News Release

Visuals available online for media. Directions below.

Carbon recycling system closer to reality for industry to soak up greenhouse gases

QUEBEC CITY, QUEBEC (April 24, 2008) **–** A network of research and technology organizations is getting closer to piecing together a system that would fast-track Mother Nature's own greenhouse gas recycling process in large volumes.

Scientists through Innoventures Canada (I-CAN) are working towards creating a system that would convert carbon dioxide diverted from industrial facilities into valuable products using Earth's oldest plant life – micro-algae.

I-CAN is a not-for-profit consortium of ten Canadian research corporations who have joined together for key strategic projects. The organization kicked off its annual meetings in Quebec City April 24 and 25 with an update on its CARS project – Carbon Algae Recycling System. CARS proposes to feed flue gas (CO_2, NOx, etc.) directly from industry into ponds to feed the growth of micro-algae, which would then be harvested and processed into value-added products such as ethanol, bio-diesel or fertilizer.

"In essence, the goal of CARS is to fast-track Mother Nature's own process of using plants to soak up greenhouse gases that would otherwise be released into the atmosphere," says John McDougall, vice-chairman for I-CAN from the Alberta Research Council. "Algae growth research isn't new, but our goal is. Other algae projects are aimed at creating bio-fuels. The goal of CARS is to provide industry with a sustainable, affordable way to deal with their greenhouse gas emissions."

The base case chosen for the preliminary CARS work is sized to consume up to 30 per cent of the greenhouse gases produced by the average 300 megawatt coal-fired power plant. "That's the base case, and we'll work upwards to larger capacities from there," says McDougall. He predicts the sale of byproducts like ethanol or fertilizer from harvesting the algae would help offset the cost of operating the CARS algae systems.

Since announcing the CARS project last year, scientists from four different provinces have made head-way in proving this concept could work in Canada in a cost-effective way.

"Until now, it was believed Canada's climate and light conditions wouldn't support these kinds of algae projects," notes Denis Beaulieu, chairman for I-CAN and a special consultant for the Centre de Recherche Industrielle du Quebec (CRIQ). "We've now discovered the less intense sunlight in Canada is actually beneficial to the growth of algae, and we are devising concepts of how covered pond systems could work economically in our climate."

The comprehensive research program is taking a two-pronged approach. The biological piece of this puzzle will identify a strain of algae that thrives on the specific chemical composition of flue gas, at a target temperature, given the angle of sunlight in Canada. On the engineering side, the researchers have already determined that neither the existing photobioreactor nor the open pond systems would deal with large enough volumes of CO_2. I-CAN partner researchers are now developing a hybrid covered pond system that maintains the consistent environment required by the chosen strains of algae.

National demand for such a project is mounting. Governments are targeting industries to reduce their greenhouse gases in the coming years, leaving industry scrambling for ways to cut their emissions in a way that's good for the environment and their bottom line.

Participating organizations for the CARS project include Centre de Recherche Industrielle du Québec (CRIQ), Alberta Research Council (ARC), Saskatchewan Research Council (SRC) and Manitoba Industrial Technology Centre (ITC). The project is currently funded by the Government of Canada through Natural Resources Canada, the Province of Alberta through the Alberta Energy Research Institute, Alberta Bio-fuel Fund and the Alberta Life Sciences Institute, as well as the Province of Quebec. Industry partners include Mosaic Potash, Suncor Energy, EnCana, Graymont Mining, New Brunswick Power, EPCOR, Petro-Canada and Shell Canada.

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VIEW CARS ANIMATION ILLUSTRATION VIDEO AT:

http://www.youtube.com/watch?v=yx3qonMjrnU

VISUALS AVAILABLE ONLINE:

http://outside.arc.ab.ca/download/CARSsystem.jpg
http://outside.arc.ab.ca/download/CARSalgaelab.jpg
http://outside.arc.ab.ca/download/CARSalgaetesttubes.jpg
http://outside.arc.ab.ca/download/CARSmicroalgae.jpg

DVD B-ROLL OF I-CAN LAB WORK AVAILABLE UPON REQUEST

About Innoventures Canada:

I-CAN (Innoventures Canada) is a national organization linking Canada's provincial research organizations and other specialized applied research and development partners across the country to create a critical mass. I-CAN improves Canada's performance in commercializing research by eliminating duplication of resources and strengthening the linkages among R&D service providers, government, and industry.

For more information please contact:

Bonni Clark
Corporate Relations, Alberta Research Council
Tel: (780) 450-5277
Cell: (780) 722-8672 cell
Email: bonni.clark@arc.ab.ca

Carole Roch
Agente de communication
Centre de recherche industrielle du Québec (CRIQ)
Tél.: (514) 383-3254
Cell: (514) 946-0226
Courriel: carole.roch@criq.qc.ca

Mona Etcheverry
Director of Communications
Saskatchewan Research Council
(306) 933-5326
Cell: (306) 381-6100
E-mail: etcheverry@src.sk.ca

I-CAN Background Information

Innoventures Canada (I-CAN) is an incorporated not-for-profit consortium that brings together several of Canada's leading research agencies in 20 communities across eight provinces, to develop and commercialize new technologies on a national scale. I-CAN's strategic focus is to integrate the skills and expertise of its members to address major Canadian challenges.

Forward-thinking initiatives

I-CAN is creating solutions for clean air, coping with climate change, and sustainable development. We take part in research, development and pilot project activities that have both medium- and long-term impacts. We support companies to help them maintain and improve productivity and competitiveness.

With respect to climate change and greenhouse gas emissions, I-CAN has begun important work that will result in economically viable processes and technologies that can be used to capture and convert CO_2 emissions into products that are useful and valuable.

An impressive team

- Alberta Research Council
- Saskatchewan Research Council
- Manitoba Industrial Technology Centre
- Centre de Recherche Industrielle du Québec
- New Brunswick Research and Productivity Centre
- Northern Centre for Advanced Technology
- FPInnovations (formerly Feric/Forintek/Paprican)
- Institut Nationale d'Optique (INO)
- British Columbia Powertech Labs
- Prince Edward Island Food Technology Centre

Nationwide resources

By bringing these organizations together under the I-CAN umbrella, we give companies, including small and medium-sized enterprises (SMEs), a single portal to our combined resources, specialized facilities, equipment and expertise. Together, I-CAN:

- improves Canada's performance in technology commercialization;
- consolidates resources and avoids duplication;
- shortens a company's "time to market" for new product development;
- provides to leading edge, specialized facilities that may not otherwise be accessible or cost-effective; and
- strengthens the ties between R&D service providers, government and industry.

Carbon Algae Research System (CARS) research tasks by I-CAN organizations

- Alberta Research Council
    - Algae characterization and genetics, bio-processing, bacterial digestion

- Centre de Recherche Industrielle du Quebec
    - Recycling, CO2 capture, heavy metals, hydrogeology, bio-diesel and value-added products

- Industrial Technology Centre
    - Lighting options, design, controls, etc

- Saskatchewan Research Council
    - Bio-reactors, fermentation, algae characterization and genetics

Project Partners

- Government of Canada through Natural Resources Canada
- Province of Alberta through Alberta Energy Research Institute, Alberta Bio-Fuels Fund, and Alberta Life Sciences Institute
- Province of Quebec
- Mosaic Potash
- Suncor Energy
- EnCana
- Graymont Mining
- New Brunswick Power
- EPCOR
- Petro-Canada
- Shell Canada

Challenging Assumptions
Carbon Algae Recycling System

Past assumptions

- Conventional wisdom said that Canada's light and weather conditions would not foster year-round algae growth. In the past, algae projects have been focused in more tropical climates.
- The amount of space needed to absorb large volumes of carbon dioxide gas was excessively large since light for photosynthesis only penetrates the first 10-20 cm of surface water, making it prohibitive from a land availability perspective.
- The cost of heating the ponds in a Canadian climate wasn't worth the value of the end marketable bio-based products.

Present reality

- The intensity of light hitting Canada's surface can support year-round algae growth under temperature-controlled conditions.
- The less intense light in Canada actually benefits growth. Studies indicate even algae take a siesta in activity under intense sunlight.
- Covered, closed-system ponds could maintain target temperature and climate conditions. The cover would prevent contamination by unwanted algae strains, as well as preventing water loss due to evaporation.
- The use of various forms of light projection technology into greater depths of the covered ponds would reduce the surface footprint of the pond.
- Improvements in bio-mass processing and higher fossil fuel costs are making the bio-fuel value-added products of CARS more market-competitive.

Future frontiers

- Identify which algae strains perform best in each flue gas chemical composition specific to different industries (Coal-fire power generation, heavy oil upgrading, etc.). CARS will be adaptable for different industry emissions.
- Determine the best, most cost-effective methods of projecting the light needed for photosynthesis into the depths of a covered pond. This ensures algae growth all the way to the bottom of deeper ponds in order to limit the land required for production.
- Analyze the most efficient and cost-effective way of heating covered ponds, possibly a combination of geothermal heat and waste heat created by industry.
- Continue to refine the best bio-mass processing systems that minimize input costs such as energy and chemicals, while optimizing the volume of value-added products created from algae carbon biomass.

Additional benefits

- Purification of industrial, agricultural and municipal waste water through CARS.
- Future proliferation of CARS programs would help fill the market demand for bio-fuels through algae production, freeing up arable agricultural land for food production. Algae produces an estimated 50 times the bio-fuel per acre compared to soybeans, oilseeds and corn at present productivity levels, which CARS aims to increase.