



Canada School of Energy and Environment

Corporate Plan

2011 - 2012

Corporate Plan: 2011 – 2012

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CANADA SCHOOL OF ENERGY AND ENVIRONMENT

CORPORATE PLAN: 2011/12

Introduction

The Canada School of Energy and Environment (CSEE or 'Canada School'), a not-for-profit corporation under the *Canada Corporations Act*, has received funding in the form of a conditional grant from the Government of Canada's Industry Canada department in support for centres of excellence. Disbursements of the grant commenced in the last three weeks of fiscal year 2007/08.

This corporate plan is partly in fulfillment of the CSEE's grant management obligations under the Funding Agreement between the CSEE and Industry Canada (March 7, 2008). It begins with a summary of the origins and history of the CSEE, reviews the main activities and notable achievements to date and presents a plan for future activities. While focussing on the 2011/12 period, the report is a provisional multi-year operational plan to the end of fiscal year 2013/14, by when all funds from the grant are to be committed.

Owing to a significant change of circumstances including departure of the CSEE's management in March 2011, many activities planned for 2011 were cancelled or curtailed. The CSEE's future activities will continue to focus on the key energy and environmental issues facing Canada; the focus of funding will be centred on the core objectives of enabling research collaboration and commercialization of the products of research.

The issues of energy and environment and their interrelationship remain even more compelling than when the CSEE was formed. Canada and especially Alberta holds major energy resource endowments, notably unconventional oil and gas and important renewable resources. Their development has been criticized and challenged on the basis of poorly understood environmental concerns and the presumption that development cannot be carried out in a sustainable manner. Meeting this challenge is of central importance to Canada and Alberta.

Sustainable resource development depends on a constant flow of creative and innovative technologies and techniques aimed at improving the efficiency of production, transformation and use while reducing the environmental effects. Issues surrounding energy and environment are the subject of research for hundreds of researchers at the three partner universities in Alberta. The Canada School serves as a vehicle to help marshal and support this research capacity with a view to achieving world class excellence and leadership in the area of energy and environment.

Further disbursement of the grant funds from Industry Canada will focus on facilitating transfer and commercialization of technologies and on collaboration to advance knowledge and techniques that address energy and environment concerns. The funding will have three main components: A) merit-based grants to individual researchers to advance energy and environmental technologies or knowledge transfer to implementation through the proof of principle stage, B) enhanced research collaboration through innovative web-based tools, and C) continued block funding to support CSEE-related activities at the respective partner energy and environment institutes at the associated universities

About the Canada School of Energy and Environment

The concept for the CSEE was established in early 2004 under a tri-partite agreement between the University of Alberta, University of Calgary and University of Lethbridge. The aim was to promote collaboration in research and education related to the implementation of Alberta's energy and environment strategies, in support of the province's Energy Innovation Strategy. The strategic areas of

research were oil sands, improved recovery, clean coal, CO₂ management, water management and alternative energy.

Funding for the CSEE was announced in the federal budget of 2007 in response to the federal government's recognizing the need for more research and commercialization centres capable of global leadership; energy and environmental technologies were identified as a target where Canada could achieve global stature and the CSEE was named as the recipient of funding.

The CSEE was subsequently incorporated in 2007 and its mandate updated to encompass five activities;

- a. Be a repository and a creator for knowledge on energy and environment (E&E) with international influence and impact;
- b. Link research institutes, researchers, and students at the participating universities to undertake cutting-edge research on energy and environment;
- c. Facilitate the development of commercial technologies;
- d. Serve as a resource for policy and industry leaders in their decision-making processes; and
- e. Stimulate discussion regionally, nationally and internationally among researchers and decision-makers to guide and inform public policy on energy and environment issues.

The Funding Agreement with Industry Canada, eventually concluded a year later (March 2008), identified three purposes for the grant:

1. *Establish a Canada-based interactive Web-site for information exchange of research findings and collaboration among an international community composed of academic and industry researchers, students, government, policy-makers and opinion leaders to address energy development and environmental research and management issues worldwide;*
2. *Enhance international collaboration by way of conferences, seminars and guest speakers in order to advance and disseminate knowledge in the areas of energy and environment;*
3. *Facilitate technology transfer and commercialization in the area of natural resources, energy development and environmental sustainability through proof of principle funding.*

The funding agreement went on to define the Expected Results under four headings that can be further broken down into two main themes of enabling and enhancing researcher collaboration and advancing research towards commercialization:

Most of the funding will be channelled into supporting operating costs to attract world-renowned lecturers, policymakers and industry representatives, and to promote research findings. As a result of these activities, the following results are expected and CSEE's success in doing so will be evaluated:

- a. *Enabling international data sharing and research collaboration pertaining to energy and the environment through the creation of a comprehensive and interactive website;*
- b. *Expanding collaboration opportunities for researchers nationwide and internationally who have an interest in energy and environment;*
- c. *Enhanced researcher collaboration resulting in increased discoveries and academic publications pertaining to issues on energy and the environment; and*
- d. *Provision of merit-based funding for approved proof-of-principle projects for research transfer and commercialization (of) research activities.*

The distribution of expenditures to achieve these 'Expected Results' was never intended to be either equal or necessarily continuous for the duration of the grant. To date most funding has been focused on delivering results under items b), c) and d), above. For the future of the program, we plan to put more emphasis on delivering results under items a) and d), than on b) and c). There is particular interest at the three universities in moving into application or commercialization the products of Energy and Environmental research, whether the products are insights to inform policy and investment decisions or

technologies and techniques to address the environmental challenges of energy production, transformation and use. This corporate plan outlines the CSEE's strategy aimed at the two themes; namely, enhanced researcher collaboration and accelerating and expanding activities in order to prove up concepts and move them through the critical proof-of-principle stage of the 'idea-to-commercialization' pipeline.

Summary of Activities and Notable Results and Benefits to date

The Canada School has had two basic types of funding activities:

- A. **Block funding to the partner institutes**, the School of Energy and Environment (SEE) at the University of Alberta, the Institute of Sustainable Energy, Environment and Economy (ISEEE) at the University of Calgary and the Water Institute for Sustainable Environments (WISE) at the University of Lethbridge;
- B. **Centralized funding** managed by the CSEE office.

Expenditures associated with both funding activities were scrutinized to ensure alignment with the Purpose and Expected Outcomes of the Funding Agreement, described above. The following four sections describe some of the initiatives carried out to achieve the expected results and benefits.

a) Interactive Web Site

Because rapid evolution of the World Wide Web quickly made redundant the idea of a 'single, CSEE-based hub' as an instrument for interactive collaboration and information sharing among researchers in what is after all a very broad and diverse range of disciplines and fields, it was decided in 2010 to instead focus on supporting several 'hubs' or website developments that facilitated research collaboration in different disciplines or specialist areas of research endeavour addressing the energy and environment challenge. Thus, the CSEE has contributed to the development of at least five major collaborative 'hubs' or webs—a 'network of networks'—and will continue to support this type of platform to facilitate collaboration among researchers:

- **Carbon Management Canada (CMC)** (<http://www.cmc-nce.ca/>). CMC was spearheaded by ISEEE and the Canada School of Energy and Environment on behalf of Canadian universities and other partners and supporters. Hosted at the University of Calgary, CMC is the first nationwide, university-led research network that aims to accelerate Canada's fossil energy sector towards a zero-carbon emissions future. In December 2009, the federal government announced \$25 million over five years for CMC through the Networks of Centres of Excellence program. In April 2010, the Government of Alberta announced separate funding of \$25 million. CMC's work will include the research and development, training and commercialization of knowledge and technologies needed to make the transformation to zero-carbon fossil energy systems. CMC brings together about 100 top researchers from 21 universities in eight provinces, and from Natural Resources Canada and the National Research Council. The network also includes collaboration and partnerships with 13 companies, seven non-governmental and industry associations and four governments. This national network is addressing one of mankind's most compelling environmental issues.
- **A Water and Environmental Sciences Hub** at the University of Lethbridge, an interactive web-based repository for water and environmental data, mapping and imagery and analysis (<http://www.cybera.ca/projects/WEHub>);

- **The Oil Sands Research Information Network (OSRIN)** at the University of Alberta, a network that is focused on assembling and compiling decades of research to reduce the environmental footprint associated with oil sands tailing ponds (<http://www.osrin.ualberta.ca/Resources.aspx>);
- The **School of Energy and the Environment (SEE)** website with information on the various activities at the University of Alberta in the area of energy and the environment (<http://www.see.ualberta.ca/>).
- The **Institute for Sustainable Energy, Environment and Economy's (ISEEE)** new website, which provides a portal to the research, graduate student training and knowledge exchange initiatives related to Energy and Environment at the University of Calgary (<http://www.iseee.ca>).

In addition, CSEE provided leverage funding to support two student-led international, Energy and Environment initiatives managed by ISEEE, and three websites associated with these initiatives:

- International Student Energy Summit 2009: <http://www.ises2009.com/>
- Solar Decathlon Project: <http://www.solabode.ca> (website for Team Alberta's entry in the U.S. Dept. of Energy Solar Decathlon competition and http://www.solardecathlon.gov/past/2009/where_is_alberta_now.html);
- ISEEE Students' Association: <http://www.iseeesa.com/> –the ISEEE-affiliated student club that conceived of and led both of the above international initiatives.

b) Expanding Research Collaboration

The corporate plan for 2010/2011 referred to the Canada School's vision of contributing to a future of abundant supplies of clean energy, a vibrant and healthy environment, sustainable prosperity and social well-being for Canadians. To achieve this vision, CSEE saw part of its role as facilitating collaboration in informing policy development. Therefore, CSEE sponsored or led conferences and seminars on energy and environment regulation and policy as well as conferences/seminars that explored new energy and environmental technologies or that assessed the costs, benefits and tradeoffs associated with energy/environment choices.

These initiatives were organized both centrally by the CSEE offices, and by at least one of the block-funded university institutes (ISEEE). For example, centrally organized and funded initiatives included:

- Support for Canada's delegation to United Nations Climate Change Conference in Copenhagen;
- Working with the National Round Table on Environment and the Economy to host a dialogue on the "Need for a Canadian Clean Energy Strategy;"
- Co-hosted the annual Nexen-sponsored Global Roundtable on Energy, Environment and the Economy, with the topic of 'Energy Security;'
- Served on a cost-recovery basis as *rapporteur* for the Canadian Association of Petroleum Producers' Oil Sands Dialogues in major Canadian and American cities.

Engaging students in addressing real challenges through actual experiential learning is a critical long term investment in building leadership and pursuing excellence in developing an environmentally sustainable economy. The Canada School's investments in student collaborative projects include the following;

The **International Student Energy Summit (ISES) 2009**, a forum for post-secondary students, held in Calgary, focused on sustainable resource management and the role that students will play in shaping the future of energy development. CSEE provided financial support of \$100K to

student-conceived, organized and led ISES 2009, an event that attracted more than 300 students from 30 countries and more than 30 internationally recognized experts and speakers. Building on their success, including ISES 2011 at the University of British Columbia in Vancouver, the U of C students have incorporated to market and license the ISES concept globally, including a 2012 event scheduled in India.

The success of the **Alberta Solar Decathlon Project** is a noteworthy initiative, which while managed by ISEEE, involved more than 150 students from four Calgary university and post-secondary schools for three years in designing, building and operating an 800-square-foot completely solar-powered and solar-heated home for international competition in the U.S. Department of Energy's high-profile 2009 Solar Decathlon competition on the National Mall in Washington, D.C. CSEE contributed \$50K in financial support to the ASD project. "Team Alberta's" 'SolAbode' home received approximately 100,000 visitors during the competition and finished sixth out of 20 international teams, besting many top U.S. as well as teams from Spain and Puerto Rico. The project received widespread media attention locally, nationally and internationally and brought an international profile to the University of Calgary and its partnering schools, SAIT Polytechnic, Mount Royal University and the Alberta College of Art + Design.

The ASD Project, in collaboration with the Canadian Embassy and Alberta's representative office in Washington, D.C., presented a trade show at the Embassy focused on commercialization of clean technologies, including clean energy technologies.

The Canada School also supported ISEEE-led initiatives for international/national/regional exchange of E&E knowledge and research including the **ISEEE Distinguished Speaker Series**, which sponsored more than a dozen distinguished speakers, who are internationally recognized experts on Energy and Environment to present free talks to a public audience in Calgary; the **ISEEE Experts Series**, in which University of Calgary E&E researchers speak to downtown business audiences and the **ISEEE Energy and Environmental Systems Seminar Series**, more than forty seminar presentations, many from other universities, to mainly University of Calgary faculty and graduate students.

The ISEEE continues to support and deliver important energy and environment conferences and events with the financial assistance from CSEE.

c) Collaboration to Increase Discoveries

The CSEE investments toward this outcome were focused on moving into application or commercialization the products of E&E research at the three universities and the three CSEE-supported institutes, whether the products were insights to inform policy and investment decisions or technologies to address the environmental challenges of energy production and use.

The following three sections describe some of the initiatives that have been developed in this area, including noteworthy technological advances that have been achieved with the support of CSEE funding leveraged with university institute resources.

- i. **School of Energy and Environment (University of Alberta)** (linking centres of expertise in engineering, science, agriculture, business, economics, law and native studies). The SEE issues annual invitations for proposals for support of operating and/or salary costs to support research

infrastructure. Projects that received support in 2010/2011 will be described in greater detail in the **Annual Report** for 2010/2011. The following are some highlights;

- **Nanofab**, an open access micro and nano fabrication research facility has helped several projects leading to technologies or techniques that greatly enhance the ability to monitor and measure toxic materials in water, such as in oil sands tailings ponds; one builds on the 'lab-on-a-chip' technology developed for cancer diagnostics adapted to serve as compact detector for pollutants, for example, and the other provides standards for laser based measurement of toxic materials. Nanofab also facilitated diverse work, for example in fabricating high surface area electrodes for lithium batteries, simulating hydrocarbon reservoirs to assess their capacity for storing greenhouse gases and developing hybrid electronics for high temperature down-hole applications.
- The **Alberta Centre for Surface Engineering and Science (ACSES)** is a core, cross-disciplinary, world-class resource for the development of new methods to control the physical, chemical and biological surface properties of materials. CSEE funding through SEE has enabled ACSES developments in such diverse areas as, design, synthesis and characterization of solar cells built with highly controlled nano-scale architectures, electrochemical (super) capacitors, improved bitumen recovery and upgrading, clean coal technology and high temperature solid oxide fuel cells.
- The newly constructed **Molecular Biotechnology Center in Environmental Engineering**, which can provide information on microbial community dynamics, is contributing to understanding of remediation techniques for one of the most compelling management challenges associated with oil sands mining, breaking down or eliminating naphthenic acids from tailings ponds. Work supported by SEE/CSEE is looking at some treatment options' potentially perverse effects on the natural microbial community in tailings that breakdown toxins.
- The **Geomechanical/Reservoir Experimental Facility (GeoREF)** is a unique collaborative, multidisciplinary academic research facility for testing geologic materials. \$50,000 in SEE funds will enable GeoREF to continue with its up to-date world leading research for unconventional hydrocarbon reservoirs and geological storage of CO₂.
- SEE funds directly supported the establishment of the **Solar Device Assembly and Characterization Facility**, which provides a standardized evaluation service for testing photovoltaic components and performing solar simulation tests.
- Policy options to address environmental concerns range from technical standards, command-and-control regulations, and economic or market based instruments. The latter include payments for environmental services, offsets and mitigation banks and tradable permits. SEE funds supported the **Center for Market Based Instruments (CMBI)**, which carries out research to inform the development and appropriate deployment of market based instruments for resource and environmental management in public policy, including in the energy sector.
- The **Oil Sands Research and Information Network (OSRIN)** is a university-based, SEE-supported independent organization that compiles, interprets and analyses available knowledge about returning landscapes and water impacted by oil sands mining to a natural state and gets that knowledge into the hands of those who can use it to drive breakthrough improvements in reclamation regulations and practices. OSRIN was launched with a start-up grant of \$4.5 million from Alberta Environment and a \$250,000 grant from the Canada School of Energy and Environment Ltd.

ii. **Institute for Sustainable Environment, Energy and Economy (ISEEE - University of Calgary)-affiliated technology transfer and commercialization initiatives:**

- The ISEEE successfully tested in 2008 the **Direct Air Capture of CO₂ Technology** that captures carbon dioxide (a principal greenhouse gas) directly from the air. The work was highlighted on Discovery Television and led to a Calgary-based private spin-off company, Carbon Engineering to commercialize the technology. Carbon Engineering is the only Canadian finalist among 11 finalists vying for the Virgin Group's \$25-million Earth Challenge prize to commercialize air capture technology.
- ISEEE has supported University of Calgary's researchers developing **solid oxide fuel cell technology** with a strategy to produce made-in-Canada commercial products within five years.
- The **Research on In Situ Energy (RISE)** initiative located in the In Situ Energy Centre at the University of Calgary is the focus for multidisciplinary researchers working to commercialize next-generation technologies and processes to more cleanly and cost-effectively extract and upgrade Alberta's oil sands deposits, too deep to mine and comprising 90 percent of the recoverable oil sands resource. With support from the Alberta government and several industry partners, the centre opened a new 'pilot plant' laboratory facility in February 2010 that enables researchers to test novel bitumen-extraction and upgrading processes in simulated oil sands reservoirs.

iii. **The Water Institute for Sustainable Environments (WISE – University of Lethbridge)**
(interdisciplinary research in water— conservation, source diversity, quality protection and impact mitigation)

WISE is a unique collaboration of scientists, drawing primarily from Biological Sciences and Geography as well as the Physics and Astronomy departments. Its research focus is chiefly in the areas of Aquatic and Ecosystem Science and Geomatics and Hydrology. Research interests of the scientists at WISE related to addressing energy and environment issues are in the area of climate change and its influence, for example, on glacier melting and aquatic environments. Their expertise in aquatic environments positions them to assess, for example, the impact of industrial use of water on minimum flow requirements for streams and the effects of contamination on fish communities.

The Canada School's support for environmental innovations at the University of Lethbridge has helped advance the development and commercialization of many new technologies; for example:

- A patent for innovative gene-transformation technologies that allow many types of agricultural plants to survive and thrive with less water thereby reducing agricultural water use where there are multi-users of limited water resources. In 2010 the relevant patents were assigned to a spinoff Company led by the principal investigator.

d) **Merit-based Funding for Proof of Principle Research**

The Central office of the CSEE managed a Proof of Principle (POP) Grant competition with the assistance of the Institutes, which encouraged and helped to process the applications from their

respective universities. The POP program was focused on moving into application or commercialization the products of Energy and Environmental research, whether the products were insights to inform policy and investment decisions or technologies to address the environmental challenges of energy production and use.

Research projects aligned with five main themes specified in the application process;

- 1) Reducing environmental impact of energy exploration, extraction and use ;
- 2) Energy efficiency and conservation technologies;
- 3) Improved management of Greenhouse Gas Emissions;
- 4) Alternative and renewable energy sources;
- 5) Energy/Environment policy and practices.

Since the beginning of the program, through four rounds of funding adjudicated by panels of independent experts, 37 proposals out of a total 111 submitted were funded, for a total value of \$1,665,047 (2009-2011). Projects funded are shown in **Table I**. Most projects have been in support of or respond to themes 1, 2 and 4 although several projects related to more than one theme. For example, improvements in the efficiency of energy production can lead to reductions in greenhouse gas emissions.

Several examples of positive and significant outcomes from these investments include:

At the University of Alberta,

- **Benoit Rivard** and his team (2009 grant) have developed an imaging technique to ascertain the mineral distribution of oil sands tailings. This tool could lead to improved management and faster stabilization of fine tailings, a major environmental challenge in oil sands mining operations.
- Naphthenic Acids (NAs) in process-affected waters from oil sands operations, especially tailings ponds, are toxic to aquatic life. Detecting, characterizing and measuring the concentrations of different NAs present major challenges in the environmental monitoring of the industry. **David Sego** and his team (2010 grant) have sparked industry's interest with their prototype multi-LED fluorescent system, which can detect NAs at very low concentrations.
- **Zubin Jacob** and colleagues (2011 grant) have made significant progress in developing a material whose nano-designed structure gives it a unique electromagnetic personality. The first application is in light sources for quantum communications, a highly secure form of communication. The second major application being pursued for these designer materials is in renewable energy devices.

At the University of Calgary,

- **George Shimizu** and colleagues (2009 grant) in collaboration with University of Ottawa are designing improved materials to capture carbon dioxide and to uptake and store hydrogen for mobile fuel cell technology.
- **Patrick Hettiaratchi** (2008 grant) invented a methanobiofiltration (MBF) device to control methane emissions from landfills; the technology is being field-tested at two landfill sites in British Columbia.
- **Joules Bergerson** (2009 grant), collaborating with the University of Toronto, has developed a Life Cycle Assessment tool to evaluate different policies, strategies or

industry business cases and greenhouse gas scenarios associated with degrees of integration along the oil sands value chain.

- **Simon Trudel** and his team have advanced a unique, potentially game-changing clean energy technology that has been taken up by a private investor.

At the University of Lethbridge,

- **Paul Hayes** and his team (2010 grant) have developed new green catalysts for producing from renewable crops an alternative to conventional plastics that is both biodegradable and compatible for use in pharmaceuticals as well as other applications (e.g., replacement of hydrocarbon-based plastic in water bottles).

Table I: Proof of Principle Grant Projects (Rounds 1 – 4)

ROUND 1		
<i>Scientific Leader</i>	<i>Title of Project</i>	<i>School</i>
Amirfazli, Alidad	Advanced multi-functional Composite Material for energy systems	U of A
Berlinguette, Curtis	Development of organic solar cells using phosphorus-based molecular dyes and nanostructure titania	U of C
Hettiaratchi, Joseph	MethanoBiofilters (MBFs) to Control Low-volume Atmospheric Methane Emissions	U of C
Kim, Jeong Woo	Spaceborne Surface Heave Monitoring by Production Activities at Albertan Oil Field	U of C
Kumar, Amit	Thermo-chemical conversion of agricultural biomass for carbon sequestration	U of A
Love, Jim	Field Assessment of displacement ventilation in a School	U of C
Lubell, Adam	Development of magnesium-phosphate ceramic composite containing coal waste ash	U of A
Mayer, Bernhard	Testing the Effectiveness of Stable Isotope Approaches for Tracing the Fate of Nitrogen and Sulfur Emissions from Oilsand Operations in Surrounding Ecosystems	U of C
Messier, Geoffrey	Wireless Network for Monitoring of Home Energy Consumption	U of C
Sego, David	Characterization of Petroleum Naphthenic Acids (NAs) in Oil Sands Process-Affected (PA) waters Using Fluorescence Technology	U of A
ROUND 2		
Chua, Gordon	Application of the alga <i>Dunaliella</i> in biofuel production and bioremediation of naphthenic acid	U of C
Mingzhe, Dong	Development of a Novel Method of Treating Water-in-Heavy Oil Emulsions at a Low Temperature for Energy Saving and CO ₂ Emission Reduction	U of C
Goss, Greg	Nanomaterials for Environmental Remediation of Oil Sands Tailings Water	U of A
Hashisho, Zaher	Integration of microwaves and novel molecular sieves for energy efficient gas separation and purification	U of A
Hayes, Paul	Green Catalysts for the Preparation of Biodegradable Plastic from Renewable Resources	U of L
Musilek, Petr	Field Verification of Satellite-based Environmental Monitoring in Oil Sands Development Areas	U of A
Shimizu, George	Selective gas separation membranes based on nanoporous metal organic frameworks	U of C

ROUND 3		
Bergens, Steven	Prototyping the first rechargeable direct 2-propanol alkaline fuel cells for mobile electronics	U of A
Bergerson, Joule	Should Alberta produce bitumen, SCO or refined petroleum products? The relative value of downstream processes evaluated using two complementary assessment models	U of C
Luckert, Marty	Forest Plantations in Alberta: Prospects for Bio-Energy	U of A
Mahinpey, Nader	Pretreatment of lignocellulosic biomass using bio-catalysis for bio-butanol fermentation	U of C
Rivard, Benoit	In situ hyperspectral imaging for the characterization of oil sand tailings	U of A
Sutherland, Todd	A new concept for organic bulk-heterojunction solar cells: Charge transport in liquid crystals	U of C
Wang, Xin	Using Data Mining Methods to Optimize Steam Injection Processes for Alberta Oil Sands Production	U of C
Xue, Deyi	Feasibility study of a Green Battery: Portable Direct Alcohol Fuel Cell (DAFC) System	U of C
Zareipour, Hamidreza	An Energy Monitoring and Control Platform for Smart Electricity Grids	U of C
ROUND 4		
Amirfazli, Alidad	Study of Drop-Particle Collision to Increase Efficiency in Fluid Coker Process	U of A
Berlinguette, Curtis (1)	Towards Clean Hydrogen Production: Immobilization of a Cobalt Water Oxidation Catalyst on a Surface	U of C
Berlinguette, Curtis (2)	Rational Design of Stable Dyes for Dye-Sensitized Solar Cells	U of C
Gieg, Lisa	Bioconversion of crude oil from marginal oil fields to natural gas as a sustainable energy recovery strategy	U of C
Jacob, Zubin	Metamaterial enhanced renewable energy devices	U of A
Liu, Yang	Novel Microbial Fuel Cells for Energy Efficient Oil Sand Process-Affected water Remediation	U of A
Park, Simon	Development of Cost Effective High Performance Dye Sensitized Solar Cells	U of C
Rival, David	Development of Novel Gust-Measurement Tool for the Wind-Energy Industry	U of C
Trudel, Simon	Facile generation of solar fuels: Highly active catalysts for efficient water-splitting	U of C
Tsenkova, Sasha	Energy Efficiency Retrofits: Policy Solutions for Sustainable Housing in Canada	U of C
Wang, Xin	Using Two-step Fuzzy Ranking and Artificial Neural Network for Steam Assisted Gravity Drainage (SAGD) Reservoir Characterization	U of C

Proposed Activities for 2011/12

In 2011 – 12 the Canada School of Energy and Environment, while maintaining its broad mandate and block funding for its partner institutes to support research collaboration to increase discoveries, will solicit from the partner universities proposals aligned with enhancing collaboration and results-oriented research with a strong focus on transferring technology and commercialization. To achieve this goal, requests for proposals (RFPs) will be issued within a three-part framework as illustrated in **Table II**.

Table II: Proposed Programs & Activities and Associated Disbursements, 2011/12

CSEE Expected Outcome	Type of Proposal	Estimated Budget	Call for Proposals
<i>A. Merit-based funding for approved Proof-of-Principle projects for research transfer and commercialization of research activities.</i>	1. Up to \$100K Grants to test feasibility of existing technologies or insights	Possible 2 Rounds UP TO \$800K Total	Round Five Dec, 2011 Due Jan 16/12
	2. Proof of Concept \$25K Grants for testing feasibility of potentially game-changing ideas in Energy and Environment	Possible 4 Rounds UP TO \$800K Total	Round One Dec , 2011 Due Jan 16/12,
<i>B. Enhanced researcher collaboration resulting in increased discoveries and academic publications pertaining to issues on energy and the environment; and</i>	To be covered under current block grants to the three universities	-	-
<i>C. Enabling international data sharing and research collaboration pertaining to energy and the environment through the creation of a comprehensive and interactive website;</i>	1. Innovative, new interactive web-based collaboration tools. Only the three partner institutes can apply for these grants, not individual researchers	Up to \$800K	Jan 16, 2012

Although the ‘proof’ grants are split into two types, both come under the general heading of Proof of Principle. Proof of Concept is essentially an early-stage of Proof of Principle. The goal of the CSEE’s Proof of Concept funding is to address the need for early stage, high risk work that explores the feasibility of novel concepts for new technologies or concepts for policy insights—concepts that have the potential to be truly transformative or game-changing. The principles and suggested research areas for the Proof of Concept and Principle grants (A) are described in the Request for Proposals and Grant Application Forms, available on the Canada School’s website.

Applications for funding under C will be restricted at the institute level for the three partner institutes, and not at the individual researcher level.

Schedule

As reflected in the funding framework above, the schedule of Requests for Proposals (RFPs) will be launched in December 2011 with a call for proposals to be submitted by mid-January, 2012. The duration of each grant varies as follows;

1. Proof of Principle (PoP) grants are for 18 months with reports due after a year and at the end of the period;
2. Proof of Concept (PoC) grants run for 12 months with a detailed final report due after 12 months;
3. The Website development grants, for which only the three partner institutes (not individuals) are eligible, run until March 31, 2014 with a progress report due March 2013 and a final report in March 2014.

As notionally illustrated below, and of course depending on response to the various RFPs, a second call for proposals for PoP grants could be issued in mid-summer, 2012 and subsequent rounds for PoC grants approximately every four months until the last in January, 2013.

Calendar Year	2011												2012												2013												2014		
Fiscal Year	2011 - 2012												2012 - 2013												2013 - 2014														
Month	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M			
Proof of Principle Grants																																							
Round 4	█												█												█														
Round 5													█												█														
Round 6													█												█														
Proof of Concept Grants																																							
Round 1													█												█														
Round 2													█												█														
Round 3													█												█														
Round 4													█												█														
Interactive E&E Website Grant													█												█														

Grant Management: Projected Receipts and Disbursements for 2011/12

Table III shows the projected cumulative expenditures of \$8,864,193 as of the end of FY 2010/11. Of the remaining \$6,135,807, \$1,036,390 has already been committed as block funding to the partner institutes in 2011/12; a revised budget of costs for the CSEE including the new rounds of Proof of Principle grants together with \$800,000 for web-based collaboration tools, would leave a small contingency fund of about \$119,416 at the end of the funding period to cover, for example, unanticipated costs associated with the adjudication panels and costs associated with reporting after the end of the program in 2014.

Table III: SUMMARY OF RECEIPTS AND DISBURSEMENTS, Cumulative & Projected to 2013/14				
	Actual to date 2007/8 - 2010/11	Forecast 2011/12	Forecast 2012/13	Forecast 2013/14
RECEIPTS				
Federal Government Grant	\$ 15,000,000			
Investment Income	\$ 358,412	\$ 15,000	\$ 8,000	\$ 999
Revenue	\$ 72,275			
DISBURSEMENTS FOR ACTIVITIES				
Block Funding to Partner Institutes	\$ 4,088,610	\$ 1,036,390	\$ 475,000	\$ 400,000
Merit-based research grants	\$ 1,665,047	\$ 1,540,000	\$ 200,000	
Grants for Interactive web-based research collaboration	\$ 500,000	\$ 800,000	\$ -	
CSEE Operating Expenditures	\$ 3,041,223	\$ 687,000	\$ 476,000	\$ 426,000
TOTAL DISBURSEMENTS LESS INCOME & REVENUE	\$ 8,864,193	\$ 4,048,390	\$ 1,143,000	\$ 825,001
FUNDS REMAINING	\$ 6,135,807	\$ 2,087,417	\$ 944,417	\$ 119,416

Anticipated Results and Outcomes

The overarching expectation is that the resulting collaborative activities will lead to the eventual development of promising, transformative technologies that have the potential to help resolve the most critical environmental issues associated with Canadian energy developments.

Developing and stewarding Canada's remaining resources requires significant inputs of manpower, energy, water, materials and other resources. To make the claim that this can be done sustainably will require new technologies and techniques whose application results in markedly increased efficiency all along the chain from exploration to development, production, transportation, transformation and end-use.

By framing the calls for proposals to align with themes such as collaboration, tools to improve collaboration, issues-focussed research proposals (improved energy efficiency, reduced greenhouse gas emissions, water use and management in energy development, environmental monitoring of energy developments and alternative and renewable energy sources) will ensure results-oriented research activities that can result in commercialization. While it is not possible of course to predict outcomes before proposals are received and approved, it can be said that the prospect of additional funding will enable researchers to examine their activities to look for opportunities of what it would take to advance their research to proof of principle, proof of concept or even further towards commercialization.

Increased collaboration has the potential to reduce costs and accelerate the achievement of research goals by pooling effort and resources and avoiding duplication among researchers. Web-based tools for

collaboration provide a vehicle for researchers, for example, to access common databases that have been vetted and approved by practitioners; this can avoid costly duplication and the contentious differences regarding the authenticity of existing data that can arise at the outset of research projects.

Anticipated Revenues from other sources

It is not anticipated at this time that the CSEE will receive revenues from other sources in 2011/12, however it is fully expected that the various centres and research grant recipients will continue to leverage their CSEE funds to attract funding from other sources.

Risk Assessment and Mitigation strategies and ongoing performance monitoring strategies

With a significantly scaled down program of activities, the profile and nature of risks will change. Previous corporate plans identified the principal risks as human resources, corporate governance, alignment of activities with, and follow-through on, the corporate plan and financial. Risks, both internal and external, are assessed on an ongoing basis.

- For project selection for proof of principle funding, proposals will be adjudicated by a panel of experts with competence and knowledge in the fields or themes for which funds are applied.
- For block funding to the partner institutes, oversight and accountability procedures within the respective institutes and by the CSEE Board will ensure that funds are applied consistent with the mandate of CSEE and the funding purposes. Moreover, the Canada School relies on the internal audits of the partner institutes to perform recipient audits.
- Recipients of CSEE grants are required to follow the Tri-Council guide on the use of research grant funding.
- Day to day operations are subject to management overview to identify changes in the external environment that could affect or disrupt operations.
- At the governance level, the Board and its committees monitor activities and ensure that the normal standards of financial reporting and accountability, including external audits and quarterly updates on activities to ensure they align with the funding undertakings.
- The CSEE has no plans at this time to seek other sources of income therefore changes in the external environment are considered of minimal potential impact as the only revenue is from placements of uncommitted grant funds in very low risk investments as prescribed in the Funding Agreement.
- A significant concentration of credit risk exists in the cash and marketable securities, however, this exposure is mitigated by placing the cash in a major Canadian chartered bank and securities with very low risk, as noted above.