



SUSTAINABLE DEVELOPMENT  
TECHNOLOGY CANADA™

Partnering for real results.



**“The Foundation will act as the primary catalyst  
in building a sustainable development technology  
infrastructure in Canada.”**



- SDTC began operations in November of 2001
- Registered as a not-for-profit, non-share capital corporation under the Canada Business Corporations Act
- Operates as an arms-length independent organization
- Funding allocation of \$550M from Government of Canada
- Accountable to Parliament through the Minister of Natural Resources
- 15 Directors on the Board, 7 appointed by Canada
- Member Council (15) – proxy for shareholders
- International recognition for this Canadian initiative



- Emphasis on new technologies in the following areas:
  - Energy exploration, production, transmission and distribution
  - Power generation
  - Energy utilization (industrial, commercial and residential sectors) - buildings and processes
  - Transportation
  - Agriculture
  - Forestry
  - Waste management
  - Emission controls and enabling technologies



- Foster the development and demonstration of technological solutions that address:
  - Climate Change
  - Clean Air
  - Clean Water
  - Clean Soil
- Forge innovative partnerships representing multiple players in the Innovation Chain and build a SD technology infrastructure
- Ensure timely diffusion - increase number and rate of uptake of SD technologies into the marketplace across Canada, providing national benefits



- Increase the pool of available sustainable development technologies
- Fast track technologies to market
- Build private sector partnerships / leverage funding
- Reduce development, market and financial risk
- Build critical mass of sustainable development technology developers



## Sustainable Development Technology Canada

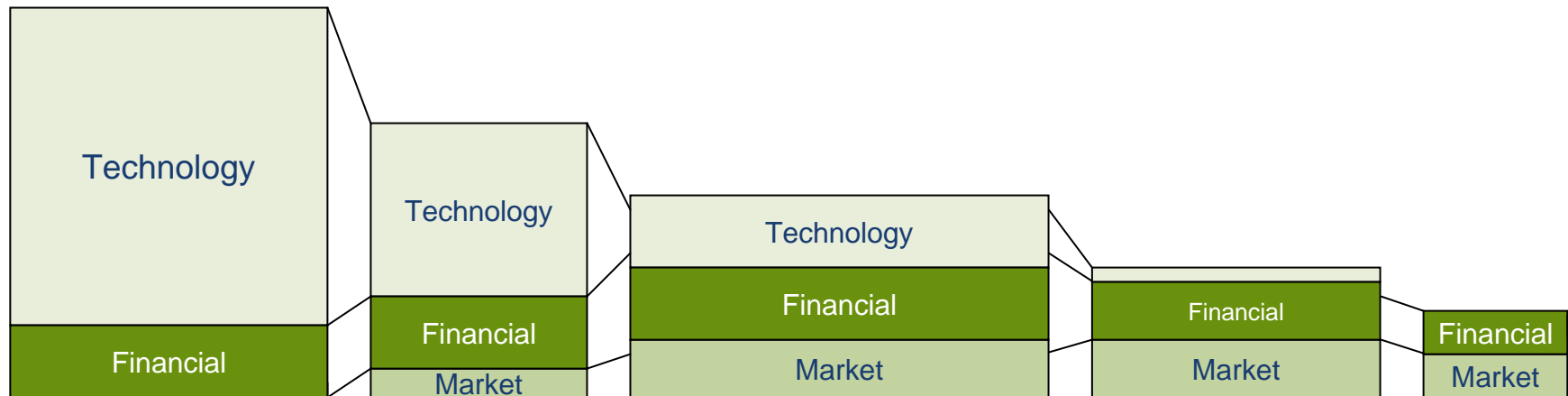
- “Go To Market Consortia” - maximizes representation of the different innovation chain players in each consortium
- Links and integrates a fragmented and diverse set of interests
- Creates innovative and robust partnerships with a greater likelihood of future market entry success
- Emphasizes pre-commercialization stage (technology pre-revenue) which is the weak link in the Innovation Chain
- Funds into the Pre-Private Sector Investment Stage – “Bridging the Gap”



## Stages of Technology Development

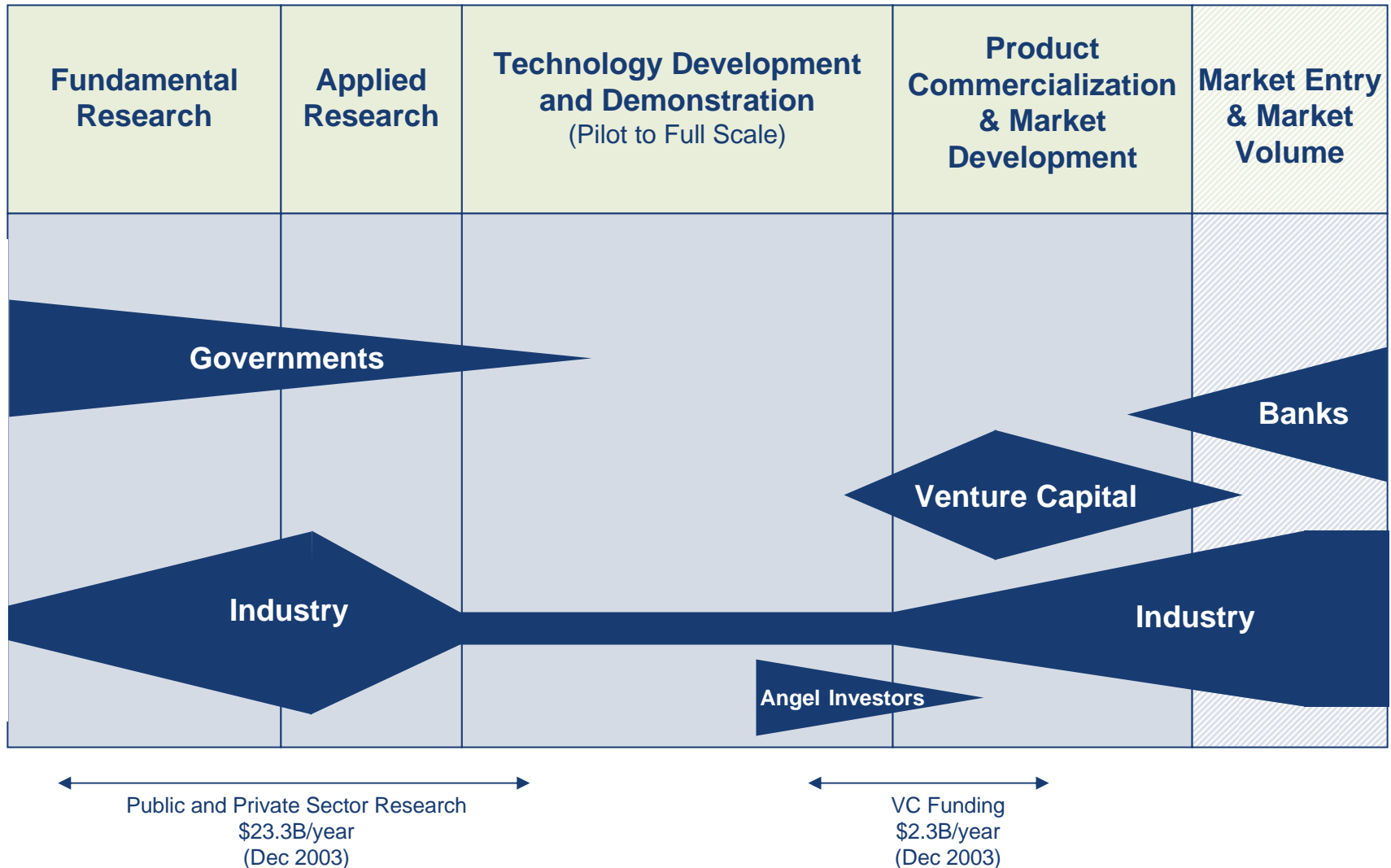


## Risk Profile

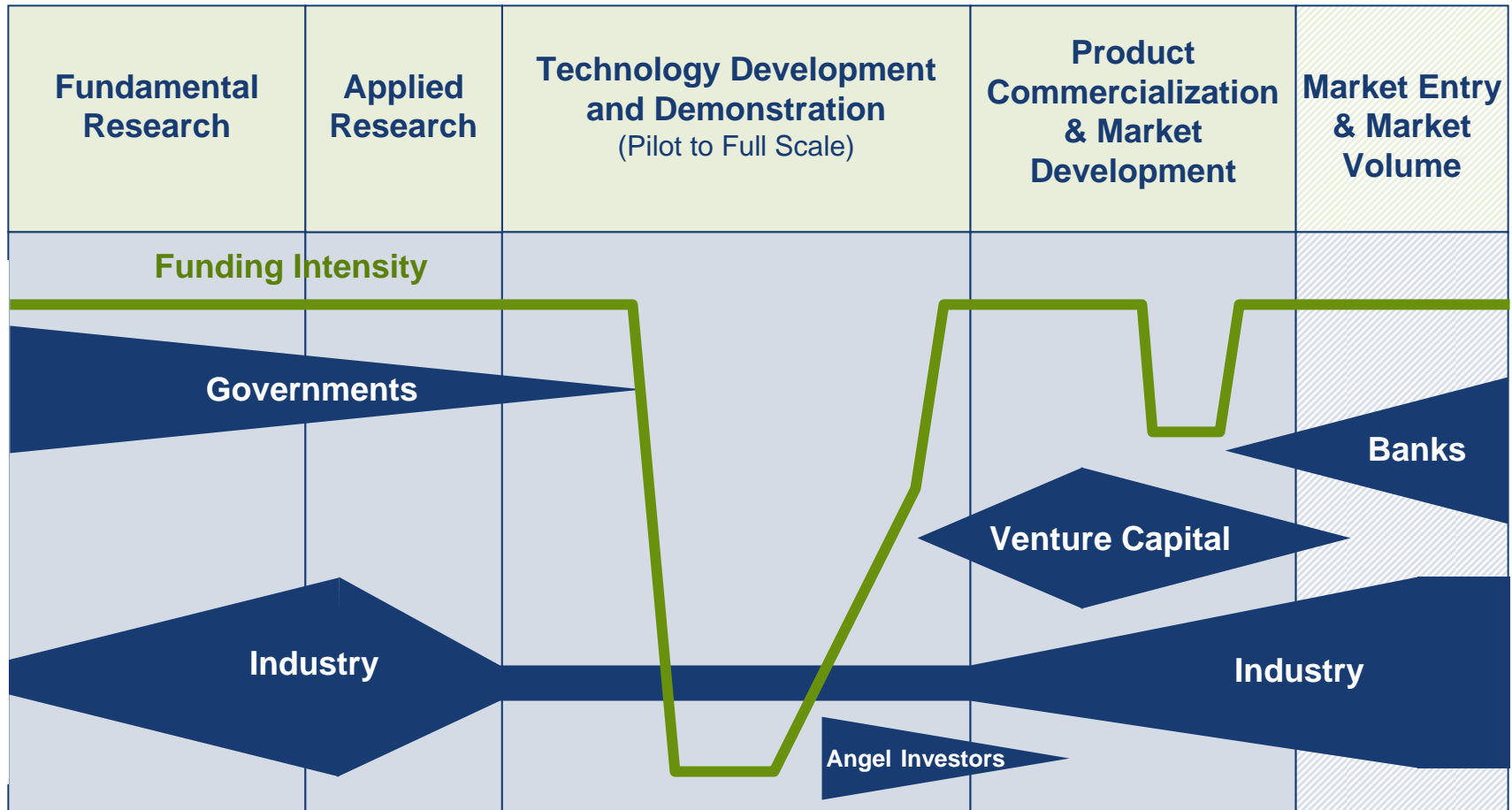




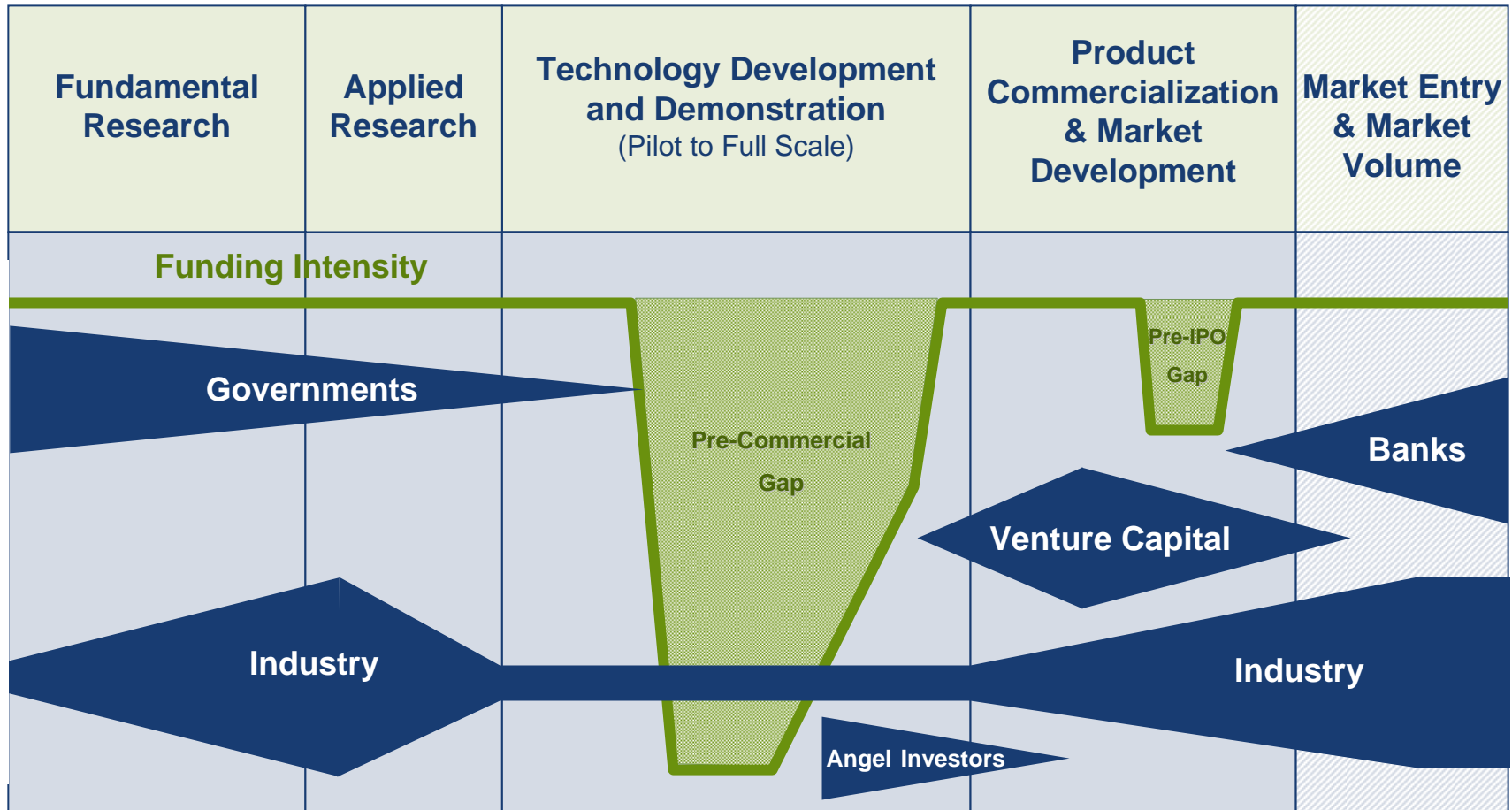
# Sources of Funding



# Funding Intensity



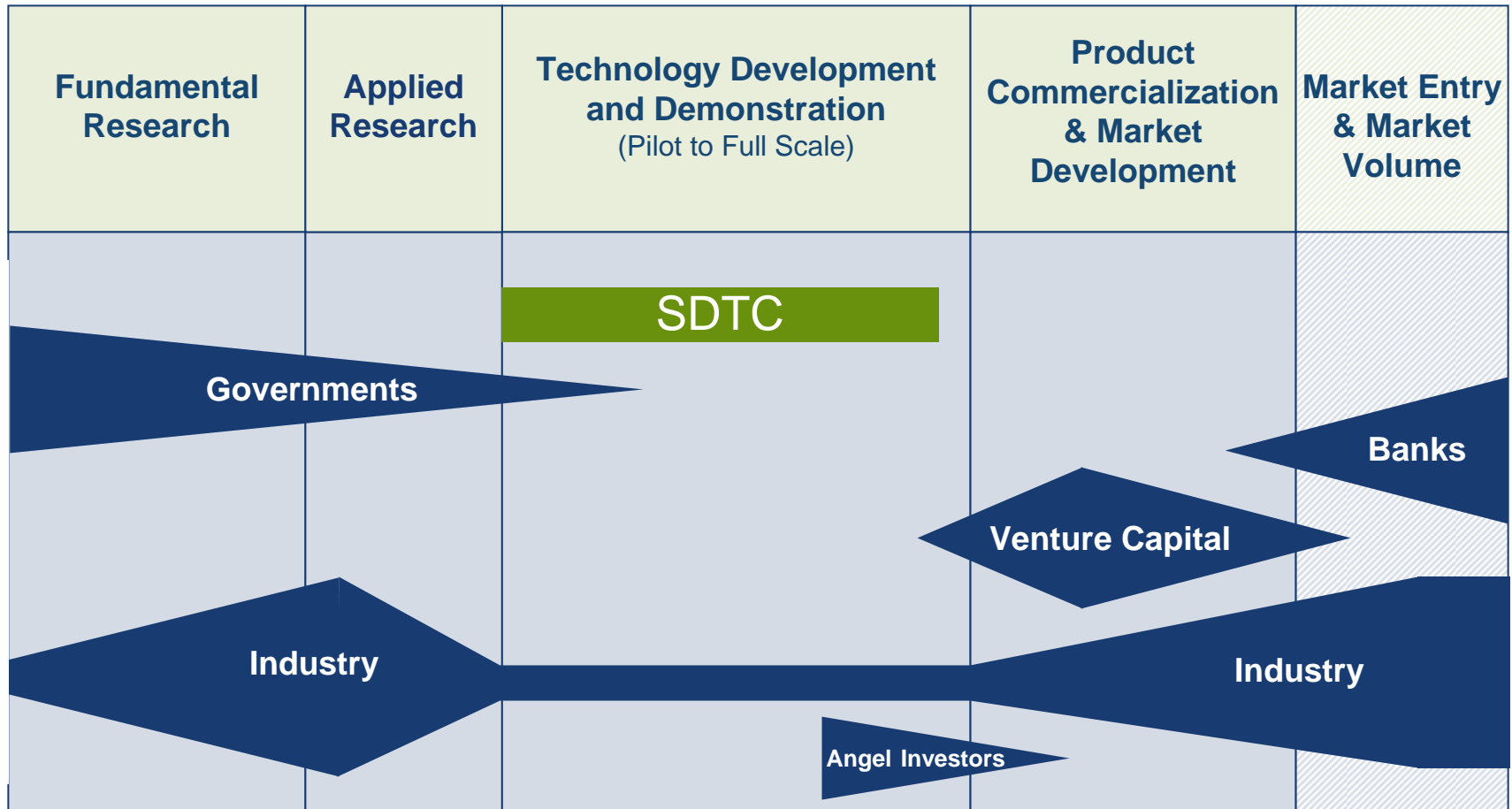
# Funding Gaps



← Public and Private Sector Research →
   
 # of energy & environment deals by stage-seed, expansion & mezzanine.
   
 12    130    10
   
 From 2000 – Q3 2004

Source: MacDonald and Associates, Oct 2004

# SDTC Funding





Has two phases for applicants and four decision gates

- Phase I – Statement of Interest (SOI) – not too onerous, it is informative and sufficient to assess
- Phase II – Proposals by Invitation – equivalent to a business plan
- Gate I – SDTC review
- Gate II – technical and business experts
- Gate III – Investment Committee + Project Review Committee
- Gate IV – Board Approval

Screening Criteria

- Technical, Market, and Business



- **Applications to Date (8 Rounds)**

- 1084 applications (>2,600 entities)
- \$2.3 Billion in funding requests
- \$9.2 Billion in total project value
- 80% industry-led

- **Projects Approved (7 Rounds)**

- 75 projects
- \$169 Million from STDC
- \$446 Million leveraged from consortia members (82% from industry)
- \$615 Million in total eligible project value

- **Emissions Reductions (undiscounted applicant projections for market rollout)**

- 125 Million tonnes annually undiscounted

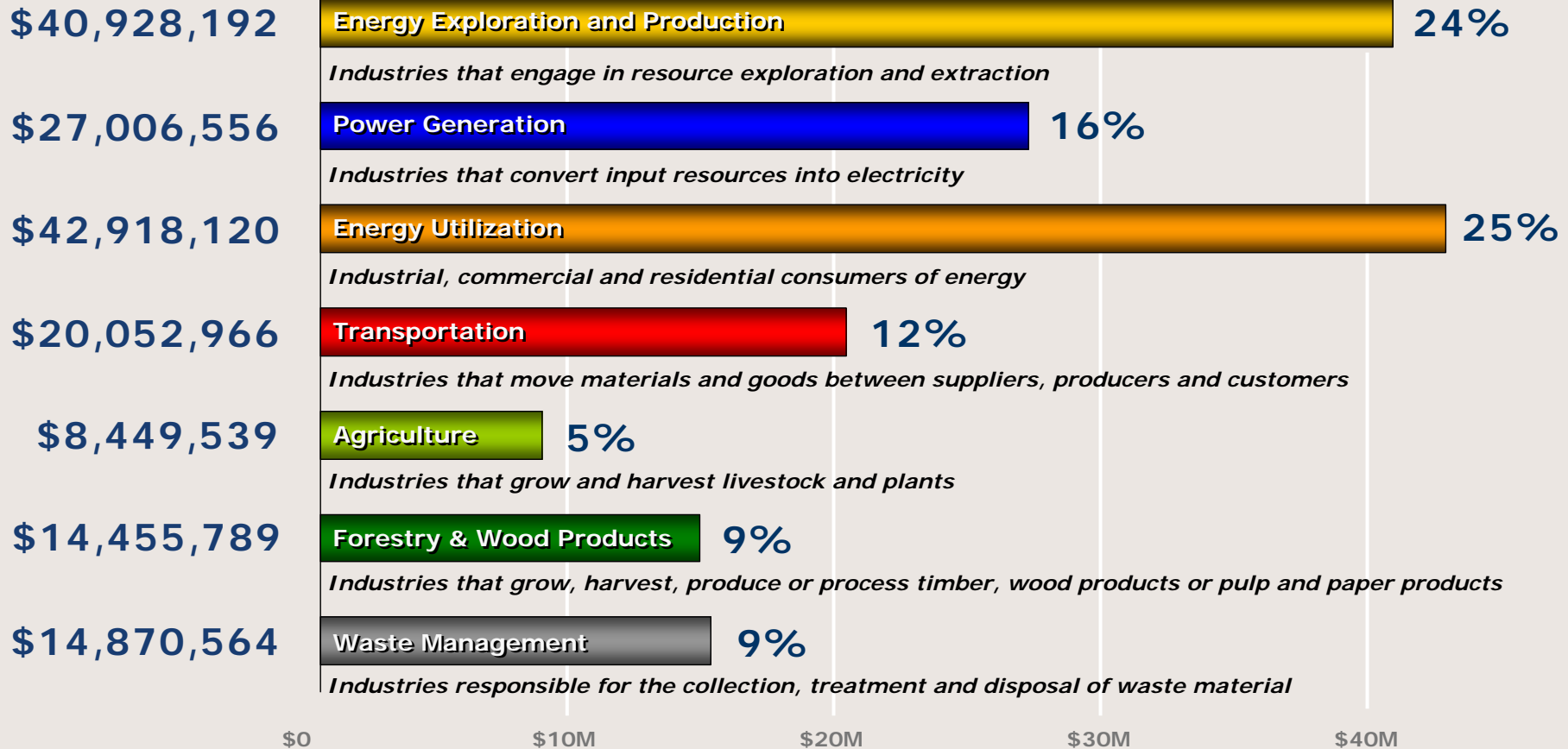
- **SDTC Discounted Emissions**

- 12.5 Million tonnes annually in 2010

# Investment Portfolio

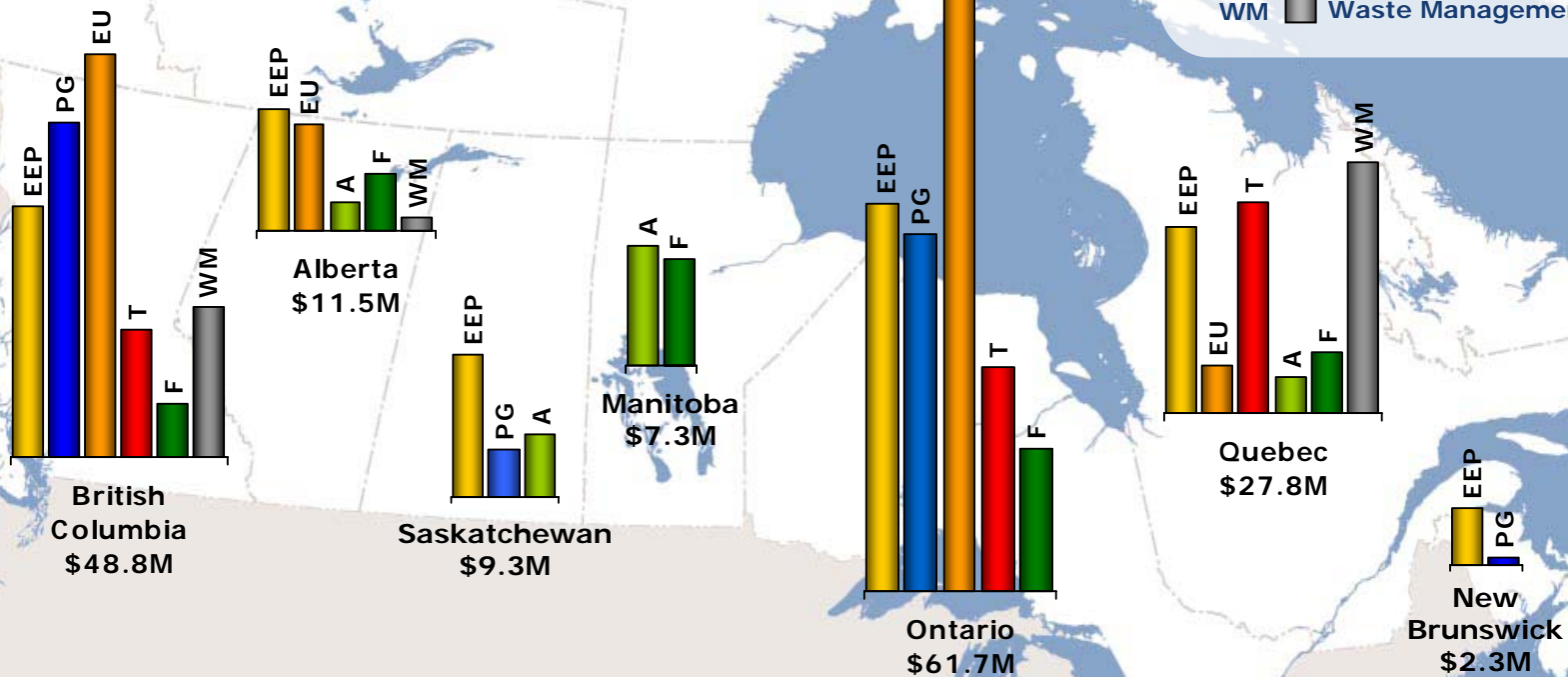


SDTC's current investment in 75 projects totals \$169 million.



## SDTC Funding Breakdown by Sector (up to last Board funding approval, October 5, 2005)

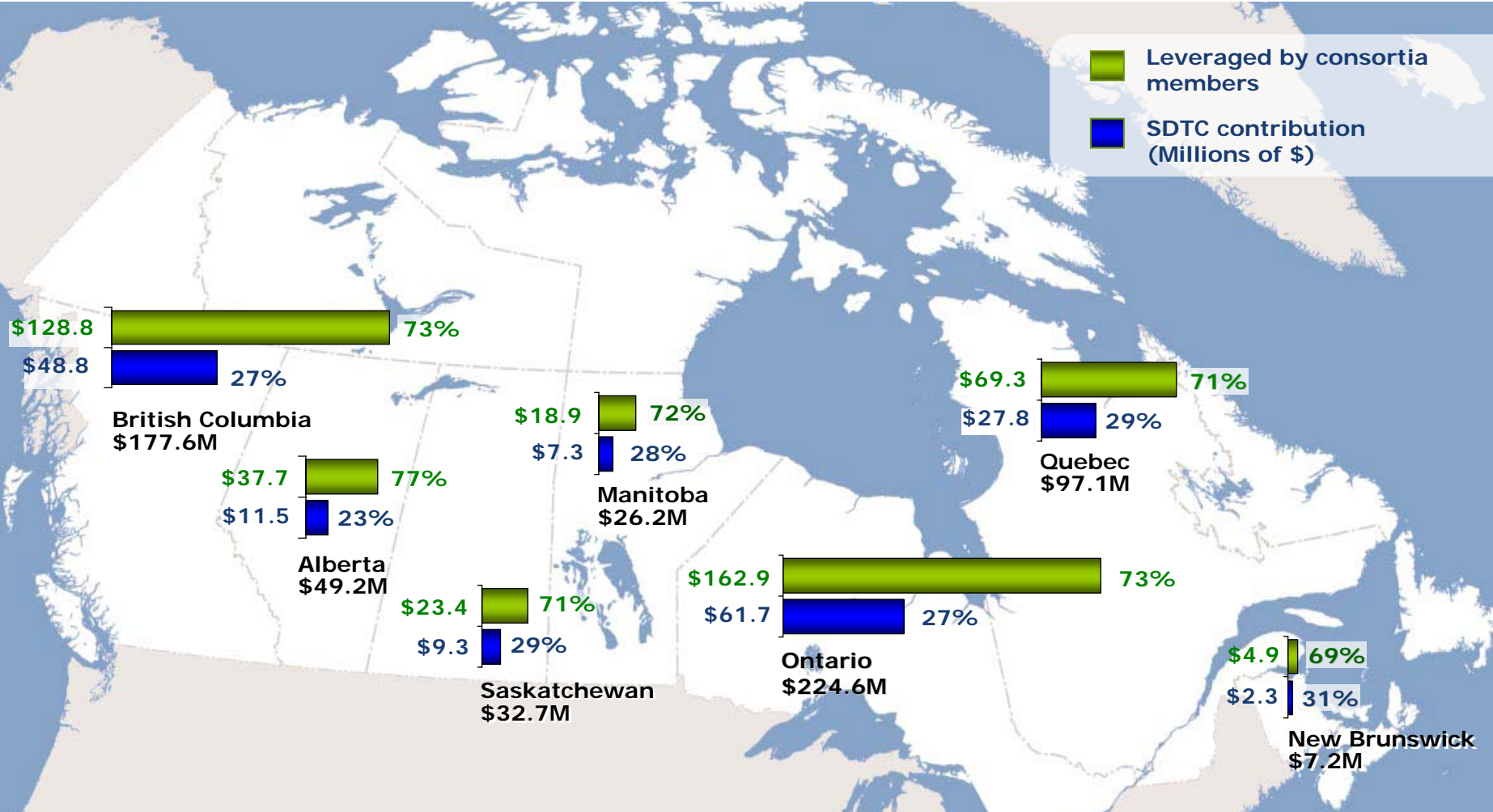
# Investment Portfolio



**SDTC Sector Funding by Province**  
 (up to last Board funding approval, October 5, 2005)



# Investment Portfolio



■ Leveraged by consortia members  
■ SDTC contribution (Millions of \$)

**SDTC Leveraged Funding by Province**  
 (up to last Board funding approval, October 5, 2005)



## For more Information:

Sustainable Development Technology Canada

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Ottawa, Ontario K1P 5E4

[www.sdtc.ca](http://www.sdtc.ca)



- ***Bio-Terre Systems Inc.*** – Bio-Terre is demonstrating 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 is designed to capture and treat methane gas and then convert it into usable energy in accordance with site specific energy demand.
  - **Consortium members:** Agriculture and Agri-Food Canada, Enviro-Accès inc., Ferme Famille Saint-Hilaire, Hydro Québec, Richard Peloquin, Université de Sherbrooke (Groupe Recherche sur les Technologies de Procédés de Conversion)
- ***Carmanah Technologies Inc.*** – Carmanah is demonstrating an adaptation of solar powered LED technology to edge-lit signage, which will lead to the development of a more diverse and robust solar industry. This project is expected to enable solar powered lighting to enter mainstream applications.
  - **Consortium members:** B.C. Hydro, British Columbia Institute of Technology
- ***CO2 Solution Inc.*** – This technology consists of an enzyme bioreactor designed to operate in an aqueous environment. It leverages mechanical and physical chemical principals, as well as the catalytic action of an enzyme to sequester CO<sub>2</sub> in the form of inert, bicarbonate compounds.
  - **Consortium members:** Agency of Energy Efficiency, Aluminum Association of Canada, CIFM (Centre intégré de fonderie et de métallurgie), Elkem Metal Canada Inc., Federation of Canadian Municipalities (Green Municipal Investment Fund), Fonderie industrielle Laforo inc., Place Bonaventure, Ville de Québec



- ***Mabarex inc.*** – Mabarex’s Dry-Rex is a two-step, integrated, wet granular-drying process that uses low vacuum, forced-air stream at temperatures above 5°C as the main driving force to effectively dry paper mill biomass at temperatures much lower than other process.
  - **Consortium members:** EM Optimisation Inc., Enviro-Accès Inc., Kruger Inc., Natural Resources Canada (CANMET Energy Technology Centre)
- ***NOVA Chemicals Corporation*** – 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:** Alberta Research Council, University of Waterloo



- ***Suncor Energy Inc.*** – This project addresses carbon sequestration and enhanced methane production in a closed cycle pilot project designed to capture CO<sub>2</sub> 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:** Alberta Energy Research Institute, Alberta Research Council, Encana Inc., Federal Government (TEAM and PERD), MGV Energy Inc., TransCanada Pipelines Ltd.
- ***Westport Research Inc.*** – Westport plans to demonstrate the technical and economic feasibility of operating heavy-duty (Class 8) trucks in a line-haul application using liquefied natural gas as the primary fuel mixed with diesel.
  - **Consortium members:** Challenger Motor Freight Inc., Enbridge Gas Distribution Inc., Natural Resources Canada, Transport Canada (Freight Sustainability Program), Westport Innovations Inc.



- ***DynaMotive Energy Systems Corporation*** – DynaMotive is demonstrating its combined fast pyrolysis technology called BioTherm for the production of liquid fuels (bio-oil) from forest and agricultural residues (i.e. wood, bark and straw) in an integration platform with a 2.5 MW gas turbine developed specifically to run on bio-oil.
  - **Consortium members:** Classic Power LLC, Erie Flooring and Wood Products, Ontario Power Generation, Inc., Orenda – division of Magellan Aerospace Corporation, UMA Engineering Limited
- ***Enerkem Technologies Inc.*** – Enerkem is in the process of developing a complete technology platform for the production of alcohol biofuels derived from complex wastes, using municipal solid waste as the demonstration feedstock.
  - **Consortium members:** Enviro-Accès inc., Québec Government, SOQUIP Énergie Inc., Université de Sherbrooke (Groupe de Recherche sur les Technologies et Procédés de Conversion), Ville de Sherbrooke
- ***Ensyn Technologies Inc.*** – Ensyn plans to demonstrate an industrial integrated biomass refinery concept, including the core Rapid Thermal Processing (RTP) process that produces intermediate products and the multiple downstream refining that produces the final chemical, fuel and carbon products.
  - **Consortium members:** Opeongo Forestry Service, Renfrew Industrial Commission
- ***Highmark Renewables Inc.*** – Highmark Renewables plans to complete its late-stage development and demonstrate its IMUS technology, an anerobic digestion system which utilizes cattle manure to produce energy, biobased fertilizer and reusable water.
  - **Consortium members:** Agriculture Canada (Energy Co-generation from Agriculture and Municipal Wastes), Alberta Agricultural Food and Rural Development, Alberta Agricultural Research Institute, Alberta Research Council, CETAC-West, Climate Change Central, Cor Van Raay Farm Ltd., Federation of Canadian Municipalities (Green Municipal Investment Fund), Greenhouse Gas Mitigation Program for Canadian Agriculture, G. Thompson Livestock Co. Ltd., Highland Feeders Inc., Nolan Cattle Co. Ltd., Rick Paskal Livestock Ltd., TEAM, University of Alberta



- ***IBC Technologies Inc.*** – IBC is proving a new, high efficiency combined ventilation and space/water heating system. This product is significantly more energy-efficient than standard systems.
  - **Consortium members:** Dexon Canada Manufacturing Corporation, GSW Water Heating Company (a division of GSW Inc.), Mechanical Systems 2000 Inc., Natural Resources Canada (CANMET Energy Technology Centre), Nutech Energy Systems Inc.
- ***Mikro-Tek Inc.*** – Mikro-Tek plans to demonstrate its technology to increase carbon sequestration through the application and management of naturally occurring soil fungi called mycorrhizae.
  - **Consortium members:** Falconbridge/Noranda, IBK Capital, North Sun Nurseries Inc., TransCanada Pipelines Ltd., Woodrising Consulting Inc.
- ***Radiant Technologies Inc.*** – Radiant is in the process of development, demonstration, and validation of a family of technologies that use microwave and high frequency energy to enable extraction and recovery of waste oils, contaminants and fine chemicals.
  - **Consortium members:** Bunge Canada, CanAmara Foods, Environment Canada, McGill University - Department of Food Sciences, NORAM Engineering and Constructors Ltd., Science Applications International Corporation Canada



- ***University of New Brunswick*** - UNB is furthering development and demonstration of high performance interconnection technologies based on power electronic inverters for wind and small hydro-distributed power generation systems.
  - **Consortium members:** Briggs & Little Woolen Mills Ltd., Custom Research Ltd., EoleTech Inc., NB Power Corp., Turbowinds Canada Inc., Village of Dorchester
- ***ZENON Environmental Inc.*** – ZENON is in the late-stage development and demonstration phases for a new, membrane-supported biofilm reactor for wastewater treatment. The process eliminates air emissions from the aerated bio-reactor typical of most applications.
  - **Consortium members:** Environmental Technology Advancement Directorate (ETAD), McMaster University, Ryerson University – Department of Applied Chemical and Biological Sciences





- ***BET Services Inc.*** — BET plans to test and demonstrate eight prototype hybrid-electric shuttle buses in daily operation in a municipal transit authority. The proponent claimed that its battery-dominant design combined with its ground-up lightweight bus manufacturing reduces GHG and CAC emissions by 40 percent compared with diesel. These buses are capable of driving for eighty kilometers solely on electric power, producing zero emissions. Small diesel engines, operating at optimum speed, would keep the batteries charged, thereby reducing emissions for longer-distance service runs.
  - **Consortium members:** Overland Custom Coach
- ***Blue-Zone Technologies Ltd.***— Blue-Zone has developed a technology to capture, reclaim, and purify halogenated inhalation anaesthetic gases, which are used in hospital operating rooms. These are very aggressive greenhouse gases, and some have global warming potential up to 1,900 times that of carbon dioxide. Most of these gases escape into the atmosphere during medical application. Blue-Zone claims that its technology, broadly called Delta™, can capture and recycle all of the vented gases. The anaesthetic can be re-used ten to twenty times. This offers hospitals significant savings in their expenditures on anaesthetic gas while preventing harmful GHG emissions.
  - **Consortium members:** Bodycote Materials Testing Canada Inc., Canadian Centre for Pollution Prevention, Highland Equipment Ltd., Jayne Industries Inc., Ontario Centre for Environmental Technology Advancement (OCETA), University Health Network, University of Toronto – Faculty of Medicine



- ***Cansolv Technologies Inc.*** — Cansolv has developed a way to reduce the cost of capturing CO<sub>2</sub> in flue gas. This technology grew from earlier projects that introduced ways of removing sulfur from process emissions, which the proponent successfully implemented at Noranda, Philips Conoco, and Petro-Canada. In this project, Cansolv would demonstrate its CO<sub>2</sub> capture technology in an oil-fired boiler at a large pulp and paper manufacturing site. The manufacturer will then use the captured CO<sub>2</sub> to acidify the pulp during the paper-bleaching process using carbonic acid.
  - **Consortium members:** Enviro-Accès inc., Pulp and Paper Research Institute of Canada
- ***Cellex Power Products Inc.*** — Cellex developed fuel cell-based power products for use in industrial vehicles. This project focuses on demonstrating a fuel cell-powered lift truck (a.k.a. forklift). Cellex aims to target the electric- and ICE-powered lift truck market. Cellex believes that, with SDTC's help, it can be in a position to assemble Cellex Fuel Cell Power units for commercial use by the end of 2005.
  - **Consortium members:** Arpac Storage Systems Corporation, Fuel Cells Canada
- ***Hydrogenics Corporation*** — Hydrogenics plans to develop, demonstrate, and commercialize fuel cell-powered forklifts. This would involve outfitting two Class-1 forklifts with motors and fuel storage systems, as well as developing refueling facilities and demonstrating the newly outfitted forklifts to industrial end users. One of the technological challenges Hydrogenics hopes to overcome is to reduce refueling time, currently a major cost to warehouse operations.
  - **Consortium members:** Canadian Transportation Fuel Cell Alliance, Deere and Company Inc., Federal Express Canada Ltd., General Motors of Canada Ltd., NACCO Materials Handling Group Inc



- ***Paradigm Environmental Technologies Inc.*** — Paradigm developed a process for efficiently breaking down biological wastewater sludge. This technology, which the proponent calls *MicroSludge*, uses chemicals and rapid depressurization and deceleration from a high pressure homogenizer to pre-treat waste sludge before it goes into an anaerobic digester, where decomposition is far more efficient. Conventional waste-treatment methods are inefficient, and only break down 35 percent of the sludge. The remaining 65 percent, teeming with microbes, usually goes into a landfill, where subsequent uncontrolled decomposition releases significant amounts of methane into the atmosphere.
  - **Consortium members:** CH2M HILL, Chilliwack Waste Water Treatment, National Research Council, Natural Resources Canada, Powertech Labs Inc.
- ***Quantiam Technologies Inc.*** — Quantiam has developed surface coatings for furnace coils inside olefin cracking units. These coatings are catalytic, thereby minimizing residue buildup, permitting lower operating temperatures, and reducing maintenance downtime. The proponents plan to demonstrate their technology and improve catalyst and coating production techniques. Other competitors, mainly in the US, Europe and Asia are developing olefin manufacturing processes that could lower temperatures by 200–300 degrees Celsius, but these will require new facilities built from the ground up. Quantiam's advantage is that its technology, which would lower temperatures by 50–100 degrees, is retrofittable to existing furnaces, thereby minimizing capital investment and providing a viable near-term solution.
  - **Consortium members:** NOVA Chemicals Corporation, NOVA Research & Technology Corporation, Technology Partnerships Canada



- ***Railpower Technologies Corp.*** — Railpower plans to demonstrate 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 emit large amounts of particulates. Railpower's prototypes are powered by custom designed lead-acid batteries which are kept at full charge by a computer-controlled, smokeless diesel generator.
  - **Consortium members:** Alstom Transport Service, Southern Railway of British Columbia Limited, Transport Canada (Freight Sustainability Demonstration Program)
- ***Saskatchewan Power Corporation*** — SaskPower plans to demonstrate mercury emissions reduction technology which uses recyclable activated carbon. Such technology would make low-rank coal-fired generating plants environmentally feasible. Currently, there is no commercially available technology for controlling mercury emissions.
  - **Consortium members:** Alstom Canada Ltd., Luscar Ltd., Natural Resources Canada (CANMET Energy Technology Centre), Saskatchewan Research Council, University of North Dakota Environmental and Energy Research Center, University of Regina

# 2003-B Funded Projects



- ***BIOX Canada Ltd.*** — Has developed a way to convert vegetable and animal oils and fats to biodiesel at near-ambient pressure and low temperature. It can also convert oils and fats to biodiesel faster than competing processes. The proponent believes these advantages will result in lower production costs, making biodiesel competitive with petroleum diesel.
  - **Consortium members:** AMEC, Dynex Capital Limited Partnership, University of Toronto, Vopak Terminals of Canada Inc. (Canadian Subsidiary of Royal Vopak), Weatons Holdings Limited/Notae Limited
- ***DeCloet Greenhouse Mfg. Ltd.*** — Developed a suite of greenhouse technologies, consisting of removable foam and transparent insulation, heat recovery and storage systems, cogeneration, energy management and process control systems, and infra-red thermal film and energy curtains. According to the proponent, these technologies, combined, can increase greenhouse operating efficiencies by 50 to 75 percent, with corresponding reductions in operating costs.
  - **Consortium members:** Agricultural and Adaptation Council (CanAdapt program), CEA Technologies International, Enbridge Gas Distribution Inc., Greenhouse Engineering, Industrial Research Assistance Program (National Research Council), Quist Engineering & Consult., Union Gas (a Duke Energy Company)
- ***Fifth Light Technology Ltd.*** — Plans to demonstrate a microprocessor-based dimmer for magnetic ballasts in fluorescent lights. This enables fixture-level dimming control and could lead to significant energy savings. The proponent claims that its dimmer makes magnetic ballasts operate more efficiently even when they are not dimmed, and actually improves their performance with respect to flicker, noise, heat, and life expectancy. This offers a substantial advantage over electronic ballasts. Fifth Light dimmers reduce electricity in direct proportion to the amount of dimming.
  - **Consortium members:** Great West Life Realty, Lindsay Electronics, New Orbit Technologies Inc., Smith and Anderson Electrical Engineering Inc., Toronto Hydro Energy Services Inc.



- ***Gen-X Power Corp. Ltd.*** — Developed a membrane technology which it hopes can reduce the overall cost of ethanol production, in any ethanol plant, by 3.5 cents per litre. In current ethanol production, a feed is fermented then distilled. The fermented feed contains solids, which are separated from the liquids (water and ethanol) by heating the whole mixture. Then the water-ethanol mixture is heated to boil off the ethanol. These stages are energy intensive. The last stage, purification, uses molecular sieve beds, which are leaky and inefficient and which require further energy intensive regeneration.
  - **Consortium members:** KATZEN International, Inc., Natural Resources Canada, University of Calgary, Virtual Materials Group Inc.



- ***Gradek Energy Inc.*** — Developed a process for separating bitumen from oilsands (primary extraction), low-grade oil sands ore, and from tailings ponds. The process is based on re-usable plastic beads to which hydrocarbons adsorb. Current oil sands processes leave vast, environmentally hostile tailings streams and ponds, in which the proponent estimates there are a billion barrels of unrecovered bitumen. The process also extracts the significant concentrations of titanium, aluminum, and zirconium oxides embedded in oil sands.
  - **Consortium members:** SNC-Lavalin, Syncrude Canada, University of Alberta
- ***Lignol Innovations Corporation*** — Developed a cellulose-biomass de-lignification process that it claims effectively and economically converts forest industry wastes into ethanol and other marketable products, with virtually no leftover wastes. This is done in two general stages. First, lignin is chemically separated from the waste material. Second, the remaining insoluble cellulose, hemicellulose, and lignin residues are converted to ethanol and a variety of other marketable products. The second stage involves breaking down the three materials using an enzymatic process called Organosolv—based on recently-developed enzymes which are 3 times more efficient than previous enzymes.
  - **Consortium members:** Faculty of Forestry at UBC, Forintek Canada, Hipp Engineering Ltd.



- ***Nanox inc.*** — Developed a low-temperature catalyst powder that it claims will replace platinum group metals (PGMs) as the coating on catalytic converters for the automotive industry. This catalyst is capable of converting 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 are exhausted directly into the atmosphere.
  - **Consortium members:** Business Development Bank of Canada, Hydro Québec CapiTech inc., Pangaea Ventures, Sovar s.e.c., The Solidarity Fund QFL, Université Laval
- ***NxtPhase T&D Corp.*** — Developed optical current and voltage sensors to control and monitor large-scale electricity grids. It expects that devices of this type will replace the instrument transformers and circuit breakers currently in use, which are ill-suited to interface effectively with modern control and monitoring systems (which contributed to exacerbating the August 14 blackout). Further, existing instrument transformers and circuit breakers are insulated either with toxic oils or sulfur hexafluoride (SF<sub>6</sub>) gas, the latter of which is an extremely potent greenhouse gas.
  - **Consortium members:** BC Transmission Corporation, Hydro Québec, Powertech Labs, University of British Columbia





- ***Sacré-Davey Innovations Inc.*** — Developed a plan to establish a hydrogen fuel refining, storage, and distribution infrastructure and application demonstration based on waste hydrogen from a chemical plant. The proponent believes that by integrating waste hydrogen capture and purification with storage and distribution, it can achieve an economical solution to the problems of cost and availability that currently hamper the development of the hydrogen economy.
  - **Consortium members:** Clean Energy, Dynetek Industries Ltd., ERCO Worldwide (a division of Superior Plus Inc.), Powertech Labs Inc., QuestAir Technologies Inc., Westport Innovations Inc.
- ***Synodon Inc.*** — Plans to develop a commercial mobile remote natural gas sensor capable of detecting leaks in pipelines. This detector, called realSens™, is based on remote sensing methods and instrumentation developed at the University of Toronto. Certain components upon which realSens is based are currently in use on NASA's Terra satellite. The proponent has nearly completed testing a prototype, and SDTC funds are requested in order to build a full-scale unit, and test/demonstrate it in partnership with TransCanada Pipelines' Leak Detection and Repair Division.
  - **Consortium members:** Airborne Energy Solutions Ltd., Mosaic Mapping Systems Inc., TransCanada Pipelines Ltd.



- ***Alternative Green Energy Systems Inc.*** — The AGES Kinetic Destruction System (KDS) is a patented technology for the one step processing of biomass waste streams, which comminutes and dewateres wet materials used in the pulp & paper and other forest products industries. Implementation of KDS technology enables the combustion of wet biomass materials that can mitigate land filling and produce energy, thereby replacing fossil fuels. The market impact for this technology is potentially large as it converts waste streams into revenue streams while reducing GHG and CAC emissions.
  - **Consortium members:** First American Scientific Corp., Host Pulp and Paper Mills, Hydro Québec CapiTech Inc., Thermix Combustion Systems, University of Toronto–Forestry Department, UNISO-PMP–Project Management Group
- ***Atlantic Hydrogen Inc.*** — Atlantic Hydrogen Inc. has developed a method, called Carbonsaver, that produces hydrogen and solid carbon black from natural gas using a low-temperature plasma. Other, more widely used methods of producing hydrogen, such as steam methane reforming or electrolysis, are energy intensive and therefore expensive. They also produce significant greenhouse gas emissions, which defeats the purpose of the hydrogen economy. The proponent claims that Carbonsaver has the advantage of producing two salable products inexpensively, and, because the carbon in the methane will be converted to carbon black, the process is greenhouse gas free.
  - **Consortium members:** BOC, E-H2 Inc., Energy Reaction Inc. (McGill University), Fuel Cell Intelligence Ltd., Fuel Cells Canada, Hydrogen Engine Center, Hydrogenics Corporation, PrecisionH2 Power Inc., Purolator Courier Ltd., University of Toronto at Mississauga (Hydrogen Village), University of New Brunswick



- ***Atlantic Packaging Products Ltd.*** — TORBED is a patented torroidal fluidized bed technology that has been in use since 1985 and provides a combustion, drying and calcination process in a single step. The current proposal would adapt the technology for use in drying of wet paper mill sludge. The net GHG reduction is associated with the reduced need for natural gas at the paper mill facility. The solution has inherent value in avoiding land application of the sludge, but is further valued as it can be used in CHP systems in the paper mill and the recovered clays can also be sold.
  - **Consortium members:** Teng and Associates Inc., Torftech (Canada) Inc.
- ***B.C. Eco-Systems Inc. (formerly Genesis)*** — The proposed project will demonstrate the environmental, technological and economic viability of 'zero-discharge', integrated closed-loop waste to energy and nutrient recovery systems or clusters. The project will combine the technologies of 'anaerobic digestion', co-generation and hydroponics and will demonstrate the technologies' ability to mitigate environmental impact while recovering value-added for the partners in the form of renewable energy, clean water, organic fertilizer, hydroponics cattle feed and GHG emission reduction credits.
  - **Consortium members:** Bifano Farms Ltd., CETAC West, FULL Systems, Olds Agricultural College, RCM Digesters, The Aggasiz Research Centre, The North Okanagan Regional District (NORD), University of British Columbia



- ***Dofasco Inc.*** – Using the strength and stiffness of steel as the outer skins and a natural fibre/resin base core as the web, as in an I-beam, a lightweight panel will reduce vehicle weight by 20 – 30 % with equivalent stiffness. If successful with panels in light trucks it could have a market penetration of 25% and an average weight saving of 20.45 kg per vehicle.
  - **Consortium members:** General Motors of Canada Ltd.
- ***Great Northern Power Corp.*** – Design and construct of a full-scale 2.5 MW BESS demonstration plant at Northland Forest Products mill to show-case the technology to other sawmills, C&D operations and Oil & Gas companies from across Canada. The consortium has 11 other potential projects in Alberta and 3 sawmills in Ontario.
  - **Consortium members:** Northland Forest Products Ltd., Powerhouse Engineering Inc.
- ***M.A. Turbo/Engine Ltd.*** – Continuous Water Injection (CWI) is a system for injecting precise amounts of demineralized water into the intake combustion airflow of diesel engines to: reduce NOx emissions up to 35%, reduce PM emissions by 15 – 20%, reduce fuel consumption up to 5%, and reduce engine wear about 20%. After successfully retrofitting large marine diesel engines, the technology now needs to be demonstrated on smaller diesel engines working in a high maneuvering mode.
  - **Consortium members:** Finning Power Systems, Rival Technologies Inc.



- ***QuestAir Technologies Inc.*** — This project focuses on the recovery of hydrogen in oil refining applications—assisting refineries in meeting their commitments for the production of low sulphur diesel mandated by environmental legislation and required by modern emissions reduction control technologies to substantially reduce vehicle NOx and particulate matter emissions. Improving the utilization of hydrogen throughout the refinery has become a focus within the industry in recent years. Refineries need more hydrogen to achieve the additional desulphurization and are looking into different technologies to process outlets, purge or recycle streams from hydro processors to recycle the hydrogen contained within them, thus decreasing their overall hydrogen consumption.
  - **Consortium members:** ExxonMobil Research and Engineering Company
- ***Techint Goodfellow Technologies Inc. (formerly Stantec)*** — Techint Goodfellow Technologies Inc. has developed an optical temperature and off-gas analysis device for large-scale combustion processes, which allows operators to make adjustments for efficiency and consistency. Given the harsh environment in these processes, such a device has not been practical up to now, and critical real-time control and optimization of these processes has not been possible. Techint Goodfellow Technologies' system overcomes previous barriers and makes this analysis possible. University of Toronto
  - **Consortium members:** The Ontario Centre for Environmental Technology Advancement (OCETA), Unisearch Associates Inc., University of Toronto



- ***Xantrex Technology Inc.*** — Xantrex plans to develop and demonstrate an integrated drive train for variable speed wind turbines. This drive train incorporates a gear unit, an induction generator, and power electronic controls. Xantrex itself specializes in the latter, power electronic controls, and will develop those for this project. The other two consortium members will develop the other components. Xantrex also plans to lead the systems integration work.
  - **Consortium members:** Loher GmbH, Winergy AG



- ***Angstrom Power Incorporated*** —Angstrom Power will demonstrate and test hydrogen fuel cell-powered portable electronic devices, including lights and chargers, in remote field operations without access to the electricity grid. The devices will be coupled with a portable, centralized hydrogen refueling system. The technology has the potential to significantly reduce greenhouse gas emissions. This will be the first major deployment of portable fuel cell devices in Canada, and one of the first integrated, end-to-end Micro Hydrogen demonstrations in the world. Micro Hydrogen can recharge faster than battery-based devices for portable power, with better operating characteristics, less maintenance and no emissions. The project will also be used to develop safety certifications for the technology.
  - **Consortium members:** City of Vancouver, Urban Search and Rescue, Canada Task Force 1; HTEC Hydrogen Technology & Energy Corp.; Powertech Labs Inc.; The BOC Group; University of Victoria; and Vancouver Airport Authority.
  
- ***Clean Current Power Systems Inc*** — The “Pearson College-EnCana-Clean Current Tidal Power Demonstration Project at Race Rocks” will demonstrate Canada’s first free-stream tidal power project, to be installed at a British Columbia Ecological Reserve located 10 nautical miles southwest of Victoria, BC. The project will enable the marine park to convert tidal energy to electric power – replacing power supplied to the island by two diesel generators -- beginning in early 2006. The multi-year demonstration project will involve the installation, operation and monitoring of a 65kW free-stream tidal turbine generator. It will be the first sustained field testing of a new electricity-generating technology in this harsh marine environment.
  - **Consortium members:** AMEC Americas Ltd., AMEC Dynamic Structures Limited, EnCana Environmental Innovation Fund, Lester B. Pearson College of the Pacific, Ocean Works International, Powertech Labs Inc., and Triton Consultants Ltd .



- ***Electrovaya Corp*** — Electrovaya Corp. plans to develop and demonstrate its patented Lithium Ion SuperPolymer® battery system for zero-emission battery electric vehicles, principally in vehicle fleet applications. Electrovaya's award-winning battery technology delivers the highest energy density of any battery technology on the market today, allowing for a long range, clean transportation alternative.
  - **Consortium members:** SouthWestern Energy Inc., Unicell Limited.
  
- ***Encelium Technologies Inc*** — Encelium's Energy Control System (ECS) is an advanced lighting control and energy management technology that delivers optimum light levels to each workspace in a building, eliminating wasted energy. The system allows every occupant in a building to control their own "environment" through personal control of light levels in their workspace from their desktop computer. The advancements proposed for this demonstration project, known as "Advanced Negawatt ECS," will allow for the aggregation and control of lighting loads across multiple buildings and remote management of these loads for the purpose of demand response. This will reduce overall energy consumption and shave peak demand, thereby easing pressure to build new generation capacity.
  - **Consortium member:** Toronto Hydro Energy Services Inc.





- **EnerWorks Inc** — The consortium led by EnerWorks will develop and demonstrate advanced renewable energy systems in 500 Canadian homes. The project integrates highly energy efficient solar water heating and geexchange space heating and cooling technologies into a system that will be installed in homes at no upfront cost to the homeowner. The new business model removes the main barrier to market adoption – initial capital cost – and at the same time introduces innovative renewable energy generation for residential housing. Heating, air conditioning and hot water account for over 80 percent of the energy consumed in Canadian households.
  - **Consortium members:** Clean Energy Development Corp., The Quantum Leap Company Limited, Toronto Hydro Energy Services Inc., Windfall Ecology Centre.
- **GE Canada** — This project will develop and demonstrate an advanced turbine drive train that converts mechanical energy into electrical power for next-generation multi-megawatt wind turbines. The technology will provide enhanced performance, increased reliability and higher power density in the turbine’s rotating equipment. The project will design and test a prototype drive train at GE Canada’s Peterborough facility, followed by wind turbine validation tests at a consortium partner’s site in Canada. The technology will advance wind as a mainstream energy supply option with a competitive cost of energy.
  - **Consortium members:** École de technologie supérieure, McGill University, University of Western Ontario.



- ***Group IV Semiconductor Inc*** — Group IV Semiconductor will develop and demonstrate a new breed of energy-saving solid-state lighting products. The project builds on a revolutionary silicon thin-film process that for the first time will enable solid-state lighting to reach the mass market. The goal is to develop a light bulb that achieves the performance and price that could enable widespread adoption and the full energy savings potential of the technology. The benefits of solid-state lighting derive from a much higher efficiency than conventional light bulbs, reducing energy consumption by as much as 80 percent.
  - **Consortium members:** Business Development Bank of Canada, Canadian Photonics Fabrication Centre (NRC), Carleton University Faculty of Engineering, McMaster University Faculty of Engineering.
- ***NORAM Engineering and Constructors Ltd*** — NORAM will develop and demonstrate the first full-scale implementation of a new approach to creating a closed-loop kraft pulp mill. The Tembec mill at Skookumchuck, BC will play host to the first phase of the program, which involves progressively closing the mill's water consumption and effluent loop. The project will demonstrate the viability of technologies that reduce greenhouse gas emissions through chemical recycling and increased use of biomass as a fuel; reduce demand for water; and reduce waste effluent. In addition to reduced emissions, benefits include the recovery of valuable chemical, energy and fibre components from waste streams.
  - **Consortium members:** PAPRICAN (Pulp and Paper Research Institute of Canada), Tembec Industries Inc.



- ***Parkland BioFibre Ltd*** — This project involves a process that will utilize raw industrial hemp fibre to produce insulation and other products while reducing waste streams. The process will utilize European technology, currently used in small-scale operations, that will be adapted and configured into a larger pilot processing facility. The main value-added product will be biofibre insulation, which can be used in place of “pink” fibre glass insulation in the construction industry. Other products produced initially will be non-woven matting for use in the horticulture industry, fibre for the paper recycling industry and short fibre that makes excellent horse and pet bedding. Products made through this initiative will eliminate the atmospheric emissions from the current practice of burning hemp plants after grain harvest and will sequester carbon for extended periods if used in long life buildings.
  - **Consortium Members:** McMunn & Yates Building Supplies, North American Natural Fibers, Olds Agtech Industries Inc., Parkland Industrial Hemp Growers Coop, Plant Fibre Technology, UKAL (Canada) Ltd.
- ***Prairie Pulp and Paper Inc*** — The consortium led by Prairie Pulp and Paper Inc. will explore the viability of producing high quality paper products from 100 percent agricultural materials. Employing an innovative, agricultural fibre pulping process, this project has the potential to reuse otherwise discarded agricultural residues and help offset the demands on Canadian forests. The project will evaluate, develop and trial the process for producing ‘tree-free’, 8.5” x 11” sheet paper for use in computer printers, fax machines and photocopiers.
  - **Consortium members:** Bannatyne Financial, Manitoba Straw Producers Co-op Ltd., Provincial Government of Manitoba, SNC-Lavalin.



- ***Pratt & Whitney Canada Corp*** — This project will develop and demonstrate an innovative, low-emission technology for gas turbine engines used in air transportation. The technology has the potential to deliver major reductions of NO<sub>x</sub>, CO, VOC and particulates, as well as reduced greenhouse gas emissions. It also has the potential to be used in land-based applications as well. Pratt & Whitney Canada will undertake the majority of the engine demonstration project in Ontario and Quebec.
  - **Consortium members:** Goodrich Corporation's Turbine Fuel Technologies division; Hamilton Sundstrand Corporation; INCO Ltd.; National Research Council; United Technologies Research Center; and University of Toronto, Institute for Aerospace Studies
- ***SAIC Canada*** — This project involves the development and demonstration of high-temperature thermal underground energy storage, and would be the first one of its kind in North America utilizing underground thermal energy storage (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. This is a new and innovative concept in the Canadian energy market.
  - **Consortium members:** ATCO Gas, City of Medicine Hat, Enerworks, IF Technology International, Sterling Homes, Town of Okotoks, United Communities.



- ***Sunarc du Canada Inc*** — Sunarc of Canada has developed on-demand insulation systems for transparent structures such as greenhouses, reducing by 50 percent the use of fossil fuels for heating in greenhouses and other solar-receptive buildings. This project will enable Sunarc to further develop its technology and to conduct demonstration projects with growers in Quebec and Ontario. SUNARC L-FOAM™ is inserted automatically when required between two layers of translucent plastic film forming the covering of the structure. When in place, the foam dramatically increases insulation values by ten-fold or more (R15-20). As the foam collapses and returns to liquid state, it is recovered and re-used. Sunarc's technology, which can be installed in both new and existing greenhouses, will contribute to efficient and competitive horticulture.
  - **Consortium members:** Agriculture and Agri-Food Canada, Greenhouse and Processing Crops Research Centre; Fonds en efficacité énergétique; Les Industries Harnois Inc.; Les Jardiniers du Chef and two additional Quebec greenhouse growers; and Université Laval, Faculté des sciences de l'agriculture et de l'alimentation.
- ***Terra Gaia Inc*** — Terra Gaia will demonstrate technology that eliminates two of the largest hazardous wastes produced by the steel industry: electric arc furnace dust and waste hydrochloric acid. Current disposal practices for these wastes results in a substantial cost to the industry, including significant environmental liabilities, energy consumption and greenhouse gas production. Terra Gaia's patented technology involves a low-pressure, low-temperature process which is cost-competitive, produces significantly less greenhouse gas emissions and provides additional revenue streams through the generation of saleable byproducts.
  - **Consortium members:** Bateman Engineering, Enpower Corp., Norambar (Stelco Inc.)



- **University of British Columbia** — This project involves the development and demonstration of an advanced, high performance building envelope system that will reduce energy consumption and greenhouse gas emissions. The building envelope includes everything that separates the interior of a building from the outdoor environment, including the windows, walls, foundation, basement slab, ceiling, roof and insulation. UBC's system will utilize photovoltaic panels and other energy saving components, coupled with a sensing, monitoring and controls system, to be installed in the new Centre for Interactive Research on Sustainability (CIRS), to be built in Vancouver, BC. This project will facilitate the adoption of streamlined monitoring and controls protocols that can be widely replicated in buildings across Canada.
  - **Consortium members:** Busby Perkins + Will Architects; British Columbia Institute of Technology (BCIT) , Technology Centre; Keen Engineering; Siemens Building Technologies Ltd.; and Visionwall Corporation.



- ***AirScience Technologies Inc.*** — The consortium led by AirScience Technologies Inc. will demonstrate a new process, Terragas, to economically produce hydrogen from biogenous 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 CO<sub>2</sub>. 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 CO<sub>2</sub>. Production of hydrogen from landfill gas at a commercial scale would generate an estimated 4-6 times the economic value of electricity produced from landfill gas.
  - **Consortium members:** Air Liquide Canada, Inc., Municipality of Dolbeau, Que./ SmartSoil Energie, University of Waterloo.
- ***Clear-Green Environmental Inc*** — Clear Green and its partners will demonstrate an innovative, three-stage process to treat dead stock and slaughter waste that couples pretreatment, anaerobic digestion and nutrient recovery for renewable energy and fertilizer applications. The technology will demonstrate the ability to extract valuable fertilizer nutrients from digested waste, replacing commercial fertilizer. The goal is to eliminate waste storage and land disposal systems and allow for intensive livestock facilities to be located closer to infrastructure while eliminating concerns over water, air and soil contamination as well as odours.
  - **Consortium members:** Ag West Bio Inc., Agriculture and Agri-Food Canada, Agriculture and Bioresource Engineering, Clear-Green Environmental Inc., Cudworth Pork Investors Group (CPIG) Inc., Prairie Agricultural Machinery Institute (PAMI), Saskatchewan Research Council, SaskPower, Sinnett Pork Farm Ltd., University of Saskatchewan



- ***Dépôt Rive-Nord Inc.*** — Dépôt Rive-Nord and its consortium partners will demonstrate an end-to-end treatment and transformation process for residual wastes from several sources including municipalities, agriculture, agri-food, and industrial, commercial and institutional (ICI) operations. The project involves the integration of existing commercial waste processing technologies to produce recyclable materials such as paper and plastic; biogas (upgraded to pipeline-quality natural gas); and organic fertilizers. The new solution will optimize conventional treatment methods, minimize the amount of waste sent to landfill sites and reduce greenhouse gas emissions.
  - **Consortium members:** Bio-Metha Inc., Biotechnology Research Institute - National Research Council Canada, EBI Energie Inc., EBI Environnement Inc., Gestion Environnementale Econord Inc., Industries Machinex Inc
- ***EcoSmart Foundation Inc.*** — EcoSmart and its partners will develop a system that will allow developers, architects, engineers, contractors and material suppliers to optimize the use of supplementary cementing materials (SCMs) by simulating the effects of varying these materials on construction projects. By determining optimal SCM levels, the system will reduce costs along with emissions of greenhouse gases and air contaminants by directly reducing the amount of Portland cement required for construction projects. The system will gather scientific and technical knowledge, experience and intellectual property on SCMs and make it available to industry through a continuously updated, computer-based system.
  - **Consortium members:** Greater Vancouver Regional District (GVRD), Halcrow Yolles, Lafarge Canada, Natural Resources Canada - CANMET - Materials Technology, Public Works & Government Services Canada (PWGSC), Read Jones Christoffersen Ltd., University of New Brunswick, University of Calgary, Yolles Partnership.





- ***Envirogain Inc.*** — Envirogain and its partners will develop and demonstrate a fertilizer stabilizing and drying process that uses heat from both a previously commercialized hog manure treatment system (Biofertile ®) and the new process. The new 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. The project is an example of environmental co-benefits that include soil and water.
  - **Consortium members:** F. Ménard Inc., William Houde Ltée.
- ***Hatch Ltd.*** — The consortium members will design, build and operate a 2,000-barrels-of-oil-per-day demonstration plant to field test a patented process (N-Solv™) for in-situ extraction of oil from tar sands using a pure condensing solvent. The principal advantages of this process are commercially attractive oil-production rates with -- when compared to steam injection -- a 90 percent reduction in energy costs and an effective 80 percent reduction in greenhouse gas emissions. In addition to that, the process does not consume any water and produces an enhanced-quality oil product with higher value. The N-Solv demonstration plant will provide the data required to confirm the key technical, geological, environmental and economic parameters of the process. An oil company will host the demonstration plant.
  - **Consortium members:** N-Solv Corporation, Nenniger Engineering Inc.



- ***Maratek Environmental Inc.*** — A consortium led by Maratek Environmental will build a world's-first demonstration project that will recover and reuse the solvent in dirty 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 dirty 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:** Fuji Hunt Chemicals, Omega Recycling.
- ***Netistix Technologies Corporation*** — A consortium led by Netistix Technologies Corporation seeks to deliver 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 will indicate real situations when driving behaviours are inefficient, resulting in more fuel use, or when maintenance is required. The system analyzes both vehicle and driver behaviour data and provides reporting mechanisms to consumers on their driving history. An education program will be developed to inform consumers where improvements can be made to reduce fuel consumption and operating costs. Other key elements of the project are the development of a low-cost, compact in-car device to collect vehicle and driver data, driver behaviour and vehicle performance algorithms, secure communications, and a scalable system design.
  - **Consortium members:** Automotive Industries Association of Canada, Carleton University, Jacques Whitford, Petro-Canada Certigard



- ***Nexterra Energy Corp.*** — Nexterra and its partners will install a full-scale biomass (wood waste) gasification system that will be used to heat an existing lime kiln at a pulp mill in western Canada. The direct firing of the synthetic gas - utilizing a dual fuel (syngas/natural gas) burner nozzle - will potentially enable lime kilns to convert their energy feedstock from fossil fuels to gas produced from their own wood residue, thereby reducing energy costs as well as greenhouse gas emissions.
  - **Consortium members:** Pulp & Paper Research Institute of Canada (PAPRICAN), A major integrated pulp and paper producer.
- ***Outland Technologies Inc*** — Outland Technologies, Inc., in conjunction with its partners, will develop and demonstrate a new technology capable of generating electricity with reduced emissions using waste energy at gas pressure let-down sites (sites where gas pressure is deliberately reduced for processing or to facilitate safe distribution to customers). The “rotary positive displacement” (or CvR™) technology will achieve the same result as a piston but in rotary motion, allowing for significantly higher output relative to size. The project will involve the demonstration of CvR Technology coupled with 20kW and 400kW electricity generators, the combination of which Outland refers to as a “Power Recovery Generator.” The technology represents a new operational principle for piston devices with numerous applications including rotary positive displacement pumps and possibly engines.
  - **Consortium members:** BP Canada Inc., Braeside Fabricators Inc., Cojo Technology Inc., Crimtech Services Inc., L.O.P. Omnitech Inc., Single Buoy Moorings Inc., Zed.i.solutions Inc.



- ***Petroleum Technology Research Centre*** — The Petroleum Technology Research Centre and its partners will develop, demonstrate and evaluate a more environmentally sensitive and energy-efficient enhanced oil recovery (EOR) process for heavy oil reservoirs in western Canada. The technology uses a solvent vapour extraction process instead of steam to recover the heavy oil, reducing CO2 emissions and fresh water use by over 90 percent.
  - **Consortium members:** Canadian Natural Resources Limited, Husky Energy Inc., Nexen Inc.
- ***Plasco Energy Group Inc.*** — Plasco and its partners will demonstrate a Plasma Gasification Process that will economically convert municipal solid waste (MSW) into synthetic gas, inert solid material and heat. The heat and gas will be utilized in a combined cycle co-generation power plant to produce electricity for sale into the electricity grid. Plasco has developed an economically viable means of treating MSW that reduces the environmental impact compared with current disposal methods such as landfill. The project will process up to 75 tonnes/day of MSW at Ottawa's Trail Road landfill site and generate a net 4 megawatts of electricity for sale to the grid. The City of Ottawa will provide a site and related services for the demonstration project while Hydro Ottawa will facilitate its integration into the grid.
  - **Consortium members:** Ameresco U.S., City of Ottawa, HERA Holdings S.L.



- ***Power Diagnostic Technologies*** — The consortium led by Power Diagnostic Technologies Ltd. will develop a portable leak detection and repair (LDAR) technology to detect and image gas leaks in confined spaces such as refineries and natural gas processing plants. The new gas imaging detection system will be capable of detecting and imaging leaking gases such as methane. The system will be a light, hand-held and highly portable device engineered for LDAR inspectors. A module to calibrate the rate of a detected leak will also be developed. If successful, this tool will enable the petrochemical industry to find leaks more efficiently, accurately and cost-effectively, with the industry-requested feature of calibrating the leak rate of fugitive emissions in compliance with the new regulatory climate.
  - **Consortium members:** Alberta Research Council, Accura Embedded Systems Inc., Cantronic Systems Inc., BP Canada Energy Company, BP Refining Technology, USA, Interay BV , Dr. Mark Rockley, Oklahoma State University, Opgal Optronics Industries Ltd., Public Works & Government Services Canada



- ***SHEC LABS - Solar Hydrogen Energy Corporation*** — The consortium led by SHEC LABS will demonstrate hydrogen production using solar energy, featuring the world's first commercial-scale renewable solar hydrogen "Dry Fuel Reformation" (DFR) reactors, unique solar concentrator designs and "Direct Water Splitting" (DWS) technologies. Natural gas will be used initially to verify the performance of the DFR systems, with the ultimate goal of testing the complete DFR process using landfill gas (methane) at the project's location, the City of Regina Fleet Street landfill. Currently, steam reformation of fossil fuels is responsible for 95 percent of the world's hydrogen production. A key project objective is to demonstrate that SHEC LABS' technology can be cost-competitive with steam methane reformation as well as dramatically reducing greenhouse gas emissions and other air pollutants. SHEC LABS' solar hydrogen production will provide a net energy gain when converting methane into hydrogen since the energy used to drive the process is harvested from the sun. The technology is particularly attractive for smaller and distributed production of hydrogen at end-user sites, but could also be applicable for large-scale hydrogen production in the future. The DWS technology, the next generation of solar hydrogen production, will also be demonstrated on a smaller scale and will involve direct water splitting with only water as the primary feed component.
  - **Consortium members:** Clean 16 Environmental Technologies Corp., Giffels Associates Limited (An Ingenium Group Company), Praxair, University of Toronto - Department of Chemical Engineering and Applied Chemistry



- ***Vaperma Inc.***— The consortium led by Vaperma will develop and demonstrate an advanced dehydration process for the biofuel industry using an innovative polymer membrane to separate water vapour from organic compounds such as ethanol. The process offers increased energy efficiency – reducing energy costs by up to 40 percent – lower greenhouse gas emissions, easy integration into any fuel-grade ethanol process, modularity, flexibility, simple operation and low maintenance. Applications for the technology include gas separation in the chemical, petrochemical and natural gas processing industries. Vaperma has teamed up with Canada's largest producer of ethanol, Commercial Alcohols Inc. to prove the technology prior to industrial-scale commercialization.
  - **Consortium members:** Commercial Alcohols Inc., NRCan/CANMET—TEAM