope and offered to any company in Ontario regardless of size or industry sector. These two pilots led to the implementation of the Canada-wide Industrial Energy Audit Incentive Program, supported by NRCan's Office of Energy Efficiency and managed by OCETA.



CONESTOGA-ROVERS & ASSOCIATES

Multiple benefits from landfill gas

A pilot-scale landfill gas (LFG) utilization system designed in Waterloo, Ontario by Conestoga-

Rovers & Associates (CRA) was constructed at the Canabrava landfill site in Salvador, Brazil – the first LFG utilization system in operation in South America. Partnered with R.J. Burnside International and Golder Associates under Industry Canada's Sustainable Cities Initiative, with the assistance of TEAM funding, the group was honoured with an award in the "Partnership" category at the Ontario Global Traders Forum. The lights at the local soccer field are powered by the electricity produced at the site, and plans are in place to expand the use of the electricity to a proposed composting facility. The demonstration project has gained wide public attention in Brazil, and new export markets have been developed in South America through the purchase of a Brazilian engineering firm.

A third-party validation of this project predicts an annual reduction of emissions of 850 tonnes CO₂e compared to partial flaring of LFG, and 4,100 tonnes CO₂e compared to a scenario where there is no control on landfill emissions.

ENHANCED CONVENTIONAL ENERGY PRODUCTION

Canada is heavily dependent on fossil fuels. These resources make an important contribution to Canada's economy, but they are also large contributors of GHG emissions. TEAM continues to invest in demonstrating cleaner energy production technologies to reduce Canada's reliance on fossil fuels and to make their consumption less harmful to the environment. Canadian leadership in this area is important in assisting other countries achieve more efficient production and utilization of fossil fuels, which, in turn, could earn offset credits.

SYNCRUDE

A smaller footprint in the oilsands

This project piloted a new technology that thickens oil sands tailings towards a higher density of thickened tailings or a potentially paste-like material, with the goal of reducing the volume of tailings and allowing them to be reclaimed more quickly. First demonstrated at Syncrude's Aurora mine, this innovation could play a pivotal role in the continued improvement of tailings technology. The goal is to reduce the need for settling ponds, while reducing energy needs and producing fewer GHGs. TEAM funds were instrumental in accessing matching provincial funds and reducing the initial financial risk for all partners.

Since the completion of the TEAM project, work has continued on this promising technology. An additional investment of more than \$20M has been made by the remaining project partners. Current plans include the application of this technology at the oil sands plants north of Fort McMurray. Other project benefits include the potential to reduce land disturbance for tailings storage and reduce water use.



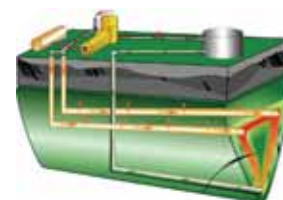
“TEAM IS ONE OF THE SMARTEST TECHNOLOGY FINANCING GROUPS that I have worked with in government. They are in tune to the needs of technology commercialization, the needs of small companies and the needs of the marketplace.”

Jonathan Rhone, President and CEO, Nexterra Technologies

PETROLEUM TECHNOLOGY RESEARCH CENTRE (PTRC)

Vapour extraction efficiencies

The vapour extraction (VAPEX) technology has the potential to significantly reduce GHG emissions and water usage in enhanced oil recovery. TEAM made a relatively small contribution to the project at an early stage, which was nevertheless recognized by the proponents as being crucial to their ability to proceed. Nexen, one of the project stakeholders, intends to develop and commercialize the VAPEX process to increase recovery from three of the largest heavy oil fields in Saskatchewan, and is in the process of conducting a multi-million dollar program involving three field pilot projects in three different major oil fields that span a range of heavy oil reservoir types. TEAM is still engaged to conduct a SMART evaluation on future VAPEX demonstrations.





ALBERTA RESEARCH COUNCIL
Adding value to coalbed methane with carbon dioxide injection

Carbon dioxide (CO₂) is a waste by-product of combustion. Coalbed methane is essentially natural gas, a clean form of useful fossil energy. Combining the two provides a win-win solution. The Alberta Research Council is leading a national and international consortium of more than 25 partners to demonstrate the technology of enhanced coalbed methane (ECBM) recovery. CO₂ or CO₂-rich flue gas (carbon dioxide, nitrogen oxides, and trace gases) is injected into deep coal beds and adsorbed in the coal matrix, displacing the methane in the coal and creating a storage site for the CO₂. TEAM funding was a major catalyst in securing funding and support from industry and from the Alberta government and moving the technology to the next stage of multi-well pilot testing.

As a result of the progress made on the Alberta pilot project, ARC is leading a Canadian consortium in a CIDA-supported project in northern China which has successfully completed a single-well test to demonstrate this technology. The next step is to design and implement a multi-well pilot. The ultimate goal of the China project is to reduce CO₂ emissions and to provide a clean energy source for China.

SUSTAINABLE COMMUNITIES

Canada is characterized by a wide range of communities, from large metropolitan areas to small villages and towns, all with significant potential to reduce energy consumption and GHG emissions. Community infrastructure systems range from large, centralized facilities, to small, communal, and site-specific installations which employ a wide range of energy-related technologies. TEAM has supported the development of cost-effective technologies and processes which can enhance the sustainability of communities not only in Canada, but internationally.



VISIONWALL® CORPORATION
Building-integrated photovoltaics

The VISIONWALL® technology for building-integrated photovoltaics (PV) integrates photovoltaic-laminated glass and an interior circuit wiring system into modular frames of energy-efficient glazing systems. Demonstrated at a new federal government building in

Yellowknife, NWT, the VISIONWALL® PV curtain wall technology has overcome challenges, including high temperatures of the PV modules and access to wiring for maintenance. The electricity produced by the 33.5- kW PV curtain wall will be sold to the local electric utility, Northland Utilities, resulting in notable GHG reductions in an area heavily reliant on fossil fuels (diesel). Although the present high cost of PV limits the market for the company's PV curtain wall, this market could grow dramatically as economic conditions change. TEAM support has ensured that the technology will be market-ready.

A third-party validation has assessed the emission reductions of the VISIONWALL® installation in Yellowknife to be 129 tonnes CO₂e annually, with photovoltaic electricity generation offsetting emissions from Yellowknife's local electrical grid.

ATS AUTOMATION TOOLING SYSTEMS INC.

Automation of PV manufacture

In this TEAM project, ATS Automation Tooling Systems developed two types of automated equipment lines for the manufacture of photovoltaic (PV) panels. The fully automated manufacturing equipment line was successfully implemented in France, with the resulting increase of the company's annual PV capacity from 10 MW to 35 MW. The semi-automated line was successfully implemented in China. A significant outcome of this project was the formation of a joint Canada-China venture, Canadian Solar Inc. (CSI), of which ATS is a part owner. CSI has built a 10 kW demonstration grid-connected solar power plant in Changshu, Jiangsu Province. CSI has supplied over 10 MW of solar module products to customers in China and around the world. The role TEAM played in the initial project was crucial in helping to leverage additional funding and support, and in expanding markets domestically and internationally.

As part of the rollout of this project, PV cells were installed on the CN Tower in Toronto, and at Queen's University in Kingston. With emissions from system installation considered in the equation, the 20 kW_p (kilowatts peak) installation at Queen's was validated by a third party as reducing GHG emissions by an average of 6.3 tonnes of CO₂e annually, compared with margin electricity from the Ontario grid.



“TEAM FUNDING ADDED CREDIBILITY TO THE PROJECT and gave the existing investors confidence to continue investing in the project.”

Ken Bell, President, Outland Technologies, Inc.



TOWN OF OKOTOKS, ALBERTA
Solar district heating

Innovation, technology and partnership are combining to capture the sun's rays in the summer to heat homes in the winter in Okotoks, Alberta. More than 90%

of the space-heating requirements for the 52 homes being built in the Drake Landing Solar Community, just south of Calgary, will be met through solar thermal collectors mounted on garage roofs. The heat will be collected and transferred to an underground storage system. During the winter season, the thermal energy will be retrieved and distributed to homes through a community district energy system. This project is the first of its kind in North America. With TEAM's early support, this project has brought together a broad range of project participants and funding partners at the federal, provincial and municipal levels, as well as the private sector.

SUSTAINABLE AGRICULTURE: FINDING VALUE IN WASTE

The livestock industry is expanding rapidly in Canada, and the treatment and utilization of large quantities of manure generated at livestock farms present many challenges to farmers and the environment. TEAM has supported the development of a range of technologies that can be utilized by small-, medium-, and large-scale farm operations.



HIGHMARK RENEWABLES
Animal manure as renewable energy

Highmark's Integrated Manure Utilization System (IMUS) converts animal manure into renewable energy, solid organic fertilizer and

reusable water by integrating biogas production and utilization, separation of liquid/solid components, nutrient recovery and enrichment, and organic fertilizer production technologies into a closed system. Through the IMUS pilot plant, enough power is being generated to supply 700 homes. The IMUS system has the potential to increase profits for livestock operators, increase the nutrient value of manure, and reduce existing environmental, social and economic barriers for livestock operations. This project has also significantly increased the R&D capability at Highland Feeders.

A third party estimated through SMART that the IMUS would reduce GHG emissions compared to standard manure handling techniques by 6,600 tonnes CO₂e per year for a farm of 7,500 head of cattle.

ENVIROGAIN
Odour-free hog manure

During this project, Envirogain partnered with the French corporation Dénitral to hybridize their two technologies for the treatment of liquid hog manure. The aerobic

treatment process is the first complete and integrated hog manure treatment solution in Quebec that eliminates odours and the need for spreading manure. The purified liquid is safely irrigated and the solid fraction of the waste can be safely applied directly to land or transformed into a granulated biofertilizer and then applied to land.

A third-party validation of the Envirogain process estimates annual GHG emission reductions of between 1,000 tonnes CO₂e when compared to regional manure treatment, and 1,900 tonnes CO₂e when compared to simple manure spreading on adjacent lands.



“TEAM HAS PROVIDED LEADERSHIP in helping SME innovators commercialize their technologies, and in identifying opportunities for industry to reduce GHG emissions while improving their economic performance.”

Dr. Ed Mallett, President and CEO, OCETA

LYNN CATTLE COMPANY INC.
Turnkey Integrated Manure Processing Plant

This project, located on the Lynn Cattle family farm, will show the full resource potential of agricultural manure, while reducing manure-related environmental

concerns and creating new revenue streams. Using the RENTEC anaerobic digestion technology, all manure will be processed into biologically stable, odourless and pathogen-free fertilizer/soil amendment; electricity; and water, which will be recycled on-farm. It is anticipated that enough power will be generated by this technology to supply the North Middlesex municipal infrastructure requirements, with additional surplus electricity potentially available to be fed into the Ontario electrical grid. This project includes a research component with Trent University to analyze GHG reductions, as well as the rural environmental and economic effects of agricultural organic-resource development.



TEAM PROJECTS

PROJECT NUMBER	PROJECT TITLE	TOTAL PROJECT INVESTMENT (\$K)	INVESTMENT BY GOVERNMENT OF CANADA (\$K)	
		TOTAL	TEAM	OTHER FEDERAL
ADVANCED END-USE EFFICIENCY: 34 PROJECTS		\$368,439	\$30,783	\$28,022
COM-002	Montreal electric vehicles	\$ 2,400	\$ 420	\$ 100
COM-054	Green roof technology	\$ 840	\$ 320	\$ 105
COM-058	Fly ash in concrete construction	\$ 27,589	\$ 257	\$ 106
COM-059	Gas infusion for wastewater treatment facilities	\$ 1,554	\$ 620	\$ 269
COM-079	EcoSmart Concrete	\$ 154,551	\$ 1,090	\$ 720
COM-094	CIMCO ECO-CHILL technology in three ice rinks	\$ 3,458	\$ 870	\$ 150
IND-003	Microwave-Assisted Process (MAP) for extraction of edible oils	\$ 7,987	\$ 1,987	\$ 400
IND-063	SME eco-efficiency	\$ 3,996	\$ 578	\$ 624
IND-068	ēKOCOMFORT advanced home HVAC appliance	\$ 13,985	\$ 2,900	\$ 715
IND-070	Natural gas technologies for industrial settings	\$ 11,598	\$ 787	\$ 262
IND-073	Plasma treatment for tool and dye manufacturers	\$ 2,686	\$ 859	\$ 286
IND-091	High-volume fly ash for roadways	\$ 743	\$ 315	\$ 48
IND-092	Sustainable buildings using life-cycle assessment	\$ 765	\$ 225	\$ 90
IND-096	Rapid cooling of foods in commercial kitchens	\$ 4,989	\$ 803	\$ 250
IND-097	Automated anode replacement system for aluminum production	\$ 6,528	\$ 1,155	\$ 485
IND-100	New membranes for water and wastewater treatment	\$ 4,075	\$ 1,575	\$ 500
IND-101	High Pressure Direct Injection (HPDI) engines	\$ 2,265	\$ 805	\$ 250
IND-107	Residential natural gas vehicle refueling appliance	\$ 9,030	\$ 1,036	\$ 1,983
IND-110	Air-cooled refrigerant compressor	\$ 9,598	\$ 1,506	\$ 478
IND-111	Pervaporation technology	\$ 1,059	\$ 350	\$ 102
IND-115	Advanced harvesting technology	\$ 923	\$ 198	\$ 65
IND-123	HVAC and refrigeration systems in Loblaws supermarkets	\$ 3,344	\$ 734	\$ 155
IND-130	Diesel electric propulsion for fishing vessels	\$ 12,154	\$ 1,500	\$ 775
IND-135	Demonstration of in-situ leach mining process for metals extraction	\$ 1,964	\$ 780	\$ 237
INT-008	Natural gas technology in Romania	\$ 993	\$ 515	\$ 120
INT-010	Low-emission autorickshaws in Pakistan	\$ 1,244	\$ 347	\$ 235
INT-020	Landfill demonstration in Brazil	\$ 1,947	\$ 585	\$ 132
INT-029	Energy efficiency program in Russia	\$ 3,316	\$ 384	\$ 2,072
INT-030	Natural gas motorcycles in Egypt	\$ 1,410	\$ 580	\$ 110
INT-039	Hydrocarbon refrigerant in Cuba	\$ 337	\$ 152	\$ 40
INT-040	Building rehabilitation and energy efficiency in China	\$ 7,297	\$ 980	\$ 365
INT-043	Natural gas vehicle flagship project for Mumbai, India	\$ 8,330	\$ 3,570	\$ 56
TPC 731-473889	Small engine technology	\$ 27,294	\$ 1,000	\$ 8,280
TPC 731-461093	Hybrid electric bus	\$ 28,190	\$ 1,000	\$ 7,457

PROJECT NUMBER	PROJECT TITLE	TOTAL PROJECT INVESTMENT (\$K)	INVESTMENT BY GOVERNMENT OF CANADA (\$K)	
		TOTAL	TEAM	OTHER FEDERAL
BIOTECHNOLOGY: 23 PROJECTS		\$ 144,743	\$ 24,227	\$ 15,885
COM-008	Cryogenic processing of landfill gas	\$ 1,091	\$ 563	\$ 210
COM-047	Composting of swine manure	\$ 460	\$ 200	\$ 55
COM-048	Co-composting of industrial/municipal wastes	\$ 1,786	\$ 336	\$ 190
COM-056	On-farm demonstration of manure treatment technologies	\$ 459	\$ 84	\$ 400
COM-081	Montreal biodiesel transit buses	\$ 3,701	\$ 436	\$ 100
COM-089	Integrated Manure Utilization System (IMUS)	\$ 7,853	\$ 818	\$ 1,950
COM-090	Aerobic manure treatment for pork producers	\$ 1,700	\$ 500	\$ 300
COM-093	Turnkey integrated manure processing plant	\$ 6,755	\$ 712	\$ 150
IND-048	Development of high-grade pelletized activated carbon	\$ 1,157	\$ 434	\$ 145
IND-058	Szego mill process	\$ 854	\$ 324	\$ 108
IND-062	Green diesel from pyrolysis oil	\$ 410	\$ 156	\$ 50
IND-102	Wastewater treatment for pulp and paper applications	\$ 19,798	\$ 2,348	\$ 750
IND-103	Biomass gasification system for greenhouse applications	\$ 765	\$ 335	\$ 60
IND-105	Biodiesel technology processing	\$ 1,228	\$ 465	\$ 138
IND-109	Enzymes for fuel ethanol production	\$ 5,475	\$ 1,875	\$ 900
IND-133	Heffley Creek biomass gasification demonstration	\$ 6,059	\$ 1,750	\$ 297
IND-134	Development and demonstration of Turbion™ CHP system	\$ 4,197	\$ 1,770	\$ 300
INT-017	Energy from waste in Argentina	\$ 2,280	\$ 987	\$ 240
INT-024	Seedling inoculation in Chile	\$ 2,767	\$ 872	\$ 155
INT-031	Landfill methane bioreactor in Egypt	\$ 1,740	\$ 760	\$ 140
INT-041	Peak electrical power generation from landfill gas in Brazil	\$ 1,988	\$ 797	\$ 180
TPC 731-122410	Production of ethanol from agricultural waste and crops	\$ 45,000	\$ 4,980	\$ 4,987
TPC 731-451040	Municipal solid waste digestion for power production	\$ 27,220	\$ 2,725	\$ 4,080
CLEANER FOSSIL FUELS: 9 PROJECTS		\$ 52,306	\$ 8,110	\$ 3,260
IND-067	Oil sands thermal solvent process	\$ 697	\$ 189	\$ 8
IND-076	Coalbed methane	\$ 15,300	\$ 2,250	\$ 750
IND-090	Fine tailings paste technology	\$ 2,272	\$ 607	\$ 15
IND-094	VAPEX engineering for heavy oil recovery	\$ 315	\$ 65	\$ 38
IND-095	Thermal solvent process	\$ 357	\$ 92	\$ 0
IND-112	Application of advanced clean coal technology	\$ 4,998	\$ 1,000	\$ 666
IND-113	Flue gas desulphurization with fertilizer co-product	\$ 22,000	\$ 2,574	\$ 823
IND-117	GHG imaging systems	\$ 1,261	\$ 297	\$ 85
IND-119	Energy audits in the upstream oil and gas sector	\$ 5,106	\$ 1,036	\$ 875
DECENTRALIZED ENERGY: 27 PROJECTS		\$ 328,632	\$ 24,069	\$ 44,635
COM-001	Sudbury cogeneration district energy	\$ 14,500	\$ 545	\$ 200
COM-010	Deep lake cooling	\$ 120,150	\$ 1,150	\$ 10,000
COM-035	Wind power cooperative in Toronto	\$ 1,549	\$ 347	\$ 121
COM-038	Adopt-a-roof solar thermal technology	\$ 230	\$ 82	\$ 42
COM-043	Heat recovery from diesel power generation	\$ 1,440	\$ 400	\$ 0
COM-046	Building Integrated Photovoltaics (BIPV)	\$ 300	\$ 110	\$ 40

PROJECT NUMBER	PROJECT TITLE	TOTAL PROJECT INVESTMENT (\$K)	INVESTMENT BY GOVERNMENT OF CANADA (\$K)	
		TOTAL	TEAM	OTHER FEDERAL
COM-051	Watson Lake district energy	\$ 750	\$ 109	\$ 28
COM-060	Mini and small hydro retrofit demo	\$ 15,905	\$ 412	\$ 135
COM-086	Photovoltaic solar homes	\$ 2,073	\$ 891	\$ 160
COM-091	District solar heating	\$ 5,561	\$ 956	\$ 3,780
COM-092	Wind-diesel control systems in Newfoundland	\$ 1,225	\$ 528	\$ 111
IND-061	Solar water heating	\$ 5,346	\$ 760	\$ 231
IND-074	Morgan Falls small hydro demonstration	\$ 943	\$ 400	\$ 72
IND-078	Micro-turbines for heat and electricity	\$ 668	\$ 113	\$ 38
IND-089	Canadian 10- and 60- kW wind turbines	\$ 2,246	\$ 999	\$ 162
IND-116	Manufacturing process for generic wind turbine blades	\$ 1,791	\$ 970	\$ 0
IND-118	Spherical Solar Technology	\$ 98,482	\$ 4,150	\$ 25,500
IND-124	Multi-energy source platforms for distributed generation	\$ 3,206	\$ 818	\$ 190
IND-125	Building integrated PV in high-performance curtain walls	\$ 2,800	\$ 599	\$ 150
IND-131	Demonstration of Power-Spar® solar technology	\$ 4,129	\$ 1,333	\$ 558
IND-132	Power-recovery turbine demonstration	\$ 5,500	\$ 1,897	\$ 225
INT-002	Small hydro control systems in China	\$ 3,349	\$ 557	\$ 260
INT-025	Low-head hydro in Poland	\$ 12,151	\$ 746	\$ 245
INT-028	Solar photovoltaics for developing and developed countries	\$ 10,426	\$ 3,267	\$ 847
INT-032	Multi-country solar drying	\$ 1,583	\$ 583	\$ 175
INT-038	Small hydro development in Nepal	\$ 8,305	\$ 680	\$ 100
TPC 731-461092	Gas turbines for bio-oil	\$ 4,024	\$ 667	\$ 1,265
FUEL CELLS AND HYDROGEN: 13 PROJECTS		\$ 113,627	\$ 16,967	\$ 18,388
IND-056	Hydrogen refueling appliance	\$ 4,025	\$ 2,123	\$ 375
IND-075	Solid oxide fuel cell heat and power demonstration	\$ 26,250	\$ 1,119	\$ 373
IND-079	Solid oxide fuel cell materials	\$ 550	\$ 163	\$ 94
IND-080	Solid oxide fuel cell heat and power balance of plant	\$ 1,600	\$ 378	\$ 200
IND-084	Intelligent control systems for fuel cell vehicles	\$ 2,945	\$ 765	\$ 350
IND-086	Compressed H2 on-board storage	\$ 1,044	\$ 534	\$ 150
IND-088	Fuel cell powered 10- and 50- kW generators	\$ 6,078	\$ 1,678	\$ 400
IND-099	Fuel cell enabling electronics	\$ 9,275	\$ 2,605	\$ 1,500
IND-122	Compressed hydrogen fuelling stations	\$ 4,030	\$ 1,730	\$ 300
IND-128	Vancouver fuel cell vehicle demonstration	\$ 6,495	\$ 1,730	\$ 300
TPC 730-477199	Gaseous fuel control program	\$ 19,500	\$ 1,142	\$ 5,358
TPC 731-122373	Oxygen separation technology	\$ 14,135	\$ 1,500	\$ 3,447
TPC 731-460753	Hydrogen supply for fleet use	\$ 17,700	\$ 1,500	\$ 5,541
TEAM OPERATIONS OFFICE		\$ 9,127	\$ 2,026	\$ 5,578
	Operating costs	\$ 7,039	\$ 1,558	\$ 5,481
	Projects	\$ 2,088	\$ 468	\$ 97
GRAND TOTAL		\$1,016,874	\$106,182	\$115,768

TEAM PROJECTS WITH SMART RESULTS

PROJECT NUMBER	PROJECT TITLE	GHG MEASUREMENT AND REPORTING STATUS		THIRD-PARTY VALIDATED GHG EMISSIONS REDUCTIONS FOR PROJECT (T CO ₂ E/YEAR)	THIRD-PARTY VALIDATED GHG EMISSIONS REDUCTIONS PER UNIT OF ACTIVITY (T CO ₂ E/UNIT OF ACTIVITY)
		SMART PROJECT ¹ MASTER PLAN	SMART ²		
COM-002	Montreal electric vehicles		✓ ³	22	0.51 t CO ₂ e/1,000 km travelled
COM-008	Cryogenic processing of landfill gas		✓ ³	-118	1.95 t CO ₂ e/1,000 L of LNG used in vehicles
COM-048	Co-composting of industrial/municipal wastes		✓ ³	792 ⁴	0.11 t CO ₂ e/t of organic waste processed ⁴ (0.17 t CO ₂ e/t of finished compost) ⁴
COM-060	Mini and small hydro retrofit demo		✓	8,274	0.078 t CO ₂ e/MWh _e
COM-081	Montreal biodiesel transit buses		✓	1,277	2.36 t CO ₂ e/1,000 L of 100% biodiesel
COM-089	Integrated Manure Utilization System (IMUS)	✓		6,624	0.93 t CO ₂ e/MWh _e , (0.71 t CO ₂ e/t manure)
COM-090	Aerobic manure treatment for pork producers	✓		1,614	0.054 t CO ₂ e/t manure
COM-093	Turnkey integrated manure processing plant	✓		24,528	4 t CO ₂ e/MWh _e ⁴ , (0.73 t CO ₂ e/t manure) ⁴
COM-094	CIMCO ECO-CHILL technology in three ice rinks	✓		293	0.022 t CO ₂ e/m ² /year (for ammonia refrigerant); 0.040 t CO ₂ e/m ² /year (for R-404a refrigerant)
IND-078	Micro-turbines for heat and electricity		✓ ³	195	electric element – 0.78 t CO ₂ e/MWh _e ; thermal element – 0.037 t CO ₂ e/MWh _t
IND-101	High Pressure Direct Injection (HPDI) engines for stationary power	✓		154	0.25 t CO ₂ e/MWh _e
IND-118	Spherical Solar Technology	✓		27,273	0.68 t CO ₂ e/kW _{peak} of PV cells produced
IND-119	Energy audits in upstream oil and gas sector <ul style="list-style-type: none"> • Sirius Emission Reducer • REMVue® Natural Gas Engine Controller 	✓	✓	332 738 (per engine controller)	55.3 t CO ₂ e/controller/year 0.29 t CO ₂ e/1,000 m ³ natural gas consumed
IND-123	HVAC and refrigeration systems in Loblaw's supermarkets	✓		564	0.080 t CO ₂ e/m ² floor space/year
IND-124	Multi-energy source platforms for distributed generation	✓		13	0.97 t CO ₂ e/MWh _e

TEAM PROJECTS WITH SMART RESULTS

PROJECT NUMBER	PROJECT TITLE	GHG MEASUREMENT AND REPORTING STATUS		THIRD-PARTY VALIDATED GHG EMISSIONS REDUCTIONS FOR PROJECT (T CO ₂ E/YEAR)	THIRD-PARTY VALIDATED GHG EMISSIONS REDUCTIONS PER UNIT OF ACTIVITY (T CO ₂ E/UNIT OF ACTIVITY)
		SMART PROJECT ¹ MASTER PLAN	SMART ²		
IND-125	Building integrated PV in high performance curtain walls	✓		129	0.45 t CO ₂ e/m ² of Visionwall surface/year
IND-128	Vancouver fuel cell vehicle demonstration	✓		11	0.11 t CO ₂ e/1,000 km travelled
IND-130	Diesel electric propulsion for fishing vessels	✓		962	1.37 t CO ₂ e/t of fish caught and processed
IND-131	Demonstration of Power-Spar [®] Solar Technology	✓		77	displacing propane heating – 0.25 t CO ₂ e/MWh _t displacing electric heating – 0.30 t CO ₂ e/MWh _t
IND-132	Power-recovery turbine demonstration	✓		597	0.98 t CO ₂ e/MWh _e
IND-133	Heffley Creek biomass gasification demonstration	✓		13,727	0.53 t CO ₂ e/t veneer produced
IND-134	Development and demonstration of Turbion™ CHP System	✓		1,705	0.32 t CO ₂ e/bone dry t of wood residue combusted in system
IND-135	Demonstration of in-situ leach mining process for metals extraction	✓		Lead – 11,927 All products – 40,446	Lead – 1.83 t CO ₂ e/t Pb All products – 1.26 t CO ₂ e/t product
INT-017	Energy from waste in Argentina		✓	154 (20-year horizon); 200 (50-year horizon)	0.6 t CO ₂ e/t waste in controlled part of landfill
INT-024	Seedling inoculation in Chile ⁵		✓ ³	Jack Pine – 0.52 (per ha); Black Spruce – 0.26 (per ha); White Spruce – 0.37 (per ha).	Jack Pine – 23.5 t CO ₂ e/ha/rotation; Black Spruce – 24.7 t CO ₂ e/ha/rotation; White Spruce – 31.7 t CO ₂ e/ha/rotation.
INT-028	Solar photovoltaics for developing and developed countries		✓	6.3 ⁶	0.345 t CO ₂ e/MWh _e ⁶
INT-041	Peak electrical power generation from landfill gas in Brazil		✓	850	0.003 t CO ₂ e/t waste in controlled part of landfill

¹ Once a new project has been approved for TEAM funding, a SMART-based project master plan (PMP) must be developed. The PMP includes sample plans and procedures for the project; a description of how risks will be managed; testing procedures; monitoring protocols; GHG emission reduction procedures; and reporting methods.

² A full SMART can only be undertaken after the completion of the TEAM project, when final results are measured and assessed.

³ Indicates a SMART performed prior to the updated SMART format (January 2004).

⁴ Indicates first- or second-party reporting only.

⁵ Only first-year growth measurements from Chile were available at time of reporting; these data were insufficient to support a SMART evaluation. In the absence of multiple-year Chilean growth data, surrogate data for three softwood species in Canada, compared to one softwood species and two hardwood species in Chile, were used. Emissions reductions will be greater in the Chilean case.

⁶ Third-party validation of an installation at Queen's University only.

STRATEGIC PARTNERSHIPS PRODUCE GREAT RESULTS

TEAM has funded a total of 106 climate change solutions projects since its inception in 1998. Through the TEAM process, the ratio of federal government investment to private sector and non-federal sources represents a ratio of better than 1 to 5. What this means is that for every dollar invested by TEAM and the federal government, there is, on average, investment of greater than five dollars from other non-federal government sources.

TEAM partners include both small and large companies in Canada and abroad, as well as federal, provincial, municipal and foreign government agencies. TEAM has partnered in over 60 Canadian cities and 15 countries with close to 350 private companies and organizations, and over 100 government programs and research institutions in Canada and abroad.

In addition to TEAM, the partners of the projects profiled in this report are:

Advanced Power Recovery Generator – Outland Technologies Inc. in association with:

- BP Canada (facilitated by Petroleum Technology Alliance of Canada (PTAC))
- Northrock Resources Inc.
- Single Buoy Moorings, Monaco
- National Research Council
- Cojo Technology Inc.
- zed.i solutions inc.
- Braeside Fabricators
- Natural Resources Canada, CANMET Energy Technology Centre – Ottawa

Aerobic Manure Treatment Technology for Pork Producers – Envirogain in association with:

- Canada Economic Development, Quebec Region
- Fermes Grenier

Biomass Gasification Plant in BC – Nexterra Energy Corp. in association with:

- Tolko Industries Ltd.
- University of British Columbia
- Natural Resources Canada, CANMET Energy Technology Centre – Ottawa
- Ethanol BC
- ARC Financial Corp.
- Natural Resources Canada, Program of Energy Research and Development

BIPV in High Performance Curtain Walls – Visionwall Corporation in association with:

- Natural Resources Canada, CANMET Energy Technology Centre – Ottawa and Varennes
- British Columbia Institute of Technology
- Public Works and Government Services Canada

Demonstration of ECO-CHILL Technology in Three Ice Rinks – CIMCO Refrigeration, a Division of TOROMONT Industries in association with:

- A.D. Williams Engineering Inc.
- Natural Resources Canada, Office of Energy Efficiency Commercial Building Incentive Program
- Natural Resources Canada, CANMET Energy Technology Centre – Varennes
- City of Fort Saskatchewan, Alberta
- Town of La Peche, Quebec
- City of Dauphin, Manitoba

Coalbed Methane – Alberta Research Council in association with:

- Environment Canada
- Natural Resources Canada, Program of Energy Research and Development
- Province of Alberta
- Saskatchewan Energy and Mines
- International Energy Agency Greenhouse Gas R&D Programme

- US Department of Energy
- Netherlands TNO
- UK Department of Trade and Industry
- Commonwealth Scientific and Industrial Research Organisation (CSIRO) Australia
- JCOAL, Japan
- BP Amoco Corporation
- Suncor Energy
- Exxon Mobil Canada
- EnCana Corporation (Pan-Canadian)
- Gulf Canada Resources
- Husky Energy (Renaissance)
- Burlington Resources
- MGV Energy Inc.
- Dow Chemical
- EPCOR Utilities
- TransAlta Utilities
- TransCanada Pipelines
- Air Liquide Canada
- Computalog
- BJ Services Company Canada

Demonstration of a Combined Solar Thermal and PV Technology – Menova Energy Inc. in association with:

- Natural Resources Canada, CANMET Energy Technology Centre – Ottawa

Diesel Electric Propulsion for Fishing Vessels – Terra Nova Marine Co., Ltd. in association with:

- AMP Fisheries Ltd.
- Toromont CAT
- National Research Council, Industrial Research Assistance Program
- Atlantic Canada Opportunities Agency

District Solar Heating (Seasonal Storage) – Town of Okotoks, Alberta in association with:

- Natural Resources Canada, Program of Energy Research and Development
- Natural Resources Canada, Renewable Energy Deployment Initiative
- Federation of Canadian Municipalities, Green Municipal Fund
- Climate Change Central
- ATCO Gas
- Government of Alberta, Innovation Program
- Natural Resources Canada, CANMET Energy Technology Centre – Ottawa
- SAIC Canada
- United Communities
- Sterling Homes Ltd.
- Environment Canada, Climate Change Division, Atlantic Region
- EnerWorks Inc.
- Nu-Air Ventilation Systems Inc.

Environmental and Energy Audits in the Upstream Oil and Gas Sector – CETAC-WEST in association with:

- Amine Experts Inc.
- Clearstone Engineering Ltd.
- DGC Consulting Ltd.
- NC Hircock Process Consulting Ltd.
- New Paradigm Engineering Ltd.
- Norwest Corporation
- Power Optimization
- RCL Environment Group Ltd.
- Saybry Inc.
- Sensor Environmental Services Ltd.
- Stantec Consulting Ltd.
- Sulphur Experts Inc.
- Alberta Energy
- Alberta Environment
- Natural Resources Canada, Office of Energy Efficiency
- Western Economic Diversification Canada
- Environment Canada

Greenhouse Gas Abatement Project: Demonstration Project for Peak Electrical Power Generation – Conestoga-Rovers & Associates in association with:

- Industry Canada, Sustainable Cities Initiative
- Golder Associates
- R. J. Burnside International Limited
- Empresa de Limpeza Pública Urbana de Salvador (LIMPURB), Brazil
- Company of Urban Development of the State of Bahia (CONDER), Brazil

Innovative HVAC and Refrigeration Systems in a Loblaws Supermarket – Loblaws Properties Ltd. in association with:

- Natural Resources Canada, CANMET Energy Technology Centre – Varennes
- Hydro Québec
- Dessau Soprin

- Hill Phoenix
- Kysor-Warren
- Keeprite
- Micro Thermo Technologies
- Consolidated Energy Solution
- Natural Resources Canada, Office of Energy Efficiency
- Agence de l'efficacité énergétique du Québec

In-situ Leach Mining Process – Yava Technologies Inc. in association with:

- Vizon SciTec Inc.
- Noram Engineering and Constructors Ltd.
- Dr. Frederick Michel
- Madhav Dahal, PhD
- Enterprise Cape Breton (ECBC)

Integrated Manure Utilization System (IMUS) – Highmark Renewables in association with:

- Alberta Research Council
- Agriculture and Agri-Food Canada
- Federation of Canadian Municipalities, Green Municipal Fund
- Sustainable Development Technology Canada
- Government of Alberta
- University of Alberta
- CETAC-West
- Nolan Cattle Ltd.
- Rick Paskal Farm
- Thompson Livestock Co. Inc.
- Cor Van Ray Farms Ltd.

Lynn Cattle Turnkey Integrated Manure Processing Plant – Lynn Cattle Company Inc. in association with:

- RENTEC Renewable Energy Technologies Inc.
- Municipality of North Middlesex
- Agriculture and Agri-Food Canada, National Program on Energy Cogeneration from Agricultural and Municipal Wastes

- Ontario Ministry of Agriculture
- Ontario Ministry of Energy
- Ontario Ministry of Municipal Affairs and Housing
- Ontario Cattle Feeders Association
- Trent University
- Canadian Biogas Association

NGV Flagship Project in India – ATF Advanced Technologies & Fuels Canada Inc. (ATFCan) in association with:

- Environment Canada, Emissions Research and Measurement Division
- A Canadian-led consortium of companies
- An Indian consortium of public and private participants

Paste Technology (Thickened Fine Tailings) – Syncrude in association with:

- Canadian Oil Sands Network for Research and Development
- Suncor
- Shell (Albian Sands)
- ExxonMobil
- Canadian Natural Resources
- TrueNorth Energy
- Alberta Oil Sands Technology and Research Authority
- Western Economic Diversification Canada
- Natural Resources Canada, CANMET Energy Technology Centre – Devon

SME Eco-efficiency – Ontario Centre for Environmental Technology Advancement in association with:

- National Research Council, Industrial Research Assistance Program
- Business Development Bank of Canada

- Automotive Parts Manufacturers' Association
- Ontario Ministry of Agriculture and Food
- Canadian Plastic Industry Association
- Canadian Chemical Producers Association

Solar PV for Developing and Developed Countries – ATS Automation Tooling Systems Inc. in association with:

- Canadian International Development Agency (CIDA)
- Natural Resources Canada, CANMET Energy Technology Centre – Varennes
- Xining New Energy Development Company
- China Renewable Energy Industry Association

VAPEX Engineering and Economics for Heavy Oil Recovery in Saskatchewan and Alberta – Petroleum Technology Research Centre (PTRC) in association with:

- Alberta Energy Company
- Anadarko
- Chevron
- Conoco
- Crestar
- ExxonMobil
- Husky
- Marathon
- Petrovera
- Nexen
- Natural Resource Canada, CANMET Energy Technology Centre – Devon
- Natural Resources Canada, National Centre for Upgrading Technology (NCUT)



“OUR PARTNERSHIP WITH TEAM IS THE CORNERSTONE TO THE SUCCESS OF OUR PROJECT.
TEAM’s interpretation of partnership has gone way beyond what one might expect from a traditional funding partner in terms of collaboration, advice and time invested to get things done right and make our project a full success on all counts.”

Nils Semmler, President, Rentec Renewable Energy Technologies Inc.



PLEASE VISIT THE TEAM WEBSITE FOR MORE DETAILED
INFORMATION ON TEAM AND ITS PROJECTS AND PARTNERS.

www.team.gc.ca

FOR MORE INFORMATION about the Government of Canada and climate change, including requests for publications, refer to Canada's Climate Change Links Directory at www.climatechange.gc.ca/english/links/ or call 1-800-0-Canada (1-800-622-6232).

This report is also available in French.

Ce rapport existe également en français.

