



National Energy
Board

Office national
de l'énergie

Canada's Energy Future

2008 WORKSHOP SUMMARY



STAKEHOLDER INPUT 2008

Canada

**Canada's Energy Future:
2008 Workshop
Summary**

22 April 2008

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Introduction

On November 15, 2007, the National Energy Board (NEB or the Board) released a report entitled *Canada's Energy Future: Reference Case and Scenarios to 2030*. A primary goal of the report was to present comprehensive and plausible long-term outlooks. The report considered growing Canadian energy demand, adequacy of future energy supplies, and related issues of greenhouse gas emissions, global energy context, new and emerging technologies, energy infrastructure and energy exports.

As a follow-up to the report release, the NEB hosted the *Energy Futures Workshop* in Ottawa, Ontario on 22 January 2008. Eighteen experts were asked to provide a presentation to workshop participants on their area of expertise. The experts were also asked to comment on the results of the report on *Canada's Energy Future: Reference Case and Scenarios to 2030*.

The key objective of the workshop was to provide a forum for interested energy stakeholders in Canada to discuss long-term energy issues. The benefit of a workshop is that it can expose participants to diverse energy views; allows for real-time communication, discussion and networking, and; provides an opportunity to discuss timely issues, such as the emergence of \$100 per barrel of oil, announced government policies and impending government legislation.

The workshop can be considered the NEB's third and final public consultation for the 2007 *Energy Futures* report. It is the NEB's intent that information gathered at the workshop be used to guide our future energy analysis as well as work that is being undertaken by our stakeholders. To this end, the NEB has prepared this high level summary of the workshop proceedings and has posted all of the workshop presentations on our external website. To view these presentations and related material to the *Energy Futures* report please visit www.neb-one.gc.ca.

Key Messages

The workshop provided an opportunity to explore a variety of views on key energy issues to supplement the assumptions and outcomes contained in *Canada's Energy Future*. Differences that were identified helped to emphasize the uncertainty that exists on particular issues. Some of the most significant differences surrounded expectations for future energy prices and the penetration of various technologies and fuels. These differences are briefly described in the session summaries below.

There was also general consensus on many significant issues. Global and Canadian energy markets are expected to continue to be in a state of flux. Crude oil prices are likely to remain stubbornly high and volatile. The combination of maturing energy resource basins and geopolitical tensions has created uncertainty about future availability and access to global energy resources. At the same time that supply concerns are becoming more prevalent, energy demand around the world is growing to support rapidly expanding economies. The interaction between all energy commodities and the environment is growing in importance due to increasing public awareness. Decisions made by Canadians over the next few years will be instrumental to shaping long-term energy market trends.

Importance of emerging, new generational and transformational technologies was raised through several sessions ranging from electricity to oil sands to energy demand. These technologies have a high potential for simultaneously addressing challenges in environment, energy security, and economic development. Canada's energy history shows a progressive evolution of energy sources, and the projections show a more diverse mix than ever before. For instance, there is renewed interest in nuclear energy developments and conservation management, as well as increasing support for alternative and emerging energy resource adoption (e.g., wind power and biofuels). Technologies, such as carbon capture and storage (CCS), are also being explored because of their potential to play a significant role in greenhouse gas (GHG) mitigation.

The need for capital replacement and new energy capacity investments was also stated. The need is especially noticeable in the electricity sector where a large proportion of existing capacity is expected to reach economic maturity in the near future. Large new investments are also expected in other areas such as the oil sands. As well, there is need for increased investment in infrastructure human capital. Skilled labour will be required for future energy jobs.

The continuously changing energy landscape will always make it difficult to predict long-term energy supply and demand trends in Canada. Despite these challenges, workshop speakers and attendees expressed a high level of satisfaction with the analysis undertaken by the NEB. Broad support was expressed for the Board's methodology, assumptions and analysis. By providing both a Reference Case and Scenarios, the NEB was able to capture a reasonable range of potential energy outcomes. Conclusions drawn in the report on *Canada's Energy Future* often aligned closely with other independent work

being carried out both nationally and internationally, as well as by the Workshop speakers.

The combination of factors identified above that make energy markets challenging to predict also makes it desirable for energy stakeholders to have access to quality energy information in a timely manner. Workshop participants expressed appreciation for the Board's long-term outlook as it fills a gap for this type of analysis in Canada. Workshop participants suggested that the NEB is a good source for this information because of its independence and its strong reputation for quality analysis.

Decisions taken today have the potential to alter energy markets over the next 25 years. The report on *Canada's Energy Future*, along with the workshop, provided an opportunity for interested Canadian stakeholders to discuss these long-term energy issues.

Session Summaries

Keynote Address

Speaker

Opportunities and Challenges for the Canadian Energy System Over the Next Three Decades:

Dr. Andre Caillé, Immediate Past Chairman, World Energy Council

Summary¹

Dr. Caillé addressed the opportunities and challenges in the energy system at both the Canadian and international level, with a particular focus on balancing the energy requirements with greenhouse gas emission reductions. The current focus on achieving near-term emission reduction targets is impractical and unachievable as policy decisions made prior to 2015 will only affect post-2030 energy demand intensity. The fixation on obtaining absolute emission reductions in the near-term does a disservice to the climate debate as it suggests that real reductions are possible within this time frame and it takes focus away from investing in changes that will have a longer-term benefit. Greenhouse gas emissions, according to Dr. Caillé, will only continue to grow in the near-term, and reductions will not be seen until some time after 2030. The emissions intensity, however, could continue to decrease.

Dr. Caillé noted two dilemmas posed by the World Energy Council's report, *Deciding the Future: Energy Policy Scenarios to 2050*. First, will the world be equipped with adequate energy resources to satisfy future energy requirements globally, and secondly, will the

¹ Please note, there is no associated visual presentation with the keynote address

world be able to produce these resources without increasing greenhouse gases. In response, Dr. Caillé suggested that not only is global collaboration essential in meeting these two objectives, but more significantly, the role of international governments will be fundamental. Secondly, fulfilling these objectives requires considerable change in the way we currently live and use energy. Dr. Caillé also called attention to the need for energy-related investments, most notably in the development of skilled labour as well as in global energy infrastructure and exploration and production. In order to encourage such developments, energy prices will need to remain high and stable to support investment decisions.

To facilitate satisfying future global energy requirements while simultaneously reducing greenhouse gas emissions, Dr. Caillé emphasized the need for clean coal technologies, noting that Canada would have a major role in liaising with Asia-Pacific countries in developing such technologies. Additionally, Dr. Caillé supports the notion of a nuclear “renaissance”, reminding that, globally, there are 500 years of uranium reserves available. Further, the energy industry should favour gas for power generation over coal, while exploring and developing global renewable resources.

Dr. Caillé congratulated the National Energy Board on *Canada’s Energy Future*, concurring with the report’s distinguishing 2015 and 2030 timeframes and deeming the scenario hypotheses well contemplated. Dr. Caillé encouraged the NEB to develop its role as a public awareness entity, noting that the organization has a great contribution to make while remaining independent and neutral.

Concurrent Sessions

Session 1A - External Context

Speakers

Geopolitics & Canadian Energy Markets & Prices

Dr. Marwan Masri, President and CEO – Canadian Energy Research Institute

World Market Trends

Michael Lynch, President and Director of Global Petroleum Service – Strategic Energy & Economic Research Inc

Developments in Environmental Policy: Climate Change and Beyond

Tony Young, Director General – Economic Analysis Directorate, Environment Canada

Moderator

John McCarthy, Business Leader - National Energy Board

Summary

The External Context session highlighted the key geopolitical issues that will influence Canadian energy markets in the future, with discussion focused on geopolitical instability, world market trends and price, and environmental policy.

Global energy resources are more and more concentrated in areas of the world where there is geopolitical instability, and world crude oil prices show volatility in response to this insecurity. The politicized nature of the oil industry combined with a world economy reliant on oil trade therefore creates an uncertain future. As future supply and access to global energy resources become less predictable, price volatility will continue. There is no guarantee that surplus oil capacity may provide a “cushion” to disruptions in supply.

Geopolitical instability will remain into the future, with unresolved issues witnessed in the Middle East, Iraq, Nigeria and Venezuela. Additionally, political tensions between the U.S. and Iran will linger. These geopolitical dynamics will continue to impact energy markets and price. Future energy markets will witness an increased import dependency by major oil and gas consumers, concurrent with tight world oil refining capacity. Simultaneously, there will be continued volatility, and higher demand for energy supplies. While Canada will remain a low political risk with abundant resources, the geopolitical impact on oil price will still have an impact domestically.

Increases in global energy production and use necessitate better environmental policy, particularly given the expected increase in energy demand. Action on the environment has become much more significant in today’s world than at any other time in history. Hence, greenhouse gas emissions and climate change will continue to dominate environmental policy both internationally and locally. Without ambitious targets, scientific evidence suggests that it is possible for global GHG emissions to double by 2050.

In the future, the responsibility to reduce GHG emissions will be increasingly focused on developing countries. However, Canadians and the Canadian energy industry will continue to be expected to face new environmental obligations. Growth and economic viability in the energy sector will be largely determined by how these environmental challenges are handled. Canada has committed to a mandatory reduction of greenhouse gas (GHG) emissions to 20 percent below 2006 levels by 2020 in the federal government’s current plan entitled *Turning the Corner*. In meeting the Canadian environmental challenge, it is important to note that provincial energy and environment policy will also be critical, given that provinces have exclusive authority in many sectors to reduce GHG emissions.

Session 1B - Focus on Alternative and Emerging Energy

Speakers

The Future of Biofuels

Dr. David Layzell, President and CEO – BIOCAP

Renewable Energy: Opportunities in Power Generation

Martin Tampier, Principal – Envint Consulting

“Up and Coming” Energy & Environmental Technologies

**Graham Campbell, Director General - Office of Energy Research and Development,
Natural Resources Canada**

Moderator

Dr. John Bulger, Board Member - National Energy Board

Summary

This session focused on issues surrounding the adoption of alternative and emerging sources of energy.

There was consensus among the three presenters that Canada is in the fortunate position of having excellent diversity and capacity in terms of alternative and emerging sources of energy supply. All presenters stressed the need for an integrated approach to achieving long-term alternative and emerging energy objectives.

A common theme was the complexity of integrating these new sources of energy not only into the electricity grid, but into the whole energy supply-demand infrastructure. The message was not overly supportive towards publicly-funded research and development (R&D) and commercialization. The emphasis was on the need for strategies that take R&D, regulatory policy, incentives, and infrastructure building into account.

The two industry representatives suggested that the NEB scenarios did not go far enough to capture the potential of alternative and emerging energy. Both presenters showed large gaps between the technical potential of resources and achievable supply targets. These targets exceeded the NEB’s estimates. Dr. Layzell suggested 20 percent of Canada’s energy use could be derived from biofuels by 2030 (half of this coming from existing forestry and agri-sources and half derived from future energy-specific crops). Martin Tampier suggested the achievable target for Canada was 15 percent renewable (excluding large hydro) by 2020 and 25 percent by 2030. This would be more than 50 percent higher than the NEB’s estimate. It was suggested that *Canada’s Energy Future* lacks inclusion of crucial supply crises, such as “peak oil” or aggressive carbon pricing. Therefore, it was suggested that the report underestimates the potential contribution of alternative and

emerging energy. Additionally, the speakers suggested that new provincial policies would tend to allocate some of the Triple E assumptions to the Continuing Trends assumptions.

The biggest gap between the industry's alternative and emerging potential and that of the NEB is attributable to the expected pace of future technology improvement. Speakers noted that the biomass and wind capacity projection presented in *Canada's Energy Future* is similar to industry projections. However, several other technologies, including solar, wave/tidal, small hydro, and geothermal may have been underestimated.

Dr. Layzell's *The Future of Biofuels* was particularly specific about "road mapping" energy futures. One of the most well-known renewable energy sources, ethanol from fermentation, was used as an example of isolated policy which is not representative of the wider biofuels industry. Ethanol could be a relatively minor player in the national biofuels economy. If government's priority is to reduce greenhouse gas emissions, then solid mass biofuels displacing coal would be much more advantageous. Gasification technology for biomass to liquid fuel for transportation fuel would be preferable to ethanol from fermentation in improving efficiency. The biofuel industry would need to be tied into conventional energy infrastructure in order to be effective.

Session 2A - Outlook and Issues for Canadian Oil Supply

Speakers

Natural Gas & Oil Sands Production

Bob Dunbar, President – Strategy West Inc.

Canadian Oil Sands

Rob Bedin, Vice President - Ross Smith Energy Group

Shifting Sands: The Evolving Environmental Context for Oil Sands Development

Dan Woynillowicz, Senior Policy Analyst – Pembina Institute

Moderator

Bill Wall, Technical Specialist - National Energy Board

Summary

The session highlighted key issues in oil sands development including reservoir quality, financial, environmental, and technological.

The wide variation in oil sands deposits was discussed, including the irregular and discontinuous nature of the deposits. Mining projects were described as more forgiving of quality differences while in situ projects are more sensitive to subsurface compartmentalization and "thief zones" that dissipate injected steam too readily and

interfere with heating the reservoir. Such variability has a profound impact on project economics.

Escalating costs for labour and materials combined with construction delays have led to major cost overruns and continue to pose a challenge to oil sands development, and indeed energy projects worldwide. Annual spending on oil sands in Alberta has steadily increased, averaging around \$6 billion per year prior to 2005, increasing to \$10 billion in 2005, and increasing further to \$14 billion in 2006. Efforts to control costs include better scope definition through increased up-front engineering as well as more test wells and coring. There are also some who favour a slowing of oil sands activity to spread peak employment over more years and reduce pressure on the economy. As sub-prime lending issues have impacted investment from the U.S., European sourced investment is increasing.

As more oil sands projects are developed, cumulative environmental impacts are becoming a larger issue for regulators. Although the surface footprint of the projects is small on a provincial scale, only 10 percent of potential oil sands leases have been granted. Environmental impacts may be magnified through habitat fragmentation from road and pipelines construction. Low carbon fuel standards proposed by California and under consideration by 19 states could impact the oil sands export market.

Investment is attracted to companies with better technology, as this enables operators to access lower quality reservoirs, pose less environmental risk and improve economics. Often tradeoffs are involved, such as the use of saline rather than fresh water for oil sands operations to reduce fresh water requirements. In that case, the water treatment required prior to use does consume energy, introduces emissions and may leave a salt residue. More expensive retrofits may be avoided should carbon capture and storage be integrated into future of oil sands projects.

Session 2B - Issues in Electricity Generation & Transmission

Speakers

Generation & Transmission Issues

Bill Marshall, President & CEO - New Brunswick System Operator

A Nuclear Renaissance in Canada

Ron Oberth, Director - Atomic Energy of Canada Limited

Conservation Options & Their Impacts

Peter Love, Chief Conservation Officer - Ontario Conservation Bureau

Moderator

Bill Seney, Market Analyst - National Energy Board

Summary

This session highlighted some of the key areas of consideration for electricity generation and transmission in Canada over the next 25 years.

Electricity demand is projected to increase over the next two decades. Consequently, new generation capacity and infrastructure will need to be added and existing infrastructure will need to be replaced. These projects require significant amounts of capital and the availability of skilled labour. As well, these projects will be undertaken in a changing business environment. Operating and fuel costs, such as uranium and fossil fuels, have experienced rapid growth in recent years and future energy prices are highly uncertain. Speakers expressed differing opinions on whether or not prices can be expected to moderate in the future, as assumed in the *Canada's Energy Future* Reference Case.

A key message across all of the session presentations is that the environmental impact of the electricity sector is becoming increasingly important. In most, if not all, regions of Canada, environmental considerations are shaping government and commercial choices. For example, the Ontario Power Authority (OPA) is mandated to ensure that the province has a reliable, sustainable long-term electricity system. Ontario's electricity road map envisions coal-fired generation being replaced in the supply mix with renewable energy and natural gas, restoring and building new nuclear power, and reinforcing transmission to improve reliability and connect renewable energy to population centers. In addition, to help achieve their mandate, the OPA has created a Conservation Bureau to manage energy demand growth. Seventy-five percent of expected electricity demand growth in Ontario between now and 2025 is expected to be met with conservation, which is an aggressive conservation target.

Environmental considerations are influencing generating capacity addition decisions. For example, nuclear generation is attractive for its low, or no, emissions. Consequently, the nuclear energy industry could be experiencing a global renaissance. For many years, there was little discussion of new nuclear energy in Canada. However, this is changing with a number of new announcements. Ontario is continuing to reassess its nuclear program and New Brunswick is investigating the option of adding a second nuclear reactor at its Point Lepreau site. As well, there are proposals to build nuclear facilities in provinces that have no previous history with this generating technology. In 2007, an application was filed with the Canadian Nuclear Safety Commission proposing to build a nuclear generator in north-central Alberta.

The environment also continues to be at the forefront of transmission issues. Wind power is becoming increasingly attractive because it is a renewable energy source with low emissions and reasonable economics. However, the increasing wind capacity additions across the country can create transmission challenges as wind power is intermittent and non-dispatchable. These challenges can be alleviated in part by coordination across regions. However, it requires improved transmission infrastructure.

Discussions surrounding the viability of an East-West transmission grid in Canada continue. One of the key selling features is the ability to reduce emissions from intensive generating options in Ontario with hydroelectric energy from Quebec and Manitoba. As well, the development of the Lower Churchill facility in Newfoundland could provide economic benefits and contribute to reduced greenhouse gas emissions in Eastern Canada and the Northeastern United States.

Session 3A - Gas Market Dynamics

Speakers

Gas-fired Generation and Influence on Demand, Storage and Pipeline Operations
Malini Giridhar, Director – Enbridge

North American Supply Competitiveness, Gas for Oil Sands and Pipeline Flows
Bill Langford, Vice President – TransCanada Pipelines

Moderator

Paul Mortensen, Technical Leader – National Energy Board

Summary

This session examined the changing supply and demand fundamentals of the North American natural gas market, and also provided a look at how traditional gas markets are changing in Ontario.

A shift is occurring in the North American gas market, with U.S. imports from Canada likely to decline, but with rebounding Lower 48 supply and expectations for a dramatic increase in LNG set to meet increasing gas demand.

North American gas demand could grow by 1.3 percent annually, reaching 90 Bcf/d by 2020, with the bulk of this increase related to gas-fired generation (GFG) of electricity, as nuclear, hydro and conventional coal are currently less attractive alternatives.

In the longer term, supply from the Western Canadian Sedimentary Basin (WCSB) could remain relatively flat at 16.5 Bcf/d, through increasing contributions from unconventional gas. In the near term decreased drilling levels due to lower gas prices and higher costs could cause exports to shrink by 2 to 3 Bcf/d. Export levels are also affected by increasing demand for gas required for oil sands development. In spite of improvements in gas intensity, gas usage for oil sands could rise to 2.3 Bcf/d by 2020.

Outside of the WCSB, gas supplies are projected to increase. In the U.S. Lower 48, production from the Rockies area could expand from 8 Bcf/d in 2006 to 12 Bcf/d in 2020. Likewise, shale gas plays could increase production from 2.5 Bcf/d in 2006 to 6.0 Bcf/d

by 2015. Production increases are also expected from the Independence Hub area of the deepwater Gulf of Mexico. Expansion of existing LNG facilities in North America, and the building of new ones, could allow LNG imports to expand from 1.0 Bcf/d in 2005 to 18 Bcf/d by 2020. Lastly, frontier areas connected by the Mackenzie Valley pipeline could deliver 1 to 1.5 Bcf/d by 2014, while the Alaska pipeline could deliver 5 to 6 Bcf/d by 2018.

In Ontario, demand growth in traditional sectors is seen as limited, with commercial and industrial markets influenced by efficiency gains and demand destruction. However, overall demand is projected to grow by about one percent annually, led by the residential sector and demand related to GFG.

The Ontario government's Supply Mix Directive for Electricity sets out a requirement to maintain the ability to use natural gas capacity at peak times. The government is committed to 4267 MW of GFG by 2010, and GFG energy production as a proportion of the total could increase three percent by 2015.

Declining WCSB production combined with increased U.S. imports could pose scheduling issues for Ontario distributors. Demand is becoming more residential-centered, with increased peaks in demand. In the longer term, changes to supply and demand fundamentals pose implications for local distributors' balancing role, with more storage, short-haul transport, and pipeline balancing services required.

Session 3B - Carbon Dioxide Capture and Storage

Speakers

Canadian CCS Opportunities & Challenges

Brent Lakeman, Manager – Alberta Research Council

CO₂ Storage Potential in Canada

Bill Reynen, Director – Geological Survey of Canada

Overview of International Experiences

Dr. Malcom Wilson, Director – Office of Energy and Environment, University of Regina

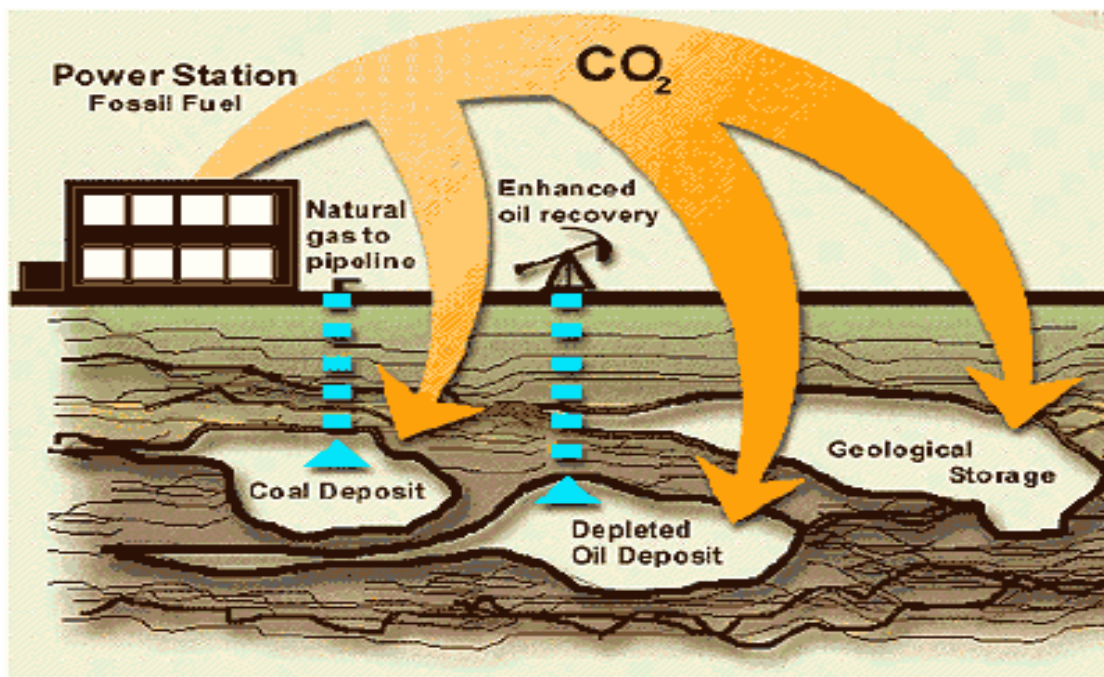
Moderator

Tara Smolak, Energy Futures Assistant Project Manger - National Energy Board

Summary

This session provided an overview of carbon dioxide capture and storage (CCS) as well as highlighted the associated benefits and challenges.

The process of CCS involves extracting carbon dioxide (CO₂) from a gas stream typically released during fossil fuel-fired electricity generation, fuel processing or other industrial processes. Once the CO₂ is captured it is compressed and transported to a storage site either by pipeline or tanker. Storage sites are typically underground in a geological formation.



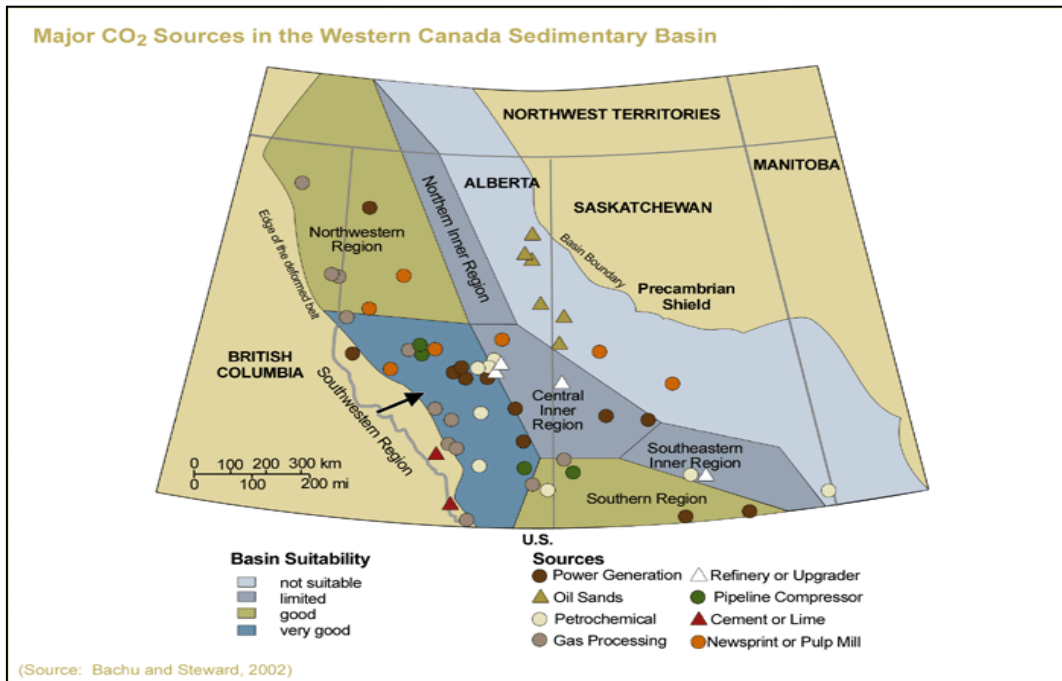
Source: Natural Resources Canada

The primary benefit of CCS is to reduce the amount of GHG emissions released into the atmosphere. Globally, CCS is important because it has the potential to disconnect the relationship between economic growth and global GHG emissions rate. There are a number of research and pre-commercial CCS projects around the world as well as a few commercial projects in the oil and gas industry. Canada, Germany, Norway, the United Kingdom and the United States all have programs underway.

CCS is of particular interest to Canadians as we are a major global energy consumer, producer and exporter. Energy is essential to our daily lives as it is used to heat our homes, power our offices and transport goods and people across the country. Energy is also an important economic driver. Canada is ranked in the top ten energy producers and exporters in the world. Significant amounts of electricity, coal, crude oil, and natural gas are produced and exported every year and contribute to Canada's gross domestic product.

Associated with the production and use of fossil-fuel energy in Canada are GHG emissions.

In Canada, many of our large point sources of CO₂ emissions are located close to substantial geologic CO₂ storage opportunities. This is particularly true for the WCSB. Major GHG emitting sources in this area include: fossil-fuel fired power generations, the oil sands industry, the petrochemical industry, gas processing plants, refineries and upgraders, pipeline compressors, the cement and lime industry, and newsprint and pulp mills. At the same time, the WCSB is thought to have significant storage potential, with an estimated 3 762 Mt of CO₂ storage potential in oil and gas reservoirs alone.



There are some economic, technological and regulatory challenges to the adoption of CCS in Canada. The cost of capturing, transporting and storing CO₂ is high, making a large scale CCS system uneconomic at this time. According to the Intergovernmental Panel on Climate Change, CCS systems can be assembled from existing technologies; however, the combination of these technologies into one system has yet to be commercially proven. There is the potential for CO₂ to leak out of storage, creating uncertainty surrounding long-term liability. As well, there is a lack of public awareness and stakeholder confidence.

These challenges are not viewed as insurmountable. The creation of a long-term CO₂ market could support the development of CCS. Building demonstration projects has the potential to increase public awareness and stakeholder confidence in this new technology as well as lead to cost reductions through process replication. Coordinated and measured development of transportation infrastructure, such as a backbone CO₂ pipeline, could result in economic efficiencies. Development of storage monitoring programs and response plans could also allay uncertainty.

Canada is seen as having the potential to be a global leader in CCS knowledge and expertise. Some of the best minds and researchers in the country are examining ways to make CCS a reality in Canada. Currently, a National Atlas for CO₂ storage is being developed by Natural Resources Canada and the Alberta Geological Survey. This atlas could be an important tool for industry, regulators and policy makers across the country. As well, other provincial and federal government departments are supporting the development of CCS.

Appendix 1 – Participant List

Participant List

The Board would like to take this opportunity to recognize and thank all the participants of the 2008 Energy Futures Workshop.

Organization

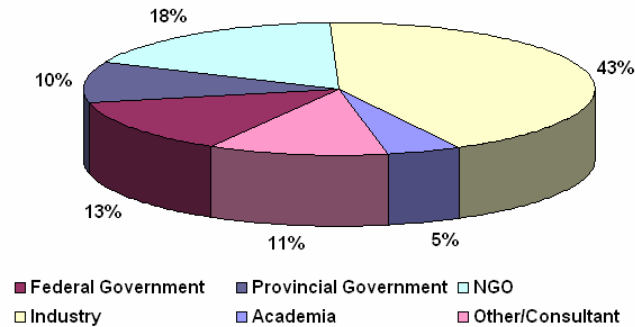
Association de l'industrie électrique du Québec (AIEQ)	Canadian Steel Producers Association
Association of Major Power Consumers in Ontario (AMPCO)	Cement Association of Canada
Association of Power Producers of Ontario	Centre for Marine CNG Inc.
Association québécoise de lutte contre la pollution atmosphérique	Coal Association of Canada
Atomic Energy of Canada Limited (AECL)	COGEN Canada
Brookfield Power	Conference Board of Canada
Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB)	ConocoPhillips Canada
Canadian Alliance of Pipeline Landowners Association (CAPLA)	Conseil québécois du biodiesel
Canadian Association of Petroleum Producers (CAPP)	Department of Foreign Affairs & International Trade Canada (DFAIT)
Canadian Chemical Producers' Association	Department of Natural Resources, Government of Newfoundland & Labrador
Canadian Electricity Association (CEA)	Earnscliffe Strategy Group
Canadian Gas Association (CGA)	ECO5 Inc.
Canadian Hydropower Association	EnCana Corporation
Canadian Nuclear Association	Énergie Brookfield Marketing Inc.
Canadian Society for Unconventional Gas	Energy Futures Network
	Environment Canada
	Federal Department of Finance
	Gaz Métro

Geological Survey of Canada	New Brunswick System Operator (NBSO)
Government of Newfoundland & Labrador	Nexen Inc.
Green Party of Canada	Ontario Centres of Excellence for Energy
HEC Montréal	Ontario Energy Board
Hydro-Québec Production	Ontario Ministry of Energy
Independent Electricity System Operator (IESO)	Ontario Power Authority
Indian & Northern Affairs Canada	Ontario Power Generation (OPG)
Industrial Gas Users Association (IGUA)	Power Workers' Union
Industry Canada	Québec Kyoto
Informetrica Limited	Royal Netherlands Embassy
International Institute for Sustainable Development	RPEC Inc.
l'Association québécoise des consommateurs industriels d'électricité (AQCIE)	Saskatchewan Energy and Resources
Manitoba Hydro	SaskPower
Mining Association of Canada	Shell Canada
Ministère des Ressources naturelles et de la Faune	Statistics Canada
Mouvement Au Courant	Strategy West Inc.
Natural Resources Canada	Terasen Gas Inc.
Nature Québec	TransCanada Pipelines
NB Power Generation Corporation	Transport Canada
	Université Laval
	Vale Inco

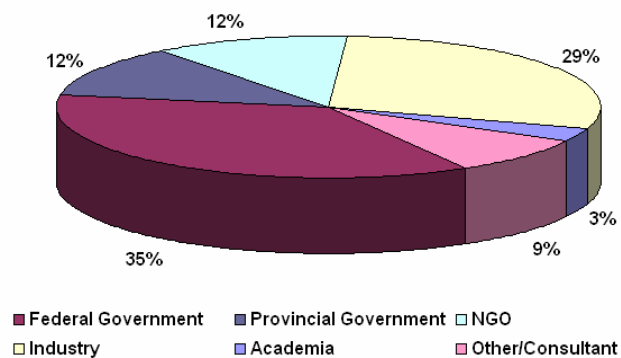
Appendix 2 – Conference Demographics & Evaluation

Conference Demographics & Evaluation

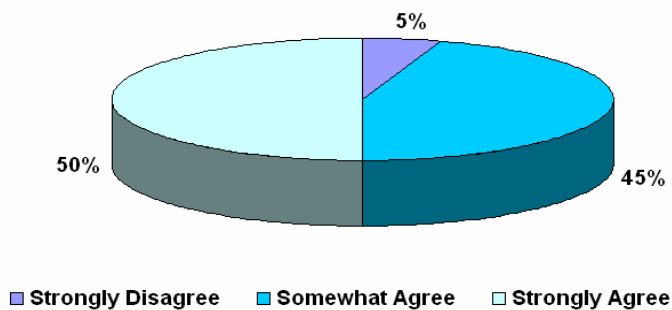
Conference Invitations



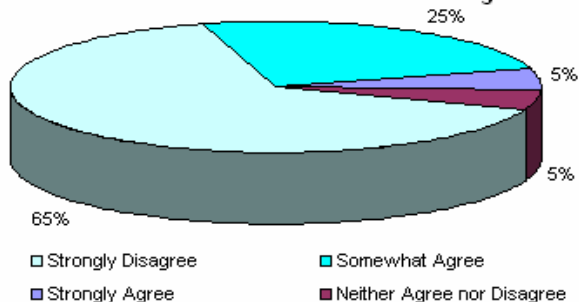
Conference Participation



Information presented was interesting and relevant



Likelihood of future attendance and recommendation of conference to colleagues



In December 2007, the NEB sent out over 500 invitations to industry, government and association representatives, requesting their participation in the January 2008 Energy Futures Workshop. Almost 250 different organizations were included in the conference invitation.

Close to a third of those who were invited and attended were energy industry representatives, including a cross-section of attendees involved in oil, gas, electricity.

Federal and provincial government agencies represented the majority of attendees and included representatives from across Canada. The conference location, Ottawa, also influenced the large number of government staff in attendance. Of note, close to a quarter of participants travelled to Ottawa from outside the National Capital Region.

The majority of conference participants felt the information presented was interesting and relevant and would recommend attendance at future conferences to their colleagues.

Appendix 3 – Workshop Agenda

**2008 ENERGY FUTURES WORKSHOP
OTTAWA - JANUARY 22, 2008
AGENDA**

8:00-8:30am

WORKSHOP REGISTRATION

8:30-10:00

OPENING OF THE WORKSHOP

Welcoming Remarks

John McCarthy, Business Leader – National Energy Board

Overview of Outcomes from Canada's Energy Future

Dr. Abha Bhargava, Energy Futures Project Manager – National Energy Board

Keynote Address - Opportunities & Challenges for the Canadian Energy System over the Next Three Decades

Dr. André Caillé, Immediate Past Chairman – World Energy Council

10:00-10:20

BREAK

10:20-12:00

CONCURRENT SESSIONS 1

Session 1A –External Context

How geopolitical realities and policy developments influence Canadian energy markets.

Moderator

John McCarthy, Business Leader - National Energy Board

Geopolitics & Canadian Energy Markets & Prices

Dr. Marwan Masri, President and CEO – Canadian Energy Research Institute

World Market Trends

Michael Lynch, President and Director of Global Petroleum Service – Strategic Energy & Economic Research Inc

Developments in Environmental Policy: Climate Change and Beyond

Tony Young, Director General – Economic Analysis Directorate, Environment Canada

Session 1B – Focus on Alternative and Emerging Energy

Can these resources make a significant contribution to Canadian energy supplies?

Moderator

Dr. John Bulger, Board Member - National Energy Board

The Future of Biofuels

Dr. David Layzell, President and CEO – BIOCAP

Renewable Energy: Opportunities in Power Generation

Martin Tampier, Principal – Envint Consulting

“Up and Coming” Energy & Environmental Technologies

Graham Campbell, Director General - Office of Energy Research and Development, Natural Resources Canada

12:00-1:30

LUNCH

1:30-3:00pm

CONCURRENT SESSIONS 2

Session 2A – Outlook and Issues for Canadian Oil Supply

Exploration of various views on oil supply and the key issues surrounding growth

Moderator

Bill Wall, Technical Specialist - National Energy Board

Natural Gas & Oil Sands Production

Bob Dunbar, President – Strategy West Inc.

Canadian Oil Sands

Rob Bedin, Vice President - Ross Smith Energy Group

Shifting Sands: The Evolving Environmental Context for Oil Sands Development

Dan Woynilowicz, Senior Policy Analyst – Pembina Institute

Session 2B – Issues in Electricity Generation & Transmission

Can we expect significant changes in electricity supply and infrastructure?

Moderator

Bill Seney, Market Analyst - National Energy Board

Generation & Transmission Issues

Bill Marshall, President & CEO - New Brunswick System Operator

A Nuclear Renaissance in Canada

Ron Oberth, Director - Atomic Energy of Canada Limited

Conservation Options & Their Impacts

Peter Love, Chief Conservation Officer - Ontario Conservation Bureau

3:00-3:20

BREAK

3:20-4:50

CONCURRENT SESSIONS 3

Session 3A – Gas Market Dynamics

The changing geography of natural gas supply and demand and impacts on transmission

Moderator

Paul Mortensen, Technical Leader – National Energy Board

Gas-fired Generation and Influence on Demand, Storage and Pipeline Operations

Malini Giridhar, Director – Enbridge

North American Supply Competitiveness, Gas for Oil Sands and Pipeline Flows

Bill Langford, Vice President – TransCanada Pipelines

Session 3B – Carbon Dioxide Capture and Storage

What you need to know about CO₂ capture and storage

Moderator

Tara Smolak, Energy Futures Assistant Project Manger - National Energy Board

Canadian CCS Opportunities & Challenges

Brent Lakeman, Manager – Alberta Research Council

CO₂ Storage Potential in Canada

Bill Reynen, Director – Geological Survey of Canada

Overview of International Experiences

Dr. Malcom Wilson, Director – Office of Energy and Environment, University of Regina

Appendix 4 – Presentations