

ensuring our future prosperity

Petroleum Technology Research Centre
2010/2011 Annual Report



Petroleum Technology
Research Centre

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About the PTRC

The Petroleum Technology Research Centre (PTRC) is a not-for-profit corporation founded in 1998 by the University of Regina, the Saskatchewan Research Council, the Government of Saskatchewan, and Natural Resources Canada. It is located in the Innovation Place Research Park in Regina, Saskatchewan, adjacent to the University of Regina campus. Its diverse portfolio of research projects is funded through ongoing contributions from several federal, provincial and private sector partners, including direct funding from:

- Government of Canada: Western Economic Diversification, Sustainable Development Technology Canada, Networks of Centres of Excellence, and Natural Resources Canada.
- Saskatchewan Government: Ministry of Energy and Resources, Ministry of Environment, and Enterprise Saskatchewan.
- Private sector: Canadian and internationally based oil and gas companies, utilities, and technology providers.

In addition, in-kind research support is provided by the University of Regina's Petroleum Systems Engineering program and the Energy Division of the Saskatchewan Research Council – both of which are housed in the PTRC building. Additional research partners include organizations and universities from across

Canada, the United States and the world. The PTRC is governed by a Board of Directors comprising representatives of the founding partners and of industry leaders operating in Western Canada. Its laboratory and modeling (physical and numerical) facilities in Regina, shared with the University of Regina and Saskatchewan Research Council, are among the most advanced and complete in North America.

Mission and Goals

The mission of the PTRC is to develop world-leading technologies and processes to ensure that the recovery of Canadian hydrocarbon resources is environmentally and economically sustainable for the benefit of stakeholders. The company's goals include:

1. To enhance oil recovery through innovative research and demonstration.
2. To ensure that the broad deployment opportunities for technologies are identified to the value of the industry.
3. To conduct R&D on geological containment and process integrity technologies that contribute towards sustainable enhanced oil recovery.
4. To provide evidence-based, value-added services to our stakeholders.
5. To support federal and provincial policy makers in developing regulations and policies.

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companies are a bit like individuals

Message from the chair



“The innovative methods are attracting oil companies in the province, IN THE UNITED STATES AND OVERSEAS.”

Companies are a bit like individuals – to truly grow and become stronger they need to constantly be open to new experiences and understand when the changing demands of friends, associates and business colleagues require fresh approaches.

The Petroleum Technology Research Centre is in the enviable and – some might say – challenging position of being in an industry that progresses through constant change. The oil and gas industry both globally and, more importantly, in Saskatchewan has been forced to meet the increasing challenges of economics and environmental stewardship through adaptation and innovation. The rise of the Bakken Formation in North America as a critical hydrocarbon source has left the PTRC in an ideal position to examine enhanced oil recovery (EOR) technologies specifically tailored for that unique geology, and to help companies maximize recovery.

The PTRC’s foundation in 1998 was predicated on developing technologies that would help extract more from Saskatchewan’s difficult-to-access oil resources (many of them heavy or extra-heavy) using technologies that are as environmentally and economically sound as possible. Now, the PTRC has come to recognize that all of Saskatchewan’s

hydrocarbons require technological innovations that will help unlock what would otherwise remain in the ground. The STEPS Business-Led Network of Centres of Excellence in enhanced oil recovery has expanded its focus in the past year beyond heavy reserves – to light, medium, extra-heavy and tight oil plays. The innovative methods being researched in STEPS are attracting the interest of oil companies active in different parts of the province, and beyond, to companies working in the United States and overseas.

As a final testament to the PTRC’s ability to change and transform itself to changing economic and environmental needs, the single project that has more than any other defined the organization in the eyes of the world – the IEAGHG Weyburn-Midale CO₂ Monitoring and Storage Project – had its research component come to an end in 2010-11. The project, so important to the future plans of oil companies worldwide in helping to move CO₂-EOR operations forward, will be producing its Best Practices Manual in fiscal year 2011-12. The project has helped inform Aquistore – the next of the PTRC’s research and

development projects related to CO₂ storage – and may help in determining future research directions using CO₂ in different sorts of geological formations like the Bakken.

As new and existing companies begin to investigate the varying and variable hydrocarbon regions of this province, the PTRC will continue to be on the leading edge of innovation, as well as research, development and deployment, to meet the challenges they face.

I would like to personally thank our departing Chair, Dr. Patrick Jamieson, for his two-year commitment to the PTRC. Pat retired from Nexen in 2010, but remains as an independent director of the PTRC’s board. Likewise, a warm thank-you to Mr. Bill Jackson who retired from Apache Canada this year, but also remains as an independent director. The expertise and direction of both of these people will continue to be valued as the PTRC moves forward.

Michael Monea

“ PTRC will continue to be on the LEADING EDGE OF INNOVATION ”

part of the uniqueness of the ptrc

Message from the CEO



“PTRC began to reconfigure its enhanced oil recovery work with the goal of **BECOMING MORE FIELD ORIENTED.**”

Part of the uniqueness of the PTRC has always been its industry-inclusive organizational structure; members of the oil and gas industry actively participate on the Board of Directors. This allows the PTRC to guide and foster not just the direction of research and development (R&D) but also the application of that research in field situations and its practical deployment.

The Joint Implementation of Vapour Extraction (JIVE) project completed this past fiscal year is an excellent example of how applied research should work. Demonstrations of solvent vapour extraction (SVX) technologies were implemented in three different fields in Alberta and Saskatchewan, and those trials alternated and modified their injection regimes based on modeling and simulation work done by the Saskatchewan Research Council (using specialized equipment at the PTRC’s building in Regina). The usual direction of research – from bench-scale, to scale-up to field demonstration – was transformed into a sophisticated give-and-take between laboratory testing and field optimization.

In 2010-11, the PTRC undertook one-on-one discussions with a number of companies (current and future partners) to understand more about the problems industry is facing. As a result of these discussions, PTRC began to reconfigure its enhanced oil recovery (EOR) work in the STEPS Business-Led Network of Centres of Excellence with the goal of becoming more field oriented. One example

is a project planned with several partners – including the Petroleum Technology Alliance of Canada – to conduct field demonstrations of a new hot water-vapour extraction technology in a partnering company’s oil field.

Plans were also set in motion to develop field applications for technologies that would help address the most pressing environmental and economic concern in the Saskatchewan oilpatch today – produced water. Whether in the province’s southeast (Bakken Formation and Williston Basin), the west (Lloydminster) or southwest (Swift Current area), the quality of produced water from oil formations and the use of large amounts of water in enhanced oil recovery have been identified as significant problems, particularly for small-to-medium companies that lack the resources to pay for water disposal and cleanup. The PTRC plans to take new technologies that have shown promise in cleaning up produced water directly to the field in the coming fiscal year. The PTRC also met, head-on, a challenge to our most well-known research program – the IEAGHG Weyburn-Midale CO₂ Monitoring and Storage Project – when a consultant’s report was issued in January 2011 alleging that a CO₂ leak had occurred at a farm near the injection area. The PTRC issued a report within a week of the allegations, employing the skills of

“The PTRC plans to take new technologies in cleaning up produced water **DIRECTLY TO THE FIELD** IN THE COMING FISCAL YEAR.”

independent researchers from several universities and research organizations, questioning the science employed in the consultant’s report and challenging it with the ten years’ worth of data collected in the project. The project’s final round of soil gas sampling – planned for June 2011 by the British and French Geological Surveys – had to be moved to October 2011 due to wet conditions, but we are optimistic the results of this final round of sampling should lay all concerns to rest.

I would like to thank the staff of the PTRC for its ongoing work and commitment to our researchers and clients in 2010-11. I would also like to personally thank our Directors for their dedication and commitment to innovation and their support for change in the PTRC.

Dr. Malcolm Wilson

PTRC Organizational Chart and Board of Directors 2010/2011



Michael Monea (Chair), President of Integrated Carbon Capture and Storage Projects, SaskPower

Brian Watt (Vice Chair), EOR Planning and Land Manager, Heavy Oil and Gas Business Unit, Husky Energy Inc.

Chantal Abou Debs (non-voting observer), Senior Program Manager, Business-Led Networks of Centres of Excellence

Kent Campbell, Deputy Minister, Saskatchewan Ministry of Energy and Resources

Rod Kelln, Vice President, Research, University of Regina

W.A. (Bill) Jackson, Independent Director

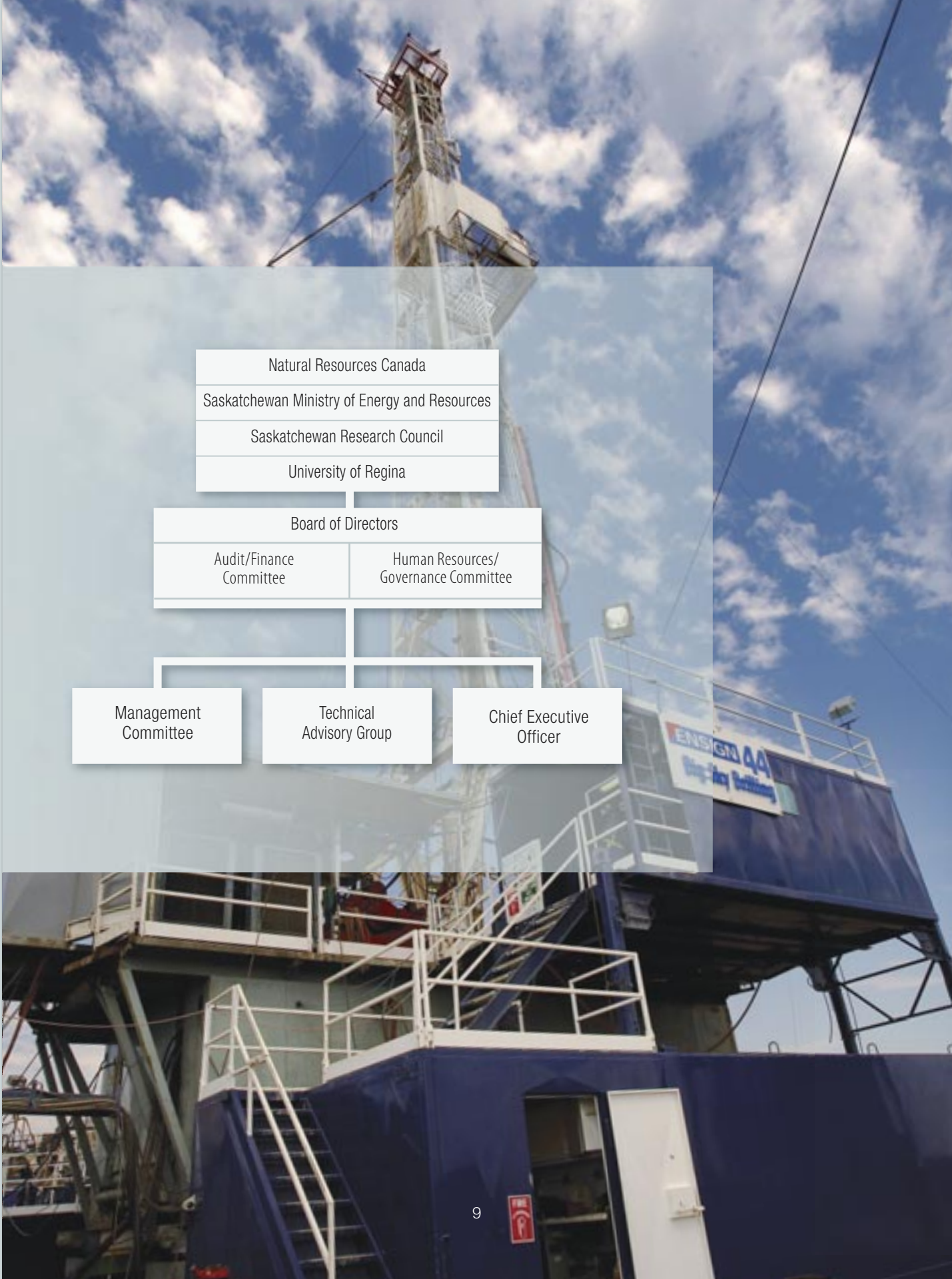
Patrick Jamieson, Independent Director

Geoff Munro (non-voting observer), Chief Scientist and Assistant Deputy Minister, Innovation and Energy Technology Sector, Natural Resources Canada

Ernie Pappas, Vice President, Energy, Saskatchewan Research Council

David Payne, Vice President, Exploitation – East, Canadian Natural Resources Limited

Dan Schiller, Vice President – Eastern Oil Business Unit, Cenovus Energy Inc.



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The Next Generation of Researchers



Left: The University of Regina's Engineering Students Society is one of the recipients of PTRC sponsorship and support.

Below: Educating Youth in Engineering and Science (EYES), a foundation that provides summer camps for Saskatchewan grade school students to experiment and engage with the world of science, received a grant from the PTRC.



The PTRC funds enhanced oil recovery and CO₂ storage research projects that help train the next generation of engineers, chemists and researchers.

The Next Generation of Researchers

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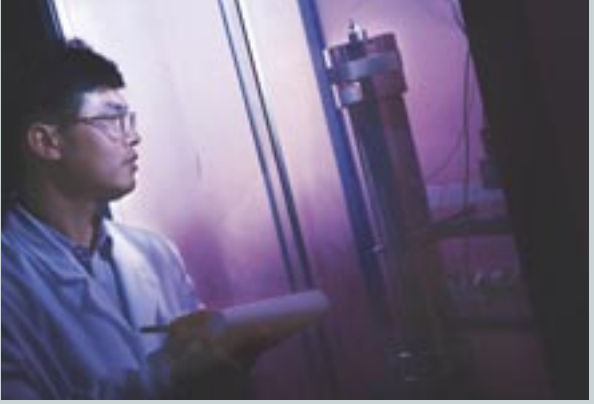
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Sustainable Technologies for Energy Production Systems (STEPS)

leading the world



Above: Dr. Tony Yang works on waterflood technology improvements for the PTRC.

Below: The PTRC gratefully acknowledges the financial contribution of the Governments of Saskatchewan and Canada.



Government of Canada
Networks of Centres
of Excellence



Gouvernement du Canada
Réseaux de centres
d'excellence



**Saskatchewan
Ministry of
Energy and
Resources**

A Business-Led Network of Centres of Excellence

The PTRC is leading the world in enhanced oil recovery research through its multi-million dollar network of advanced researchers, active field trials, and private-public sector projects.

2010-11 saw the development of our new STEPS website. Visit it to read about over 130 completed and ongoing research programs, to query our experts and participate in a blog, or to start your own discussion about challenges in the oil patch.

www.ptrc-steps.ca



Above: The new STEPS website offers secure access to reports for sponsors and researchers, and allows for the exchange of ideas in a series of blogs.



Dr. Farshid Torabi of the University of Regina uses a pressure-volume-temperature (PVT) apparatus to work on enhanced oil recovery research.

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Enhanced Oil Recovery: Field Work Past and Present

major success
in field trialing



Above: Pumpjacks are an increasingly frequent sight across the farm fields of southern and central Saskatchewan.

Right: The Husky Edam pilot was one of three that contributed towards the successfully completed JIVE project.

The PTRC already has had major success in field testing SVX technologies in our Joint Implementation of Vapour Extraction (JIVE) project, completed in 2010.

2010-11 has seen the PTRC begin new co-operative field research projects in areas critical for improving the production from existing reserves, and developing as-yet-untapped resources.

Water – its use in extracting oil and its production during recovery – is a major concern, particularly for smaller oil companies operating in Western Canada. The PTRC has begun to develop a water research consortium to test promising technologies in the field that will help reduce water production and use.

The Bakken play – a vast area of tight oil that stretches over southeastern Saskatchewan, southwestern Manitoba, North Dakota and Montana – has challenges unique to its low permeability. Despite the billions of barrels in place, production from wells drilled into the Bakken often goes into steep and rapid decline. Developing and applying new technologies, and placing them in the field with companies at work in the Bakken, is a future goal of the PTRC.



“ Production from wells drilled into the Bakken often goes INTO STEEP AND RAPID DECLINE ”



Projects: EOR: Field Work Past and Present

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Carbon Dioxide (CO₂) Enhanced Oil Recovery (EOR) and Storage

the capture, injection and storage of CO₂



Below: A beige hut covers one of many CO₂ injection wells in the Weyburn oilfield.



The PTRC's management of the IEAGHG Weyburn-Midale CO₂ Monitoring and Storage Project will come to an end in 2011-12 with the publication of a Best Practices Manual for the geological storage of CO₂ in a depleted oil reservoir.

The use of CO₂ as a solvent in extracting more oil from other kinds of reservoirs – CO₂-EOR as it is known – is being proposed in additional field trials and as part of research within the STEPS program.

The PTRC's Aquistore project is managing a research program examining the capture and injection of CO₂ from an industrial source into a deep saline geological formation and its storage there at a depth of 3200 metres.

A Cenovus employee checks one of the CO₂ injection wells in the Weyburn field (photo courtesy of Cenovus Energy).



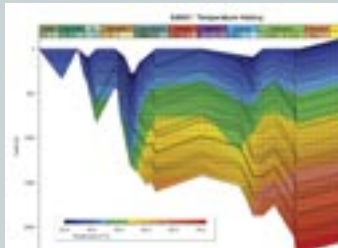
Saskatchewan Phanerozoic Fluids: Mapping Saskatchewan's Subsurface

Where are the hydrocarbons and gases below the ground?



Where are the hydrocarbons and gases below the ground in Saskatchewan most likely to be found? In the long geological history of the province, where are they likely to have migrated over the course of tens of millions of years?

The Saskatchewan Phanerozoic Fluids and Petroleum Systems project, employing the best geologists, hydrogeologists and geochemists in Western Canada, is seeking to discover this, and provide a detailed mapping of the province's subsurface. This will be invaluable information for the gas and oil industry, as well as a critical resource for research organizations across Canada. Partners include the Saskatchewan Geological Survey, the University of Regina and the University of Alberta.



Above: A burial history model provides a framework for the evolution of the Williston Basin in Saskatchewan



Gavin Jensen of the Saskatchewan Ministry of Energy and Resources checks core samples at the Subsurface Geological Laboratory in Regina.

To the Members of Petroleum Technology Research Centre Inc.

The accompanying summarized financial statements, which comprise the summarized statement of financial position as at March 31, 2011, and summarized statement of operations for the year then ended, are derived from the audited financial statements of the Petroleum Technology Research Centre Inc. for the year ended March 31, 2011. We expressed an unmodified audit opinion on those financial statements in our report dated June 29, 2011. Those financial statements, and the summarized financial statements, do not reflect the effects of events that occurred subsequent to the date of our report on those financial statements.

The summarized financial statements do not contain all the disclosures required by Canadian generally accepted accounting principles. Reading the summarized financial statements, therefore, is not a substitute for reading the audited financial statements of Petroleum Technology Research Centre Inc.

Management’s Responsibility for the Summarized Financial Statements

Management is responsible for the preparation of a summary of the audited financial statements including major totals and subtotals from the related complete financial statements.

Auditors’ Responsibility

Our responsibility is to express an opinion on the summarized financial statements based on our procedures, which were conducted in accordance with Canadian Auditing Standards.

Opinion

In our opinion, the summarized financial statements derived from the audited financial statements of Petroleum Technology Research Centre Inc. for the year ended March 31, 2011, are a fair summary of those financial statements, in accordance with Canadian generally accepted accounting principles.

Virtus Group LLP

Chartered Accountants
October 21, 2011
REGINA, Saskatchewan

Petroleum Technology Research Centre Inc.
Condensed Statement of Financial Position
For the year ended March 31, 2011

(C\$000s)	2011	2010
Assets		
Cash	\$18,867	17,318
Other assets	3,580	3,472
Total assets	22,447	20,790
Liabilities and net assets		
Deferred revenue	19,468	18,403
Other liabilities	2,649	2,057
Total liabilities	22,117	20,460
Net assets	330	330
Total liabilities and net assets	\$22,447	20,790

Petroleum Technology Research Centre Inc.
**Condensed Statement of Operations
and Unrestricted Net Assets**

For the year ended March 31, 2011

(C\$000s)	2011	2010
Revenue		
Government of Canada funding	\$ 5,370	5,857
Government of Saskatchewan funding	3,842	2,425
Industry funding	3,745	1,842
Other funding	1,083	175
Total revenue	14,040	10,299
Expenses		
Projects	12,677	8,793
Operations	1,363	1,724
Total expenses	14,040	10,517
Excess of revenue (expenses)	-	(218)
Unrestricted net assets, beginning of year	330	548
Unrestricted net assets, end of year	\$ 330	330

Petroleum Technology Research Centre Inc.
Condensed Statement of Cash Flows

For the year ended March 31, 2011

(C\$000s)	2011	2010
Net cash from operating activities	\$ 1,568	9,993
Net cash used in investing activities	(18)	(25)
Increase in cash	1,550	9,968
Cash, beginning of year	17,317	7,350
Cash, end of year	\$18,867	17,318

Statement
of operations

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