

Senate



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Summary Report

GLOBE 2008 Conference

Seventh report of the Standing Senate Committee on
Energy, the Environment and Natural Resources

The Honourable W. David Angus, *Chair*
The Honourable Grant Mitchell, *Deputy Chair*

May 2009

Ce rapport est aussi disponible en français

Des renseignements sur le Comité sont donnés sur le site :

<http://www.senate-senat.ca/EENR-EERN.asp>

Information regarding the Committee can be obtained through its web site:

<http://www.senate-senat.ca/EENR-EERN.asp>

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Members of the Standing Senate Committee on Energy, the Environment and Natural Resources

Honourable W. David Angus – Chair

Honourable Grant Mitchell – Deputy-Chair

Honourable Willie Adams

Honourable Richard Neufeld

Honourable Tommy Banks

Honourable Robert W. Peterson

Honourable Daniel Lang

Honourable Nick G. Sibbeston

Honourable Pana Merchant

Honourable Mira Spivak

Honourable Lorna Milne

Honourable Gerry St. Germain

Ex-officio members of the committee:

The Honourable Senators Cowan (or Tardif) and LeBreton, P.C., (or Comeau).

In addition, the Honourable Senators Brown, Cochrane, Dawson, Kenny, McCoy, Meighen, Nolin and Trenholme Counsell were members of the committee or participated from time to time during the 39th Parliament, 2nd Session.

Staff of the committee:

Ms. Sam Banks and Mr. Marc Leblanc, Analysts, Parliamentary Information and Research Services, Library of Parliament;

Mr. Jacques Bélanger, Acting Communications Officer, Communications Directorate;

Ms. Lynn Gordon, Clerk of the committee, Committees Directorate;

Ms. Chelsea Saville, Administrative Assistant, Committees Directorate.

Note:

This report summarizes the participation of the Honourable Senators Adams, Banks and Mitchell at the GLOBE 2008 conference during the 39th Parliament, 2nd Session. The Library of Parliament analysts Frédéric Beauregard-Tellier and Sam Banks also attended the conference.

Order of Reference—40-2

Extract from the *Journals of the Senate*, Tuesday, March 3, 2009:

The Honourable Senator Angus moved, seconded by the Honourable Senator Johnson:

That the Standing Senate Committee on Energy, the Environment and Natural Resources be authorized to examine and report on emerging issues related to its mandate:

(a) The current state and future direction of production, distribution, consumption, trade, security and sustainability of Canada's energy resources;

(b) Environmental challenges facing Canada including responses to global climate change, air pollution, biodiversity and ecological integrity;

(c) Sustainable development and management of renewable and non-renewable natural resources including but not limited to water, minerals, soils, flora and fauna; and

(d) Canada's international treaty obligations affecting energy, the environment and natural resources and their influence on Canada's economic and social development.

That the papers and evidence received and taken and work accomplished by the committee on this subject since the beginning of the Second Session of the Thirty-ninth Parliament be referred to the committee; and

That the committee submit its final report no later than June 30, 2010 and that the committee retain all powers necessary to publicize its findings until 180 days after the tabling of the final report.

The question being put on the motion, it was adopted.

Paul C. Bélisle
Clerk of the Senate

About the GLOBE Conference

GLOBE is a biennial international conference on the business of the environment. Thousands of corporate executives, government decision makers and leaders of the environmental industry from over 70 countries converged at GLOBE 2008.

The programme at GLOBE conferences is so large that, despite your committee's having been represented at GLOBE 2008 it was not possible to be present at every session, discussion, presentation, or event. The participants Senators and staff from the Senate of Canada were as follows: The Honourable Senators Adams, Banks and Mitchell and, from the Library of Parliament, Frédéric Beaugard-Tellier and Sam Banks.

The 2008 program dealt with four main themes: climate and energy, finance and sustainability, corporate sustainability, and building better cities. This report summarizes what we heard at GLOBE 2008.

Opening Plenary

Gordon Campbell, Premier, British Columbia

- Sustainability is the most important idea of our time.
- A New Future is predicated on sustainable growth.
- All of us are called to act differently. We need to start acting selflessly and think about future generations.
- We can choose the future we want to create. The time is ripe for a change on the order of the industrial revolution.
- We now need to convert words and ideas into action.
- The world is not as it was. Climate change is having serious impacts. For example, about 80% of British Columbia's pine forest has been infested by the mountain pine beetle.
- The economy versus the environment dichotomy is a false one.
- We need to think about our children and about the future we want.
- Be bold. Imagine the future you want and work to achieve it.

His Royal Highness Prince Philippe of Belgium

- Far reaching measures are needed to stabilize and then reduce emissions. Doing nothing is not an option.
- Our global challenge is to move quickly towards a carbon-free world.
- Europe has taken the lead. The European Union's emissions trading scheme could become a global carbon market.
- The carbon market is a bridge between environmental protection and business opportunity.
- The technologies, ideas and political will are all there in Europe. Venture capital is needed to make it all happen.
- First movers will gain a competitive advantage.

- To be truly successful, all nations must co-operate to mitigate greenhouse gas emissions.
- Global governance (e.g. through the United Nations) is needed to tackle the climate change problem.
- The international community has made steady progress but the Kyoto Protocol was only partially successful; there is a need for more international cooperation.
- Environmental protection ultimately is a moral issue.
- We need a common approach, but one that can be applied in a differentiated way. Rich countries have a moral obligation to those who can least cope.

Beth Lowery, Vice President of Environment and Energy, General Motors

- Internal combustion engines running on petroleum fuels can not meet the goal of sustainable personal transportation.
- Reducing greenhouse gas emissions will require a diversity of technologies and fuels.
- 35% of world energy and 96% of transportation energy comes from petroleum. We need to diversify away from petroleum.
- Today there are 6.6 billion people and 890 million vehicles. In 2020, it is estimated that the population will be 7.5 billion people and the vehicle stock will be 1.1 billion.
- General Motors supports actions to address climate change through advanced technology and on an economy-wide, market-driven basis. Consumer behaviour is also a very important part of the equation.

Global Carbon Market – Moving Forward

Henry Derwent, President and CEO, International Emissions Trading Association

- 2008-2009 is a critical period. The question of what will replace the Kyoto Protocol after 2012 is important.
- Kyoto signatories are working towards targets for the post 2012 period.
- All parties to the United Nations Framework Convention on Climate Change are negotiating a framework for after 2012.
- Not a whole lot will be determined until it becomes clear what the United States will do.
- The EU will reduce their emissions by 20-30% by 2020.
- Demand from EU countries for emissions credits from the Clean Development Mechanism post 2012 is unclear.
- The Kyoto Protocol's Joint Implementation flexibility provision may not continue beyond 2012.
- Carbon markets offer opportunities for low-cost emissions mitigation.
- The carbon market was worth \$60 billion in 2007. Volumes are getting bigger.
- The market appears to be working.

Steven Schleimer, Director, Barclays Capital

- The power sector is the largest emitter in North America. The market is already behaving as though carbon regulations are coming.

Jill Duggan, Head of International Emissions Trading, United Kingdom Department of Environment, Food and Rural Affairs

- Carbon trading offers many advantages: it reduces abatement costs, contributes to accelerating the pace of innovation, and sends a robust price signal.
- Some U.S. states and Canadian provinces are moving forward with their own regional trading systems (e.g. Western Climate Initiative).
- The challenge is how to incorporate regional schemes into a global carbon market.
- There is a need for collaboration on market design issues now to facilitate linkages in the future. It is critical to share best practices to ensure that trading systems are linkable and scalable.

Graham Whitmarsh, Head, Climate Action Secretariat, Government of British Columbia

- We can't afford not to address climate change. British Columbia has notably been hit hard by the mountain pine beetle epidemic.
- The challenge is how to address this problem on a global basis.
- British Columbia is taking action to address climate change. Budget 2008 introduced a carbon tax. The government is also spending \$1 billion on various climate change initiatives and has announced that it will adopt California's tailpipe emissions standard.
- British Columbia has joined the Western Climate Initiative; it is always better to have a bigger carbon market.
- Ultimately we will need global regulations and a global market. The International Carbon Action Partnership is a forum to address this.
- A carbon market provides an incentive for industry to deploy existing technologies.
- Political will is needed to "tolerate" higher prices that will in turn drive innovation.
- The U.S. power sector needs a carbon price of at least US\$30-40 per tonne to drive a fuel switch away from coal.
- No one thinks carbon prices will be going down over time, but emitting carbon is still free in many jurisdictions.
- A graduated approach to bringing developing countries into carbon reduction frameworks is the most likely to be achieved.

Clean Energy: Growing Renewable Energy

Geothermal power

- Benefits include no fuel from outside sources and no transmission lines.
- The new driver for geothermal and other sources of renewable energy is energy security.
- Geothermal energy is cost effective, environmentally friendly and has legislative support in the U.S.
- Geothermal is currently a niche market but has great potential as it is widely available.

Solar energy

- Can serve small residential customers as well as large corporations.
- Electricity rates for solar are “decentralized” because the power plant is on site.
- There is a need for a level playing field between solar and more mainstream sources of power. Incentives such as feed-in tariffs and rebates can help.

Hydro

- British Columbia is seeking provincial energy self-sufficiency by 2016.
- The province’s goal is to achieve a 33% reduction in greenhouse gas emissions by 2020.
- B.C. has lots of hydro and wind assets such as “run of river” small power plants.
- In B.C.’s case, success has in large part been made possible by getting First Nations onside.

Wind

- Installed wind power capacity growing.
- If government goals are achieved wind power will generate 5% of Canada’s electricity by 2016.
- Growth requires a wind energy plan or strategy. We need to see wind power as a strategic resource and “think big” and must not think of wind energy as a niche resource capable of playing only a limited role.
- We need to avoid creating a patchwork of policies and regulations across jurisdictions.
- In terms of electricity system planning:
 - Will new transmission investments be designed to facilitate access and integration with wind energy?
 - Will new generation construction be pursued with renewable energy integration in mind?
- All of this requires ongoing community and stakeholder engagement.

The Future of Energy Dialogue

Bob Elton, President and CEO, BC Hydro

- Energy demand will (and must) be greater in the next 50 years as emerging economies continue to grow rapidly.
- These emerging economies will not switch to renewables unless it becomes cheaper to do so.
- Currently, China is installing more coal-fired electricity generating capacity than the global total for all renewables.

Bill Smith, Vice President, Power Generation, Siemens Canada

- Fossil fuels will continue to dominate.
- There is no panacea to the global greenhouse gas emissions problem.
- Unlike North American energy consumers, those in Europe understand the need for conservation. This is in part because North Americans don't face the real costs of energy.
- Three forces are needed to realize a sustainable energy supply: technology push, market pull and policy framework.
- Climate protection is the new paradigm.

Marc Jozs, Head of Strategy and Portfolio Management, Suez Energy International

- China installed 105,000 megawatts of new electricity generating capacity, 90% in the form of coal-fired power plants.
- Coal could be reference fuel for the 21st century. It is abundant, widely distributed around the world and its price is fairly stable.
- Carbon capture and storage is not a free lunch; it uses more energy and is capital intensive.

Bob Huggard, President, Home and Business Services, North America, Direct Energy

- The critical issue in North America is that we're not paying the true cost of energy.
- We don't have the right economic signals in place.

Discussion

- Chris Henderson (moderator): The history of energy is one of dislocation. Recent history is an anomaly.
- Bob Elton: Markets alone will not solve our energy problems, and we're a long way from fully pricing in all externalities.
- Bob Elton: We won't solve the greenhouse gas emissions problem in our lifetimes. Developed countries will continue to adapt but we will face catastrophes.

- Bob Elton: Currently the link between climate change and energy consumption is not perceived as real and immediate by most of us; not optimistic that we can avoid dangerous climate change.
- Marc Josz: Awareness is rising among individuals and companies.
- Bob Elton: BC Hydro can be creative when it comes to demand-side management because BC Hydro is government owned. The goal of BC Hydro is not to increase production and consumption.
- Bob Elton: We elect people who represent us; they perceive that we value consumption above climate protection.
- Asked to identify their policy of choice for tackling greenhouse gas emissions, the panellists responded as follows:
 - Bill Smith - Put a price on carbon.
 - Bob Huggard - Let energy prices reflect true costs.
 - Bob Elton - Introduce radical building codes.
 - Marc Josz - Work with China and India.

Ministerial dialogue on sustainability

Colin Hansen, Minister of Economic Development, British Columbia

- The 2008 provincial budget is an attempt at ensuring economic prosperity while also ensuring a sustainable future.
- B.C. is looking at a cap and trade system and a carbon tax.
- B.C.'s carbon tax will be revenue neutral – taxpayers can make their own choices on how to reduce their carbon footprint.
- B.C. will be able to reduce personal and corporate income taxes thanks to the carbon tax.
- This will result in a big incentive to invest in the province.
- B.C. is looking at using the trees destroyed by the pine beetle to produce biofuel.
- Clean technology investments are the “next big thing” - “there is gold in green”.

Jim Rondeau, Minister of Science, Technology, Energy and Mines and Minister of Competitiveness, Training and Trade, Manitoba

- Manitoba is the first province to legislate its Kyoto targets and expects to reach these by 2012.
- Manitoba has abundant hydropower potential – hydro currently supplies 96% of the province's power.
- Manitoba exports half of the electricity it produces.
- The province has an ethanol mandate: 85% of fuel has to have a 10% ethanol content.
- Manitoba manufactures a high percentage of buses for north America and therefore has a great opportunity to have an impact on the continent if it incorporates biodiesel capacity into all the buses it makes.

Gianluca Salvatori, Minister of Science & Technology, Province of Trento, Italy

- Climate change is affecting places like Trento. Winter tourism has declined because of declines in snow quality, and the snow melt has meant less water this year.

John Gerretsen, Minister of the Environment, Ontario

- Cultural and behavioural change must take place.
- This requires a lot of collaboration between business, environment, agriculture, environmental non-governmental organizations and government.
- Ontario has established a “climate change secretariat” that bring many agencies together into one decision-making body.
- Need for local input and authority.
- Ontario has signed a memorandum of understanding with California with respect to carbon standards.
- Ontario is joining with other jurisdictions in groups such as the Western Climate Initiative.

CO₂ Capture and Storage

David Lewin, Senior Vice President, IGCC Development, EPCOR

- EPCOR will have carbon dioxide for sale by 2015.

Gerry Protti, Executive Vice President, Corporate Relations, EnCana

- The Weyburn carbon capture and storage project is an environmental and commercial win-win. It is:
 - The largest carbon dioxide enhanced oil recovery project in Canada; and,
 - The largest carbon capture and storage project in the world (2 million tonnes of carbon dioxide stored each year).
- Since 2000, about 10 million tonnes of carbon dioxide have been sequestered at Weyburn.
- Carbon dioxide injection has increased production by 60% to levels not seen in 35 years at the Weyburn field.
- The Canada-wide potential for carbon capture and storage may be as high as 600 million tonnes per year.
- Enhanced oil recovery is an interesting near-term option (where a high purity carbon dioxide source is available).
- Large-scale carbon capture and storage is a longer term option.
- The potential is real, the technology is maturing and the knowledge gaps are closing.
- Questions remain about the economics, regulatory issues and public perception.
- Carbon capture and storage could have applications in developing countries.

Jay Nagendran, Assistant Deputy Minister, Alberta Environment, Government of Alberta

- Implementing carbon capture and storage technologies to minimize greenhouse gas emissions is Alberta's biggest challenge and greatest opportunity.
- Studies show that carbon capture and storage could account for 70% of Alberta's emissions reduction objective by 2050.
- Alberta has approximately 100 large industrial facilities; there are concentrated in a few areas where the geology is ideal for carbon sequestration.
- Carbon capture and storage presents challenges: cost, public acceptability, technology, regulations, etc.
- Carbon capture and storage will be a critical component of responsible oil sands development.
- Next steps: promote carbon capture and storage to support a value-added sustainable energy sector.

Gary Weilinger, Vice President, Spectra Energy Transmission

- The issue in British Columbia is finding storage reservoirs for carbon dioxide.

Stephen Kaufmann, Chair, Integrated CO₂ Network

- The mandate of the Integrated CO₂ Network (ICO₂N) is to work with governments to establish policy and risk-sharing mechanisms for carbon capture and storage that will enable uptake in the near term.
- There is a transition period where the economics and risk profile will deter investment in carbon capture and storage technology. There is a role for governments to help kick-start the application of carbon capture and storage technology.
- We need to find a fair way to share the costs of early deployment of carbon capture and storage technology (as was done for other technologies such as nuclear, ethanol, etc.)
- It is anticipated that initial volumes of carbon dioxide to be sequestered will be small; about 10 million tonnes per year in 2015 rising to 25+ million tonnes per year in 2030.

Climate Change Policy and Regulatory Trends in North America

Bill Jones, Principal Consultant, EcoSecurities Consulting Limited

- The Western Climate Initiative aims to reduce greenhouse gas emissions by 15% by 2020, likely through the implementation of a cap and trade system. Guidelines are pending.
- Other regional initiatives such as the Regional Greenhouse Gas Initiative and the Midwestern Regional Greenhouse Gas Reduction Accord exist, though targets and timelines have yet to be established.

- The US greenhouse gas reduction strategy is primarily driven from the bottom up; there is federal inertia but action at the state level with California leading the way.
- There are several bills before congress to address greenhouse gas emissions – i.e., Lieberman-Warner bill S2191.
- California Assembly Bill 32 seeks to reduce GHG emissions to 1990 levels by 2020.
- Barriers to developing policies:
 - Political will;
 - Voluntary market uncertainty;
 - Regulated market uncertainty;
 - Potential federal regulations: how would these interact with regional and state efforts?
- Next steps: the 2008 U.S. Federal election.

Barbara Hendrickson, Partner, McMillan Binch Mendelsohn LLP

- It is uncertain how Canada’s “Turning the Corner” climate change plan will be implemented and how it will affect or overlap with provincial initiatives.

Beverly Yee, Assistant Deputy Minister, Alberta Environment

- With its 2002 Climate Change Action Plan Alberta became the first Canadian jurisdiction to require industry to report GHG emissions and meet mandatory targets for emissions reductions based on intensity.
- Options to achieve targets:
 - Performance improvements;
 - Purchase offsets; and,
 - Innovative Technology Fund.
- In terms of policy development, all Albertans need to be part of the solution. The Alberta Plan promotes stewardship and collaboration.
- Technology is key.
- The Plan encourages a bottom-up approach focusing on real opportunities and balance between the economy and the environment.
- Targets:
 - 2010 – improve emissions intensity by 23%;
 - 2020 – carbon capture and storage results in decrease in emissions; and,
 - 2050 – projected emissions will be reduced by 50%.

Forests and Climate Change

Cassie Doyle, Deputy Minister, Natural Resources Canada

- Sustainable forest management is a critical priority in addressing climate change at the global level.
- Canada has 10% of the world’s forests and forests are a renewable resource.
- Forests have been largely overlooked in climate change debates thus far.
- Deforestation accounts for 20% of global greenhouse gas emissions.

Chris Elliott, Vice President, Pacific Region, World Wildlife Fund Canada

- Carbon accounting is difficult; there is considerable uncertainty regarding the role of forests in the carbon cycle.
- WWF and the Forest Products Association of Canada are working on new carbon accounting techniques.
- Deforestation is largely occurring in developing countries (that are not Kyoto signatories).
- Indonesia is one of the world's largest greenhouse gas emitters.
- Forestry will be an important part of any climate agreement post-2012.
- The World Wildlife Federation and the Forest Products Association of Canada are trying to review and agree upon carbon accounting techniques and best practices in the life cycle management of forest products.

Bruce Lippke, President, Consortium for Research on Renewable Industry Materials

- Tracking carbon is complex; need to perform life-cycle analyses.
- Wood performs better than steel and concrete as a building material when it comes to emissions.
- Climate change could double the risk of forest fires in the Pacific Northwest.
- Putting a tax on carbon makes solar energy more attractive.

Avrim Lazar, President and CEO, Forest Products Association of Canada

- Canada's forest products industry is striving for carbon neutrality by 2015 (without the purchase of offsets).
- The challenge for the world is how to reconcile massive growth, manifested in urbanization and industrialization, with environmental sustainability.
- The world needs carbon-neutral products.
- The new "three Rs": Rethink. Redesign. Reengineer.

Biofuels – meeting the challenge with innovative solutions

Cassie Doyle, Deputy Minister, Natural Resources Canada

- Technological innovation is the key to economic and social transformation.
- The federal government's renewable fuel strategy will increase the demand for renewable fuels.

Claude Letourneau, President & CEO, Vaperma Inc.

- Vaperma manufactures membrane solutions for efficient biofuel production.
- Vaperma is trying to reduce greenhouse gas emissions at the source by removing water from ethanol using a membrane rather than through distillation. This process can reduce the energy consumption of the process by 50%.
- Government investment in Vaperma demonstrates how well different government and venture capital initiatives can fit together.

Jeff Passmore, Executive Vice President, Iogen Corporation

- Iogen is a producer of cellulosic ethanol.
- The Iogen plant does not draw energy from the grid; rather, it reuses energy separated out in the process.
- There is much media attention paid to cellulosic ethanol because it helps reduce greenhouse gas emissions, is secure energy, and offers new opportunities for agriculture.
- There is enough feedstock to meet renewable energy needs in agricultural residue alone.

Michael Scott, Senior Vice President, Corporate Development, Nexterra Energy Corp.

- Nexterra is involved in the advanced commercialization of biomass gasification technology.
- There are many financial incentives to use and develop biomass opportunities.
- Potential applications for biomass-derived syngas include heat and power.

Lithium Batteries: The Game-Changing Green Car Technology

Ulrik Grape, CEO, EnerDel Inc.

- For transportation applications, lithium-ion battery systems are the ultimate enablers for all future cars, including hybrids, plug-ins, fuel cell vehicles, etc.

Prabhakar Patil, CEO, Compact Power

- Lithium-ion battery systems will be dominant for the next 15-20 years.

David Vieau, President and CEO, A123 Systems

- The big issue is whether batteries can last as long as the vehicles they propel (i.e. about 12 years).
- The availability of raw materials to make the batteries is not an insignificant issue. Geologists could argue that it might not be possible to produce enough lithium on a timely basis.
- Diesel-hybrids are coming in Europe. This is a demand-driven phenomenon.
- Some expect that roughly 50% of all new cars sold in America in 2020 will be hybrids.
- The trend is towards the electrification of personal vehicles over the next 20-30 years.
- Rising fuel prices are making battery systems more cost effective.

Session: Clean Diesel

Timothy V. Johnson, Director, Corning Inc.

- Diesel technology offers many advantages: it is efficient, it improves performance and the technology is mature. Diesel-powered vehicles represent over 50% of new car sales in Europe.
- Challenges include: emissions regulations, cost, fuel infrastructure, and consumer perception (in North America) of diesel as a dirty fuel.
- In order to sell European cars in the U.S., they must be modified so that these cars can meet stricter U.S. tailpipe standards.

Norbert Krause, Director, Volkswagen Group North America

- “Clean” diesel technology is in competition with hybrids, advanced gasoline technology, etc.
- Governments should promote innovation and ensure fair competition by establishing technology neutral incentive programs.

Kevin McMahon, Managing Partner, The Martec Group

- There are market opportunities for clean light duty diesel vehicles.
- Many consumers have heard the term “clean diesel” but overall awareness is still low. The industry must work to change consumer perceptions that diesel is slow, smelly and loud.

The Business of Biomass

Maxson Hence, Forester, Dynamotive Energy Systems

- The use of biomass for energy can contribute to energy independence for the U.S.
- Resources should be used where they are most valuable. Subsidizing the production of crops such as corn for the production of ethanol is distortionary.

Joel Velasco, Chief Representative in North America, UNICA-Sugar Cane Industry Union, Brazil

- UNICA is responsible for half of all ethanol and sugar production in Brazil. It is also becoming a leader in the generation of electricity from biomass.
- Sugar cane producing regions are far removed from the Amazon (over 1000 kilometres).
- 45% of all fuel used in Brazil’s vehicles is derived from sugar cane.
- 90% of new light vehicles sold in Brazil can run on either ethanol or gasoline.
- Gasoline is becoming an alternative fuel in Brazil in part because ethanol is cheaper.

- Converting sugar cane into ethanol is energy efficient and cost effective: the energy balance of sugarcane ethanol is 9:1 versus about 1.3:1 for corn ethanol.
- Sugar cane yields are superior to corn yields.
- 1% of Brazil's arable land displaces nearly 50% of the country's gasoline consumption.

Uwe Sollfrank, Chairman, Holinger AG

- Concerns about climate change are driving demand for renewable energy.
- A 2007 study by the Swiss Federal Institute of Technology found that growing crops such as potatoes, corn, sugar beets, soya and canola for energy has a bigger environmental impact than using oil as an energy source.

Jack Saddler, Dean, Faculty of Forestry, University of British Columbia

- Forest biomass can be a source of energy (e.g. liquid biofuels) and industrial chemicals.
- 25% of Sweden's total energy needs are met by forest biomass.
- British Columbia has advantages: it has abundant forest biomass and growing expertise in the area of bioenergy.
- It is time to move from a hydrocarbon economy to a carbohydrate economy. This will take some time.

Discussion comments

- Society is the driving force in the move towards biomass energy.
- Necessity is the mother of invention: the mountain pine beetle epidemic in British Columbia could lead to advances in the use of forest biomass, just like the oil shock of the 1970s pushed Brazil to make use of sugar cane to produce liquid fuel.

NGO Corporate Collaborative Models: Emerging Trends

David Yarnold, Executive Vice President, Environmental Defense

- We need to build relationships and build partnerships for the sake of the planet.
- We need to encourage market based solutions that facilitate entrepreneurial and social change. Examples:
 - ED worked with McDonald's to eliminate Styrofoam packaging and with suppliers to eliminate the use of pharmaceuticals in chickens;
 - ED worked with FedEx to ensure that they have hybrid trucks on the road. Today there are several delivery companies that use hybrid vehicles;
 - Wal-Mart works with 60,000 suppliers world-wide and is therefore very influential in greening the supply chain.
- China is the next big challenge.
- Non-governmental organizations can work faster than government.
- We need to be aware of green washing. Environmental Defense seeks to work with corporations to achieve results that are verifiable and measurable.

Helen Howes, Vice President, Corporate Environment, Health and Safety, Exelon Corporation

- Exelon is an electricity generator; 90% of the electricity it generates comes from nuclear plants.
- Exelon cannot drive an environmental agenda on its own; there is a need for partnerships with non-governmental organizations.
- Exelon is involved in the U.S. Climate Action Partnership which is seeking the introduction of greenhouse gas emissions regulations in the U.S.
- There is a sense that regulations are on their way and corporations like Exelon want to work with governments and non-governmental organizations on the development of these regulations.

Paul Hunt, Enbridge

- Enbridge views corporate responsibility as an investment rather than an expense.
- There are four key elements to a sustainable community: environment, health, education, and arts and culture.
- Companies must earn a license to operate not only from regulators but also from the community in which they operate.

Closing Conference Plenary: Carbon: Tax or Trade?

Colin Hansen, Minister of Economic Development, British Columbia

- The big issue is how to best price carbon.
- Quebec and B.C. have introduced carbon taxes and industries are coming on board.
- Right now in Canada there are many different climate change programs and carbon pricing schemes.

Bob Page, TransAlta Professor of Environment Management and Sustainability, University of Calgary

- A carbon tax gives you price certainty whereas a cap-and-trade system gives you target certainty.
- Carbon taxes are like sin taxes. Revenues are not usually used to meet specific societal goals.
- Canada needs to become part of a global carbon market.
- Tax and cap-and-trade are not mutually exclusive.

Toby Heaps, President and Editor, Corporate Knights

- Emissions from China are growing rapidly.
- While a carbon tax is not a silver bullet, we need one otherwise “our gun is not even loaded.”
- We need a global carbon price otherwise emissions-intensive activities will migrate to areas where carbon is not taxed.

- The problem with cap-and-trade is that China and India will not accept a cap on their emissions.
- Consumers may not respond to carbon taxes but companies do.

Mathieu Bouchard, Vice-President, Sustainable Development and Climate Change, Rio Tinto Alcan

- We are emitting substantially more carbon than our forests and oceans can absorb. This is not sustainable.
- Governments must recognize that certain companies and industries took early actions to reduce greenhouse gas emissions.
- Intensity targets are better than absolute emissions reduction targets in the near terms because society needs our products.
- Both tax and trade have a role to play. Tools should be combined to achieve a level playing field for companies that are active internationally.

Mark Jaccard, Professor, School of Resource and Environmental Management, Simon Fraser University

- It does not really matter whether policy makers adopt a cap and trade system or a carbon tax. The important thing is putting a price on carbon.
- The atmosphere can no longer be used as a free dump for carbon. As long as there is no cost to polluting emissions will continue to increase.
- Reducing emissions will require profound technological innovation over several decades. This is going to be more expensive than simply dumping carbon in the atmosphere for free.
- A carbon tax drives technological change rather than behavioural change on the part of consumers.
- Cap-and-trade systems don't always provide certainty of outcome (e.g. because of overallocation of credits, exemptions, etc.).

David Hone, Group Climate Change Adviser, Shell International

- Solid government regulations are needed. Taxing carbon and/or cap-and-trade is not enough.
- Big changes are urgently needed in our energy systems (e.g. carbon capture and storage).
- A huge technological revolution is needed – we must really put much more money into energy technology.
- But the time frame is very short – we must change the global energy system by 2020.

Graham Whitmarsh, Head, Climate Action Secretariat, Government of British Columbia

- Cap-and-trade systems are administratively complicated. A carbon tax is simpler to administer. Regulations are also needed (e.g. building codes), as is support for technological development and commercialization.
- British Columbia is taking action to reduce emissions in part in anticipation of U.S./global action. B.C. is positioning itself to be stronger and more prosperous.

Henry Derwent, President and CEO, International Emissions Trading Association

- A carbon tax is predictable and offers low incremental transaction costs.
- But: there is no certainty of outcome, there is little evidence that consumers respond to carbon taxes, the trend is towards cap-and-trade and not taxes, taxes are inflexible, taxes can have impacts on international competitiveness, etc.
- Cap-and-trade systems offer a positive incentive to reduce emissions.
- The Chinese are beginning to understand that they will need to adopt a cap on their emissions at some point.