



Energy Council of Canada
Conseil canadien de l'énergie



WORLD ENERGY COUNCIL
CONSEIL MONDIAL DE L'ÉNERGIE

Building on Strengths: Canada's Energy Policy Framework

The Report to the World Energy Congress – MONTREAL 2010 from the Energy Council of Canada's 2009/2010 Canadian Energy Forums

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Table of Contents

Executive Summary	4
Background to the Report	6
The World Energy Council	
The Energy Council of Canada	
The World Energy Congress	
The Canadian Energy Forums – This Report	
Canada's Energy History: How Did We Get Here?	10
Canada's Regions and Communities in Energy Policy	
Canada's Federal Jurisdiction in Energy Policy	
Elements of Canada's Energy Policy Framework	14
Energy as an Economic Driver in Every Canadian Region	
Canada as a North American and Global Energy Supplier	
Climate Change Mitigation – Toward a Clean Environment	
Paths to our Shared Objectives: How Are We Getting There?	18
Multi-Jurisdictional Laws, Policies and Regulations That Work	
Sustained Investment in our Technology and Innovation Leadership	
Efficiency in our End Uses of Energy: Finding Transformative Opportunities	
Toward the Energy System Grids of the Future	
Growing Our Supply of Sustainable Fossil Fuels	
Insights from the Canadian Energy Forums	24
Newfoundland: <i>Diverse Energy Opportunities – an Energy Warehouse</i>	
Nova Scotia: <i>Strengthening our Region</i>	
New Brunswick: <i>The Atlantic Energy Hub</i>	
Prince Edward Island: <i>Working with Neighbours</i>	
Ontario: <i>The Drive To Greater Efficiency</i>	
Quebec: <i>Creating a Mobile Lower Carbon Society</i>	
Manitoba: <i>Conquering Distance, Accessing Markets</i>	
Saskatchewan: <i>Advancing Carbon Management</i>	
Alberta: <i>Sustaining Innovation and Maintaining Clear Trade Rules</i>	
British Columbia: <i>A New Green Energy Policy</i>	
Canada's Northern Territories: <i>Look North...Towards a Renewable Energy Era</i>	
The Federal Jurisdiction: <i>Canada's Energy Systems Are Already Smart</i>	

Executive Summary

The Energy Council of Canada held a series of Canadian Energy Forums across Canada leading up to Canada hosting the *World Energy Congress - MONTRÉAL 2010* in September 2010. These Energy Forums were primarily strategic and policy oriented, and they were visionary, constructive and pragmatic in terms of addressing the many challenges currently being faced by the energy industry in global and national contexts. These Forums provided a “bottom up” approach to assessing and analyzing - perhaps for the first time – an overall energy “picture” of Canada recognizing the Canadian Federation, while defining similarities, differences and synergies among our diverse provinces and territories.

Emerging from the very start of the Canadian Energy Forums is that every jurisdiction in Canada is fully committed to addressing the twin challenges of energy supply and climate change, without any reservation on the need to address the issue of CO₂ emissions.

The recognition that energy drives economic growth and development including, in many cases, strategies for achieving global technology leadership positions for Canada was evident throughout the Forums. Canadian regional cooperation also emerged as a fundamental way to maximize economic growth, while addressing climate change objectives.

The Forums revealed three very specific fundamentals underlying Canada’s energy policy framework that are widely supported.

Energy as an Economic Driver in Every Canadian Region: Energy is an input to every economic activity. A better energy sector means a better economy. Employment and incomes are created not just in energy extraction, processing, transportation and distribution, but in a broad range of other diverse activities.

Canada as a North American and Global Energy Supplier: Exports are part of Canada’s energy success story, as well as being our leading foreign exchange earner in a difficult international economic environment. Moreover, our energy exports are part of a secure energy supply for consuming countries and regions. Open, transparent, well-regulated inter-regional and international markets will help both us and our international partners to strengthen our energy security.

Climate Change Mitigation – Towards a Clean Environment: Forum participants in all of Canada’s regions not only urgently wanted to reduce greenhouse gas emissions that cause climate change; they also reported action in many areas to do so. Serious movement on climate change is desired by most Canadians and it is promised at all levels, but it is particularly evident among sub-national jurisdictions. A significant portion of our forthcoming investments will be devoted to making our resource base cleaner and more sustainable.

Our regional forum participants discussed many avenues of action that have contributed, and will continue to contribute, to Canada’s energy policy framework – how are we going to get there?

Multi-Jurisdictional Laws, Policies and Regulations That Work: The Canadian Energy Forums reaffirmed the value of Canada’s federation. Participants recognize that the multi-jurisdictional character of energy law, policy and regulation in this country has worked well for Canadians. We have combined private ownership of energy infrastructure with a constructive relationship between government and business, under a highly functional juridical-regulatory system. This has harnessed the full power of private industry in a framework of good regulation, making investments that serve public interests in every province and territory.

Sustained Investment in our Technology and Innovation Leadership: Canadians have earned their status as leaders in energy technology and innovation through many decades of investing in education, training, research and development, and then by consistently implementing the best available materials, equipment and methods that result. The Canadian Energy Forums revealed that these investments continue on many fronts and in every region, encouraged by a multi-jurisdictional framework of good policy and regulation.

Efficiency in our End Uses of Energy: Finding Transformative Opportunities: Advances in the efficient end use of energy can outlive changes in energy supplies. While end-use efficiency is often the cheapest option for making advances in the energy sector, consumers generally need to be engaged in it and it frequently still requires huge capital investments, involving partnerships among business and all levels of government. Urban regions are a key area for end-use efficiency improvements and urban transportation systems and buildings provide the largest opportunities,

Toward the Energy System Grids of the Future: Energy visionaries see our existing electrical and piped-gas grids evolving into smart energy networks for the efficient transformation, exchange, delivery and end use of low-emission, low-carbon energy. This will be through increasing interconnected smart systems – electricity, gas, heat and water. Canada’s multi-jurisdictional energy policy framework can find the right balances between public and private investment, among federal and regional jurisdictions, and among industrial, commercial and household users.

Growing Our Supply of Sustainable Fossil Fuels: Fossil fuel sources provided the bulk of Canada’s primary energy supply through most of the twentieth century and they continue to do so today. However aggressively we plan to work to reduce our dependence on them, these fuels will continue to fulfill their “base load” role in our energy supply for a few decades as we transition to new sources of energy. They will likely continue to be part of our energy supply mix into the indefinite future. Fossil fuels’ contribution to Canadian regions’ prosperity and wealth can be sustained and even grow through the twenty-first century if we invest in new supplies such as the oil sands, Arctic oil and gas, the offshore, enhanced oil recovery, tight and shale gas, and coal bed methane while continuing multi-faceted efforts to improve the efficiency, cleanness and sustainability of fossil fuels.

The Energy Council of Canada embarked on the eleven Regional Energy Forums because we want an ambitious, thorough examination of our energy policy framework that begins from, and is firmly rooted in, our regions and communities. The final part of this report shares just a few of the insights we gained from our conversations in the Regional Forums that led to the pathways forward highlighted here.



Background of the Report

The World Energy Council (WEC) www.worldenergy.org

The World Energy Council (WEC) is the foremost multi-energy organization in the world today with its mission being *“to promote the sustainable supply and use of energy for the greatest benefit of all people”*.

WEC is the only truly global and inclusive forum for thought-leadership and tangible engagement committed to our sustainable energy future. A not-for-profit body established in 1923, WEC has over 90 Member Committees, including the Energy Council of Canada, representing over 3000 member organisations from the public & private sectors, developing & industrialised countries, producing & consuming countries and covering all technologies of the energy value chain.

WEC's principal activities include organizing the World Energy Congress every three years (see below). WEC also studies relevant global energy related issues and challenges, and works with other global organizations such as the International Energy Agency, the Intergovernmental Panel on Climate Change, the World Trade Organization, and the World Bank.

The Energy Council of Canada www.energy.ca

The Energy Council of Canada, a Member Committee of the global World Energy Council, is a vehicle for strategic thinking, networking and action by senior executives in the private and public sectors that have a broad interest in national, continental and global energy issues. The Energy Council seeks to forge a better understanding of energy issues, in order to optimally shape the energy sector for the benefit of all Canadians.

The Energy Council of Canada is made up of organizations from all facets of Canada's energy sector, including governments, corporations, other stakeholders, academic institutions and individuals. Among its many activities, the Energy Council organizes multi-stakeholder Forums across Canada and hosts the Canadian Energy Person of the Year selection process and Gala.

The Energy Council of Canada fully participates in the WEC global Studies and Programmes. The Energy Council also works closely with the WEC Member Committees in the United States and Mexico forming the North America Region of WEC to address regional issues and challenges.

The World Energy Congress www.wecmontreal2010.ca

The World Energy Congress is the premier international multi-energy forum for participants to better understand energy issues and solutions from a global perspective. It brings together more than 3000 top world leaders in the field of energy, from industry, governments, and international organizations, as well as the media, universities and energy industry associations.

Canada is hosting the Congress in Montreal September 12–16, 2010. The theme of this Congress is *Responding Now to Global Challenges: Energy in Transition for a Living Planet*. This theme reflects the importance of achieving sustainable energy supply in the face of global climate change, and it explores the possibilities for transformational change in global energy systems.

The preceding Congress (Rome 2007) had the theme *Our Energy Future in an Interdependent World*. It concluded with the following:

- The global energy sector embraced integrating the twin challenges and responsibilities of growing energy demand (more than doubling over the next half century) and global warming towards a sustainable energy future.
- This challenge “will require an unprecedented level of global cooperation between industry and government, and deeper integration of regional and international energy markets”.
- Despite fossil fuels continuing to be the dominant primary energy supply for at least the next generation, there is an urgent need for transforming energy systems and using available technologies to reduce release of greenhouse gases.

Montreal 2010 is the first Congress after the 15th Conference of the Parties (COP 15) to the United Nations Framework Convention on Climate Change (UNFCCC) in Copenhagen, Denmark and less than three months following the G8 and G20 Summits in Canada. It comes just three months ahead of COP 16 in Mexico in November/December, 2010. Concurrently with the Congress, Montreal is hosting the Financial Times Energy Leaders Summit, which is taking place for the first time outside of London. Significantly from a Canadian perspective, the Congress immediately precedes the annual Canadian Energy and Mines Ministers’ Conference, also being held in Montreal.

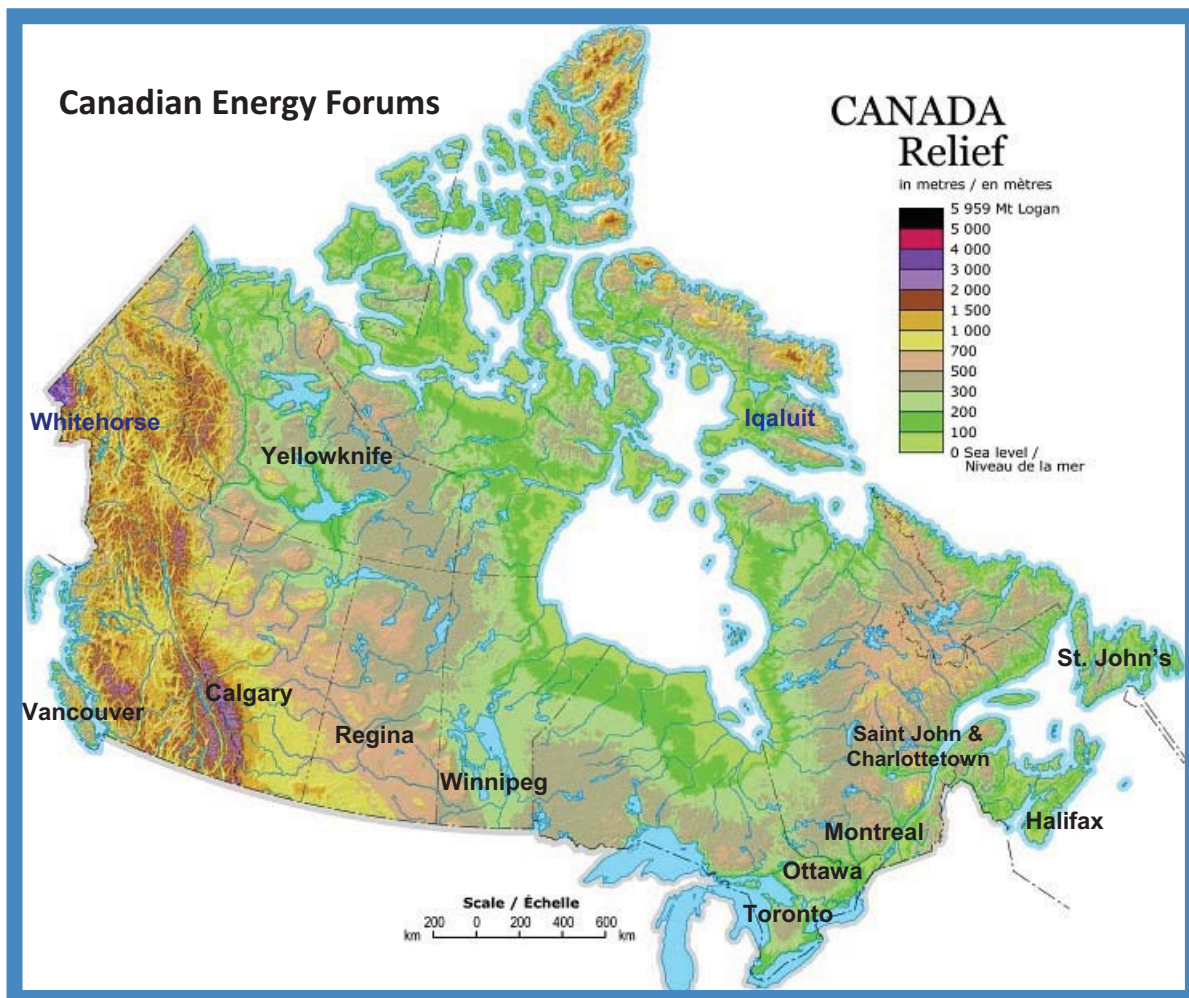
The Congress will also have a public segment to help the public become more aware of global, regional and national energy issues and challenges. In addition, for the first time, the Future Energy Leaders program will be fully integrated into the Congress program.

The Canadian Energy Forums

The Energy Council of Canada held a series of Canadian Energy Forums across Canada leading up to Canada hosting the *World Energy Congress - MONTRÉAL 2010* in September 2010. These Energy Forums were primarily strategic and policy oriented, and they were visionary, constructive and pragmatic in terms of addressing the many challenges currently being faced by the energy industry in global and national contexts.

Ten of the eleven Forums focused on a specific region of Canada and asked governments, industry and other stakeholders to provide perspectives and planned policy actions to address present and future energy challenges. These Forums were held in Newfoundland and Labrador, Nova Scotia, New Brunswick (also covering Prince Edward Island), Quebec, Ontario, Mani-





toba, Saskatchewan, Alberta, British Columbia, and Yellowknife* (covering the Yukon, Northwest Territories and Nunavut).

The Forum in Ottawa focused on the federal government's energy and environment policy jurisdiction and on “cross-cutting” Canada wide energy policy issues in a number of energy sectors. The Programmes, Delegate lists, Speaker/Panelist biographies and the detailed Forum Report for each of the events are all available at www.energy.ca.

These Forums provided a “bottom up” approach to assessing and analyzing - perhaps for the first time – an overall energy “picture” of Canada recognizing the Canadian Federation, while defining similarities, differences and synergies among our diverse provinces and territories.

Typically each Forum was half a day in duration with two main working sessions. Most Forums featured opening and closing presentations by a Premier, Minister of Energy or Environment, Deputy Minister, or chief executive of a major utility, placing the focus on strategy and policy.

In each jurisdiction in Canada the Forums revealed unquestioned commitment to achieving progress on the twin challenges of growing energy supply and climate change. A third theme

also emerged in the Forums - the remarkable opportunity to develop globally competitive capabilities for addressing specific energy supply, end use, and transformational challenges, enhancing economic growth and development.

The Energy Council of Canada appreciates the support and engagement it has received from governments, industry, universities, and associations across Canada whose contributions were of uniformly high quality. We also thank our sponsors, without whom the Forums could not have been possible, and the staff and Members of the Energy Council whose outstanding contributions made each Forum a success.

This Report

The purpose of this report is to present the highlights and observations from the Regional Energy Forums. In addition, the Energy Council of Canada has published supporting documents recording detailed results of each Forum, and these are available at www.energy.ca

This report begins with a historical perspective on the energy sector in Canada. It goes on to recap the results of the Energy Forums in the context of the three key themes: energy as an economic driver in all regions of Canada; Canada as a global supplier of sustainable energy; and approaches by Canadians toward managing greenhouse gas emissions. It then presents a more analytical narrative of the successful development of energy systems in Canada. Finally, this report offers more detailed insights into the results of each of our Regional Energy Forums. The uniqueness of the Energy Council of Canada's approach, and of this report, lies in seeing the fundamental role of our regions and localities -- their range, diversity, and federal structure -- in Canada's energy policy framework.

*The Yellowknife Dialogue on Renewable Energy in the North: Challenges and Opportunities was convened jointly by the Canada School of Energy and Environment (CSEE) and the Energy Council of Canada.

Canada's Energy History: How Did We Get Here?

Regional needs and local enterprise have always provided the foundation for Canada's energy development. This was true from the days of our first commercial coal mine (in Nova Scotia in 1720) and energy exporting industry (it was exporting by 1724), through early efforts to recover kerosene from coal (in the 1840s) and oil from petroleum deposits (1850s), to the use of water wheels and turbines to generate electricity (in the 1870s and 1880s), to the piping of natural gas to light towns and cities (1890s): all of these ventures stemmed from communities meeting local needs.

The importance of sub-national jurisdictions in energy development grew along with extensive grids for the distribution of electric power, oil and gas during the twentieth century. It is manifested in the substantial role that cities, towns and local communities play in energy innovation and investment today, notably in building standards, transportation, conservation, and in fostering many centres of excellence.

Appropriately, Canada's constitutional structure has left jurisdiction over most matters of energy policy and regulation to the sub-national level. The provinces hold explicit responsibility for natural resources and electric power. Environmental regulation is shared between the federal and provincial governments, with the provinces performing such core roles as managing wildlife and regulating discharges into air and water.

During the twentieth century, waves of transformative technological change allowed successive energy supplies to be brought to Canadian homes and workplaces. As the century

Eugene Coste (1859-1940) was a geologist and engineer who was responsible for the discovery of natural gas in Alberta. From Ontario, but educated in France, Coste worked as a surveyor in Essex County in southwestern Ontario in the 1880s and 1890s, where he drilled one of the earliest natural gas wells in that area. He moved to Alberta by 1908 and began working for the Canadian Pacific Railway. Coste's drilling in 1909 of the well that came to be known as "Old Glory" developed a large commercial natural gas field near Bow Island. Coste later leased the field from the CPR and formed the Canadian Western Natural Gas, Light, Heat and Power Company (which eventually became ATCO Gas). On July 17, 1912 the field's natural gas reached Calgary through a 176-mile transmission line, the longest 16-inch pipeline in North America at that time. Coste's vision and industrial pioneering have earned him recognition as the father of Canada's natural gas industry.

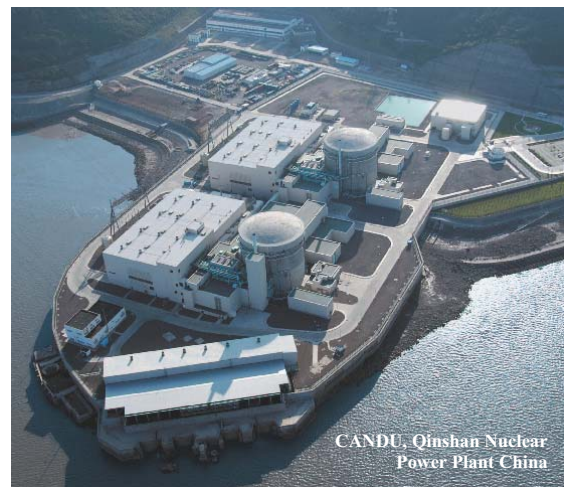
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opened, natural gas was already being distributed in cities and towns for commercial and household use. At the same time, dams, turbines, generators, transformers and transmission lines from rivers to cities allowed hydroelectricity to become the foundation of Canada's electricity supply. Beginning in the 1950s, Canada's rich uranium resources and CANDU reactor technology brought nuclear generation into our electric power base.

From the 1920s to 1960s, advances in gasoline vehicles and the extension of the road and liquid-fuel distribution grids made petroleum the dominant fuel for the transportation sector, leading to the rise of the refining and petrochemical industries -- and ultimately to much greater exploration for in-country petroleum resources, since initially most petroleum was imported from the United States. Oil and gas production flourished in the Western Canada Sedimentary Basin beginning in the 1940s and by the 1970s Canada was a net exporter of oil and petroleum products.

Exploration combined with research and development to improve the economics of refining western Canada's enormous oil sands, which, when they were eventually counted as proven reserves around the year 2000, made Canada the second largest holder of petroleum deposits in the world and an even greater player in world oil supply. Meanwhile, advances in natural gas extraction and the rapid development of the gas pipeline grid in the late twentieth century made this country a huge exporter of natural gas, not only to the United States but as far away as Mexico.



CANDU Technology: A descendent of the Zero Energy Experimental Pile reactor, which successfully achieved the first atomic fission in Canada in 1945, CANDU® technology has been a unique and invaluable asset to Canada and utilities around the world. The first CANDU reactor, the 25 MW Nuclear Power Demonstration plant, went into commercial operation in 1962 near Rolphton, Ontario. This was followed by a larger prototype, the Douglas Point station on Lake Huron, which went into service in 1968 on the current Bruce Nuclear Generating Station site.

Today, 34 CANDU reactors, along with 16 other heavy-water reactors based on the CANDU design, have been built or are under construction on four continents. CANDU has achieved international acclaim for providing safe, economical and reliable electricity production. It is the only technology that utilizes dual, independent, fast-acting shutdown systems. The CANDU 6 reactor is one of the top-performing reactor designs in the world, with an 88.9% lifetime capacity factor. The Advanced CANDU Reactor® and the Enhanced CANDU 6™ reactor are the latest CANDU technologies, maintaining proven CANDU features and offering unique advancements, including the ability to use alternative fuels.



Oil Sands: With 175 billion barrels of recoverable resources, Canada's oil sands are expected to play a significant role in the future of energy in Canada, and globally, as conventional oil reserves decline.

Today, Canadian oil sands production stands at 1.3 million barrels per day and close to half the crude oil Canada exports are produced from the oil sands. While early technology efforts targeted economic recovery of the oil sands deposit, current research and development includes a strong focus on environmental

performance, placing the oil sands as a secure, reliable and responsible energy source.

Developing the oil sands brings significant economic and social benefits to Canada and provides an important bridging role in the continental energy mix as research into alternative energy sources, particularly in the transportation sector, seeks viable solutions to meet consumer energy demand.

Canada's Regions and Communities in Energy Policy

As their vast natural resources underwent rapid and extensive development in the first half of the twentieth century, the provinces each established systems of regulators, licensing authorities and Crown corporations to administer their industries and advance their energy production, transmission and use. These entities remain the core of Canada's energy policy and regulatory system today. In the Northern Territories, devolution of quasi-provincial powers from the federal governments for similar purposes began decades ago and is an active, ongoing process. Project developers working within municipalities are subject to municipal building codes, zoning, traffic management, land-use planning, building and other municipal requirements that have strong effects on end uses of energy.

In many instances, Canada's aboriginal peoples (or "First Nations") are self-governing. Energy developers may be required to seek permits or approvals from a First Nations government entity or council, or to negotiate resource-sharing arrangements. In areas where an aboriginal right or land claim has been asserted but not resolved, legal duties to consult First Nations nevertheless exist.

Canada's Federal Jurisdiction in Energy Policy

The federal government's role in the energy sector derives primarily from its role in inter-provincial and international trade and commerce, as well as its specific responsibility for the nuclear industry, and also its authority over fisheries and fish-bearing waters.

Ottawa's (and Washington's) governance of the 8,891-kilometre Canada-U.S. boundary, and of the world's largest bilateral trade relationship, can have a decisive influence on Canada's energy sector, since nearly all of Canada's energy exports go to the United States. This became clear during the years of the National Energy Program (1980-84). The NEP was an effort by the Government of Canada to promote the country's self-sufficiency in oil. Many now view it as having unbalanced the federal government's relationships with many provincial, local and industrial interests, and as being a cautionary lesson to any effort to develop national energy policies. It could be argued that part of the NEP's legacy is an increased understanding that Canada's energy policy framework is fundamentally multi-jurisdictional in nature.

In recent decades, Canadian government policies have prioritized international trade and market access. Today, Canada is one of the world's largest producers and exporters of energy. It is the second largest holder of proven oil reserves (after Saudi Arabia), and a major generator of energy technology and innovation. It is also by far the largest supplier of imported energy in all forms to the United States, which receives most of Canada's energy exports. Energy exports accounted for over 22% of Canada's export earnings in 2009, and energy industries (including support activities) generated over 5% of gross domestic product.



Hydropower in Canada: The use of waterpower has a long history, but it was not until the development of large-scale hydropower generation at Niagara Falls that the potential to provide light and power to industries and communities far from hydropower generation sources was realized. A worldwide competition to develop the most effective means to move power over long distances in the early part of the last century led to the development of the modern AC power grid. The North American grid is often cited as the world's largest machine.

The development of large-scale AC and DC technology was critical to the development of hydropower sources far from major markets across Canada, allowing Canada to build one of the world's cleanest electricity systems.

Niagara Falls provides Ontario 2400 Megawatts of power capacity, nearly 10% of Ontario's generation capacity and 2700 Megawatts to the United States. Ontario Power Generation is undertaking the construction of a new tunnel under Niagara Falls that will increase Ontario's power supply by 1.6 billion kilowatt hours per year.

Elements of Canada's Energy Policy Framework

The Energy Council of Canada's Regional Energy Forums have revealed three very specific fundamentals underlying Canada's energy policy framework that are widely supported.

Energy as an Economic Driver in Every Canadian Region

Energy is an input to every economic activity. A better energy sector means a better economy. Employment and incomes are created not just in energy extraction, processing, transportation and distribution, but in such diverse, value-added activities as:

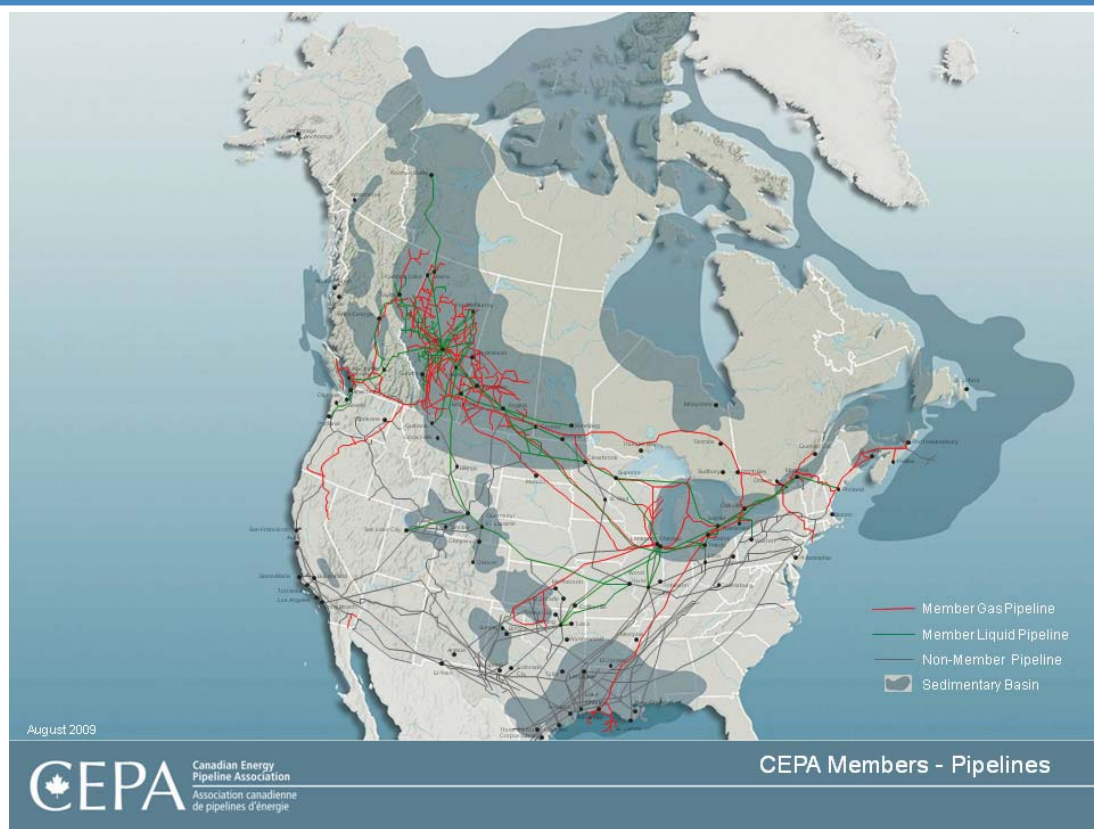
- education and knowledge transfer
- commercial energy trading
- machinery and equipment supply
- continuous development of new and better techniques and materials
- financing of all of these activities

Financing of Energy Related Activities: The various energy sectors along with the natural resource sectors, significant drivers of the Canadian economy, are capital intensive and turn to the equity markets to help support their activities. Most Canadian companies choose to establish a listing on a Canadian exchange. The Toronto Stock Exchange, the TSX, is the senior Canadian equity market. The Venture Exchange, the TSX-V, provides emerging companies with access to public equity capital. Its minimum listing requirements are tailored to a company's industry sector, stage of development, financial performance, and operational resources.

New equity capital raised in the first six months of 2010 exceeded \$15 billion, including \$5.5 billion for Energy, \$7.8 billion for Mining, \$1.3 billion for Utilities/Pipelines and \$600 million for Clean Energy and Renewable Power.



The Canadian exchanges, the TSX and the TSX-V, are well recognized in the world as key sources of supporting capital for the energy and natural resource sectors. 55% of the world's public mining companies and 43% of the world's public energy companies are listed on the Canadian exchanges, making the Canadian exchanges #1 in each of these areas.



North American Pipelines: The Canadian pipeline industry owns and operates over 100,000 km of pipelines. Those systems deliver 97% of the oil and natural gas produced and used in Canada. Pipelines are uniquely positioned to provide cost effective, reliable and the safest and most environmentally sound service. Investments in expansions and new systems continue as new markets or increased demand calls for increased capacity. Over the next twenty years pipeline investments connecting unconventional gas and oil supplies and new markets could be up to \$40 Billion, and if northern pipelines for natural gas are built that number rises to over \$80 Billion.

For Canadians, who use more energy per capita than nearly any other people on earth, better, cleaner, more efficient and effective energy sources have especially strong benefits. Today, when energy is by far the largest earner of foreign exchange while other major export industries (automobiles, forest products) have suffered steep recent declines, those benefits are more important than ever.

Every one of our regions has impressive stories to tell about its energy sector, and Forum participants of all sectoral backgrounds expressed their appreciation of the importance of energy as a driver of economic activity both now and in the future. While it is sometimes assumed that natural-resource-based sectors will occupy a diminishing share of our future economy, energy's role in Canada's prosperity has grown dramatically since Confederation in 1867 and there is good reason to expect that energy can be a core strength of our economic leadership through the twenty-first century.

Canada as a North American and Global Energy Supplier

Exports are part of Canada's energy success story, as well as being our leading foreign exchange earner in a difficult international economic environment. Moreover, our energy exports are part of a secure energy supply for consuming countries and regions. Policies aimed at only national or sub-national self-sufficiency will not lead us toward security and optimal efficiency in our energy systems. Canada's energy policy framework promotes open exchange and as a result, it has a very good record of moving Canadians toward these desirable ends. Open, transparent, well-regulated inter-regional and international markets will help both us and our international partners to strengthen our energy security.

Canada has pursued this vision in recent decades, bringing growing and reliable energy supplies to neighbours who are increasingly concerned about the stability, transparency, and accountability of the regions from which they source their energy. Additionally, Canada and its allies promote constructive international energy dialog and coordination in forums such as the International Energy Agency, the International Atomic Energy Agency, the North American Energy Working Group, the Canada-U.S. Clean Energy Dialogue, the Global Nuclear Energy Partnership, and the Asia-Pacific Economic Cooperation forum.

We are not just a major energy supplier to international markets, but also a provider of technology, innovation, finance and management skills that help other peoples advance the development of their energy sectors. Our energy policy framework should help us sustain and deepen this role in the decades ahead.

Climate Change Mitigation – Towards a Clean Environment

Forum participants in all of Canada's regions not only urgently wanted to reduce greenhouse gas emissions that cause climate change; they also reported action in many areas to do so. Serious movement on climate change is desired by most Canadians and it is promised at all levels, but it is particularly evident among sub-national jurisdictions, from provincial carbon taxes to regional mass transit planning to municipal "green roof" requirements. Very recently this was also manifested in the announcement that Canada's three largest provinces, Quebec, Ontario and British Columbia, are working independently with two U.S. states, California and New Mexico, to introduce a cap-and-trade system that would put a price tag on greenhouse-gas emissions.

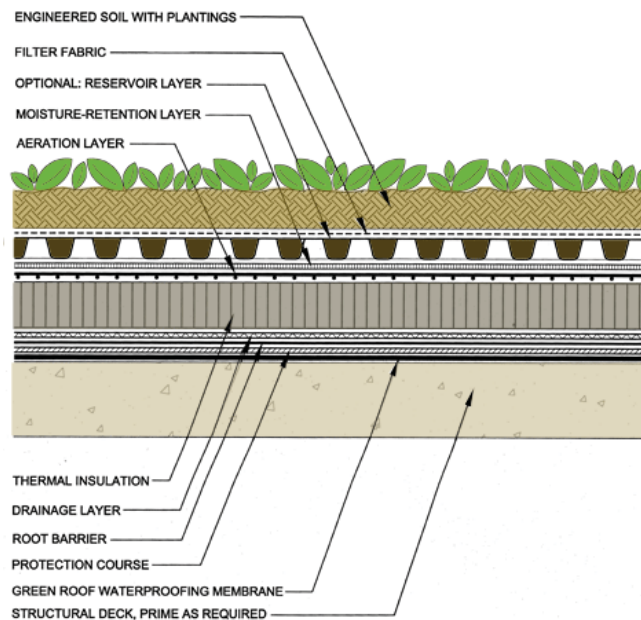
Carbon tax strategies have been introduced in several jurisdictions across Canada. There are differing positions on whether there should be a concerted move to a broader cap and trade system, or on maintaining carbon tax charges which are revenue neutral within individual jurisdictions, but where such monies are used to finance technological development for reducing impacts of associated greenhouse sources within its jurisdiction.

However, it is recognized that there is a strong desire for a pan-Canadian solution to address carbon emissions while respecting the different jurisdictions within the federation, and that this should be compatible with a global agreement on carbon emissions of which Canada should be a part. Without this, Canada could arrive at sub-optimized solutions and miss significant opportunities to minimize the cost of carbon mitigation. It is observed that the world

Green Roofs: A green roof system is an extension of the existing roof which involves a high quality water proofing and root repellent system, a drainage system, filter cloth, a lightweight growing medium and plants.

Green roof systems may be modular, with drainage layers, filter cloth, growing media and plants already prepared in movable, interlocking grids, or, each component of the system may be installed separately.

Green roof development involves the creation of "contained" green space on top of a human-made structure. This green space could be below, at or above grade, but in all cases the plants are not planted in the "ground". Green roofs can provide a wide range of public and private benefits.



looks on Canada as a whole, and therefore it is in the interest of all Canadians to find solutions acceptable to all jurisdictions in Canada and the global community.

The world's greenhouse gas increase has taken decades to develop and similarly, it will likely take decades to resolve. Human society is deeply invested in practices that contribute to the problem. Deep investments in new practices will be required over time to move us toward an acceptable resolution.

We know three things about such investments. First, they may be encouraged by government, but only private finance can deliver on a sufficiently large scale, so private finance must provide the foundation of these investment flows. Second, new practices mean technology and innovation, from which the returns can be enormous, but which can take decades to materialize. Third, we will not make a quantum leap into a new world. Rather, our fossil fuel resource base and our accumulated investment in it will be a large part of our energy mix for the foreseeable future. A significant portion of our forthcoming investments will be devoted to making this resource base cleaner and more sustainable.



Paths to Our Shared Objectives

How Are We Getting There?

Our regional forum participants discussed many avenues of action that have contributed, and will continue to contribute, to Canada's energy policy framework.

Multi-Jurisdictional Laws, Policies and Regulations That Work

While Canadians sometimes subject themselves and their federation to considerable criticism, we usually return to a deepened appreciation of our own qualities and achievements. The Energy Council of Canada's Regional Energy Forums reaffirmed the value of Canada's federation. Participants recognize that the multi-jurisdictional character of energy law, policy and regulation in this country has worked well for Canadians. We have combined private ownership of energy infrastructure with a constructive relationship between government and business, under a highly functional juridical-regulatory system. This has harnessed the full power of private industry in a framework of good regulation, making investments that serve public interests in every province and territory.

The Energy Council of Canada embarked on eleven Regional Energy Forums because we want an ambitious, thorough examination of our energy policy framework that begins from, and is firmly rooted in, our regions and communities. The final part of this report shares just a few of the insights we gained from our conversations in the Regional Forums.

Sustained Investment in our Technology and Innovation Leadership

Canadians have earned their status as leaders in energy technology and innovation through many decades of investing in education, training, research and development, and then by consistently implementing the best available materials, equipment and methods that result. The Canadian Energy Forums revealed that these investments continue on many fronts and in every region.

Canadians are investing in emerging energy sources (wind, solar, waste conversion, tidal). We are investing in established, non-fossil energy supplies (hydroelectric and nuclear generation). We are investing in fossil fuel sustainability and new supplies (discussed below), retaining our global leadership status in these fields. And we are investing in increasing the efficiency of end uses of energy across the spectrum of possible applications. As with our established energy supplies, these investments are being achieved mainly through private sector commitments, encouraged by a multi-jurisdictional framework of good policy and regulation.

Efficiency in our End Uses of Energy: Finding Transformative Opportunities

Advances in the efficient end use of energy can outlive changes in energy supplies. For example, new materials that make vehicles lighter in weight will deliver efficiency benefits, no matter whether vehicles are powered by gasoline or electricity. Similarly, more efficient office lighting pays huge dividends, no matter how our electric power may be generated. While end-use efficiency is often the cheapest option for making advances in the energy sector, consumers generally need to be engaged in it and huge capital investments, involving partnerships among business and all levels of government may be required.

Urban regions (meaning cities plus the surrounding regions that are closely bound to them in commerce and passenger transport) are the key areas for end-use efficiency improvements.



Urban Innovation:

Congestion and urban sprawl are major contributors to energy use and green house gas emissions in Canada. Transportation accounts for 31% of Ontario's GHG emissions, the majority of which arise from single-passenger commuter travel by automobile.

The Province of Ontario has undertaken measures to make public transit more attractive, including the development of the commuter rail GO system, which provides convenient and comfortable transit for many people who work in the city core. But the large majority of job growth and population growth in the Greater Golden Horseshoe region has been outside the City of Toronto. Increasingly people live and work outside the city core. The provision of convenient public transit commuting throughout the region is essential if car use is to be reduced.

To coordinate the development of this transportation across an area currently served by seven separate transit services, Ontario created Metrolinx to coordinate the development of an integrated multi-modal transport grid across the entire region. Metrolinx will initially manage a \$17.5 billion investment over the period to 2020 to begin the process of building this network, which is expected to include electrification of parts of the commuter rail system and the coordinated purchase of LRT vehicles to provide skeleton of new regional transit grid.

Urban transportation systems provide the largest opportunities, but will also require the largest capital investments. New hybrid or electric drive systems for private vehicles are another excellent prospect, one where private investment can carry much of the load, though public investments in the availability of battery charging systems will be essential. A third major prospect is innovation in architectural design to make buildings more energy-efficient, not only in heating, cooling and lighting, but also in their material life cycle from construction to demolition. All of these prospective changes are “transformational opportunities” that will allow Canadians to redesign where and how they live in ways that deliver benefits on many levels – in lifestyle, convenience, health, cost, and environmental impact. Canada’s energy policy frame-



Efficient Buildings: Manitoba Hydro’s new Corporate Headquarters, Manitoba Hydro Place, home to 2000 employees, is a 700,000 sq ft building located in downtown Winnipeg.

The building is the most energy efficient, sustainable high rise office tower in North America. The design charter consisted of 6 key objectives; exceptional occupant comfort, energy efficiency, sustainability, signature architecture, urbanism and cost effectiveness.

The building site was selected for its proximity to Winnipeg’s main transit corridor, and employees commuting by bus has increased from 5% to over 65% since the building opened.

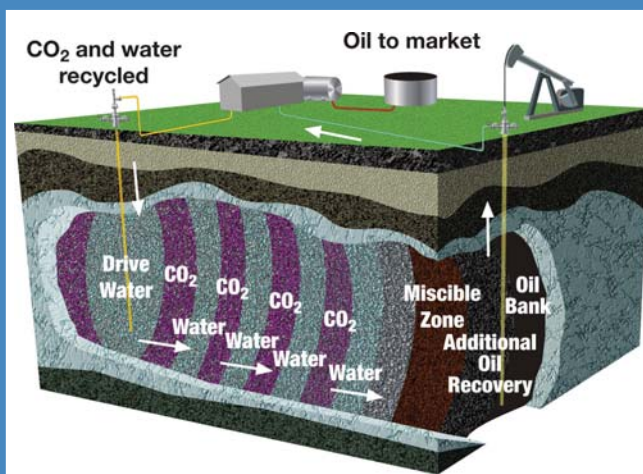
In addition the site was deconstructed, reusing or recycling over 94% of the materials. Manitoba Hydro Place achieves a 65% energy reduction using a climatically responsive approach to enhance building comfort while minimizing energy usage. An on-site weather station monitors local conditions, and the Building Management System’s 25,000 control points respond, like a living entity, to changing conditions.

work will continue to encourage us to find these transformational opportunities and make the most of them.

Toward the Energy System Grids of the Future

Energy visionaries see our existing electrical and piped-gas grids evolving into smart energy networks for the efficient transformation, exchange, delivery and end use of low-emission, low-carbon energy. These present-day energy networks increasingly have access to all kinds of market and environmental data (via the internet). They may increasingly be interconnected with other smart systems of generated and recovered thermal energy (the "heat grid"), roadways (the "road grid"), the water and wastewater systems and competing fuels for vehicles and other distributed uses.

End users may not just be users; they may become participants, returning their surplus, recovered, or generated energy into the grids. Succeeding in this world could increasingly be about the World Energy Council's four strategic "A's": the availability, accessibility, affordability, and accountability of energy service to these users-participants. Canada's multi-jurisdictional energy policy framework can find the right balances between public and private investment, among federal and regional jurisdictions, and among industrial,



Carbon Capture and Enhanced Oil Recovery: Cenovus Energy's Weyburn enhanced oil recovery operation is the world's largest geological carbon capture and storage project. A 320 kilometre pipeline connects a coal gasification plant in Beulah, North Dakota to Cenovus's Weyburn, Saskatchewan oil field where 2.2 million tonnes of CO₂, which would otherwise be released to the atmosphere, is sequestered each year.

More than 16 million tonnes of CO₂ have been sequestered at Weyburn to date. An additional 200 million barrels of oil is expected to be recovered, extending the operating life of the field by about 30 years. It is projected about 30 million tonnes of CO₂ will be stored over that time – a reduction in greenhouse gas emissions that is equal to taking about 6.7 million cars off the road for an entire year.

According to the International Energy Agency (IEA), the reservoir is capable of storing as much as 55 million tonnes of CO₂.





Shale gas: Shale gas is natural gas produced from shale. Until recently, it was not economically feasible to extract natural gas from shale but advanced technologies, such as horizontal drilling, hydraulic fracturing and multi-lateral wellbores have made it possible to profitably unlock these reservoirs at lower and lower costs.

In North America there is more than 100 years supply of natural gas at current production rates. The emergence of these abundant, lower cost supplies are at the heart of why the natural gas game has changed - supply has outpaced demand growth.

In Canada, the Horn River Basin and the Montney formation are currently being developed; these plays represent a huge natural gas resource but must compete with less costly plays in the U.S. which benefit from closer proximity to markets and development in a milder climate.

This abundant, secure, cleaner energy source presents a significant opportunity to shift North America's current energy mix and incorporate more natural gas into transportation and power generation, as well as enable the development of a growing export market via liquefied natural gas (LNG).

commercial and household users, to make Canada a model of success for our international partners to emulate.

Growing Our Supply of Sustainable Fossil Fuels

Fossil fuel sources (oil, natural gas, coal) provided the bulk of Canada's primary energy supply through most of the twentieth century and they continue to do so today. Over the past century though, fossil fuel usage shifted markedly away from coal toward oil and then toward natural gas, while at the same time technology and innovation reduced emissions from each of these fuels. As a result, our fossil fuel use has become much cleaner over time.

However aggressively we plan to work to reduce our dependence on them, these fuels will not just continue to fulfill their “base load” role in our energy supply for a few decades as we transition to new sources of energy. Rather, they will likely continue to be part of our energy supply mix into the indefinite future. They are so abundant, so affordable, so accessible, and the technologies and supply chains developed for their delivery over the past two centuries are so successful and sophisticated, that they will in all likelihood continue to be competitive – just as wood and wood products remain competitive with fossil fuels in many situations in Canada today, centuries after the rise of their fossil and hydraulic competitors.

Fossil fuels’ contribution to Canadian regions’ prosperity and wealth can be sustained and even grow through the twenty-first century if we invest in new supplies such as the oil sands, Arctic oil and gas, the offshore, enhanced oil recovery, tight and shale gas, and coal bed methane. The Canadian Energy Forums highlighted Canada’s continuing, multi-faceted efforts to improve the efficiency, cleanness and sustainability of fossil fuels. Leading examples that are already realities include a very wide range of efficiency measures (notably in building design, public transit, and hybrid vehicles), clean coal technology, carbon capture and sequestration, and carbon taxes. Carbon pricing and trading arrangements, while they are still in their infancy in Canada, offer a future avenue for possible advance.



Insights from the Canadian Energy Forums

The background and purpose of the Canadian Energy Forums is fully described earlier in this Report. This Section highlights the current energy “picture”, the strategies, the opportunities, and the synergies and differences between the diverse regions of Canada. As discussed in the earlier sections of this Report, we take into consideration the attributes of the Canadian Federation in terms of responsibilities for energy policy and the execution of the results of energy policies.

The summaries below are not intended to be comprehensive, but to highlight key policies, planning, actions, and strategies underway throughout Canada. More detailed discussion is available from the specific Regional Canadian Energy Forum Reports available from the Energy Council of Canada.

As seen in the Forums, there are many new energy initiatives and policies being announced and implemented across Canada on a continuous basis. Therefore, this report will not be absolutely up-to-date. However, the Energy Council will be continuing the Canadian Energy Forums across Canada post Montreal 2010, to update this Report.

Newfoundland and Labrador

Diverse Energy Opportunities - an Energy Warehouse

Newfoundland and Labrador is a significant contributor to the North American energy supply. The central conclusion of the St. John's Energy Forum was the strong provincial desire to exploit the diversified range of energy options and opportunities that exists in Newfoundland and Labrador, most notably in hydro, wind, oil, and natural gas.

This province has a vast supply of both renewable and non-renewable energy resources from hydro-power and offshore oil and gas. With the policies and partnerships in place the region will become an even greater contributor to the North American energy scene.

Regarding the non-renewable offshore oil and gas sector, the consensus was that more exploration is necessary in order for the industry to remain sustainable. There are vast resources, both onshore and offshore, which have yet to be discovered.

Speakers agreed that this province is a *Gateway to the Arctic*. The development of energy resources in the Arctic is becoming increasingly important, although exploration and development in this harsh environment is very challenging. On the doorstep of the North Atlantic and gateway to the Arctic, Newfoundland and Labrador oil fields have produced over 1 billion barrels of oil since 1997 in one of the most challenging environments in the world. Research and development is key to further developing the technologies and processes that have been developed for offshore applications in an effort to adapt them for even harsher environments. Newfoundland and Labrador's expertise combined with its proximity to the Arctic, make it a natural Centre of Excellence when considering developments in Arctic environments.

The key electricity challenge is the development of transmission systems and other infrastructure needed for new projects to proceed. The Lower Churchill Project is the most attractive undeveloped hydroelectric project in North America. The total output of the Lower Churchill could assist in meeting the demand for non-emitting renewable resources in Newfoundland and Labrador as well

as other jurisdictions.

Newfoundland and Labrador's full wind energy export potential, upward of 5,000 MW, is tied to the development of the Lower Churchill project and the associated transmission infrastructure. These non-emitting energy sources will assist the region and the country in meeting climate change targets.

As will be seen in the results of other Forums below, it was clearly evident at the St. John's Forum that long term strategic planning, cooperation, and coordination at the provincial and Atlantic region levels is vital to achieving even more effective energy solutions for Newfoundland and Labrador, Atlantic Canada and overall for Canada.

Nova Scotia

Strengthening our Region

The Halifax Forum was the first to strongly highlight the shared desire to better integrate the Atlantic Provinces as an energy market. Participants emphasized that strengthening and integrating Atlantic Canada's power transmission systems in a single Atlantic market will not just improve reliability and efficiency, but also open doors to greater renewable power development and ultimately to exports.

For electricity, it is noted that Nova Scotia is currently essentially an energy island, with a very carbon intensive electricity generation system designed to reduce volatility of energy prices. Nova Scotia's plan is to reduce GHGs and price volatility in an "away from oil" approach. In order to meet the province's requirement for 18.5% renewable energy content by 2013 it needs to incorporate independent power producers into the system. Changes need to be made to the system (e.g. net metering) so IPPs can play a greater role in moving forward on clean energy.

Interestingly, on July 20, 2010, Nova Scotia and New Brunswick announced that NB Power and Emera are exploring the opportunity for a new 500 megawatt line that would double the electrical transmission capacity between the two provinces.

The mutual benefits of an Atlantic region energy plan are considerable if the difficult work of reconciling multiple utilities, taxation, and regulatory systems can be accomplished. It is also recognized that any regional network should consider the unique situation of every participant.

Policies and regulations should ensure that new and innovative ideas are not excluded because they do not fit within narrowly defined or pre-established terms. Currently, regulatory issues are being addressed on a case by case basis as new technology and projects come online, with a need being identified to move towards flexibility in addressing key issues.


Oil and gas production in Nova Scotia has considerable expansion potential and tidal power is being showcased – a unique opportunity for Atlantic Canada.

New Brunswick

The Atlantic Energy Hub

The Saint John Energy Forum was jointly hosted by New Brunswick and Prince Edward Island. The Forum again showed that energy will continue to be a driver of the regional economy and there is significant potential for growth in the Atlantic Canada energy sector. Regional governments are en-





couraging this growth by investing in building infrastructure and encouraging private sector investments in the energy sector.

Energy will continue to be a driver of the economy; however, reliance on fossil fuels means that the transition towards diversified cleaner energy will take time. Maintaining and/or lowering electricity prices will pose a significant challenge, as will the needed shift from oil to natural gas in the Region. Natural gas markets are relatively new and are encouraging the shift from oil usage in some applications. It was noted that significant shale gas opportunities in New Brunswick are now under development.

The 'Energy Hub' in New Brunswick is a key part of its economic agenda and, given its resources and location, is an investment for transformative change supporting the Atlantic and Northeast United States. New Brunswick also has aggressive programs to address energy conservation and energy efficiency.

The evolution of the Maritimes and Northeast Pipeline infrastructure shows that relatively modest projects can grow larger through regional openness, harmonization, and cooperation. Smart grid presents a great opportunity for the region in terms of green jobs. Regional governments are investing in community colleges to develop the skills needed by the energy industry.

Atlantic Canada has made significant progress in developing its energy resources, despite many challenges. Important progress in the region includes streamlining government regulations; developing cleaner energy sources, such as wind nuclear and biomass; and increasing regional cooperation on energy issues. The challenge is to further develop renewable energy sources at an accelerated pace, to work towards meeting greenhouse gas emissions reduction targets. There are many opportunities for mutually beneficial cooperation between the various levels of government (both within Canada and with the US), and between the public and private sector.

There is a strong need for policy alignment across Atlantic Canada. There are market barriers (public vs. private utilities, etc.), but Atlantic Canada has the option of becoming an energy superpower if it chooses.

Prince Edward Island

Working with Neighbours

Prince Edward Island can only meet its provincial green energy objectives through cooperation.

Prince Edward Island has been championing regional cooperation for 20 years and some progress has been achieved. This is partially driven by an electricity supply system dominated by oil-fired generation. 63% of electricity generation is tied to oil, with 18% from wind and 19% from nuclear (Point Lepreau nuclear plant in New Brunswick).

The province is aggressively developing wind energy, with GDF Suez in particular. Prince Edward Island also has a number of ongoing tender processes to develop large wind projects and is studying biomass for heating buildings.

The rural population would benefit from biomass, largely an indigenous supply. Aggressive climate change targets will only increase the demand for wind power and other zero emission generation.

The large wind potential in Prince Edward Island reinforces the need for regional cooperation to take advantage of the region's excellent wind regimes.

Quebec

Creating a Mobile Lower Carbon Society

The Quebec electricity sector is essentially greenhouse gas free, with the vast majority of the supply coming from hydro power and nuclear generation. There are additional major hydro projects underway to increase supply and there is significant additional future potential.

Export of electricity to both the United States and other Canadian provinces is a key part of the Quebec energy strategy. Export of clean energy to neighboring jurisdictions can help to displace more carbon-intensive fuels and thereby make a broader contribution to carbon reduction.

The recent landmark Vermont Renewable Energy Portfolio Legislation (June 4, 2010) has designated all hydroelectric facilities to be considered "renewable" and this immediately led to the execution of a long term power supply contract with Hydro Quebec. The recent opening of the 1250 MW Hawthorne/Outaouais DC interconnect with Ontario also reinforces the growing trend for regional cooperation.

Quebec has developed an overarching policy on Climate Change incorporating a selective carbon tax generating funds for a provincial Green Fund.

Quebec is taking a leadership role in the development and implementation of alternative transportation fuels to reduce the carbon footprint of the transportation sector. The electrification of vehicles, utilizing clean hydroelectricity, is a major initiative in Quebec. Battery development, electricity delivery systems, and partnerships between Hydro Quebec and Mitsubishi are all underway. Electrification of rapid transit systems is also a key strategy for reducing greenhouse gas emissions.

Natural gas as a major fuel for transport trucking is also under development, including a delivery system along the Quebec / Ontario corridor – one of North America's busiest commercial transportation links. This will significantly advance the reduction of carbon emissions from the transport sector.

Quebec also has substantial shale gas resources, and developments are underway that could lead to natural gas self-sufficiency, and reinforce the strategy to utilize natural gas to offset oil for transportation.


Ontario

The Drive to Greater Efficiency

Ontario benefits from the most diverse electric power generation system in Canada. This includes nuclear, hydropower, natural gas, coal, wind and solar. Also added to the mix are imports from neighbouring jurisdictions in Canada and the United States. The most recent addition is noted above in the Quebec discussion - the 1250 MW DC inter connect between Ontario and Quebec.

The Ontario Forum in Oshawa focused on energy conservation and increased end-use efficiency, notably in the emerging "smart" electric power grid, in mass transportation, and in vehicle innovations. Ontario has one of the most aggressive renewable power generation regimes in Canada through the implementation of a feed-in tariff for renewable power. The Ontario Power Authority





is finalizing the 20-year plan – the Integrated Power System Plan or IPSP – that outlines what is needed in terms of conservation, generation and transmission to ensure a reliable, sustainable electricity system for the province. One target highlighted is to reduce peak electricity demand by 6,300 MW by 2025.

A partial decoupling of GHG emissions and economic growth has occurred in Ontario. GDP increased by 2.6% annually between 1991 and 2007, but GHG emissions increased only by an average of 0.5%. A portion of this can be explained by a concerted effort in Ontario to phase out all coal-powered electricity generation. The share of Ontario power generated from coal-fired sources has been reduced from 19% in 2005 to 7% in 2009. Coal-fired power generation will be fully eliminated by the end of 2014.

Ontario is taking significant additional actions to address climate change as it implements cleaner, greener renewable generation technologies across the province through its Green Energy and Green Economy Act. Ontario's economy will also be strengthened through increased investment in renewable energy, conservation and efficiency programs, and through the creation of thousands of new "green collar" jobs.

This level of growth in renewable energy, however, highlights the significant need for new transmission and distribution infrastructure investments to bring the new supply effectively onto the grid.

The "Metrolinx" regional transportation plan and investment strategy for southern Ontario is coordinating the largest set of public transport investments in Canadian history. Meanwhile, there is increased access to a spectrum of vehicle drive systems that includes diesel, gasoline, natural gas, propane, ethanol, gas-electric hybrid, "plug-in" hybrid, and battery-electric.

These efficiency advances will be mutually reinforcing: for example, public transport options will help reduce the number of vehicle trips, and smart charging of electric vehicles will help reduce peak loads on the power grid.

Manitoba

Conquering Distance, Accessing Markets

Manitoba has one of the lowest cost and lowest emitting electricity grids in Canada/North America and it has plans to grow. Manitoba recognizes it is in a unique position with its natural resources that it must leverage to play a leadership role in Canada and beyond.

The Winnipeg Energy Forum emphasized this region's impressively low-cost, low-emission electric power supply, as well as its huge further potential for hydroelectric development and exports.

Major issues in the short-term and long-term continue to be the need for upgrades to electricity transmission and improving market access, particularly to the United States. Currently large hydroelectricity generation from Manitoba is not considered part of the renewable energy generation portfolio for its US customers (e.g. Minnesota) and this could limit the development of hydroelectricity in Manitoba (and other Canadian provinces)**. The key to growth is not just the long-distance transmission challenge, shared with other Canadian regions, but the need for cross-border access to U.S. regional markets.

Secure export market access is also critical for spreading the benefits of innovations by Winnipeg-area passenger coach/bus manufacturers, who sell leading technology throughout North America and increasingly worldwide.

Manitoba's overall GHG emissions are relatively low, so GHG reductions must come from outside the electricity generation sector. In Manitoba, transportation (36%) and agriculture (33%) are the largest sources of emissions. Manitoba is therefore focusing on electrifying transportation and home heating (heat pumps) and on other ways to expand and switch energy usage to make greater use of their clean hydroelectricity generation. This approach was challenged by one panelist as not being cost effective at the national level, but it recognizes the reality of the Canadian federation.

It was noted that Manitoba's advantages for electrifying transportation include: low-cost clean electricity, pre-existing recharging infrastructure, short commuting distances of 10-20 miles within Winnipeg, and a single utility to facilitate roll-out. There was also discussion on electrifying compressor and pumping stations on pipelines passing through Manitoba.

Finally, it was noted that bringing other (non large hydro) renewable energy sources online quickly presents special challenges in Manitoba, as the current grid is so low cost and renewable.

****Note the reference in the Quebec section that Vermont now recognizes large hydropower as part of their renewable portfolio.**

Saskatchewan

Advancing Carbon Management

The Province of Saskatchewan benefits from a wealth of energy resources. When compared to other provinces, Saskatchewan is the largest producer of uranium and potash, the second largest producer of oil, the third largest producer of natural gas and coal, and the fourth largest non-fuel mineral producer in Canada.


As noted by Premier Brad Wall at the Forum – *“Our goal in Saskatchewan is nothing short of developing North America’s most aggressive and impressive innovation agenda. The foundation of that innovation agenda will be the scientific infrastructure we are building, and the scientific infrastructure we will build in the future. The foundation of our innovation agenda will also be our resource base---which would be the envy of any sovereign nation”*.

Saskatchewan's climate change plan is encapsulated in Bill 126, *The Management and Reduction of Greenhouse Gases and Adaptation to Climate Change Act*, which has the authority to establish performance agreements with emitters. The Bill sets up a Technology Fund and a Climate Change Foundation, both of which are not-for-profit, non-government corporations. Their objective is to ensure that funds collected from emitters are not used for any purpose other than for development of clean energy technologies.

Uranium production will likely play a large role in Saskatchewan's energy future. Panelists also placed emphasis on Enhanced Oil Recovery (EOR) and Carbon Capture and Storage (CCS), which will enable Saskatchewan to continue developing fossil fuel-based energy sources in a sustainable and environmentally responsible manner.

Looking ahead to year 2050, panelists noted that Saskatchewan's energy mix will likely include





nuclear (perhaps small scale), hydro power, natural gas (conventional and unconventional), clean coal and CCS technology, enhanced oil recovery, and oil production from oil sands. The Bakken Oil deposit – a 400 billion barrels resource – will become a significant Canadian producing source considering that 2 to 4 billion barrels are considered commercially viable today. SaskPower has looked at the large capacity nuclear reactor options of 1000 MW to 1600 MW, however, there are transmission, cooling water and operations issues given the size of the load in Saskatchewan.

SaskPower has been actively working with its Regional neighbours in looking for ways to boost interconnectedness. For example, the Province has been involved in the Western Electric Power Grid.

Saskatchewan will also increase its research, development and demonstration capacity, including assessment of geological storage capacity and nuclear research. The Regina Forum provided opportunities to learn about the province's fossil fuel resources and the impressive advances being made in techniques of carbon management, notably by combining carbon capture and sequestration with enhanced oil recovery. An update on the Weyburn EOR project and the Boundary Dam carbon capture and EOR projects were highlighted.

These advances are being driven by provincial and regional initiatives such as the Petroleum Technology Research Centre, the Technology Fund, the Climate Change Foundation, and the Western Electric Power Grid.

While Saskatchewan has been successful in increasing energy efficiency in some sectors, efficiency has been on the decline in residential electricity use. Saskatchewan will continue to promote residential energy efficiency through energy use reduction programs, while making sure that consumers have the right tools to make necessary decisions on transitioning to an efficient energy future.

Alberta***

Sustaining Innovation and Maintaining Clear Trade Rules

Recognizing Alberta's close interconnections with the United States petroleum sector, the Calgary Energy Forum emphasized North America as an energy region. Clearly, North America continues to lead the world in two vital respects. First, the continent's spectrum of investments in energy technology and innovation is broader and deeper than that of any other global economic region. This spectrum ranges from wood, wood by-products, waste recovery and biomass through clean coal and coal gas technologies; across Alberta's range of strengths in oil and gas extraction, heavy oils and oil sands, pipeline systems, and emerging gas supplies; through diverse sources of electric power generation; and into research involving all kinds of transport systems, building designs, and many other end-use efficiencies.

Second, North American jurisdictions, on balance, continue to provide their energy sectors with clear trade rules, accessible markets, and transparent legislative and regulatory systems. This has fostered an environment in which the full potential of private investment has been, and can continue to be mobilized.

Specific observations with respect to Alberta were noted at the Calgary Canadian Energy Forum starting with the fact that Alberta has vast energy resources: conventional oil; oil sands; natural

gas – conventional and unconventional; hydro power, and coal with 70% of Alberta’s electricity being coal-fired. It is noted that Alberta has more energy potential available from coal than even oil and gas. In addition, electricity grid developments are enhancing the capabilities for additional renewable energy investments, especially wind.

Carbon Capture and Storage is a key issue and opportunity for Alberta. Alberta has favourable conditions because of the confluence of large energy producers and favourable geological formations as well as a requirement for enhanced oil recovery. The Alberta Department of Energy has created a CCS Development Branch, and the province has committed \$2 billion to CCS funding. Alberta intends to have 3-5 CCS projects in place and 5 million tonnes of carbon captured by 2015. CCS will provide 139 million tonnes of Alberta’s planned 200 million tonnes of GHG reductions by 2050.

Alberta has introduced a Carbon Tax with revenue being applied to investments in new low carbon technologies. The Climate Change and Emissions Management Corporation is now in place to invest in new low carbon technologies.

Canada – United States energy trade restrictions could have a long term impact on oil sands developments and this was highlighted at the Calgary Forum. This was also put into a global context through the Canadian launch (at the Calgary Forum) of the World Energy Council Global Study - ***Trade and Investment Rules for Energy*** which is available from the Energy Council of Canada.

***The Calgary Canadian Energy Forum was held in conjunction with the annual 2009 WEC North American Regional Energy Forum.

British Columbia

A New Green Energy Policy


It was evident throughout the Vancouver Forum that British Columbia is one of the leading jurisdictions on energy and climate change policies in Canada. BC is the only jurisdiction in North America that has instituted a broad-based carbon tax. It is also taking steps to maximize the benefits of its significant energy resource potential and turn it into an economic opportunity while addressing the imperative of environmental stewardship. BC has been a Canadian leader in energy efficiency and conservation for many years.

The BC advantages are numerous. Its energy resource potential includes a large endowment of renewable energy and natural gas. The recent developments related to shale gas present a major economic opportunity. There is also significant remaining hydro potential. A strong bio-energy policy is likely to expand the development of that resource. Furthermore, energy efficiency and conservation are seen as critical components in the overall policy mix.

British Columbia's new Clean Energy Act sets the foundation for a new future of electricity self-sufficiency (+ exports), job creation and reduced greenhouse gas emissions, powered by unprecedented investments in clean, renewable energy across the province. This new strategy also includes the possible development of the 900 MW Site C hydro power development.

Further, BC has a competitive tax regime and government policies related to regulation, First Nation communities and infrastructure which have certainly facilitated shale gas development.





BC has the potential to reap significant economic and trade benefits by developing the Northern Energy Corridor which would strength linkages with the fast growing Asian economies such as China. It has a vibrant clean energy sector and a highly skilled labour force. Taken together, BC is well positioned to become a leading jurisdiction in advancing a low carbon economy, as well as developing its energy resource potential.

BC also faces a number of challenges. Energy resource development will need to be pursued in an environmentally sensitive fashion. To expedite regulatory approvals, there will be the need to work closely with the federal government. The rights and interests of the First Nations will need to be accommodated in the most appropriate way. Re-investment in transmission infrastructure will need to proceed to replace an aging stock, while at the same time, maximize the potential to export clean electricity to the United States.

Canada's Northern Territories

Look North...Towards a Renewable Energy Era

At their annual meeting held in May, 2010 in Whitehorse the three Territorial Premiers identified the need to address Climate Change through the encouragement of the development of all forms of renewable energy as a priority across the Territories. In order to support this priority initiative of the Premiers, the Energy Council of Canada and the Canada School of Energy and Environment (CSEE) jointly hosted the ***Yellowknife Dialogue on Renewable Energy in the North: Challenges and Opportunities***. This formed part of the Energy Council's Canadian Energy Forum series and was follow-up to an earlier Workshop convened by the CSEE on Northern Issues Related to Energy Extraction and Environmental Protection in October, 2009.

Yukon and the Northwest Territories have had some success in developing their hydropower resources, with the majority of electricity demand met through hydropower. On the other hand, the heating needs of both Territories are mostly met with diesel fuel. Wood offsets some of this diesel consumption for heating, but there are few alternatives that can equal the reliability, scalability and portability of diesel.

Nunavut operates under a different context. Whereas Yukon and the Northwest Territories have a handful of grids serving relatively larger customer bases, Nunavut has 25 grids serving 26 communities. Diesel fulfills nearly 100% of the energy demand for all 25 grids.

The challenges to renewable energy development in the north are broadly common across all Territories. Climate is the most obvious challenge: winter is the period of greatest energy demand and coincides with lower water levels that hinder hydroelectric power production. As well, the prolonged darkness virtually negates solar power potential for half the year. Finally, the extreme cold makes reliability a key consideration for all northern energy systems, requiring significant redundant capacity to be incorporated into the system. The cold also poses unique challenges to untested renewable technologies.

Climate aside, the lack of economies of scale due to the small, dispersed population may be the most systemic challenge. Financing is a challenge for energy development in small marketplaces as capital costs are prohibitive when spread over relatively few rate payers. Northern consumers are already among the highest rate payers in Canada.

A lack of capacity and expertise in the north also impedes renewable power development. Many renewable technologies are untested for performance in extreme northern environments. Personnel are needed to install and maintain renewable technologies even in the pilot testing phase. As well, access to specialized replacement parts can be very limited, especially in isolated communities.

Yukon

In January 2009 the Yukon released its first comprehensive energy strategy - a vision for conserving, using and developing Yukon's energy resources. The strategy focuses on conserving energy and using it more efficiently, increasing the supply, and the greater use of renewable energy.

This includes increasing renewable energy supply by 20% by 2020 especially for heating and transportation, developing a Geothermal policy framework, and demonstrating renewable energy projects in communities off the electrical grid to reduce diesel use. There is also a new policy to facilitate independent power production and net metering.

The Yukon also has developed a Climate Change Action Plan including Green procurement for government, an energy efficiency transportation study, and environmental stewardship in the schools.

Northwest Territories

The energy plan was released in March 2007. Key principles are Northern renewable energy should be promoted in a manner that provides for a lasting legacy of affordable and sustainable energy; regulatory process related to the development and provision of energy should be simply structured and as efficient as possible; energy development and management decisions should maintain the integrity of the natural environment; and Aboriginal equity positions in large scale energy development projects should be encouraged and supported.

Access to capital and partnerships will be required for significant renewable energy development. The Northwest Territories has a multi-year, \$60 million commitment to provide funding for energy initiatives for a wide range of projects with the premise to ensure no impact on electricity rates.

Nunavut

Nunavut has perhaps the greatest challenges implementing a renewable energy future with 26 communities with no electricity grid and being supplied almost exclusively by diesel generation in harsh environmental operating conditions.

The Kivalliq region has good hydro potential to supply the current and new mines, but mines have relatively short life spans compared to hydro power facilities (typically greater than 60 years). This mismatch illustrates a major challenge in reducing diesel usage.

Guiding principles to reducing energy demand in Nunavut are conservation and demand management, self-sustainable energy, economic development, and gaining Northern expertise. Policy issues all to be considered are crown corporation versus Government department, debt cap limits, devolution and rate based financing.



Hydropower in the Northern Territories

There is vast potential for the development of hydropower in the Northern Territories for local supply as well as export to southern parts of Canada. There is a combined potential of over 33,000 MW of hydropower in Northern Territories: Northwest Territories – 11,500, Yukon – 17,600 and Nunavut – 4,300 MW that could be exploited in the longer term.

The Federal Jurisdiction

Canada's Energy Systems are Already Smart

Contributions by participants in the Ottawa “National” Canadian Energy Forum led to two key messages. The first is that Canada already has a highly functioning, multi-jurisdictional energy policy framework that mobilizes the power of private investment and competitive markets, and respects the roles of sub-national jurisdictions and our international partners. The second is that, partly for this reason, promises and expectations should be restrained about how much and how rapidly energy policy can deliver new and transformative changes in the pattern of Canadians’ energy use. The desire to receive new technologies and services affordably and abundantly along with achieving rapid reductions in emissions (and without needing to make difficult political choices) is at risk of outrunning reality. That “expectations gap” should not obscure the fact that Canada’s federal system works to deliver good, balanced energy policy choices across a nation that is highly diverse in its population, politics, topography and resources

Energy is a key economic driver in Canada, but given our resource endowment, the transition to a low-carbon economy based on clean, renewable energy will take longer than many expect. Climate change is a global issue that requires a global response, a global approach that is supported by all major emitters, not just the developed countries.

Canada is committed to harmonizing its energy and climate policies with the United States. This includes introducing vehicle emission regulations aligned with those in the U.S. Canada-U.S. collaboration is being advanced in three key areas recognizing that clean energy science and technology is a key driver for creating a low-carbon economy: clean energy research and development; development and deployment of clean energy technologies; and building a more efficient electricity grid based on clean and renewable energy.

The federal government has made major investments in clean energy at home, and is pursuing an international climate change strategy that is fair, effective and comprehensive. The transformation of our energy system will occur more quickly and easily if there is proper energy pricing and price transparency. Without proper price signals, consumers are less likely to change their behaviour. We cannot lose sight of the market, which effectively makes instantaneous adjustments.



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WORLD ENERGY COUNCIL
CONSEIL MONDIAL DE L'ÉNERGIE

Ottawa Headquarters
608-350 Sparks Street
Ottawa, Ontario K1R 7S8

T: 613-232-8239

F: 613-232-1079

brigitte.svarich@energy.ca

www.energy.ca

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