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THE UNIVERSITY OF BRITISH COLUMBIA

CLEAN ENERGY RESEARCH CENTRE
Faculty of Applied Science

Collaborating for Sustainable Clean Energy

May 13, 2011





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CLEAN ENERGY RESEARCH CENTRE
Faculty of Applied Science

In partnership with:



COLLABORATING FOR
SUSTAINABLE CLEAN ENERGY

May 13, 2011



Overview of UBC Clean Energy Research Center

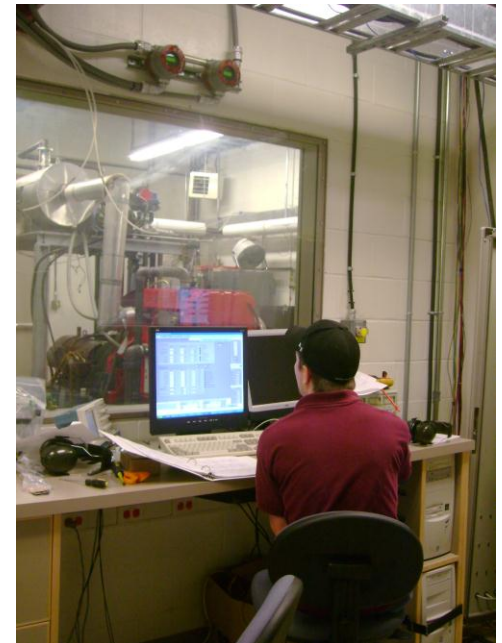
David P. Wilkinson
Director of CERC



CERC
Clean Energy Research Centre

CERC Mission

Undertake world-class research which will enable sustainable clean energy for British Columbia, Canada and the world.



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FACULTY OF APPLIED SCIENCE
Clean Energy Research Centre

CERC Goals

Research: relevant and leading

Interdisciplinary Solutions: multilateral

Education: domestic and international

Partnerships: govern., industry, academic



Brief History

- 2000, start of clean energy focus in Applied Science
- 2006, building wing established



- 2008, expands to include other UBC faculties
- 2009, Masters in Clean Energy Engineering
- 2010, significant increase in outreach & collaboration activities



Significant Growth in CERC Membership

2008

- ~ 20 faculty members
- ~ no adjunct members
- ~ 40 graduate students



2011

- ~ 60 faculty members
- ~15 adjunct members
- > 180 graduate students



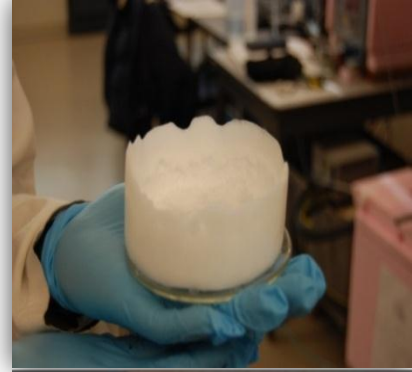
Advisory Board for CERC

- Eamonn Percy (Chair), Former President & COO, Powertech
- Wal van Lierop, CEO of Chrysalix
- Maja Velkovich, Director General, NRC Institute
- Bev Van Ruyven, Deputy CEO and Executive VP, BC Hydro
- John Thompson, VP Technology, Teck Cominco
- Angus Livingston, Director, UBC Industry Liaison Office
- Tyseer Aboulnasr, Dean of Applied Science
- David Wilkinson, Director, Clean Energy Research Centre



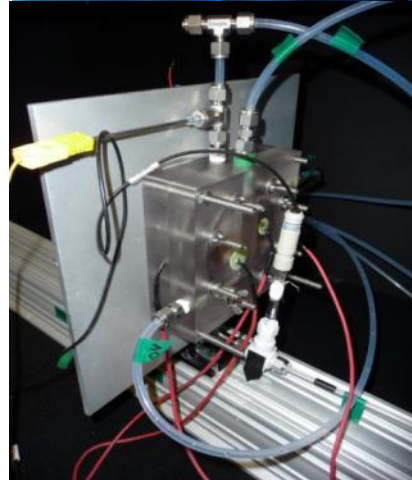
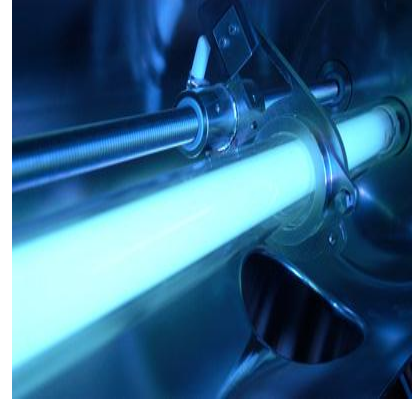
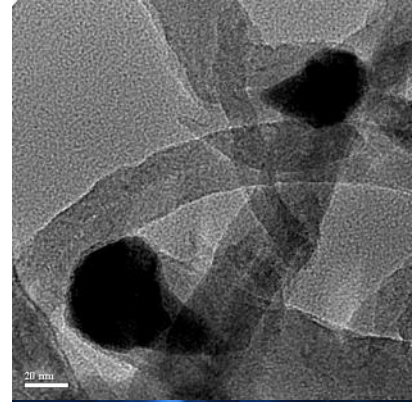
Clean Energy Research Areas

- Renewable Energy
- Biofuels and Bio-feedstock
- Non-Renewable Energy
- Energy Conversion
- Energy Storage



Clean Energy Research Areas

- Energy Materials
- Energy Related Emissions
- Water Purification
- Power Transmission and Control
- Energy Efficiency and Conservation
- Energy Analysis



Pilot Scale Demonstration

Chemical Looping Combustion (CLC)

Air Reactor: Fast-fluidized Bed

Height: 6m; Diameter: 0.04 m

Fuel Reactor: Bubbling Bed

Height: 2 m

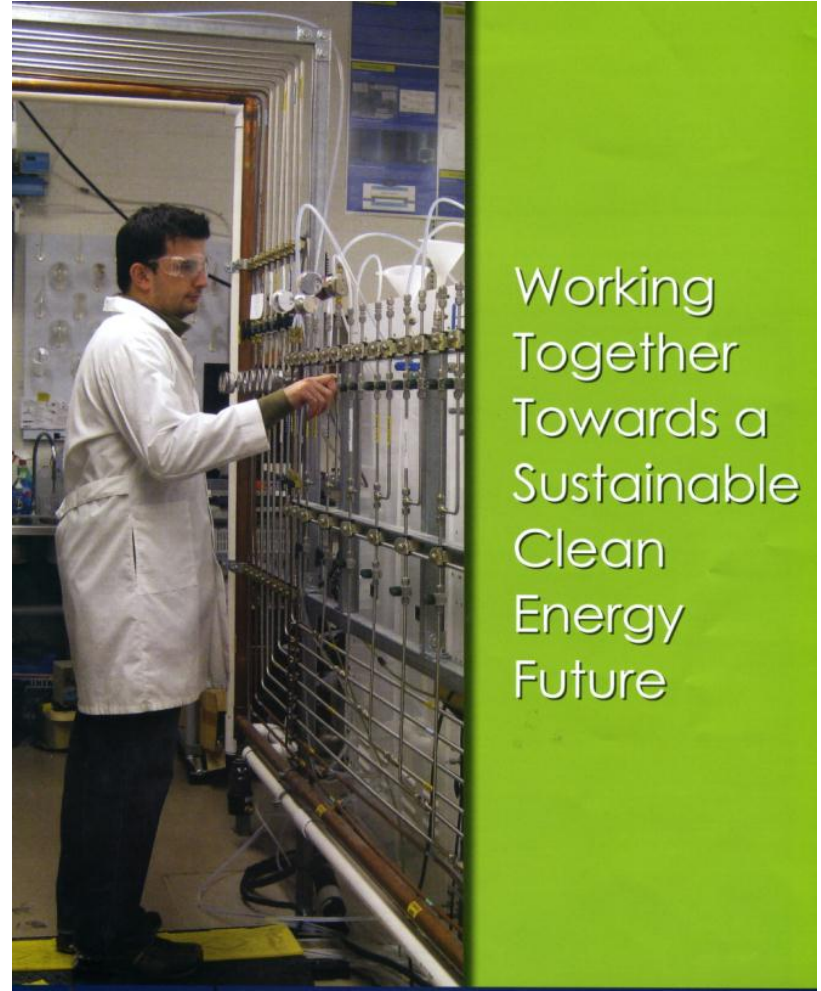
Diameter: 0.13 m



Supporting BC's Energy Objectives

Clean Energy Act:

1. Sources of Energy Supply
2. Demand Management
3. Infrastructure
4. GHG Emission Reduction



Energy Report (www.cerc.ubc.ca)

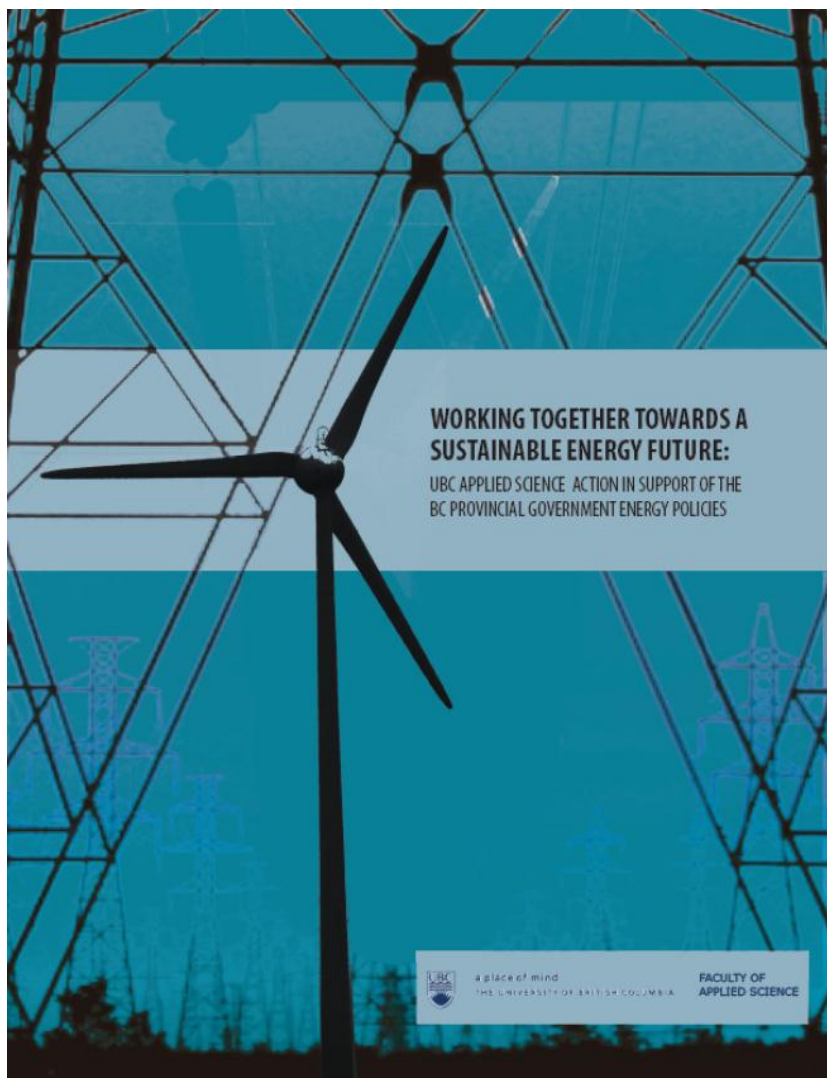
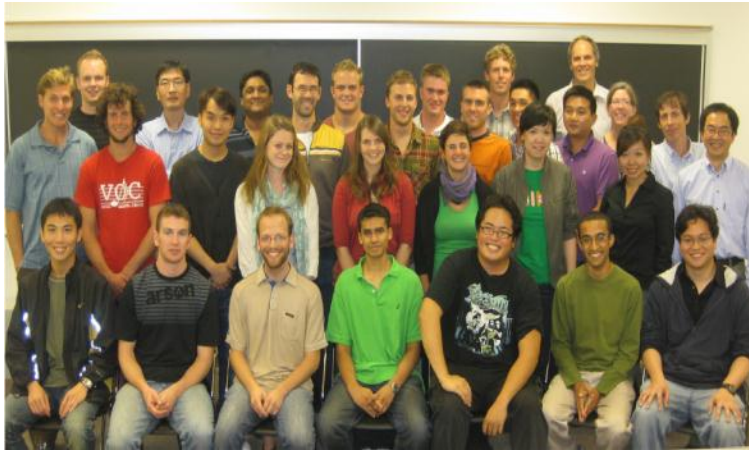


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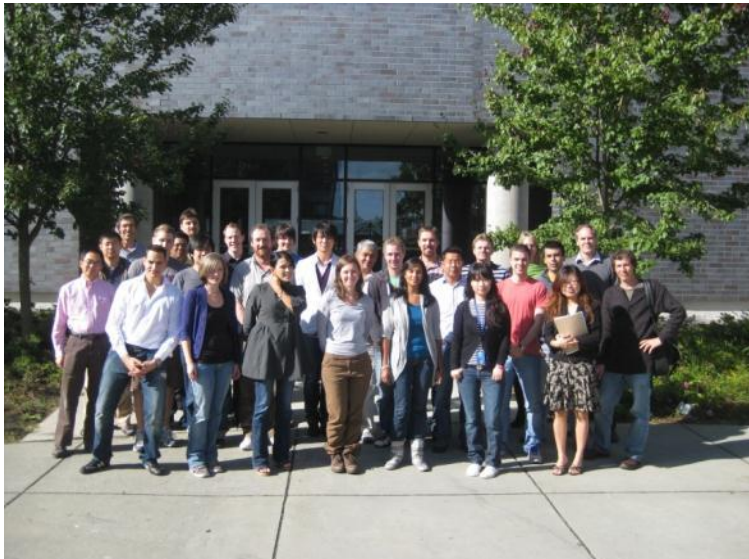
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New Clean Energy M.Eng Program



First Cohort of CEEN M.Eng students
– Fall 2009



Second Cohort of CEEN M.Eng students
– Fall 2010



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M.Eng. Clean Energy Co-op

- Power Smart subsidy: matching funds up to \$5.5k per 4-month term
- Sample employers: Canfor Pulp, Day4Energy, Willis Energy, Quantum Lighting, Adera, Nexterra, Neucel



Energy efficiency upgrade to effluent treatment at Canfor Pulp



M.Eng. Clean Energy Projects

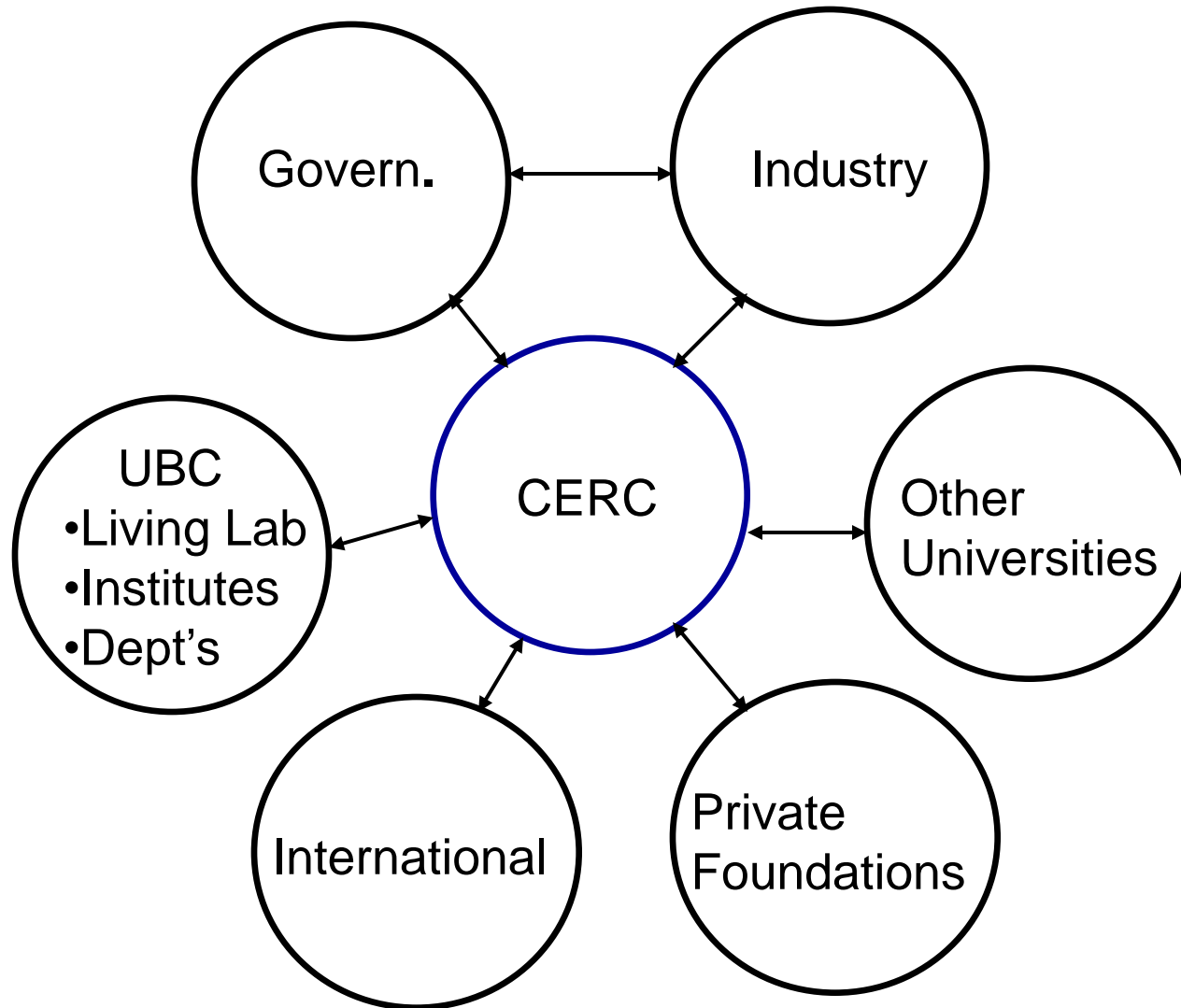
- Industry/government project sponsors (no funding required)
- Sample completed projects
 - Energy efficiency in lumber kilns
 - LED lighting to grow crops in Nunavut
 - District energy for hospital facilities
 - Organic rankine cycle heat recovery
 - Consumer feedback & electric energy savings



Hybrid energy using solar wall for lumber drying kilns



CERC Collaborations



Strategic Partnerships

- **UBC and NRC Institute for Fuel Cell Innovation (NRC IFCI) Cooperative MOU**

- First launched in 2002 for collaborative research
- Successful output: IP, publications, graduate students, fuel cell cluster input, etc

- **BC Clean Energy Technology Cooperative (NRC-UBC-Powertech)**

- Launched in 2009 to unite expertise and infrastructure of three organizations
- 200 S&T experts with competencies in over 25 areas
- 55 specialized labs and over 22,000 square metres of combined research and collaborative space
- 2 incubation sites providing office, lab and meeting space for BC SMEs



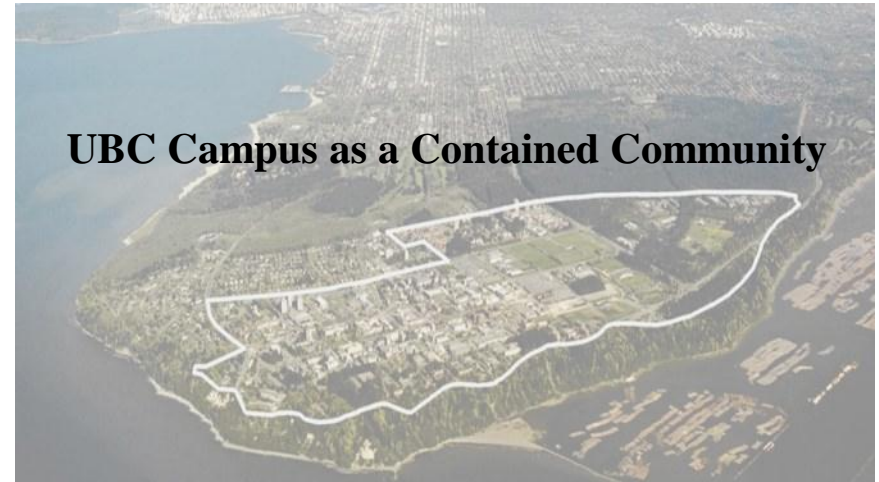
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The UBC “Living Laboratory” – A Role for CERC

- Campus and research and learning opportunities in the clean energy and sustainability sectors
- Accelerate development, demonstration and commercialization of clean energy technology on campus
- Create a globally recognized campus centre of excellence in clean, renewable energy innovation



UBC'S GREENHOUSE GAS REDUCTION TARGETS

UBC adopted its Climate Action Plan in 2010, committing the University to aggressive greenhouse gas (GHG) reduction targets of:

33% below **2007** levels by **2015**

67% below **2007** levels by **2020**

100% below **2007** levels by **2050**

CERC involvement with UBC Projects



Demand Side

Supply Side

Continuous Optimization of Campus Buildings

Center for Interactive Research in Sustainability (CIRS)

Steam to Hot Water Conversion of the Campus District Energy System

Bioenergy Research and Demonstration Project



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Staying connected with CERC

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cerc@ubc

Clean Energy Research Centre News – Summer 2010

Clean Energy and Geothermal Research
Geothermal Energy Systems Research and Development in UBC-CERLM3

Landscello, Italy – the world's first dry steam geothermal energy generation station. Start-up date: 1941

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Clean Energy & Geothermal Research	Clean Energy Solutions – Working Solutions to Real-World Problems	Introduction of Dr. Eric Meent & Power Smart Program	Meeting in Clean Energy Co-op Program	Solar Energy Rolls Ahead	Development Profile & UBC Clean Energy Technology	Announcements	Energy Storage in the Smart Grid	Events & News

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Clean Energy Research Centre (CERC)

RESEARCH SEMINAR SERIES FALL 2010

SEPTEMBER 27

Introduction to Monitoring, Targeting and Reporting (MIT&R) Methods



Robert Greenwald, P.Eng., President of Prism Engineering

In the field of energy management, it has been widely recognized that good information and setting clear targets are critical to keep energy and utility costs under control. Monitoring, Targeting and Reporting techniques combine statistics with process control as part of a continuous energy improvement cycle. For more than 15 years, Prism has offered MIT&R services and currently has 10 staff members who are highly experienced in the field. The Prism Utility Monitoring and Analysis (PUMA) online tracking tool allows users to access reports remotely without the need for any software and to view reports on a monthly basis to identify and correct problems sooner.

Prism is a BC consulting firm that specializes in energy efficiency analysis and upgrades. With over 20 years of engineering experience, Robert Greenwald has developed high level Energy Plans, determined energy management opportunities for electrical and mechanical systems, designed building upgrades of HVAC and lighting systems, and has acted as an Energy Coach to support and sustain organizational Energy Management programs. He has completed hundreds of energy audits of commercial and institutional facilities and has focused his career in the energy management field.

NOVEMBER 22

How to deal with Venture Capitalists when spinning out University Technology

If one is looking for Venture Capital ("VC") financing when spinning a technology out of a university, it is very important to understand how VCs operate, what they are looking for, and how to increase your chances of success by targeting the right VCs. Mike will discuss the VC process generally, but also give out some behind the scenes secrets on how to have the highest chance of success of achieving financing. He will also discuss the longer term issues of managing your investors over multiple rounds of financing, and the common pitfalls to avoid. Finally, Mike will also discuss how Chrysalix categorizes new University IP between "License worthy" and "Start-up



Mike Wallinshaw Chrysalix Managing Director and CFO

TIME: 3:00 PM
LOCATION: UBC CHBE Building, 202 - 2360 East Mall, Vancouver

OCTOBER 18

Carbon Capture and Storage in Mine Waste

Carbon cycling in mine waste operates on a scale and rate that can rival the generation of greenhouse gases in large industrial operations. Carbon exchange occurs via kinetically controlled mineral-microbe-fluid-gas reactions in an environment that is readily accessible for isotopic, mineralogical and geochemical characterization. At four mine sites in northern Canada and western Australia, these data suggest carbon cycling between geologic, industrial, and atmospheric reservoirs at rates that vary by several orders of magnitude as influenced by local climate and tailings handling practices.

Rates of carbon fixation are reconcilable with predictions from geochemical models that employ experimentally determined mineral dissolution rates. Geochemical modeling also identifies optimal scenarios for accelerating carbon fixation that have been demonstrated in benchtop experiments. Further calibration and verification of geochemical models with observations from mine wastes and field experiments will enhance our ability to engineer mine waste handling practices that maximize carbon uptake.



Greg Dipple Professor, Dept of Earth & Ocean Sciences

Greg Dipple is Professor and Head in the Department of Earth and Ocean Sciences, UBC. He studies fluid-rock interactions in environments from the Earth's upper mantle to the near surface. Over the past decade, his research interests have migrated from deep crustal metamorphic processes to shallower magmatic-hydrothermal systems and associated mineral deposits to, most recently, carbon sequestration at and near the surface of the Earth.

Mike Wallinshaw has been with Chrysalix since 2002. He is a board member for H2Scan, FatSpinel, and Akerman and is actively involved in sourcing new investments for the latest fund. For over five years, Mike was with Ballard Power Systems, the world's leading developer and manufacturer of PEM Fuel Cells. He held a number of roles within the organization and was the Manager of Product Strategy and a Product Manager for the Nexa Power Module, the world's first commercial fuel cell module, and the precursor to many of Ballard's current products. Prior to Ballard, he spent six years with Price Waterhouse in Vancouver, gaining his Chartered Accountant status and helping small entrepreneurial businesses grow.



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Ways to Collaborate with CERC

- CERC M.Eng. Program
- CERC Industry Affiliate
- CERC Researcher-in-Residence
- Direct Sponsored Research
- Consortium Member for Sponsored Research
- Consulting Contracts



How to reach us

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Thank You!



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