The Trottier Energy Futures Project

Setting the Stage for a Sustainable Energy Strategy: Canada's Necessary Opportunity






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1

Why energy is important to Canada, and Canada to energy

It is without question that the availability of energy is vital to the livelihoods of all Canadians. We rely on energy to feed ourselves, to provide us with shelter, to move ourselves and our goods, to enable us to produce a wide variety of products and services, to entertain ourselves, and to make a living. The energy system is key to Canada's future and opportunity.

Our energy system is also at the heart of one of humankind's most challenging problems – global climate change.

Energy production and distribution is important to Canada's economy, directly accounting for seven per cent of Canadian GDP in 2008,[1] and more than 15 per cent of GDP in three provinces (NL 26.9 per cent, AB 26.2 per cent, SK 17.1 per cent) in 2006.[2] Canada is in the business of trading energy globally, exporting $133 billion worth of energy in 2008 (a record 28 per cent of all merchandise trade), with a net trade surplus of $73 billion.[3] In 2008, about 363,000 Canadians – two per cent of the national labour force – were directly employed by the energy sector.[4] Many more are employed indirectly. Our abundant energy resources help Canadians live a high quality of life.

Intimately connected to the economics of energy is the issue of international competiveness. Global energy systems have evolved over the centuries with a number of distinct "transitions" such as coal being the main force behind the industrial revolution, or petroleum's dominant role with the rise of the internal combustion engine. The relative competitiveness, measured by economic and geopolitical power, of nation states has been marked by their ability to define and lead the next energy transition. Relative competitiveness is also defined by a country's "energy productivity" defined by the amount of energy required to create wealth. More efficient energy systems are more productive and therefore more competitive.

The imperative to reduce global greenhouse gas (GHG) emissions has sparked the next global transition in our energy system. The race is on to define and lead the next chapter in our shared energy future. The world's

National Investments in Clean Energy

Canada risks falling behind as many countries accelerate their investment in the low-carbon economy.

- The United States federal administration plans to outspend the Government of Canada 18:1 *per capita* on new renewable energy investment in 2010.[5] This is a further widening of the gap from the 14:1 investment differential seen in the two countries' 2009 economic stimulus plans.[6]
- According to analysis by HSBC, many countries have placed low-carbon investments at the heart of their economic stimulus spending. China allocated 37.8 per cent of its stimulus to low-carbon measures; South Korea 80.5 per cent; the European Union 58.7 per cent; and the U.S. 12 per cent. Canada, by contrast, has only devoted 8.3 per cent of its stimulus package to low-carbon investments.[7]
- Canadian federal investment in energy-related research and development has dropped steeply over the past 25 years, with almost 50 per cent less investment in 2003 compared to 1983.[8]

biggest economies – China, USA, and the EU – are all making significant financial and political investments into defining what will power the world in the century to come. Notably, each is pursuing substantial investments and installations of lower-impact energy technologies (see sidebar). Canada is well poised to join in this race and be a role model in both the development and deployment of lower impact technologies and in the stimulation of behavioural change.

Three reinforcing drivers are behind the global transition in energy:

1. Increasing demand for the services that energy provides, while the dominant non-renewable energy sources become increasingly challenging, risky, and costly to find and extract;
2. A strong concern for energy security demonstrated by countries' desire to be less dependent on foreign, and often unstable, sources of energy; and
3. The need to reduce the cumulative environmental impacts of energy extraction and consumption, particularly with regard to greenhouse gases and human-caused climate change.

Environmentally, the energy system is a major contributor to the stress on our ecological systems in ways that go well beyond climate change. The production and use of energy (i.e., the "energy system") is responsible for approximately 81 per cent of Canada's GHG emissions.[9] But the energy system is also the largest source of air pollutant emissions in Canada (86 per cent of NO_X, 60 per cent of VOCs, 50 per cent of SO_X, 28 per cent of $PM_{2.5}$ – the single largest source of each) and is also a significant source of air releases of several other toxic substances including benzene (~2/3) and mercury.[10] Our energy system is a major water user – power generated from fossil fuels makes the most substantial withdrawals; however, the use of water for the extraction of oil and gas is both significant and growing.[11]

As oil extraction increasingly shifts toward unconventional sources and more difficult-to-access conventional ones, costs of production are expected to rise.[12] Unconventional liquids (including biofuels) are projected to account for between 10 and 21 per cent of total world liquid fuels production by 2035, compared to five percent in 2008.[13]

Socially, big energy projects are sources of tension for many communities. In the Canadian North, the proposed Mackenzie Valley Pipeline has been in debate for more than 30 years, communities such as Fort Chipewyan, Alberta, are increasingly concerned about the impacts of oil sands development on their health and culture, and the review process is just beginning with the proposed Gateway pipeline to British Columbia's west coast. At the same time, well over a million Canadians continue to face "energy poverty"[14] while

globally, the World Bank estimates that 1.5 billion people have no access to electricity, with many more lacking access to a reliable supply.[15]

Canadians essentially assume reliable electricity. Our diversity of electricity sources provides incredible reliability and security, yet in certain regions of Canada there are increasing challenges of supply meeting demand. Significant opportunity exists to manage the demand side while strengthening our supply and distribution systems.

Canada is increasingly being seen as a global energy player due to our abundance of energy resources (see sidebar). It's up to us to determine whether we will only be a player in an energy era that's coming to a close, a player that will be able to extend the current era, or a player able to define and lead the next era. Canada can play an important role in global energy security; in fact, we have the resources and the people to play a very positive role. At the same time we must ensure we develop an energy system that meets our own growing demand in energy.

As noted above, we have begun a global transition in our energy system, and the way we access and use energy globally is changing. Systems are moving from higher-carbon to lower-carbon emitting technologies, from centralized sources to decentralized, and from energy efficiency being an afterthought to a core focus. The transition is probably most evident in the changing direction of capital investments. The United Nations Environment Program (UNEP) and Bloomberg New Energy Finance jointly reported that in both 2008 and 2009 the total investments (over $160 billion each year) made in renewable electricity generation (including large hydro) were larger than the total investments in fossil fuel–based electrical capacity.[22] In other words, for the first time globally, more capital is going into renewable electricity investments than non-renewable.

To take advantage of the opportunity before us, Canada needs to discuss and decide what kind of energy player we wish to be and become. We are one of the few industrialized economies to not have some kind of comprehensive energy policy or strategy. Given the importance of energy to Canada, and the relative abundance of supply we have available, an increasing number of people see this lack of coordinated planning as unacceptable.

In response, Canadians from all sectors – companies, industry associations, think tanks, government officials, NGOs, and First Nations – have initiated various discussions on a Canadian energy strategy. Encouragingly, there is a broad consensus that we need a Canadian energy strategy.[23] However, there is currently no consensus on what that strategy may include, how it might be implemented, or even how it would be developed.

Unique to the Trottier Energy Futures Project is the collaboration among the David Suzuki Foundation, driven traditionally by the environmental

- **OIL:** Canada is second only to Saudi Arabia in proven reserves, with 178.6 billion barrels, of which 173.2 billion (97 per cent) are in the form of oil sands. This represents 13 per cent of the world's proven reserves.[16]
- **NATURAL GAS:** Canada is the world's third-largest producer and second-largest exporter.[17]
- **URANIUM:** Canada has the third-largest uranium reserves in the world (behind Australia and Kazakhstan[18]) and is the world's largest producer, with 25 per cent of the world's total.[19]
- **HYDRO:** Canada is the second-largest producer, with over 70 GW of installed capacity.[20]
- **ELECTRICITY:** Seventh largest national system, with over 620 TWh generated annually.[21]

Lloyd's and Chatham House: "Energy security and climate change concerns are unleashing a wave of policy initiatives and investments around the world that will fundamentally alter the way that we manage and use energy. Companies which are able to plan for and take advantage of this new energy reality will increase both their resilience and competitiveness. Failure to do so could lead to expensive and potentially catastrophic consequences."[24]

imperative, and the Canadian Academy of Engineering, driven by its dedication to the application of science and engineering principles in the interests of the country and its enterprises. This paper will begin to explore how the Trottier Energy Futures Project is defining the challenge and immense opportunity of designing and implementing a Canadian sustainable energy strategy.

2

The imperative for a lower-carbon energy system

As global population and wealth have increased, we have cumulatively added stress to the planet's ecosystem. The strain on our water resources, land, and air is drawing increasing concern and demanding innovative solutions. But of particular concern to the Trottier Energy Futures Project are the clear indications of climate change and the accompanying opportunity for Canada to provide solutions to climate change. As a result, the project has defined as one of its primary goals the identification of energy strategies that enable us to "reduce Canada's emissions of greenhouse gases from all aspects of the energy sector with the target of 80 per cent below 1990 levels by 2050." By doing so, Canada can become a global role model in the sustainable production, distribution, and use of energy and ensure that Canadians have access to the energy they need to have a high quality of life.

The Trottier Energy Futures Project's concern with the reduction of greenhouse gas emissions is driven by the urgency expressed by climate scientists. *Urgency* is the word that climate scientists are now using to describe the sort of action needed to avert the worst impacts of global climate change. The national science academies of all the G8+5 countries have made a joint statement calling on their governments to "lead the transition to an energy efficient and low carbon world economy" and "agree … to adopt a long-term global goal and near-term [GHG] emission reduction targets that will deliver an approximately 50 per cent reduction in global emissions from 1990 levels by 2050."[25] People around the world need to take notice and respond with appropriate action. Why? Because the academies' conclusion is that "climate change is happening even faster than previously estimated" and that "the need for urgent action to address climate change is now indisputable."[26]

But it is not just the scientific community that is raising the alarm; experts in defence and intelligence are also drawing the connection between climate change and conflict. According to the U.S. Department of Defense:

> "Assessments conducted by the intelligence community indicate that climate change could have significant geopolitical impacts around the world, contributing to poverty, environmental degradation, and the further weakening of fragile governments. Climate change will contribute to food and water scarcity, will increase the spread of disease, and may spur or exacerbate mass migration. While climate change alone does not cause conflict, it may act as an accelerant of instability or conflict, placing a burden to respond on civilian institutions and militaries around the world. In addition, extreme weather events may lead to increased demands for defense support to civil authorities for humanitarian assistance or disaster response both within the United States and overseas."[27]

Faced with the threat of serious harm from climate change in this century, within the lifetime of today's children, decision-makers around the world have an obligation to act decisively. This decisive action must be focused on transitioning our energy system from carbon-emitting to non-emitting, given that the majority of GHG emissions from human activity are from the production and use of energy.[28] The level of urgency to transition our energy system is best summarized by the International Energy Agency's World Energy Outlook 2009:

> "The rate of growth of fossil-energy consumption projected in the Reference Scenario takes us inexorably towards a long-term concentration of greenhouse gases in the atmosphere in excess of 1,000 ppm CO_2-equivalent. The CO_2 concentration implied by the Reference Scenario would result in the global average temperature rising by up to 6°C. This would lead almost certainly to massive climatic change and irreparable damage to the planet."[29]

Canada, as a wealthy, highly developed nation,[37] carries an obligation to do its fair share in reducing emissions. Canada is a significant producer of GHG emissions, being the world's eighth-largest in absolute emissions, ninth most polluting on a per-capita basis, and 10th with respect to total cumulative emissions added to the atmosphere since 1850.[38] Reticence on the part of a country like Canada to be a leader in reducing emissions provides ready justification for less-developed countries to delay action, making it even harder to construct a global program of emission cuts that is up to the challenge.

In response, at their 2009 summit, Canada and other G8 leaders endorsed a goal of reducing developed country emissions 80 per cent by 2050, relative to 1990 or more recent years.[39] In this context, any forward-looking Canadian energy strategy must empower us to live fulfilling, high-quality lives while only emitting 118 megatonnes (Mt) of carbon dioxide equivalent annually.

The urgency of change

The leaders of the world's major economies have collectively agreed to a goal of limiting global warming to 2°C above the pre-industrial average[30] – an amount of warming widely regarded as a dangerous threshold.[31] This goal is also reflected in the Copenhagen Accord,[32] although the targets pledged to date do not yet reflect a pathway consistent with achieving that goal.[33]

Recent research has indicated that the climate system may be more sensitive to added greenhouse gas pollution than is currently assumed, leading to higher impacts for any given level of emissions.[34] Serious impacts on marine ecosystems have also led to calls from marine ecologists to stabilize CO_2 emissions at very low levels.[35]

The impacts of climate change are expected to last for hundreds to thousands of years. Therefore, limiting the magnitude of change by controlling emissions now is critical. As the U.S. National Research Council recently concluded, "future stabilization targets correspond to altered states of the Earth's climate that would be nearly irreversible for many thousands of years, even long after anthropogenic greenhouse gas emissions ceased."[36]

That's the maximum level of annual emissions that we must achieve by the year 2050 to do our fair share. To put this into perspective, our 2008 emissions were 734 Mt[40] – more than six times the annual emissions level we need to reach within the next four decades.

The high level of scientific consensus implores us to achieve at least this level of reduction. Although time is not on our side, technology is, as we already have multiple means by which we could conceivably achieve the deep reductions required. In coordination with the technology is the essential need to change our behaviour and relationship with energy. The Trottier Energy Futures Project will explore Canada's options to accomplish this significant, rapid, and prolonged reduction in GHG emissions while at the same time ensuring all Canadians have access to the energy services needed to enjoy a high quality of life. The project is driven to find Canadian opportunities to solve this difficult challenge.

Pathways to 2050

The UK Department of Energy and Climate Change (DECC) has produced a series of illustrative pathways based on existing technologies to meet the UK's goal of cutting emissions 80 per cent below the 1990 level by 2050.[41] Three common elements across the pathways are:

- Ambitious reductions in per-capita energy demand.
- Substantial electrification of heating, transport, and industry.
- Decarbonization of electricity generation, while possibly doubling supply.

The companion 2050 Pathways calculator tool allows users to create their own pathways by balancing levels of effort across different sectors while ensuring that energy supply meets demand.[42]

3

Energy as a complex system – there are no easy answers

If it were easy to transform a relatively inefficient and environmentally intensive energy system, we would have done it two decades ago or more when the risks of climate change were first becoming apparent.[43] The fact is, although the necessary technologies largely exist, implementing them and transforming the market is very challenging. Our energy system directly or indirectly impacts everyone, making it extremely political. It is a complex system – it is organic, unpredictable, and always evolving.[44] If we treat it otherwise, we run the risk of implementing poor and sub-optimal solutions.

The complexity of the energy system quickly emerges when one considers the diversity and interconnectedness of some basic but important questions:

- The core purpose of the energy system is to transform raw energy resources to useful services. Are we at a point that we require a fundamental paradigm shift in how we provide the services we need to live healthy and fulfilling lives and protect the future of the planet?
- There is often little consensus regarding the relative benefits and costs of different energy technologies; differing assessments can generate widely varying conclusions. Is it possible to come up with a complete and transparent assessment and evaluation of energy technologies?
- What is the true economic, environmental, and social impact of each of our energy options throughout their "life cycle"? How do the primary energy sources of biomass, uranium, coal, oil, natural gas, small/large hydro, wind, solar, and geothermal actually compare? What optimal combinations can be considered for the diverse regions of Canada?
- What are the boundaries for discussing our "energy system" – do we include food and the production of materials, or just heat, power, and mobility?
- Canada needs to ensure our own energy needs are met now and for generations to come, yet we are a major energy exporter. How are

our exports affected under a requirement to reduce emissions by 80 per cent below 1990 levels – and should that target include emissions from combustion of exported energy? When do our domestic needs or responsibilities take priority over the potential for export revenue? How do our trade agreements, such as NAFTA, affect our energy security?

- Our energy prices currently do not include a range of environmental and social externalities, but if they did, low- and fixed-income households would be financially affected the most. How do we deal with energy poverty and equity?
- All sources of energy have some form of environmental impact. How do we prioritize between impacts on climate, air quality, water resources, land, and toxins?
- How do we prioritize the needs of current generations against those yet to come?
- Energy resources are not equally distributed, so should their economic benefits also be unequally shared? What obligations do we carry to assist other less-developed countries to acquire a greater well-being, when the developed world has done so by appropriating much of the atmosphere's total carrying capacity for carbon?
- In Canada, every jurisdiction (federal, provincial, municipal, First Nations) has some claim to energy policy decisions. How can we best create effective plans that recognize the overlapping authorities of these different orders of government? What is the impact on government revenues, direct and indirect, with different energy systems?
- Some argue we need all forms of energy to meet the needs and wants of our growing global population, while others question whether the environment can sustain the impact of producing and consuming all forms of energy. What does "energy security" mean as a country, as a region, as a community, and as an individual? How does energy security compare in importance to environmental security, or are they equivalent?
- In the race to transition our energy system, how much do we invest in research, development, and commercialization of new technology and what technologies could be Canada's niche?
- Lower-impact energy technologies, as new entrants, face major hurdles of integrating into the incumbent system: They are often higher in capital cost but lower in fuel/operating costs. They need the electrical grid to be managed and prioritized in a different way as they are often intermittent versus on-demand. They often face the "chicken and egg challenge" (e.g., "There are no vehicles that can use this fuel so why

produce it? There is no fuel infrastructure so how do I sell the vehicle"). To what extent, and how, should public policy assist in overcoming these market barriers of lower-impact systems?

This is just a sampling of tough questions that decision-makers face, all with imperfect information and numerous trade-offs. Although it is important that we discuss, research, and debate these issues, we cannot afford to wait for perfect analysis to move ahead in deciding our energy future. The Trottier Energy Futures Project will endeavour to evaluate many of these questions, working with Canadians from all sectors to put the best information and analysis available before decision-makers so they can act swiftly.

Critical to success is taking a "systems approach" to evaluating options and making decisions. The systems approach on energy was very well defined by Canada's National Advisory Panel on Sustainable Energy Science and Technology:

> "In general, a systems approach involves defining objectives for the system and then looking at the ways they might be achieved by exploiting potential synergies between elements of the system or by finding new ways to overcome existing barriers. Too often in the energy sector, we look at individual energy resources and their associated technologies in isolation from one another, rather than taking such a systems view. A systems approach would enable us to readily identify those energy technologies that could be developed to maximize the benefits we realize from our varied portfolio of energy resources, energy carriers and end uses of energy."[45]

The Trottier Energy Futures Project will tackle the energy system's complexity by constantly bridging technology with human behaviour. Although much of the technology we need to radically improve our energy system exists, there is a significant gap in its fit and application within our current consumer behaviours and market. As a result, our technologies for transforming primary energy sources (fossil fuels, solar, biomass, hydro, wind, uranium) to the energy services we demand (heat, torque, power) must be advanced through research and development, engineering, and commercialization. At the same time, our consciousness and behaviour in how we use energy must change significantly in order to maximize conservation, efficiency, and widespread commercialization of more sustainable sources of energy. The opportunity for Canada's transformation to a better energy future is massive and will require simultaneous attention on both technology and behaviour. To get there we must actively engage with Canadians on energy and the total energy system that underpins our way of life today and in the future.

4

Collaboration is the only path to a meaningful sustainable energy strategy

While there is broad agreement on the need for a long-term Canadian energy strategy for Canada, there is no consensus across sectors or jurisdictions on what this strategy might consist of, or even how best to develop one. Given the complexity of the energy system and the impact energy has throughout society, the development and implementation must involve as many Canadians as reasonably possible. The more we involve a diversity of sectors and people in the process, the greater the likelihood of actual and successful implementation. People need to see themselves within Canada's energy future while understanding the urgency to reduce GHG emissions.

To get there, we must design and follow through on a process that is aligned with at least four key principles:

1. **Participation and inclusion of diverse opinions:** Canadians take pride in the diversity of our population. To solve the challenge of rapidly transitioning our energy system, we will need ideas and engagement from all backgrounds and regions. This will only happen if we empower people through a participatory process where everyone can see how their input will affect the decisions.
2. **Transparency in decision-making:** As citizens of a democratic country with a strong civic tradition, Canadians expect decisions on important and contentious matters to be made in an open and transparent manner. If an energy strategy is to gain the trust of Canadians, the process must ensure that the public can see what decisions were made, and how and why.
3. **Science-based and objective analysis:** Canadians largely value rational and objective evaluation, drawing on our world-class scientists and engineers. Actions are most effective and lasting when they are founded on facts and informed judgement rather than ideology and wishful thinking, and Canadians expect our decision-makers to draw on the best science and engineering knowledge available.

Lloyd's and Chatham House: "Without an international agreement on the way forward on climate change mitigation, energy transitions will take place at different rates in different regions. Those who succeed in implementing the most efficient, low-carbon, cost-effective energy systems are likely to influence others and export their skills and technology. However, the lack of binding policy commitments inhibits investor confidence. Governments will play a crucial role in setting policy and incentives that will create the right investment conditions, and businesses can encourage and work with governments to do this."[46]

4. **Accountability in implementation:** When faced with an urgent challenge, Canadians expect action, and decision-makers must be accountable for taking the action that they have committed to. As the energy strategy is implemented, clear accountability must be defined for each step, and progress (or lack of it) must be fully reported.

The design and execution of the process itself is essential for its success. Drawing on the experiences – both good and bad – of developing public policy that cuts across so many aspects of Canada, we expect the process of developing a Canadian energy strategy to at least include:

- Expert evaluation through "Blue Ribbon Panels" to ensure an objective and consistent evaluation framework is applied;
- Citizen engagement through public town halls, workshops, and debates using both in-person and online formats;
- Mechanisms to ensure implementation over the long term and regular reporting to the public on progress;
- Ongoing attention by First Ministers through regular meetings, as well by other key decision-makers in Canada's energy system.

Any successful process needs leadership. To achieve the development and implementation of a truly pan-Canadian energy strategy, there is a need for leadership from both the federal government and provincial/territorial governments. Industry, the non-profit sector, municipalities, and First Nations all need to help by bringing their own leadership, but ultimately the federal and provincial/territorial leaders must take the lead.

5

Defining a sustainable energy strategy in Canada

Complex systems can be overwhelming, and often the only practical approach is to simply start somewhere and constantly be open to evaluation and refinement. Presented here is our current perspective, at least directionally, of a definition for a Canadian sustainable energy strategy for Canada. Our vision will evolve as we move forward with analytical work (technological, economic, environmental, social) and engage Canadians from all sectors, but we must start with a clear sense of direction.

We envision Canada making a timely transition, between now and 2050, from our current inefficient use of energy and our production of relatively high-impact and carbon-intensive energy resources to a Canada that stands proud as one of the most efficient users of energy and the lowest-impact producers of energy resources in the world. We want to see Canada recognized as a global role model in the sustainable production, distribution, and use of energy resources.

This vision drives the mission statement for a Canadian energy strategy:

> To define and effect the transition of our energy system to an optimal mix of energy sources, distribution, efficiency, and conservation that delivers a truly sustainable (technologically, economically, environmentally, and socially) energy system that positions Canada as a global role model.

The focus is on the transition to a sustainable energy system that:

- Provides the services of energy to meet the needs of people today – as well as those of future generations – in an accessible, equitable, and efficient manner;
- Emits a net volume of greenhouse gases consistent with keeping the global average temperature at less than 2°C above the pre-industrial level;[47]
- Protects or restores the Earth's air, land, and water resources throughout its life cycle;

- Is safe today and results in minimal burdens of risk for future generations.

To make this transition we will have to question our current assumptions about energy supply, energy exports, what our needs for energy services are, and the technology we employ to serve these needs.

Given the complexity of the system and its dynamic character, we cannot afford to wait for perfect analysis before we act. Leadership, especially at the provincial and federal level, will be required to set priorities, take risks, and make decisions without complete information and analysis. Given the urgency to decarbonize our energy system, early action is essential.

6

Talk is easy, action is essential

As important as the process design is, we cannot fall into the trap of "paralysis through analysis" or being satisfied by process. The likely climate change–related costs of inaction, or simply action that happens too slowly, are economic, social, and environmental.[48, 49] A Canada that acts swiftly and strategically will create significant economic, social, and environmental opportunities for generations to come.

As a result, identifying an optimal sustainable energy strategy for Canada is only part of the job. Implementation – that is, action – is critical. Talk is important, but nothing will actually change until we engineer and build things differently, and until we align consumer behaviour with the scale of the challenges we face.

Canada will not be able to make the transition all at once; progressive steps will be the rule. To take meaningful action, leaders must set priorities. Some areas of a sustainable energy strategy are well understood, have been studied and evaluated, and simply need to be acted upon. Energy efficiency and conservation are prime examples. It is already clear to all that eliminating waste in the energy system will be a core component to any sustainable energy strategy, so swift action can and should be taken on this front. Other parts of the energy system require deeper analysis and debate, but they are not all equal in economic or environmental importance. The first step will be to set priorities for further understanding, debate, and action.

In short, we cannot wait for a perfect energy strategy to be finalized before taking meaningful action. Action must run parallel with prioritized deliberation if we are to achieve the GHG reductions we must reach by 2050. The energy strategy, to be successful, will require constant attention. It must be reviewed regularly, updated, and improved upon over the next 40 years to ensure it delivers the vision.

Canada's National Advisory Panel on Sustainable Energy Science and Technology:

"Canada's enormous wealth of energy resources is and will remain a key element of our prosperity and a major geopolitical advantage for the country. However, this wealth has made us complacent: It has masked major vulnerabilities that must be addressed, and unique opportunities that must be realized if Canadians are to reap the full benefits of their energy endowment in the years to come. A major effort to develop new energy technologies and new methods for fostering their development and application in Canada will be critical to achieving this goal and determining our energy future."[50]

7

The role the Trottier Energy Futures Project is prepared to play

In partnership with others, the Trottier Energy Futures Project will help Canadians work through the tough energy questions we face. We will push the envelope of debate and discussion to ensure priorities are set and followed through on. Over the next five years, a time that is critical for Canada to embark on its global responsibility to deeply reduce GHG emissions, we will apply the best available science, engineering, and public engagement to help all leaders make the public-policy decisions that will ultimately determine Canadians' quality of life and Canada's place in the world.

The Trottier Energy Futures Project is committed to applying the core principles of diverse participation, transparency, science-based analysis, and accountability to help all interested parties work toward the design, development, and implementation of a successful sustainable energy strategy for Canada.

The first phase of the Trottier Energy Futures Project will include a project definition study to ensure the project scope allows for the fullest examination of the critical issues, measures, and impacts of a sustainable energy system. The project will start with a comprehensive evaluation of Canada's current energy systems including electricity, transportation, process energy, and heating. We will seek to include all the significant work already done in specific disciplines, and build on the excellent foundation of work that exists in Canada.[51] Beyond this, our objective is to ensure that the project will produce new, important, and credible information that can advance thinking and action on implementing a sustainable energy system for Canada.

For the success of this project, consolidation of a sustainable energy strategy for Canada can only be part of the solution. Throughout this project we recognize the crucial importance of encouraging an open dialogue with Canadians on energy issues. We can only expect confidence in, and support

for, a Canadian sustainable energy system if we proceed in an open and inclusive manner. By doing high-quality work in a transparent and open manner we will facilitate the development of implementation plans. We seek to develop the necessary stakeholder commitment needed to ensure that implementation of a sustainable energy future for Canada is started.

NOTES

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