

Canadian Politics and Public Policy

# Policy



Sustainable Energy

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“Our project will add over \$4 billion into the B.C. economy. Think of what that will mean for our schools, hospitals and social programs.”

- Janet Holder, Leader of Northern Gateway



**Janet Holder:**

*Janet Holder is responsible for the overall leadership of the Northern Gateway Project. With over 20 years of experience in the energy sector, she has held a variety of senior and executive roles in liquids pipelines, energy efficiency and energy distribution. As a proud British Columbian, Janet works hard to ensure Northern Gateway will be a safer, better pipeline with lasting benefits for B.C.*

Over the past several months, I have shared our priority to ensure we protect what matters most to all of us — our beautiful coastline and environment. Our world-class safety and response measures are vital for the approval and success of the Northern Gateway Project — a project that will pave the way for significant economic benefits to help us build a stronger future for B.C. and for Canada.

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Ensuring that the economic benefits of the Project are also shared with Aboriginal communities is hugely important to us. In discussions with First Nations and Métis communities, we have offered a 10% equity stake in the pipeline. Additionally, there will be an estimated \$300 million in Aboriginal employment and contracts, plus related economic activity, adding up to nearly \$1 billion in total long-term benefits for First Nations and Métis communities and businesses.

— **Jobs and opportunities for families** —

To build this Project, we will create employment that will especially benefit communities along the pipeline's route. In fact, we are already helping to connect local residents to future employment and business opportunities, and offering education and skills development. There will be 560 long-term jobs created in B.C., and our plans call for the hiring of 3,000 construction workers. These jobs will create new sources of income for the workers' home communities. It is expected that each year \$32 million in income will be earned, which will have a profound and lasting impact on B.C. families.

— **An investment in the future while protecting what matters to us most** —

As a proud British Columbian and Canadian, I am motivated every day to ensure these economic benefits never come at the expense of our incredible environment. Let me assure you that my team and I are working hard to meet all of the 209 conditions set out by the Joint Review Panel, to ensure we build not only a safer, better pipeline, but a stronger, better B.C.



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# Policy

*Canadian Politics and  
Public Policy*

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## In This Issue

### 2 From the Editor: Sustainable Energy



Solar panels: Part of clean electricity. ABB photo

### COVER PACKAGE:

- 3 David McLaughlin**  
Same Song, Different Harmony: Canada-US Climate Policy
- 8 Clare Demerse and Dan Woynillowicz**  
A New National Prize: Making Clean Energy the Next Oil Sands
- 12 John Barrett**  
Nuclear Science and Technology: A Public Good?
- 16 Bob Fesmire**  
The Future of Transport is Electric, and It's Already Here
- 19 Greg Rickford**  
A Vision for Responsible Development of Canada's Resources
- 22 Tom Mulcair**  
A New Vision for Canada's Energy Future
- Pierre Meulien**  
**25** Genomics and Energy: Harnessing the Power of Biology to Develop Clean and Sustainable Systems
- Dan Gagnier**  
**28** Canada's Economic-Energy Conundrum: EPIC's Contribution to a National Discussion
- 32 Jim Prentice**  
Energy and the Environment: Two Sides of the Same Coin
- 35 W. Scott Thurlow**  
A Road to Clean Renewable Fuels
- Dan Wicklum**  
**39** Canada's Oil Sands Innovation Alliance: Collaboration for the Good of the Environment



From the Editor / L. Ian MacDonald

## Sustainable Energy

Welcome to our second annual full issue on sustainable energy. Clean energy is not an oxymoron. As Jim Prentice, a former federal minister at both Industry and Environment, writes in this issue: "If you are in the energy business today, you are in the environment business. They are two sides of the same coin."

There's no doubt that Canada has an abundance of resources—with proven oil reserves of more than 170 billion barrels, and perhaps twice that in potential yield, and some 1,300 trillion cubic feet of natural gas, a 200-year supply. We also have a huge market in the United States, to whom Canada supplies 27 per cent of their oil imports, 85 per cent of their gas imports, and 100 per cent of their electricity imports. A single Canadian pipeline company, Enbridge, ships more oil to the US than does Saudi Arabia. But the US also accounts for more than 99 per cent of our energy exports, and there is general agreement on the need to diversify markets for Canada's resources, while developing them in a sustainable manner.

To begin, David McLaughlin considers the alignment between Canada and the United States on meeting the Copenhagen target of reducing GHG emissions to 17 per cent below 2005 levels by 2020. While the targets are voluntary, Canada now seems unlikely to meet them, writes McLaughlin, former president of the National Round Table on the Environment and the Economy (NTREE), which was phased out by the Harper government in 2012.

Then, Clare Demerse and Dan Woy-nillowicz of Clean Energy Canada make a compelling case that clean energy could become the next oil sands—a leading sector of the Cana-

dian energy space. They note that the International Energy Agency predicts climate change will "require mobilizing US\$36 trillion in clean energy investments by 2050," providing a huge export opportunity for Canada in both goods and services.

Canadian Nuclear Association President John Barrett argues for the importance of maintaining public research facilities such as the National Research Council's facility at Chalk River, Ontario. "Even the largest companies will not build research reactors for their own use," he writes, "but they will use them if they exist."

Wondering about the future of transport? Bob Fesmire writes that it's in electricity, and already here in segments such as electric vehicles (EVs), and the electric-powered shipping industry, notably cruise ships. "There's a quiet revolution going on in transportation," writes Fesmire, co-author of *Energy Explained*, a non-technical introduction to the energy industry.

Natural Resources Minister Greg Rickford shares the Conservative government's agenda for responsible development of Canada's abundant resources. Priorities include accessing new markets, enhancing safety and environmental regulation, forging strong relationships with aboriginal peoples and investing in innovation. As he also notes: "Canada has developed one of the world's cleanest electricity systems, with over 75 per cent of our supplies coming from emission-free sources: hydropower, nuclear and non-hydro renewable energy."

NDP Leader Tom Mulcair offers a reply from the Official Opposition on the imperatives of clean energy. Quite simply, he writes, "It's time to start enforcing basic rules of sustainable development, like polluter-pay." In this way, he argues, environmental

clean-up costs would not be passed on to the next generation.

Genome Canada President Pierre Meulien writes of the role of genomics, "reading the DNA embedded in an organism," in helping Canada's energy patch achieve greener production and extraction of hydrocarbon energy. "The sector's sustainability issues need to be addressed on an urgent basis," he concludes, and energy companies and government policy makers need to work together to make it happen.

Contributing Writer Dan Gagnier, chair of the International Institute of Sustainable Development, sums up the legacy of the Energy Policy Institute of Canada (EPIC), of which he was president, and which brought together leading stakeholders from the energy sector with federal, provincial and territorial governments. While EPIC wound up its work at the end of July, some of its initiatives remain worthy works in progress, while the issues of global warming and climate change are more urgent than ever.

Scott Thurlow, president of the Canadian Renewable Fuels Association makes the case for biofuel as the cleanest source of fuel available. "The priority we place on sustainability and innovation," he writes, "will ultimately determine our long term prosperity."

Finally, from the Canadian Oil Sands Innovation Alliance, which represents 13 oil sands producers, its president Dan Wicklum writes of the unprecedented sharing of research to improve environmental performance in the oil sands. Much of this innovative technology can also be exported. **P**





President Obama and Prime Minister Harper in a relaxed moment at the G8 summit at the presidential retreat at Camp David, Maryland in 2012. In their 17 bilateral meetings since 2009, there have been many conversations about the Canada-US Clean Energy Dialogue. PMO photo

# Same Song, Different Harmony: Canada-US Climate Policy

David McLaughlin

*Canada has aligned its 2020 greenhouse gas reduction target to match that of the United States. Both countries pledged in early 2010 to reduce GHG emissions by 17 per cent below 2005 levels by the year 2020. Canada is currently forecast to get only about halfway to that target. The United States is now projected to either achieve its target or come close as it takes significant new actions on curbing coal emissions. Why the difference in progress? Shared targets do not take into account different energy producing economies and electricity generating mixes. Despite the same emission reduction targets, alignment by Canada with the US has actually stalled progress domestically. Its purpose as a political goal to convey shared commitments has in practice meant that Canada will neither exceed nor move faster than American efforts. But the US is moving faster than anticipated. It is time to rethink this approach.*

Copenhagen in the winter of 2009 was meant to be the place and moment where the world took decisive action against climate change. It turned out differently. Gathering at the United Nations 15th Conference of the Parties meeting, leaders could not agree on a coordinated binding approach to reduce greenhouse gas emissions to a point where 2 degrees Celsius of warming—the projected level at which dangerous climate change would occur—would be avoided. Instead, the resulting Copenhagen Accord only required countries to make voluntary pledges to reduce emissions by 2020. Each country would submit its commitment to the UN before the end of January, 2010. Canada duly did so. It submitted the same target as the United States of reducing emissions by 17 per cent below 2005 levels by 2020. Alignment was now policy.

Less than three years earlier, in the

spring of 2007, climate policy alignment with the US was not even on the radar screen. The federal government's *Turning the Corner* plan made no mention of matching our climate policy with that of the United States. Heavy industrial emitters would be regulated and fuel efficiency standards for automobiles and energy efficient light bulbs were to be mandated as part of achieving a new, non-Kyoto Protocol GHG target. That target was to be 20 per cent below 2006 levels. The table at right shows Canada's changing climate targets and how they equate to different baseline years. A diminution of ambition and effort is the result.

The rationale for alignment with US climate targets was both political and economic. President Barack Obama's election in November, 2008, with his commitment to climate change, offered a political lodestone for the government of Prime Minister Stephen Harper to show, first, it cared about the issue and, second, secure political cover in staying close to the new president's efforts. The economic dimension was already rearing itself in the global recession then beginning in the wake of the financial meltdown. Environmental concerns plummet as economic concerns rise among voters in both the US and Canada.

**Why move more or faster than the US if they were not prepared to do the same? With the collapse of momentum around global climate talks, aligning with the US seemed a safe anchor for Canadian policy.**

Embedded in this economic concern was the integrated nature of the Canadian and American economies. Competitiveness losses for emissions-intensive, trade exposed (EITE) sectors (which represent about 11 per cent of Canadian emissions) and companies in Canada over moving too fast to impose carbon reduction costs loomed large in the debate. Why move more or faster than the

TABLE 1: Canada's changing climate targets for 2020

Target 2020	Kyoto Protocol	Turning the Corner	Copenhagen Accord
Relative to 2005 Levels	N/A	N/A	<b>6% Below</b>
Relative to 2006 Levels	21% Below	<b>20% Below</b>	3% Below
Relative to 1990 Levels	<b>17% Below</b>	15% Below	3% Above
* Canada's Kyoto target for 2012 Official targets for each policy approach is in bold.			

US if they were not prepared to do the same? With the collapse of momentum around global climate talks, aligning with the US seemed a safe anchor for Canadian policy.

With alignment, Canada sidestepped away from its previous *Turning the Corner* plan, which proposed a possible cap-and-trade carbon emissions reduction scheme. Now, a sector-by-sector regulatory approach would be pursued. The first set of regulations reinforced the alignment approach with matching fuel efficiency standards for automobiles and later light trucks. Given the integrated automobile parts and manufacturing sector across the two countries, this made sense.

**With alignment, Canada sidestepped away from its previous *Turning the Corner* plan, which proposed a possible cap-and-trade carbon emissions reduction scheme.**

Canada's next move in early 2012 was to regulate new coal-fired emission plants for electricity generation. Its motive was clearly stated in the Regulatory Impact Assessment published at the time: "The Government of Canada is also following an approach to climate change that is broadly aligned with that of the US." Coming into effect in July, 2015, the regulations apply a performance standard to new coal-fired generating units and old units that have reached their end of useful life. A cumulative reduction of 219 Mt in CO<sub>2</sub> reductions over the 20-year period from 2015-2035 (16,000 KWH to 4,000

KWH of capacity, appx) is projected with what turns out to be a somewhat tougher standard than the Environmental Protection Agency (EPA) announced in late 2013 that it is putting in place for US new builds.

So far—to 2012—alignment was not unduly hampering Canadian climate policy. However, this changed with President Obama's re-election in 2012 and his renewed commitment to act on climate change in his second term. Two new sets of EPA regulations dealing with carbon pollution from coal plants have followed in swift succession, setting standards for emissions from both new builds and existing coal-generated electricity facilities.

The difference is not so much in approach—both countries are relying on performance standards set by regulation rather than overt carbon pricing regimes—but in focus, scale, and impact. US efforts are focusing on its major source of carbon emissions; tackling both new *and* existing coal-generated plants; and taking it a long way towards achieving its 2020 target. Canada cannot say the same.

Table 2 illustrates the similarities and differences in climate policy approaches by the two countries.

It is clear that Canada has adopted a broad definition of alignment but not necessarily harmonization. Alignment in targets is not proving to be harmonization in timetable, measures, or progress towards targets.

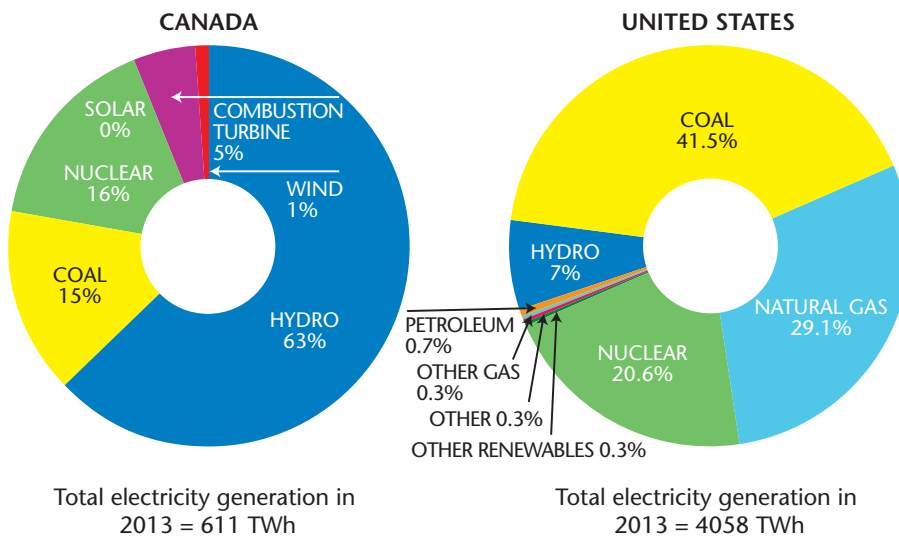
Three factors explain this. Canada simply does not match the US on our energy and electricity producing sectors profile, GHG



**TABLE 2: Similarities and differences in climate policy approaches by Canada and the US**

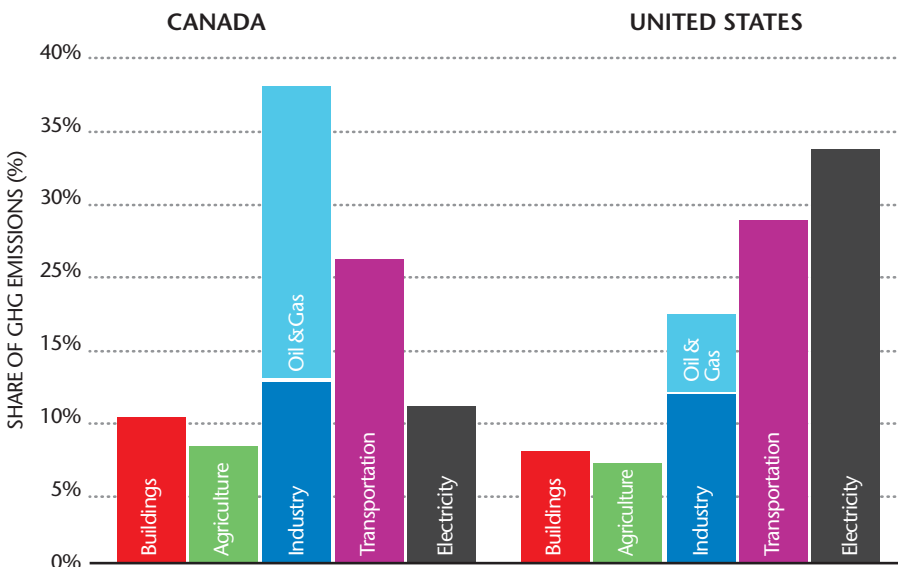
		APPROACH	SECTOR				PROGRESS
			AUTOMOTIVES	LIGHT DUTY VEHICLES	NEW COAL-FIRED PLANTS	OLD COAL-FIRED PLANTS	
Canadian Policy	TARGET: 17% BELOW 2005	• Sectoral • Regulatory	Same	Same	Higher ↑	Lower ↓	✗ 50% to Target
US Policy		• Regulatory • Subsidies	Same	Same	Lower ↓	Higher ↑	✓

**FIGURE 1: Electricity generation in the US and Canada by fuel type 2013**



Sources: US Energy Administration information, *Electric Power Monthly* and Statistics Canada CANSIM 127-0002. May, 2014

**FIGURE 2: 2011 Emissions by sector, Canada and the US**



Sources: Environment Canada and US Environmental Protection Agency as published by Pembina "Context for Climate Action in Canada" by P.J. Partington and Clare Demerse.

emissions sources and oil and gas sector growth, and the cost of reducing emissions. These differences were not enough to stifle alignment but have proved sufficient to stall harmonization. Let's take each in turn.

**Canada's predominant generation fuel is hydro, accounting for 63 per cent of electricity generation in 2013 compared to only 7 per cent in the US. On the other hand, coal accounted for 41.5 per cent of generation in the US compared to only 15 per cent in Canada.**

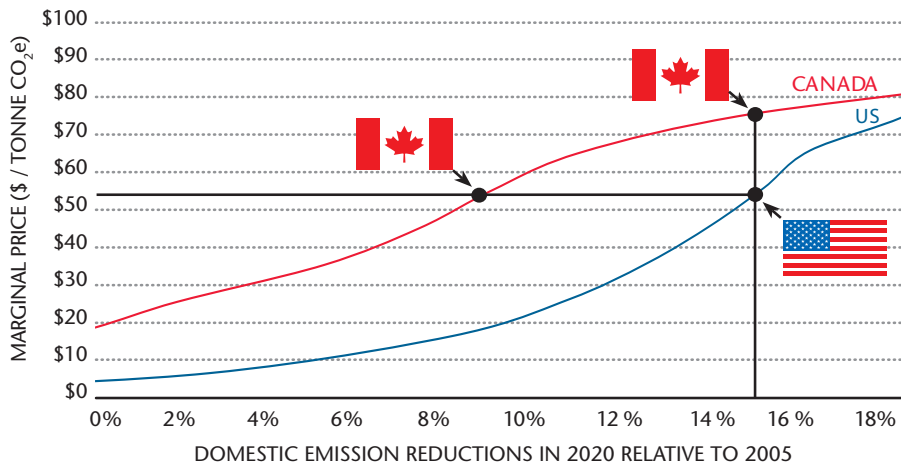
First, energy sources. Canada's predominant generation fuel is hydro, accounting for 63 per cent of electricity generation in 2013 compared to only 7 per cent in the US. On the other hand, coal accounted for 41.5 per cent of generation in the US compared to only 15 per cent in Canada. Still important in Canada, it proportionately contributes over two and half times as many emissions in the United States.

Second, GHG emission sources and oil and gas sector growth. While both countries share the same amount of emissions from transportation (28 per cent) and agriculture (10 per cent) a starker difference emerges on electricity and power generation emissions. In the US, 32 per cent of carbon emissions came from this sector compared to about 13 per cent in Canada as can be seen in figure 2.

**Emissions from the oil sands sector are forecast to grow about 65 per cent from 2005 to 2020, virtually swamping growth in all other sectors of the economy. Put another way, emissions from the electricity sector are forecast to decline by 38 Mt while oil sands emissions are to rise by the exact same amount, cancelling any gains.**

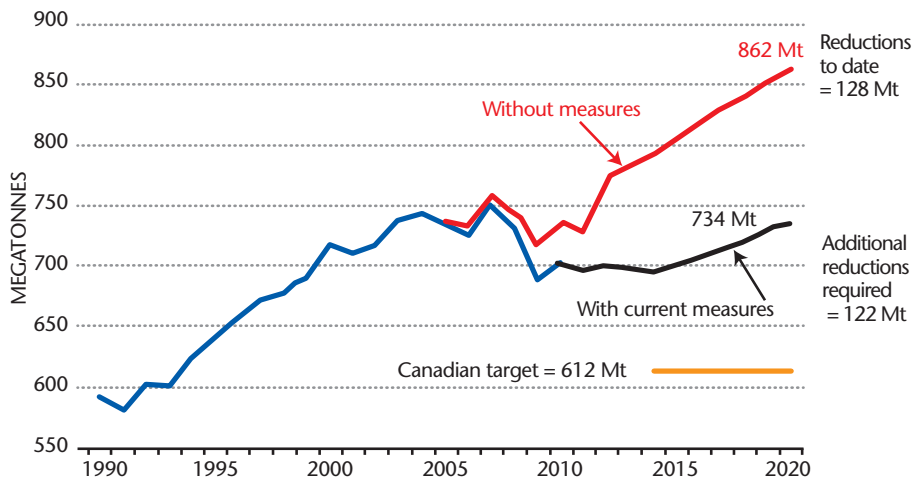
Figure 2 also shows the vast difference between the Canadian and American oil and gas sector emissions. That sec-

FIGURE 3: Canada harmonizes on carbon targets vs. price with US



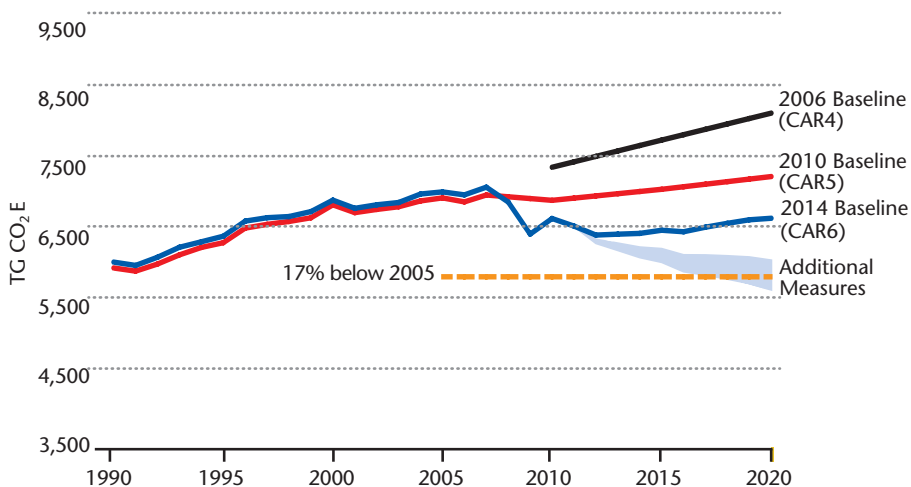
Source: National Round Table on the Environment and the Economy, Parallel Paths: Canada-US Climate Policy Choices "Figure 14c: Canada harmonizes on carbon targets vs. price with US, 2011, pg. 73.

FIGURE 4: Scenarios of Canadian emissions to 2020 (Mt CO<sub>2</sub>e)<sup>2</sup>



Source: Environment Canada, Canada's Emissions Trends, 2013, pg 4

FIGURE 5: Comparison of gross GHG emission projections from previous US climate action reports



Source: United States Climate Action Report, 2014, pg. 20

tor accounts for almost a quarter of Canadian emissions but only about 6 per cent of American emissions. To compound matters, emissions from the oil sands sector are forecast to grow about 65 per cent from 2005 to 2020, virtually swamping growth in all other sectors of the economy. Put another way, emissions from the electricity sector are forecast to decline by 38 Mt while oil sands emissions are to rise by the exact same amount, cancelling any gains.

Taken together, the differing energy and emissions profiles and trajectories add up to the third factor: cost. With most of our energy and electricity production already clean and oil sands growth the single-largest emissions growth sector, the cost of removing a ton of carbon in Canada is higher than in the US. Many (although not all) of the low-cost reductions with a carbon price of \$50 per tonne or less are spoken for; to reduce carbon emissions from the oil sands likely requires very expensive technology such as carbon capture and storage with carbon prices exceeding \$100 per tonne. In short, Canada must make a trade-off between higher costs and more emission reductions or lower costs and fewer emission reductions.

**The US is going after its biggest carbon emitting sector—coal power plants—while Canada will not move on its biggest and fastest growing carbon emitting sector—oil and gas and the oil sands—until and unless the US does so “in concert” (as the prime minister put it) with Canada.**

Put these elements together and several conclusions are now obvious:

First, the US is going faster and further on emissions reductions than Canada. Combined with lower economic growth and resulting emissions during the recession, it has a much better chance of achieving its 2020 target than does Canada as figures 4 and 5 show.

Second, the US is going after its big-

gest carbon emitting sector—coal power plants—while Canada will not move on its biggest and fastest growing carbon emitting sector—oil and gas and the oil sands—until and unless the US does so “in concert” (as the prime minister put it) with Canada. “The integration of our economies suggest our countries should be taking action together, not alone.”, stated Environment Minister Leona Aglukkaq. Regulations first promised in 2008 are nowhere in sight.

Third, however phrased, alignment, harmonization, or in concert is not proving a viable pathway to achieving targeted carbon emission reductions in Canada and is demonstrably shackling Canadian action.

**T**he perceived competitiveness risks in acting by Canada—dampening economic growth in the oil and gas sector and imposing higher energy costs on businesses—has won out over acting to meet the Copenhagen target. The unanticipated economic cost of delaying those actions—manifesting itself in the Obama administration’s severe reluctance to approve the Keystone XL pipeline from Alberta to the Gulf Coast—was not taken into account. Canada continues to export

its unconventional crude oil at a discounted price to refiners than what it would have been able to gain with KXL in place.

**Delay in acting on reducing emissions means that a higher carbon cost will be paid in the future to either meet targets quickly instead of transitioning over a decade or longer, not to mention the higher volume of carbon pumped into the atmosphere affecting climate change.**

Delay in acting on reducing emissions means that a higher carbon cost will be paid in the future to either meet targets quickly instead of transitioning over a decade or longer, not to mention the higher volume of carbon pumped into the atmosphere affecting climate change.

**B**ut policy is now firmly constrained by politics. A new federal government taking office next year with a determined view to achieve Canada’s 2020 target in just five years, would find itself in exactly

the same position as the Harper government inherited in 2006 when it had six years to meet Canada’s Kyoto target. Not enough time to meet targets at an acceptable economic cost. The cycle would simply repeat itself.

So, what is needed? A Canada-first climate policy with a realistic, GHG emission target extending beyond 2020. De-linking us from the United States opens up more viable options for reducing our own emissions on a realistic timetable. Dropping the 2020 target gives us more time to get those emissions reductions at a more acceptable economic cost.

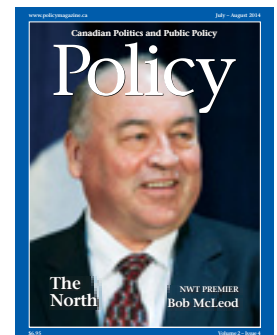
This is heresy today to all sides of the climate debate: environmentalists, liberals, social democrats, and conservatives. But it is inevitable. Next year’s COP 21 climate conference in Paris falls just after the expected election here. Our next government cannot avoid a decision. **P**

*David McLaughlin is Strategic Adviser on Sustainability at the University of Waterloo. He is a former President and CEO of the National Round Table on the Environment and the Economy. Eryn Stewart, Bachelor of Environment student, assisted with research for this article. david.mclaughlin@uwaterloo.ca*

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The world's largest vertical axis wind turbine at Cap Chat, Quebec. Wind is becoming a more significant part of Quebec's energy supply. Shutterstock photo

# A New National Prize: Making Clean Energy the Next Oil Sands

Clare Demerse and Dan Woynillowicz

*It took a critical mass of innovation, commercial viability and political will to make Alberta's oil sands the focus of Ottawa's energy policy. The same factors are converging now to make clean energy the next energy industry Cinderella story. Canadians have said they want cleaner energy, and they've said they'll pay for it, which should make the political argument clear. The rest is about vision.*

When oil patch veterans tell the story of how Canada's oil sands grew up, their history usually highlights the ingenuity and investment of pioneering companies like Esso, Suncor and Syncrude. Little wonder, then, that most Canadians aren't aware of the significant role that the federal government played in building this industry.

In the mid-1990s, government and industry experts saw that a confluence of forces—growing global oil demand,

increasing oil prices, and technology breakthroughs—could unleash oil sands development. The industry was on the cusp of growth, but its success was far from a sure thing.

In response, the Alberta Chamber of Resources convened a National Oil Sands Task Force—a collective of industry and government representatives—to align private and public sector efforts to turn this opportunity into reality. In the task force's view, the oil sands were the new “national prize,” and their development represented a “new energy vision” for Canada. The task force presented a framework for oil sands growth based on a “collaborative alliance” of government and the private sector.

Ottawa responded. From support for research and development to direct investment, to various direct and indirect subsidies, federal support became a key ingredient of the industry's success.

Why recount this history in an article about the future of clean energy in Canada? Because the clean energy sector now finds itself in a remarkably similar situation to that of the oil sands 25 years ago. The forces at play today include technology and cost breakthroughs that make clean energy increasingly competitive, as well as a rapidly growing domestic and global market for clean energy solutions fuelled by governments' and citizens' desire to reduce carbon pollution.

**The forces at play today include technology and cost breakthroughs that make clean energy increasingly competitive, as well as a rapidly growing domestic and global market for clean energy solutions fuelled by governments' and citizens' desire to reduce carbon pollution.**

According to *Bloomberg New Energy Finance*, investors poured \$207 billion into clean energy deployment around the world in 2013. In Canada, investment hit

**The International Energy Agency calculates that avoiding serious climate disruption will require mobilizing US\$36 trillion in clean energy investments globally by 2050. This would create an immense export opportunity for Canadian clean energy companies.**

\$6.5 billion—ranking us 7<sup>th</sup> among G20 countries for clean energy investment. And because clean energy technology costs are dropping, dollar for dollar, this investment is building more clean energy capacity than ever. For example, *Bloomberg* has tracked a more than 75 percent drop in solar module prices since 2008. It's little wonder that 2013 marked the first time solar power received more investment than any other renewable energy technology.

The International Energy Agency calculates that avoiding serious climate disruption will require mobilizing US\$36 trillion in clean energy investments globally by 2050. This would create an immense export opportunity for Canadian clean energy companies. So, choosing renewable energy here in Canada is not just about cleaning up our own power grids, but about developing technologies and services that are in demand by clients around the world.

For example, a recent study produced by global consultants McKinsey & Company for Natural Resources Canada found that Canada has an opportunity to enhance our competitiveness in next-generation automotive technology and advanced trains and jets. They also found that we could take the lead in emerging markets with solar photovoltaics, bioenergy, unconventional hydro and energy efficiency.

Increasingly, Canadians understand the benefits—environmental and economic—of competing in clean energy. A recent Environics Institute survey found that 70 per cent of Canadians believe it is possible for their province to shift most of its energy requirements from fossil fuels to clean, renewable forms of energy. Equally importantly, according to an Université de Montréal poll conducted for Canada 2020, they'd even be willing to pay more for it.

Thanks to a recent United Nations-backed report, we now have a clear

picture of what Canada's low-carbon future could look like. It turns out that clean energy needs to play a starring role.

A heavyweight team of experts—headed by economist Jeffrey Sachs—produced the July 2014 *Pathways to Deep Decarbonization* analysis. Research teams from 15 countries were asked to come up with scenarios that chop much of the carbon pollution from their respective economies by 2050, in line with the scale of cuts required to live up to the goal that virtually all countries—including ours—have adopted, which is to keep global warming to 2°C or less.

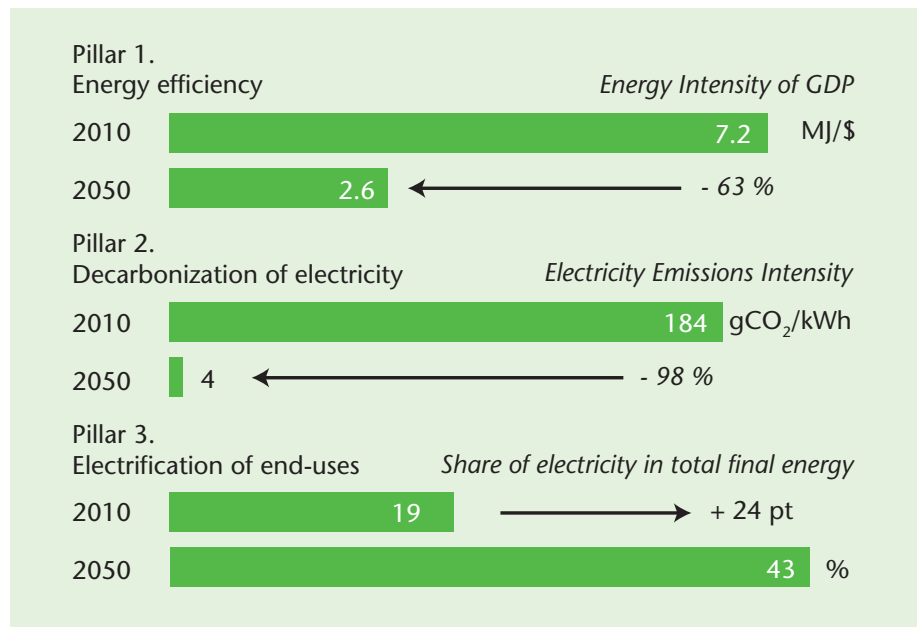
It turns out that the recipe for a low-carbon future is surprisingly simple. All of the project's 15 participating countries—a list that includes China, the US, the UK, India, Brazil, and Mexico—took the same three steps:

1. Cut energy waste as much as possible.
2. Clean up the electricity supply, which means relying far more on solar, wind, and hydro and a lot less on coal and natural gas.
3. Replace fossil fuels with clean electricity. Rather than filling up with oil, we would drive electric cars. Electric heat pumps, not natural gas, would keep us warm in winter.

As the report points out, “decarbonizing electricity production is essential, since it is a precondition to reducing emissions throughout the rest of the economy through electrification.” This is illustrated in figure 1.

The Canadian team had to find a pathway that cuts our 2010 carbon pollution total by nearly 90 percent by 2050. And they succeeded, presenting a scenario that whittles down emissions from electricity, transportation and buildings to less than 6 per cent of the 2010 level by 2050 while our GDP grows by more than 200 percent.

FIGURE 1: The three steps to deep decarbonization in Canada



Source: Sustainable Development Solutions Network & the Institute for Sustainable Development and International Relations. (2014). *Pathways to Deep Decarbonization, Interim 2014 Report*.

Canada already sources most of its electricity from low-carbon hydro-power, but the analysis still anticipates massive growth in wind and solar. According to *Pathways*, in 2050 wind and solar will provide 27 per cent of Canada's electricity generation—a huge step up from the two percent they provide today.

**W**hat will it take for clean energy generation to grow quickly in Canada?

First, like any other sector, clean energy will only grow if there is increasing demand for the product it produces.

That demand largely depends on provincial choices—provincial governments have jurisdiction over electricity generation in Canada—but (as noted above) it can also come from markets outside Canada. The United States is our natural market for exports of clean electricity, but Canadian companies can (and do) also supply clean power expertise, technologies and services to the growing global market.

If more Canadians start driving electric vehicles instead of gasoline-powered cars, demand for clean electricity will grow. The Canadian Electricity

Association points to the rate of electric vehicle adoption as one of the “key variables” influencing the future size of the electricity system in Canada.

**Matching clean power to consumer demand in real time requires a modern, smart grid, and most of Canada's jurisdictions have some upgrading to do to get there.**

Clean power can be produced almost anywhere, from a rooftop equipped with solar panels to a fast-running river, sometimes in very small amounts. That's a sharp contrast to the electricity sector's traditional model, which relied on huge plants running around the clock. Matching clean power to consumer demand in real time requires a modern, smart grid, and most of Canada's jurisdictions have some upgrading to do to get there.

Then there's power storage. Unlike coal or nuclear, many clean energy sources provide power on a variable basis: the wind isn't always blowing

and the sun isn't always shining. Technologies that store power can cover the gaps, allowing wind, solar and others to move from a niche role to become major power players.

Clean electricity experts will also tell you that the sector struggles with finding financing. The capital required to build new facilities is significant, and it can be hard to come by when investors aren't yet familiar with the sector.

Although many clean energy technologies are already mature, new research and development can cut costs even further and improve efficiency.

Finally, stronger climate policy—including a price on carbon—would be great news for a sector that offers an indispensable low-carbon solution.

**J**ust as it did with the oil sands sector two decades ago, Ottawa can play an important role today in creating the conditions for clean energy's growth and success.

The first step is the least expensive, but perhaps the most essential: making clean energy a priority.

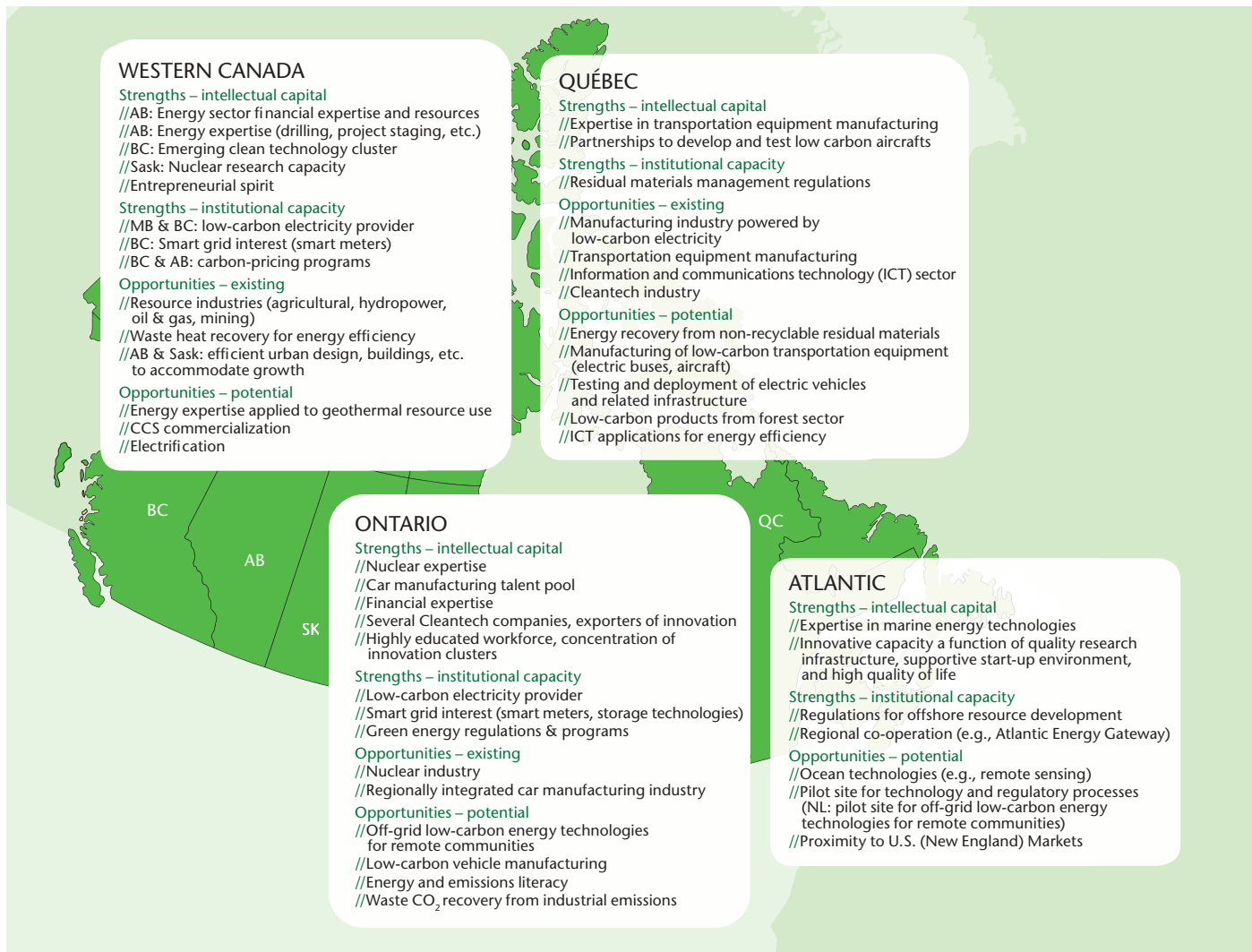
Right now, a casual observer of the government's approach could be forgiven for thinking Canada's energy edge starts and stops in Fort McMurray's oil sands. Clean energy could use even a fraction of the political attention that our government has paid to pipelines proposals for oil sands development. For example:

- Five years ago, the US launched an annual international Clean Energy Ministerial, but Canada's Natural Resources Minister has missed the last two annual meetings in favour of pitching the Keystone XL pipeline proposal. We're hoping that changes in time for the 2015 meeting.
- Canada is not a member of the International Renewable Energy Agency (IRENA). The United States, China and Australia are among the agency's 132 current members; it would be great to see Canada make it 133.

Once enough federal politicians and officials became familiar with the clean energy sector's potential, their appetite for further policy support will only grow. But meanwhile, it



FIGURE 2: Low-carbon strengths and opportunities across Canada



Source: National Round Table on the Environment and the Economy. (2012). Framing the Future: Embracing the Low-Carbon Economy.

looks like we're headed towards a surplus in the 2015 federal budget, and the time is right to invest a portion of that surplus to bolster Canada's clean energy competitiveness. Here are two simple ideas that would make a big difference for clean energy:

#### Level the tax playing field for power storage and solar technologies.

To its credit, the federal government has been systematically adding clean technologies to Capital Cost Allowance class 43.1 and 43.2, allowing companies to write off clean-tech assets more quickly and thus save on their tax bills. This year, solar technologies and power storage assets need that boost. In addition, a Residential Solar Energy Tax Credit—along the lines of the government's extremely successful Home Renovation Tax Credit—would help support

Canadians interested in installing rooftop solar systems in their homes.

**Give consumers an incentive to buy electric vehicles.** Ottawa often likes to say that it's "harmonized" with Washington on climate and energy policy. That's absolutely true when it comes to fuel efficiency standards for vehicles: our regulations are essentially identical to the rules enacted south of the border. But Washington has been offering consumer electric vehicle rebates for several years now without an Ottawa equivalent.

In the 1990s, federal support and engagement in the oil sands was justified on the basis that they represented a "national prize." The reality is that the economic benefits of oil sands development overwhelmingly accrue to Alberta—to the tune of 94 percent, according to the Ca-

nadian Energy Research Institute. In contrast, as the National Roundtable on Environment and the Economy found (figure 2), the opportunities in low-carbon goods and services are far more diverse, with strengths to build on in all regions of the country.

The oil sands' history shows the power of governments working with industry to build a "national prize." It's time for a compelling new energy vision to motivate governments again, this time with a new national prize in mind: a prosperous and competitive clean energy economy. **P**

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A team works with the NRU reactor at the Canadian Neutron Beam Centre in Chalk River, Ontario. National Research Council Canada photo

# Nuclear Science and Technology: A Public Good?

John Barrett

*Since antiquity, governments have invested in services and endeavours deemed to be in the public interest. Proving the strategic value in these “public goods” isn’t always easy. Canada’s nuclear industry and the research that keeps it safe and competitive constitute a public good with significant strategic value to Canada and Canadians, argues Canadian Nuclear Association President and CEO John Barrett.*

**W**hy do governments build lighthouses? Lighthouses are relatively cheap. They are far cheaper than the lives, ships and cargo they save, which in turn bring wealth to ports. This business model—one that pays off for society, if not for scavengers—merely requires a sovereign authority with access to both the coast and the port. Beach-combers may be poorer, but lighthouse-keepers are employed, ships go on plying their trade, and the kingdom as a whole is richer.

Lighthouses, which are classic public services, have been built since antiquity. Sovereigns everywhere provide such services, which also include law

enforcement, defence, and environmental protection. Economists call them “public goods.”

Had our ancestors left such decisions to the market alone, life would have been an even riskier business than it was. But sovereigns had strategic goals (like growing the overall wealth of the kingdom). They provided public goods (like lighthouses) that served those goals.

It is sometimes difficult to *prove* the strategic value in public goods. One could try to amass anecdotes and evidence about the value of lighthouses, but this faces many challenges in terms of accuracy (how do you quantify the benefits; how far down the economy’s value chain do you go?) and incentive (those best positioned to know the facts might overstate the value of services in order to get them increased—or understate it to avoid being taxed).

In the end, sovereigns might be forced to fall back on intuitive wisdom (“lighthouses just seem like the right thing to do”) or a sense of best

practices (“all the richest kingdoms appear to have lighthouses”).

Today, government investment in science and technology presents an updated version of this classic problem.

In nuclear physics and engineering, for example, Canada hosts a number of world-class facilities (the world’s largest cyclotron near Vancouver, the synchrotron light source in Saskatoon, and the nuclear laboratories at Chalk River, Ontario—not to mention other university-hosted facilities).

How do we know these are worthwhile? Why spend taxpayer dollars this way?

The answers are not easy. Even with today’s data and methodologies, benefits can be difficult to measure. Commercial spin-offs depend on many factors: is someone ready to take on the risk and the venture? Is there a market available? Attempts to trace the links to commercial outcomes can also overlook incidental benefits, such as the career development of engineers, scientists and technicians.

Even now, we may need to fall back on best-practice analysis. Governments fund and operate scientific laboratories in all economically advanced countries. Either these governments are wasting their money, or there is some real, strategic value in these expenditures.

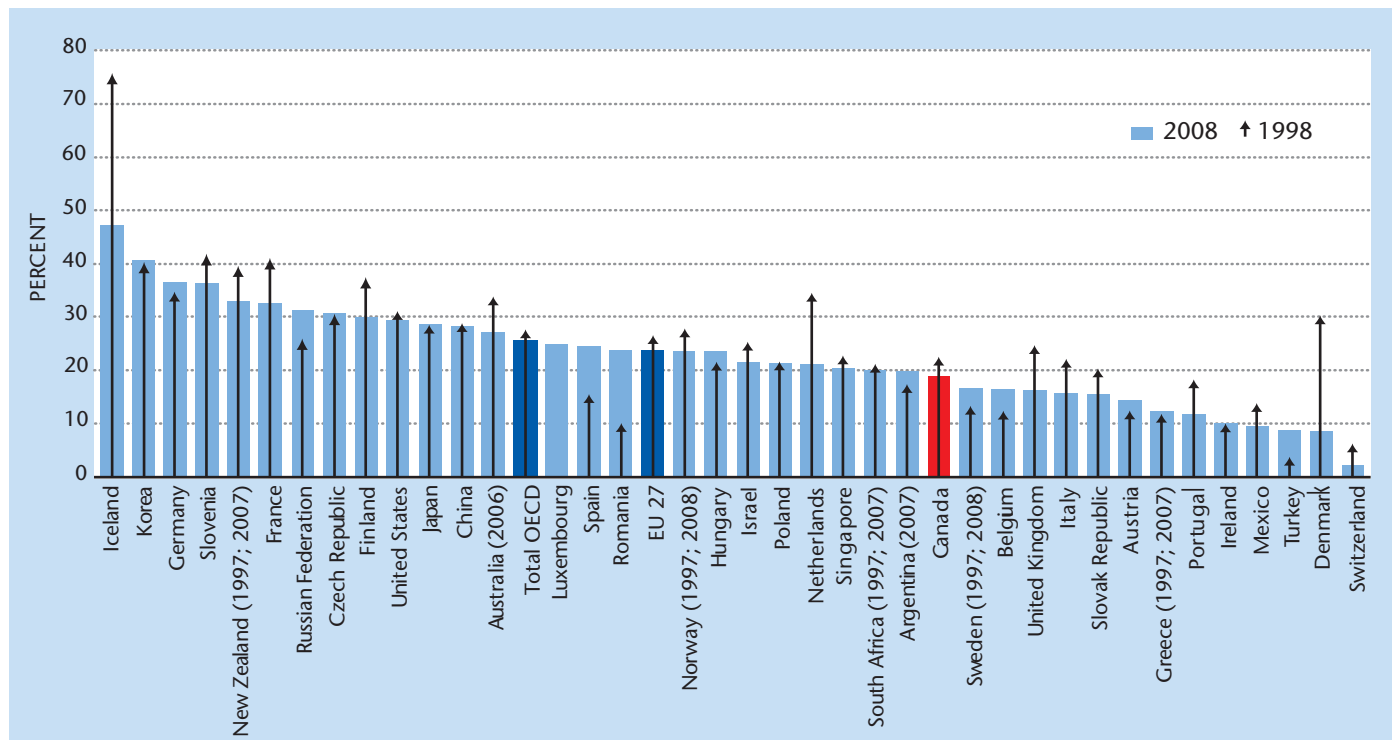
In recent years, Canadian policy has leaned heavily toward giving businesses tax incentives to perform science and technology. But it is false to assume that by getting businesses to do more *private* science, we reduce the need for government to do *public* science.

Rather, it’s clear that the jobs done by government and industry are positively related, in other words, public and private science and technology are complementary. In fact, some aspects of science and technology are like lighthouses: only governments will fund them enough to reflect their strategic value.

First, public laboratory infrastructure permits investigations whose payoff may be very

FIGURE 1: Percentage of GDP spent on research in government institutes.

In the OECD’s survey of 38 industrial or industrializing countries, Canada ranks 25th, far behind leading innovator countries (Korea is second, Germany third, the USA tenth, Japan eleventh, and China twelfth).



Source: OECD, *Science, Technology and Industry Outlook 2010*, figure 1.6.



large, but is too uncertain or unknowable for private firms to finance. Semiconductors and global positioning are most often cited as examples these days, but the first wave of practical nuclear reactors—both for power generation and for driving marine vessels—also paid off massively.

Second, there are “spillover” effects from public R&D that increase the chances of a successful outcome in the private sector. Publicly available science research, and the experts who perform it, help companies put their own knowledge into context and better judge its implications.

Third, public labs are a necessary enabler or precondition for some business R&D. Much Canadian corporate work on lightweight car engines, aircraft landing gear, or turbine blades could never occur without the non-destructive testing available at research reactors like the one at Chalk River Laboratories. Even the largest companies will not build research reactors for their own use, but they will use them if they exist.

**Much Canadian corporate work on lightweight car engines, aircraft landing gear, or turbine blades could never occur without the non-destructive testing available at research reactors like the one at Chalk River Laboratories.**

The very nature of science is that it happens a long way (in both time and development) from commercial results. Vannevar Bush, who authored the US government’s science policy in the postwar era, stressed the need for such distance. Insisting that centres of basic research show commercial benefits would only undermine their value. “As long as they are vigorous and healthy and their scientists are free to pursue the truth wherever it may lead, there will be a flow of new scientific knowledge to those who can apply it to practical problems in government, in industry, or elsewhere,” he argued.

Note that Bush didn’t limit his argument to industry. Governments, too, are problem-solvers, and they benefit in many ways from having major science infrastructure.

**A 2013 commission led by former US national security adviser Brent Scowcroft argued that US civil nuclear technology constitutes a strategic asset for the United States; accordingly, maintaining its prominence and influence internationally constitutes a “strategic imperative”.**

My organization, the Canadian Nuclear Association, recently made this argument with specific reference to the continued operation of the Canadian government’s National Research Universal (NRU) reactor at Chalk River Laboratories. Here are just some of the strategic advantages we were able to identify from NRU’s operation:

**Canada’s energy advantage at home** – The NRU supports operating power reactors here in Canada, particularly in dealing with aging reactor components.

**Key bilateral relations and energy partnerships** – Six other countries use Canadian nuclear reactor technology. Should the NRU be shut down, it would be a signal of Canada’s retreat from the nuclear energy market. Our reliability as a technology and investment partner would be less credible.

**Strengthening nuclear security** – More proliferation-resistant reactor fuels are currently under development in Canada with NRU support. Such fuels will strengthen nuclear security in Canada and elsewhere.

**Increased safety** – Canada is at the forefront of efforts to push reactor safety standards higher and higher, thereby reducing the risk of nuclear accidents. The NRU has facilitated this. It has also enabled a multi-disciplinary team that, when needed, can urgently analyze complex issues in reactor operations—a valuable safety resource for Canada and other countries.

**Global market opportunities** – Just two countries, India and China, between them have 35 reactors under construction and 230 more planned or proposed (Source: World Nuclear Association). Canadian reactor technology and intellectual property are already in use in both of these countries. Our technology may be a candidate for future purchases, provided we maintain its scientific base.

**Highly qualified personnel in the knowledge economy** – The NRU is

a strategic training infrastructure. It develops the human capital Canada needs in all kinds of science and engineering fields.

**Canadian influence in key international organizations** – A quick look at top personnel in international nuclear organizations (e.g. World Nuclear Association, World Association of Nuclear Operators, International Atomic Energy Agency) shows Canadians in key positions where they exercise multilateral influence. Why? Because of Canada’s skill, knowledge, practical experience, and credibility in nuclear science and technology.

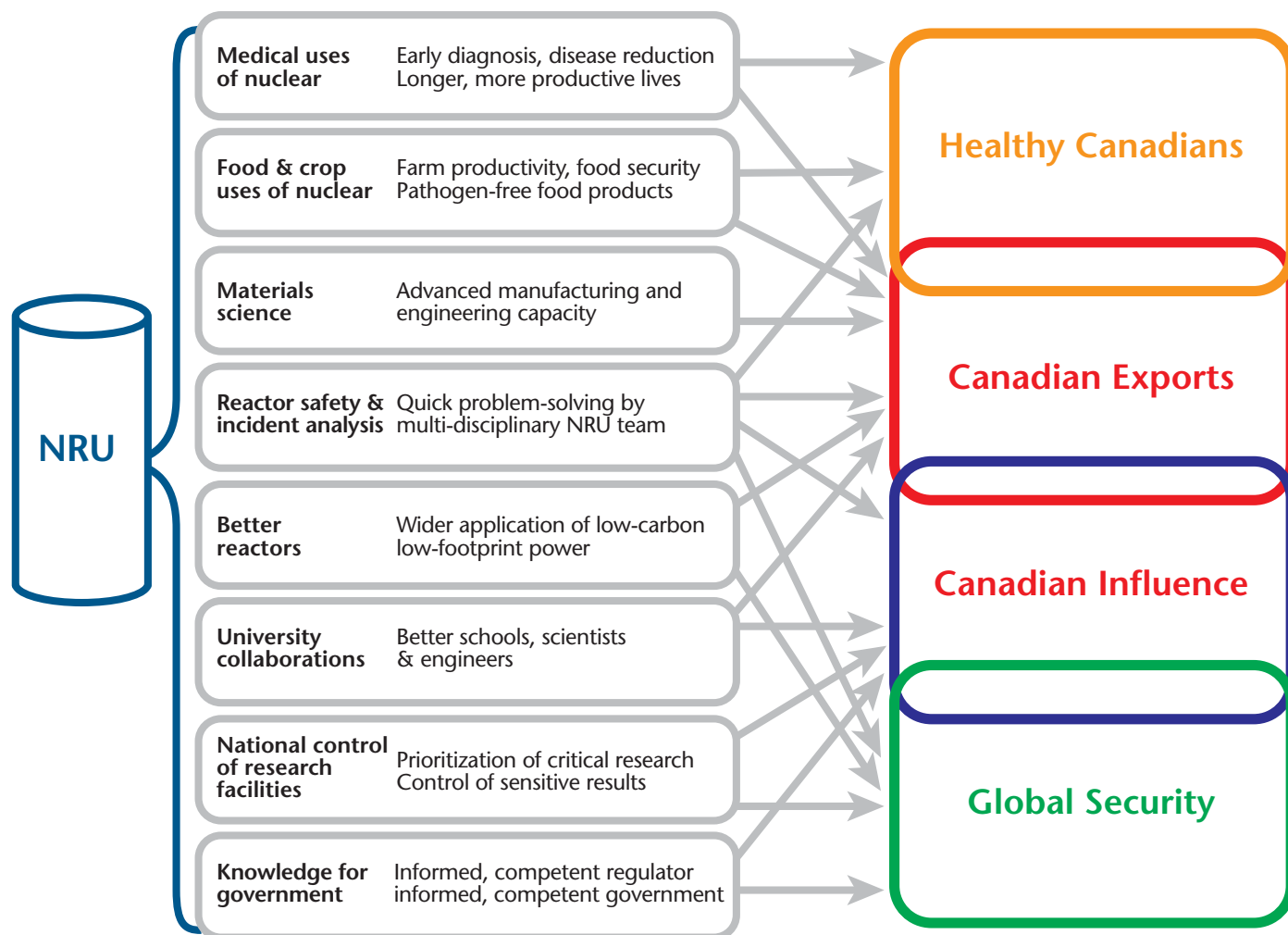
Taken together, these add up to a strong case for treating Canada’s experience, expertise and innovative R&D potential in the nuclear sphere as a strategic asset and a public good.

Other governments see the value. In fact, a 2013 commission led by former US national security adviser Brent Scowcroft argued that US civil nuclear technology constitutes a strategic asset for the United States; accordingly, maintaining its prominence and influence internationally constitutes a “strategic imperative”.

**Nuclear power plants make a significant contribution to reducing carbon emissions, offsetting those of other Canadian resource sectors by avoiding the release of some 89 million tonnes of CO<sub>2</sub> annually.**

If all this did not provide a convincing case for strategic value in nuclear science, consider that nuclear power plants make a significant contribution to reducing carbon emissions, offsetting those of other Canadian resource sectors by avoiding the release of some 89 million tonnes of CO<sub>2</sub>.

FIGURE 2: An illustration of the value of a publicly-owned science facility, the National Research Universal reactor, to Canada's strategic national goals



Source: Canadian Nuclear Association

annually. A recent meta-study to be unveiled this fall by Hatch, the Canadian engineering and consulting group, shows that nuclear power generation would be roughly as “clean” as wind farms, even if the wind blew steadily, but is much cleaner if wind’s intermittent character means that it is backed up by natural gas—which it often is.

**T**he most common alternative to nuclear energy, here and abroad—and the main thing slowing its advance—are cheap and ubiquitous fossil fuels that do not pay the full cost of their own carbon emissions. The environmental impact of failing to advance nuclear power generation as rapidly as possible is accordingly huge, with soar-

ing GHG emissions (on the climate front) and air pollution (affecting the health of hundreds of millions). Canadian technology is already mitigating this impact and has the potential to do much more, with world-beating proliferation resistance and safety.

The strategic value of Canada’s nuclear technology can be grouped under four main headings that reflect the federal government’s priorities: Healthy Canadians; Canadian Exports; Canadian Influence; and Global Security. (See figure 2.)

Yes, some propose leaving science (and other public goods—like security and lighthouses) to the markets. But countries have strategic goals. Public goods serve those goals, not just for industry but also for government and citizens. Governments of

leading innovative countries do science for a reason. Canada should remain one of them. **P**

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Royal Caribbean's Oasis of the Seas, the world's largest cruise ship powered by electricity. ABB photo

# The Future of Transport is Electric, and It's Already Here

Bob Fesmire

*Transportation accounts for 31 per cent of all energy use in Canada and 37 percent of all greenhouse gas (GHG) emissions, according to Environment Canada. In the realm of clean energy, electrified transport is much more than just hybrid cars and state-of-the-art metro lines. It's being used in whole new ways to make the movement of goods and people more efficient and environmentally sustainable.*

Recently, the NASA Mars rover Opportunity celebrated its 10th birthday, which is remarkable when you consider its original mission was only scheduled to last 90 days. Opportunity's endurance is the result of multiple elements—design, testing, materials science—but at its core is a technology that dates to the first half of the 19th century: the humble electric motor. It might not be considered humble for much longer.

The fact is that there is a quiet revolution going on in the world of transportation, but if you think that it's mostly about electric vehicles (EVs) like the Nissan Leaf or even hybrids



like the Prius or the Volt, you'd be missing most of the bigger picture. Electricity is being used not only to provide propulsion for everything from cars to ships, it's being applied in a variety of less obvious applications to make the movement of goods and people more efficient, cost-effective and environmentally sustainable.

Transportation accounts for 31 per cent of all energy use in Canada and 37 percent of all greenhouse gas (GHG) emissions, according to Environment Canada. That alone makes the sector a target for improvements. Understandably, public attention is focused primarily on the auto industry, if for no other reason than that it touches consumers directly. The Canadian government has set a goal to have 500,000 EVs on the road by 2018, but as of 2008 there were fewer than 100,000 hybrids driving Canadian roads, according to the advocacy group Electric Mobility Canada. Industry analyst Green Car Reports expects the number of all-electrics in Canada to reach 10,000 by the end of this year.

EV supporters often highlight the fact that much of the true cost of traditional vehicles is externalized. EMC in particular points to the societal cost of carbon. At \$25 per ton, the group says EVs would save society around \$2,500 per vehicle per year thanks to the difference in emissions between petro-cars and their electric counterparts. But if we examine the entire energy value chain from "well to wheels," something interesting appears.

**T**he fact is that the extraction, refining and distribution of gasoline is more energy efficient than the generation and distribution of electricity. It's only when the energy is used to actually do the work of moving a vehicle that the electric vehicle pulls ahead. But does it ever pull ahead.

Today's typical gasoline engines convert about 30 per cent of the energy contained in the fuel to traction. Diesels do a bit better at around 40 per cent. The rest of the energy is lost in the form of heat. Electric motors, by contrast, convert around 90 per cent of the energy supply to traction.

**Electricity is being used not only to provide propulsion for everything from cars to ships, it's being applied in a variety of less obvious applications to make the movement of goods and people more efficient, cost-effective and environmentally sustainable.**

They're also quiet and, with few moving parts, virtually maintenance-free.

EVs still have a way to go before they reach widespread adoption, and overcoming challenges like the weight and cost of batteries will be paramount. But EVs are only the most visible tip of a much larger iceberg.

**Nearly all heavy rail systems in North America use locomotives that are technically hybrids, relying on diesel generators to serve electric motors for final drive. Outside of intra-city metro lines, there are almost no all-electric trains running in Canada or the US.**

Railways provide an example of another mode of transport where electrification has already made an impact but could be expanded much further. Nearly all heavy rail systems in North America use locomotives that are technically hybrids, relying on diesel generators to serve electric motors for final drive. Outside of intra-city metro lines, there are almost no all-electric trains running in Canada or the US. Canada itself has almost 50,000 km of railways, and of that number only 129 km is electrified. The reason is simple: installing catenary wires or a third rail is extremely capital-intensive. Still, if you consider that diesel locomotives use 2.5 to three times as much energy as electric locomotives, the economics become more promising for electrification.

In Ontario, GO Transit published a study in 2010 that found electrifying certain lines would make financial sense in the long term thanks to maintenance cost savings in addition to lower fuel costs. For heavy rail, though, rising oil prices will likely be the central motivating force behind any substantial effort to go electric.

Light rail and commuter systems, on the other hand, are moving forward.

Many light rail systems use "electric multiple units," trains in which each car is equipped with its own propulsion system. The specialty transformers needed to convert power from the grid to a useful voltage onboard historically have been located in "machine rooms" that occupy space inside the car that otherwise could be used for passenger seating. Now a new, more efficient generation of traction transformers uses a compact design that allows them to be placed under the floor or on the roof.

In addition, while regenerative braking has been used in trains for decades, advances in power electronics and energy storage have made it possible for more of the energy from decelerating trains to be captured. In a pilot project at SEPTA, the Philadelphia area transit operator, a wayside energy storage system not only supplies the recaptured energy to trains as they depart, it also provides power back to the grid, a service for which SEPTA is paid. The agency estimates that between energy savings and new revenues, the energy storage system delivered returns of \$250,000 in its first six months.

Those are remarkable results, but to date perhaps no segment of the transportation market has made better use of electrification than the shipping industry. Indeed, in some markets (e.g., cruise ships) electric propulsion has become the industry standard. Part of the reason is that podded propulsion systems can rotate 360 degrees, acting like a giant outboard motor and giving even the largest ships tremendous maneuverability. But the business case for electric ships mainly comes down to fuel costs, which have tripled in the past 20 years.

**O**ne ferry line in Japan, for example, realized fuel savings of 20 per cent when it moved to electric propulsion. The



Charging an electronic vehicle. It's estimated 10,000 EVs are now on the road in Canada. The auto space is just one segment of the transport sector increasingly powered by electricity. ABB photo

lack of a traditional engine and drive-shaft also allowed more of the interior of the ship to be used for cargo, and the reduced noise and vibration were appreciated by passengers and crew alike. Now, similar systems are being used widely in tugboats, ice breakers, and specialty vessels like offshore platform service ships that employ dynamic positioning to hold position in open water.

What all of these have in common is a working environment that requires frequent changes in the demand being placed on the ship's engines. Constant ramping up and down puts stress on mechanical systems. By contrast, electric motors are better able to handle the variations in demand that such applications require.

Now, shipyards are taking the improved efficiencies of electrification one step further by looking to onboard systems, and ports are changing the way ships use power when docked. Instead of running their engines, ships in many ports around the world now have the option of plugging into the local grid via shore side connections. This, again, saves fuel and avoids harmful emissions.

Onboard, ship builders are beginning to experiment with DC power systems to replace the traditional AC networks that ships use today. AC systems typically have multiple points where the power supply is transformed (i.e., where the voltage is shifted up or down), and every one of these incurs losses. A DC system does not require as many conversions and is therefore more efficient.

**Southwest Airlines saves \$50 million per year by tapping into the local grid instead of relying on diesel generators to serve onboard electrical needs while planes are parked at the gate.**

The Electric Power Research Institute has funded research projects that demonstrate the value of going electric in everything from warehouse forklifts to the cranes used to move shipping containers, to the vehicles pulling carts full of luggage across

the tarmac at airports. Southwest Airlines saves \$50 million per year by tapping into the local grid instead of relying on diesel generators to serve onboard electrical needs while planes are parked at the gate. Another EPRI program showed long-haul truckers could save around \$4,000 per year if they were able to plug in at rest stops instead of running their engines to heat and power their sleeper cabs.

Electrification may not be a panacea, but its potential for Canada is hard to overstate. Indeed, we are already reaping the benefits of electrified transport, whether we know it or not. **P**

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Natural Resources Minister Greg Rickford during Question Period in the House of Commons. The energy file will be front and centre when the House resumes sitting in mid-September. PMO photo

# A Vision for Responsible Development of Canada's Resources

Greg Rickford

*Canada's energy priorities—accessing new markets, strengthening global energy security, enhancing safety and environmental regulation, forging stronger relationships with aboriginal peoples, and investing in innovation—demonstrate our determination to ensure we can all enjoy the maximum benefit of our country's energy resources.*

Canada is fortunate to have abundant natural resources that contribute to the strength of our communities and the prosperity of our country. The resource industry provides employment to 1.8 million Canadians and contributes substantially to our economy from coast to coast to coast. Furthermore, this sector contributes over \$32 billion a year in government revenues that help build schools, hospitals and other important services for Canadians. The government's vision for the future of resource development is the continued responsible



development of our natural resources for the benefit of all Canadians. We are demonstrating leadership in environmental protection, safety, Aboriginal engagement and non-emitting electricity. Only through continued actions in these critical areas will Canadians be able to fully realize the economic and societal benefits that resource development provides.

First, I would like to highlight some of the fundamentals of Canada's resource sector. Canada has the third-largest proven oil reserves in the world, with approximately 173 billion barrels. With advances in technology, Canada's oil sands have the potential to yield nearly double that amount. We have an estimated 1,300 trillion cubic feet of natural gas, which is enough to last for 200 years at current levels of demand. These energy resources allow Canada to provide a safe and reliable supply of energy to our allies. Currently, the only customer for our oil and gas is the United States. Recent discoveries of domestic supply will allow the US to achieve energy independence in the coming years. Without new markets, our resources will be stranded. It is for this reason that our government strongly believes that we must diversify our energy markets both here at home and abroad.

**We are taking action to ensure we have a world class safety system for the transportation of our energy products. A safe and efficient transportation system will allow Canada to move energy resources to world markets.**

Pipeline projects that will bring Western Canadian oil and gas to Eastern Canada will displace foreign oil with Canadian product. I think all Canadians will agree that they would rather fill their cars with locally sourced gasoline, rather than imported oil from a place like Algeria. On the international front, recent events in Europe have made it clear that energy security is central to global political and economic stability. At this year's meeting of G7 energy ministers in Rome, I advocated for the adoption of a number of criti-

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cal principles to support energy security. These same principles apply to the North American context, beginning with the development of diverse energy options, from oil and gas to nuclear, renewables and hydroelectricity. This transformation means advancing innovative approaches to support the responsible development of our energy resources and reduce our overall energy use. It also means building and maintaining safe and modern energy infrastructure to increase our capacity to supply growing markets in North America, Europe and Asia.

The development of our resources does not have to come at the expense of the environment. The government has been clear that no major resource project will proceed unless it is safe for Canadians and safe for the environment. Canada has a strong record of safety in the development and transportation of our energy resources, and we are constantly working to improve on that record. We are taking action to ensure we have a world class safety system for the transportation of our energy products. A safe and efficient transportation system will allow Canada to move energy resources to world markets. We have already introduced comprehensive measures for tankers and pipelines to ensure world-class safety, and we will continue to implement additional safety measures for rail. Together, these measures will ensure that Canada's energy transportation system—on land and on water—is among the safest in the world.

In Canada, pipeline companies are regulated by the National Energy Board, an independent body that subjects pipeline development proposals to an extensive scientific review that ensures pipelines are safe. It is for this reason that Canada can boast a safety record of 99.999 per cent for federally regulated pipelines. But we recognize

that we can do better, and that is why we are taking further action.

New environmental protections for pipelines and tankers include major increases in surveillance inspections, safety audits and the powers of enforcement. For example, this year we announced the introduction of absolute liability for all federally regulated pipelines, meaning companies will be liable for costs and damages regardless of fault. We are raising the liability from \$30 million in the Atlantic and \$40 million in the Arctic to \$1 billion for all major oil pipelines. Companies continue to have unlimited liability when at fault or negligent.

**We are working to ensure that the actions we take to establish a stronger relationship with First Nations are shaped by First Nations themselves, based on the principles of trust, inclusion and reconciliation.**

Another vital aspect of our world-class safety system is the way it involves local communities in planning, operations and related opportunities, including aboriginal communities. Aboriginal communities have the local knowledge and expertise needed to make these plans work, and it is essential that they are directly involved. We are working to ensure that the actions we take to establish a stronger relationship with First Nations are shaped by First Nations themselves, based on the principles of trust, inclusion and reconciliation. I recently announced the creation of the Major Project Management Office West and the establishment of a Tripartite Forum, two initiatives designed to bring the federal government, the province of British Columbia and First Nations

leaders together to share information and make decisions on projects and responsible resource development.

**Canada has developed one of the world's cleanest electricity systems, with over 75 percent of our supply coming from emission-free sources: hydropower, nuclear and non-hydro renewable energy.**

These engagement measures complement our government's efforts to protect the environment by reducing greenhouse gas emissions, increasing energy efficiency and supporting the development of clean technology. Canada's resource potential extends far beyond oil. Canada has developed one of the world's cleanest electricity systems, with over 75 percent of our supply coming from emission-free sources: hydropower, nuclear and

non-hydro renewable energy. In fact, we lead the G7 with our renewable resources accounting for over 63 percent of electricity production.

We have taken significant action to reduce our reliance on energy sources that are harmful to the environment. We recognize that coal is the single largest source of greenhouse gases in the world. That is why, in 2012, we were the first major coal user to ban construction of traditional coal-fired power plants. Under our leadership, per-capita carbon emissions have fallen to their lowest level since tracking began. In fact, emissions in 2012 were 5.1 per cent lower than their 2005 levels, while the economy grew by 10.6 per cent over the same period. We have achieved these impressive results without raising taxes on hardworking Canadians.

**I**nnovation and new technologies are instrumental to supporting responsible energy use. We can be proud that Canada is making

real progress and showing real leadership in this area. In 2011, the International Energy Agency ranked Canada second for its rate of energy efficiency improvement. We are investing in next-generation clean technologies through our continued support of Sustainable Development Technology Canada. We will continue to take action on clean energy through these important initiatives.

All of these initiatives—accessing new markets, strengthening global energy security, enhancing safety and environmental regulation, forging stronger relationships with aboriginal peoples, and investing in innovation—demonstrate our determination to ensure we can all enjoy the maximum benefit of our country's energy resources. **P**

*Greg Rickford, MP for Kenora (Ontario), is Minister of Natural Resources. He is a graduate in both civil and common law from McGill University, and holds an MBA from Laval.*  
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With leading-edge technology and abundant supplies of grain, oilseeds, and other feedstocks, Canada is uniquely positioned to become a global leader in the production of biofuels.

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Opposition Leader Tom Mulcair writes that “It’s time to start enforcing the basic rules of sustainable development, including polluter-pay.” NDP photo

# A New Vision for Canada’s Energy Future

Tom Mulcair

*Canada stands at a crossroads both in terms of our energy future and how we negotiate that future among governments, business and communities, particularly First Nations. The challenge for Ottawa in the years to come will be how to demonstrate leadership, embrace a long-term vision and work with the provinces and First Nations so that resource development serves Canadians, and not the other way around. Unfortunately, the Harper Conservatives are taking Canada in the opposite direction.*

Canada’s natural resources are a tremendous blessing. Today, they are driving our economy in ways that were unimaginable just a generation ago. But with the incredible growth of our energy sector also come significant challenges for the future if we are to ensure that all Canadians draw maximum benefit from our resources.

We stand on the edge of a new energy world, one where a strict reliance on conventional, non-renewable energy sources is increasingly disadvantageous from an environmental and energy security perspective. We are



also at a crossroads when it comes to aboriginal involvement in development: the recent Supreme Court decision in favour of the Tsilhqot'in and Xeni Gwet'in nations has driven home the fact that resource development will simply not happen without proper First Nations consultation and accommodation.

There is a compelling need for a pan-Canadian approach to energy that is rooted in a vision of maximizing benefit not just for the immediate future, but for future generations as well. Canada needs resource prosperity to last, environmental protection to become a vital part of all projects, and for development to be done in a way that involves communities rather than alienating them.

This is the shape of the challenge facing the federal government in the coming years—how to demonstrate leadership and work with the provinces and First Nations so that resource development serves Canadians, and not the other way around.

Unfortunately, the Harper Conservatives are taking Canada in the opposite direction with their refusal to ensure that polluters pay for the pollution they create, their systematic attacks on environmental protection, and their abject failure to partner with First Nations.

A great lesson of the 20<sup>th</sup> century is the need to consider intergenerational environmental impacts of development projects. In my speech to the Economic Club of Canada last December, I spoke about one striking example of what happens when governments pit jobs against the environment—the case of Giant Mine at Great Slave Lake.

This mine, situated next to the deepest freshwater lake in North America, was one of the richest gold mines in Canada. It also released more than 237,000 tonnes of arsenic trioxide waste in its 50 years of operation, with little regard for what cost that would impose on future generations. Today, the clean-up bill for Giant Mine's waste has doubled from initial estimates to nearly a billion dollars—all of which will be paid for by taxpayers.

**Canada needs resource prosperity to last, environmental protection to become a vital part of all projects, and for development to be done in a way that involves communities rather than alienating them.**

Put simply, a legacy of reckless environmental debt bequeaths future generations the clean-up bill for today's projects, rather than ensuring that the companies that produce pollution foot the bill. This puts our future economic prosperity at risk, mortgaging the wealth of future generations for a quick buck today. Last year, Stephen Harper visited the site of the Giant Mine and lamented the fact that our generation was stuck with the clean-up bill. The irony is that his development motto is "live for today and let tomorrow take care of itself." We can be forgiving of past generations who left us these messes all across our resource-bearing regions: that was just the way mining was done at the time. No one will forgive us. We know better. It's time to start enforcing basic rules of sustainable development, like polluter-pay.

There are important steps the federal government can take to prevent massive environmental legacy costs like those of Giant Mine. But instead of building strong, world-class environmental protection standards, the Conservatives have gone out of their way to weaken environmental reviews and gut the laws that are the cornerstone of environmental protection in natural resource development.

**Instead of building strong, world-class environmental protection standards, the Conservatives have gone out of their way to weaken environmental reviews and gut the laws that are the cornerstone of environmental protection in natural resource development.**

From removing thousands of rivers and lakes from protection under the Navigable Waters Act, to a wholesale

rewrite of the Canadian Environmental Assessment Act designed solely to short-circuit credible project reviews, their legislative changes have systematically undermined some of the oldest tools for environmental protection in Canada. These changes have also gutted the federal infrastructure for community consultation—which breeds opposition to projects communities increasingly feel are being imposed on them. In short, the public wants an objective environmental review process in all cases, and the Conservatives want an environmental approval process in all cases.

**The public wants an objective environmental review process in all cases, and the Conservatives want an environmental approval process in all cases.**

Aboriginal consultation, accommodation and participation in resource projects is another area that has suffered tremendously under successive federal governments. Rather than reaching out to engage First Nations as partners in development, and to ensure that benefits accrue to the First Nations communities that are often the most directly impacted by development, the Conservative government has completely dropped the ball.

Instead of rising to meet the complex challenge of ensuring that resource development happens in partnership with First Nations, the Harper government has disregarded the concerns and input of First Nations communities—even against the advice of their own appointees.

The government's own special envoy on aboriginal and energy issues, Douglas Eyford, has repeatedly warned that projects are failing largely because industry has been left alone to navigate consultation and

accommodation of First Nations concerns. More than nine months after his final report was tabled, little has changed—and the recent Supreme Court decision in favour of the Tsilhqot'in and Xeni Gwet'in Nations with respect to logging has made it even clearer that ignoring aboriginal title is unacceptable.

**F**inally, the Conservatives' record of inaction on climate change and the environmental impacts of oil sands development presents a significant challenge for industry. Other countries have taken note of the Conservative government's intransigence on climate action, and it has served to sour Canada's international and trade reputation. One needs to look no further than the proposal for a Fuel Quality Directive in Europe, or the forceful opposition to Keystone XL in the United States, to see how failure to protect our environment has direct impacts on our ability to access global markets. Even the International Monetary Fund has said that Canada can do more to internalize the price of carbon and still improve the economy.

**Business leaders understand the urgency of meeting these challenges head on—in fact, while many may have initially welcomed the Conservative push for de-regulation, most now see it for the poisoned chalice it is.**

It's clear that Canada can, and must, do better. Business leaders understand the urgency of meeting these challenges head on—in fact, while many may have initially welcomed the Conservative push for de-regulation, most now see it for the poisoned chalice it is. You can indeed guarantee a regulatory licence faster if you gut environmental laws. However, without a social licence, any major project will actually have more difficulty moving forward.

If Canada is to be a model of successful and sustainable resource development, rather than backing away from its responsibilities, the federal government needs to play an active

**We should be working with the provinces to upgrade and refine our resources at home, rather than shipping these jobs out of the country with our raw resources. The Keystone XL pipeline is a case in point—40,000 potential jobs will go south along with raw bitumen if the project is approved.**

role in working with the provinces to meet our environmental obligations and ensure that all Canadians benefit from resource development.

This begins by establishing a thorough, credible and efficient system of environmental assessments for resource development projects. It is imperative that our processes build in the time it takes to get development right, to consult with communities, to listen to and accommodate First Nations and to evaluate the scientific evidence about potential project impacts. A quality environmental review process is imperative both for improving projects that do go ahead, and for assuring our trade partners that we are developing our resources sustainably. This is not simply the right thing to do; it is also good for business—providing certainty and the ability for companies to plan around well-established process, instead of a regime that changes at the government's whim.

**I**n addition to establishing a credible environmental review process, the federal government must ensure that First Nations become equal partners in resource development. A critical step in this process is the resolution of outstanding land claims and treaty disputes, an issue too long neglected by successive federal governments. This means adopting a nation-to-nation relationship with First Nations, Inuit, and Métis peoples in Canada, and ensuring that they are consulted prior to, and benefit from, any projects that impact them and their traditional lands. The ability to build and sustain this kind of respectful relationship is a critical question of political will that could well determine Canada's energy future.

Other Canadian communities also need to see direct benefits from resource development. In addition to meaningful local consultation and ensuring the highest standards of safety and environmental protec-

tion, the federal government needs to support value-added jobs right here in Canada. We should be working with the provinces to upgrade and refine our resources at home, rather than shipping these jobs out of the country with our raw resources. The Keystone XL pipeline is a case in point—40,000 potential jobs will go south along with raw bitumen if the project is approved. This is not in Canada's long term interest. Instead, the federal government should focus on supporting local jobs and prosperity for the long term.

Crucially, we need real accounting for the environmental impacts of resource development. This includes a price on carbon and taking an active role in shouldering our fair share of global greenhouse gas emissions reductions. Canada must also take steps to reduce the demand for energy, through energy efficiency retrofits for homes. The Conservatives ended a sensible and successful program that saved Canadians money and reduced energy use.

Canada also has to step into the global clean energy market. We have the potential to become a leader in this sector, which is expected to be worth an astonishing \$3-trillion a year by 2020, thanks to our skilled workforce, advanced economy and vast natural resource wealth. What's missing is decisive direction from the federal government that would send signals to the market to stimulate investment in clean tech, such as cancelling perverse fossil fuel subsidies and investing in renewable energy.

In sum, with the right vision and the policies to back it up, Canadians can be the ones who benefit the most from our resources not just today, but for generations to come. The time to change our approach is now—and all that we are missing in Canada to get it done is political will. **P**

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A Suncor employee gives Dr. Gerrit Voordouw and colleagues a site tour and safety orientation prior to coring an exploratory well. Dr. Voordouw's research is assisting in the greener production and extraction of hydrocarbon energy. Suncor photo

# Genomics and Energy:

## HARNESSING THE POWER OF BIOLOGY TO DEVELOP CLEAN AND SUSTAINABLE SYSTEMS

Pierre Meulien

*When the Deepwater Horizon disaster dumped crude oil into the Gulf of Mexico in 2010, it was oil-degrading microbes that contributed overwhelmingly to the clean-up. Every day, Canadian and international researchers are finding out more and more about how the energy sector can benefit from naturally occurring organisms and genomics is the science behind the innovation.*

Canada's energy sector is one of the key engines of its economy. The sector represents some 9.6 percent of GDP, has annual export revenues of \$111 billion, and employs some 5 per cent of the Canadian workforce. With growing global demand for energy, the sector is critical to this country's future.

Some of the challenges the sector faces, though, will require greater innovation to boost productivity and global competitiveness, and to ensure that extraction processes are carried out in the most



environmentally responsible way.

The energy sector will need to look beyond its traditional zone of influence and partnerships to find solutions to some of the serious issues it faces. Already, biological systems are seen as providing innovative solutions to some of the industry's most intractable problems.

In the case of the Deepwater Horizon oil spill in the Gulf of Mexico in 2010 (the largest oil spill in the petroleum industry ever recorded), the role of naturally existing oil-degrading microbial communities was critical in the cleanup of this environmental disaster. What if we could harness the biological power exhibited by these microbes to clean up existing polluted sites or more rapidly remediate the detrimental effects of tailings ponds—the result of extraction of oil from the oil sands of Alberta?

The application of genomics—the science focused on understanding the genetic makeup (the DNA) of individual life forms—is emerging as a viable solution to some of the most pressing issues facing the sector, both in terms of maximizing the yield of petroleum extraction and minimizing the potential damage from environmental release.

**All self-replicating forms of life on this planet contain DNA—the code of life that serves as a blueprint for every living thing. “Reading” the DNA embedded in an organism’s set of genes allows us to understand what different life forms can do.**

**A**ll self-replicating forms of life on this planet contain DNA—the code of life that serves as a blueprint for every living thing. “Reading” the DNA embedded in an organism’s set of genes allows us to understand what different life forms can do. Microbes are no exception, and they contain the same DNA that we find in humans. The difference is in how the DNA code is instructed through its genes to create a human being from human DNA and a microbe from microbial DNA.

**We know that microbial communities can play both a positive and negative role in tailings ponds. They can accelerate pond settling and help to degrade toxins, but on the flipside, they can generate greenhouse gases.**

Recent technological advances are now allowing us to read DNA code 1 million times faster and cheaper than was possible 15 years ago and this in turn is allowing us to understand which microbes already present in environmental samples can help us with the remediation issues we face on such a grand scale.

Energy sector stakeholders are now collaborating to increase our knowledge in this area.

We know that microbial communities can play both a positive and negative role in tailings ponds. They can accelerate pond settling and help to degrade toxins, but on the flipside, they can generate greenhouse gases. What are the microbes involved in pipeline corrosion and oil well souring? How can we tell that a particular site is safe and remediated sufficiently to be officially certified as “clean”? Can we harness the power of methane consuming microbes to offset some of the effects of greenhouse gases that directly contribute to climate change?

Already, scientists from both academia and industry are tackling some of these questions. We’re getting a clearer picture of these fascinating microbes with the goal of knowing which ones are where, what they’re doing, and how we can we steer their actions to our advantage.

Over the past four years, a team of researchers co-led by Dr. Gerrit Voordouw of the University of Calgary and Julia Foght of the University of Alberta analyzed 250 samples collected from eight tailings ponds. From the DNA of millions of microbes, they generated genomic profiles of the ponds’ whole microbial communities. These revealed that each pond has a unique community of naturally occurring bacteria, but the predominant microorganisms are similar and they have common biological processes.

Ten industrial partners were involved in this particular project, which will

make publicly available a catalogue of oil sand’s microorganisms, genes and biological processes, something that is of great value for companies to better manage the oil sands and reduce risk.

**O**ther Canadian research projects in Quebec and Ontario are devising new environmentally friendly approaches to decontaminating various polluted sites. In one case, a team of chemical engineers, biologists and consultants are working with industry to apply their knowledge of gene sequencing and computer modeling to identify, screen and analyze communities of microbes capable of restoring contaminated land and water. Understanding the natural function of such indigenous recyclers to break down contaminants, the team has developed and commercialized a microbial culture (called KB-1®) that is already being used for groundwater clean-up at sites around the world.

Meanwhile, Canada’s well-established biomonitoring framework—which is critical for ringing the bell on environmental stresses before they reach critical thresholds—is getting a complete overhaul through new genomics tools and technologies that cut down on biological sampling costs while dramatically increasing the amount of information that can be gleaned from samples. A research project called Biomonitoring 2.0 is coordinating closely among industry, government, Aboriginal and non-government stakeholders to improve Canada’s ability to manage its natural resources and maintain its strength in biomonitoring.

Enhancing energy extraction is, of course, another area of exploration for genomics researchers. There is huge potential in this area both for mining and energy extraction, though so far with limited commercial success. Through a better understanding of the microbial activities operating in natural resource environments,

scientists are confident that genomics and related sciences can improve the effectiveness of biotechnological solutions to raise recovery rates well above current low and diminishing levels.

The world of biofuels is also going through dramatic change as microbial communities are being used to help in the biochemical conversion processes necessary to convert biomass to useful fuel. These new biologically based conversion technologies promise to decrease the energy used to produce a whole new generation of biofuels.

Genomics is still a young science. Its power and potential, especially in areas outside its more evident spheres of influence such as health and agriculture, are just beginning to be probed.

Canada has the unique opportunity to advance genomic applications in the energy sector thanks to an abundance of natural hydrocarbon resources and the foundations of the necessary genomics infrastructure that has been established through sustained federal and provincial government investments in the field.

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dance of natural hydrocarbon resources and the foundations of the necessary genomics infrastructure that has been established through sustained federal and provincial government investments in the field.

The sector's sustainability issues need to be addressed urgently. Energy companies and government

policy makers need to work closely together to create an environment where data sharing practices and interfaces between academia and industry are as productive as possible. Much more needs to be done to ensure Canada's future as a responsible energy superpower.

Harnessing the power of biology in industrial processes at scale must be a compelling priority for the federal and provincial governments if we as a country wish to remain competitive. Given Canada's footprint in the life sciences and the importance of our traditional industries to our economy, this should be feasible. **P**

*Pierre Meulien is President and CEO of Genome Canada, a federally-funded not-for-profit organization that acts as a catalyst for developing and applying genomics and genomic-based technologies, to create economic and social benefit for Canadians.*  
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Wind is one of the clean energy renewables, along with hydro and solar, that will meet growing electricity demand. ABB photo

# Canada's Economic-Energy Conundrum: EPIC's Contribution to a National Discussion

Dan Gagnier

*For five years, the Energy Policy Institute of Canada gathered expertise and research to help the country's decision leaders formulate a national energy strategy. Now chair of the International Institute for Sustainable Development, former EPIC president Dan Gagnier sheds light on what EPIC found, how global markets are shifting and what Canada can do to take the lead in energy transformation.*

On July 31 of this year, the Energy Policy Institute of Canada (EPIC), a not-for-profit policy think tank founded by traditional and renewable energy interests and other private sector CEOs, ceased to operate. The EPIC Report on Canada's Global Energy Leadership was delivered to governments in 2012. For some five years, experts from the energy industry and other sectors had directed research and exchanged non-competitive information on what we should do to have a viable energy strategy for this country.



The aim was to enhance our competitiveness in a fast changing geopolitical context, demonstrate environmental responsibility and create prosperity and growth. Before you, as a reader, assume it was self-serving, you should consider some of the key recommendations of the report. They included:

1. Major review and overhaul of federal/provincial regulatory systems
2. Move toward a national carbon pricing regime
3. Creation of innovative cluster partnerships and enhancement of the Scientific Research and Experimental Development (SRED) program
4. Enhancement of Canada's energy security through infrastructure investment, market diversification and technological leadership

**We have the natural resources and the technological resources to make a contribution if we can take the decisions in time to lead on energy transformation by demonstrating how to invest and increase the share of renewables; by using best standards for the safe and environmentally acceptable extraction, transportation and distribution of both fossil fuels and electricity.**

5. Promotion of energy literacy and conservation

Through 2011 to this July, EPIC worked with both the federal and provincial governments, sharing our efforts and answering questions on the benefits of taking a more directive approach to an energy strategy that would reflect jurisdictional prerogatives and regional realities. Political and private sector leadership was at the base of bringing about positive change.

Before we assess what has been achieved, we need to consider the energy demand, production and investment profile in 2013 and 2014.

The 2013 International Energy Agency (IEA) study provides a great overview. In its opening slide, the key determinants of change in the sector are clearly represented.

**T**he imperative for Canada in this fast changing situation is basically a call to action. We have the natural resources and the technological resources to make a contribution if we can take the decisions in time to lead on energy transformation by demonstrating how to invest and increase the share of renewables; by using best standards for the safe and environmentally acceptable extraction, transportation and distribution of both fossil fuels and electricity.

Within the Canadian context, we have demonstrated the ability not only to consult but to participate with communities, including aboriginal communities, in the development of energy projects.

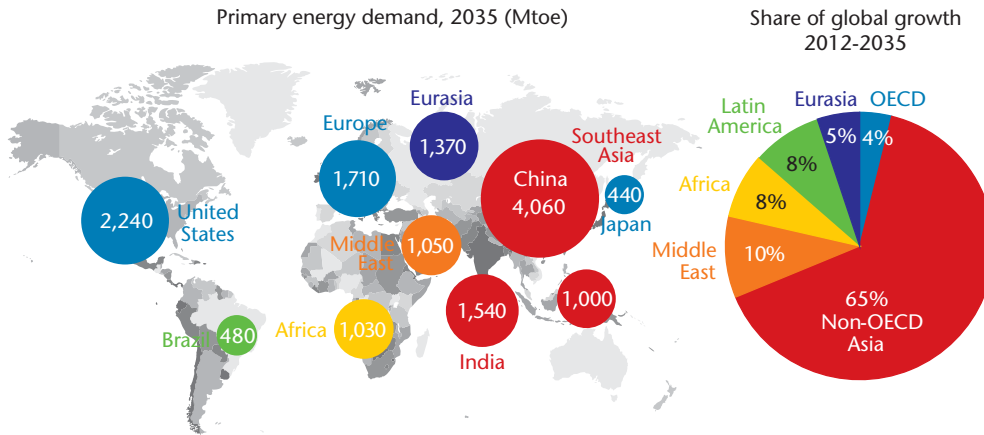
EPIC policy sessions included many conversations on what it would take to create the kind of collaborative economic and social partnerships that could lead to accelerated investments and realization of specific projects.

The one slide in the IEA study that captures the challenge is the projected growth in energy demand. Over the past 25 years, despite increased investments and efforts on renewables, their overall share has remained stable.

In power generation, the projections see China and India together building almost 40 per cent of the world's new capacity.

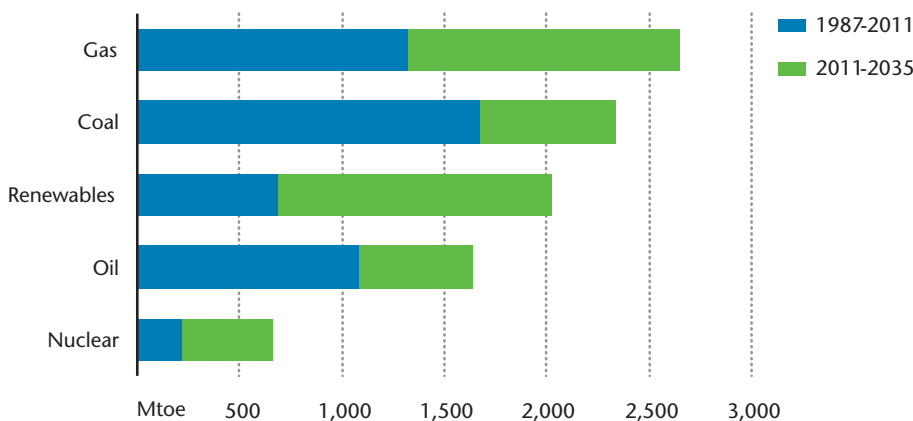
In short, our geopolitical situation

**FIGURE 1: The engine of energy demand growth moves to South Asia**



Source: IEA World Energy Outlook 2013

**FIGURE 2: Growth in total primary energy demand**



Source: IEA World Energy Outlook 2013

is being turned on its head with the USA projected to soon be the largest oil and gas producer on the globe, even going so far as to contemplate exporting energy to help European allies in the face of Russian aggression in the Ukraine. In the IEA's conclusion, we clearly see the impact of a fast changing world:

1. China, then India, drive the growing dominance of Asia in global energy demand and trade
2. Technology is opening up new oil resources, but the Middle East remains central to the longer-term outlook
3. Regional price gaps & concerns over competitiveness are here to stay, but there are ways to react—with efficiency first in line
4. The transition to a more efficient, low-carbon energy sector is more difficult in tough economic times, but no less urgent

What about Investments?

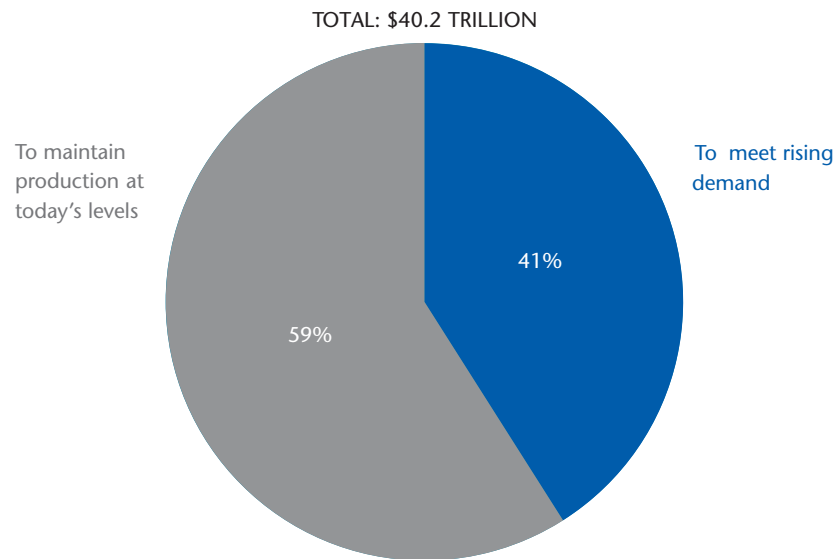
The WEIO (World Energy Outlook Conference) of 2014 again lists a reality outside our borders that we ignore at our own future economic and social peril:

1. Today's investments lock in patterns of consumption, fuel use and emissions long into the future
2. Capital costs to produce energy have doubled since 2000
3. Investment is surging to meet rising Asian demand, but shale in US and renewables in Europe also show dynamic growth
4. Investors are having difficulty navigating policy and market uncertainty
5. Geopolitical concerns are a reminder of risks to reliable supply
6. A disconnect exists between climate change goals and the necessary actions
7. High oil prices and persistent regional price variations for gas and power remain factors
8. Growing public pressure on energy and environmental issues

The investment flow required to meet future expected demand is eye popping:

The conference, after highlighting in-

FIGURE 3: Investment in energy supply, 2014-2035



Source: IEA World Energy Investment Outlook 2014

vestment estimates in the trillions for Europe, hundreds of billions for the LNG industry and over \$16 trillion for the electric power sector to 2035, characterized the challenges we face in merely getting things done:

1. The role of governments in energy markets is on the rise, while private investors are wary of political and regulatory risks
2. Energy investments are moving to areas with high up-front costs, complicating the task of securing finance
3. Without reform to power markets, the reliability of Europe's electricity supply is under threat
4. Investment in gas rises almost everywhere, but meeting future growth in oil demand depends heavily on the Middle East
6. Credible policy & pricing signals, plus new financing vehicles, are essential to re-direct capital flows towards a two degrees Celsius target

The last point is one where many climatologists and experts conclude that our ability to meet the two degrees Celsius target is defunct. We are into scenarios, regardless of whom you want to blame for climate change, of a 3-4.5 per cent increase in GHGs. Quite frankly we are beyond mitigation and need to

focus hard on adaptation.

The first, however, is illustrative of the ever more important role of governments at all levels in ensuring we have the policy and regulatory environments that encourage us to run faster and put the conditions in place that will meet the needs of an energy driven world.

**We are into scenarios, regardless of whom you want to blame for climate change, of a 3-4.5 per cent increase in GHGs. Quite frankly we are beyond mitigation and need to focus hard on adaptation.**

These points apply to Canada as well. We need to reform our electricity transportation systems, to invest in infrastructure to ensure safe and reliable delivery of energy of all kinds to Canadians but also to our export markets.

Political leadership is needed to get through the risk-opportunity scenarios going forward and to ensure we are well served by infrastructure rather than being constrained by inability to resolve issues. This means better interconnectivity on east-west electricity, tidewater ports for the export of our energy, and enhanced focus on green renewables with innovative and new financing mechanisms.

**We need to reform our electricity transportation systems, to invest in infrastructure to ensure safe and reliable delivery of energy of all kinds to Canadians but also to our export markets.**

Our mission in EPIC was to build an energy framework and strategy from the perspective of Canada's economic future. We aimed to engage organizations that cared about energy, about our environment and about employment and wealth generation in order that Canadians in all regions and from all backgrounds could afford the social programs, health care systems and educational excellence required in tomorrow's world.

We partially succeeded. Our first big success was simply achieving consen-

sus in a varied, highly competitive traditional and renewable energy sector that had as many varied views and opinions as any group of organizations can display.

The second was to engage in a discussion with both provincial and federal governments to secure a heightened awareness of the energy/economic and social issues generated by a fast changing reality. Both the provincial and territorial premiers at several meetings of the Council of the Federation, federal ministers and municipal leaders engaged in presentations and discussions around EPIC's five major areas of research and recommendations. The EPIC final report can be found on its web site ([www.canadasenergy.ca](http://www.canadasenergy.ca)).

Third, we made recommendations that were accepted and implemented by governments on regulatory reform. We were less successful with the market diversification recommendations, although the principle of opening to non-US markets has taken on added intensity as a result of European and

other conflicts. The US's energy independence has also served to reduce the intensity of American concern over security of supply issues. The political-environmental controversy over individual projects such as the Keystone XL Pipeline has also borne out the recommendations.

There is no shortage of expertise on the issues. The challenge on renewables, clean-tech, research and innovation will be to drive investment and meaningful change. We will need investors and new investment mechanisms. We will need to modernize, replace and build new infrastructure both for ourselves as a domestic market and for our export markets. That is Canada's clean energy challenge. **P**

*Dan Gagnier is chair of the International Institute for Sustainable Development and former president of the Energy Policy Institute of Canada. Previously, he was chief of staff to former Quebec Premier Jean Charest.*  
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"Focusing on environmental policy isn't exclusively a question of morality," writes Jim Prentice, echoing his message to a Canada 2020 symposium in Ottawa. "Increasingly, it's an economic imperative." Canada 2020 photo, Matthew Usherwood

## Energy and the Environment: Two Sides of the Same Coin

Jim Prentice

*As the massive changes in the North American energy market take effect, Canada will have to rely on guiding principles to balance development and conservation. A former federal minister of both industry and environment, Alberta Progressive Conservative Party leadership contender Jim Prentice provides a unique perspective on what those principles should be, and on how we can reconcile what should not be considered competing imperatives.*

The early days of the conservation movement in North America can be traced back to the actions of US President Teddy Roosevelt. During his two presidential terms at the dawn of the 20th century—working in the interests of what he described as “the people unborn”—this one man, a conservative, set aside almost one-tenth of the land mass of the United States as national parks, forest preserves and bird sanctuaries. He didn’t attend the swearing-in of his successor because he was holed up in his office, using the final moments of his presidency to sign a raft of executive decrees

on wilderness conservation. Among other accomplishments, he saved the Grand Canyon with the stroke of his pen. Taken together, it was—and remains—an astounding achievement.

Conservatives have always been alive to these responsibilities. Over time, environmental concern and action have been hallmarks of our party. I think of the Acid Rain Accord and the other environmental achievements of the government of Brian Mulroney, who in 2006 was honoured by an expert panel as the “greenest” of Canada’s prime ministers.

I think, too, of the long history of conservation efforts in my home province of Alberta—which responded to its nascent energy industry by creating not the Oil and Gas Development Board, but the Oil and Gas Conservation Board. Here, too, in Alberta—indeed, in Canada—the way was led by conservatives.

Conservation was a critical precept in the development of the west, in both Canada and the United States. The dominant presence of public lands across western Canada and the fact that virtually all mineral resources in Alberta and Saskatchewan are publicly owned is a direct product of this ethic. So too, is the legal and constitutional framework surrounding access to water and waterways across the west.

As conservatives, we have led on this issue throughout our history. We have done so with pride and with purpose. We should not cede this ground to others—or allow ourselves to appear indifferent to the well-being of the world around us.

Certainly, there is something of a “pick-a-side” mentality that prevails in debates that involve resource development and environmental concern. There is a notion that you can be on the side of development, or you can be on the side of the environment, but you can’t have it both ways.

**W**e should not fall into this trap, nor accept this dynamic. We should not view concern for the environment as political anathema. On the contrary, I believe that leading on the environment has become a political imperative.

**There is something of a “pick-a-side” mentality that prevails in debates that involve resource development and environmental concern. There is a notion that you can be on the side of development, or you can be on the side of the environment, but you can’t have it both ways.**

The world is more complicated than ever. Global issues are increasingly intertwined: security and economic development; privacy and technological innovation; energy and the environment.

Focusing on environmental policy isn’t exclusively a question of morality. Increasingly, it’s an economic imperative. Around the world, the wave of concern over climate change crested a few years ago—but those who are paying attention can see that the next wave is building. That wave will come, and it will be highest when it crests on our shores. Canada needs to be ready for it.

And it is all the more complicated due to the recent dynamism of the North American energy marketplace.

Forty-five years ago, Richard Nixon became the first US president to highlight the strategic importance of the Canadian oil sands and to propose a Continental Oil Policy. An alignment was achieved: Canada as a supplier, the US as a consumer.

Since the 1980s, sheltered and framed by free trade agreements, Canada and the United States have enjoyed the mutual benefits of an extraordinary partnership. Our two countries have created the largest and most integrated energy marketplace in the world.

And now, we have together entered a new era.

The North American energy renaissance is transforming the supply-demand balance on our continent and transforming the goal of North American energy security from pipe dream to probability.

The scope of this upheaval is unprecedented.

The United States is today the world’s largest producer of liquid fuels and will be the largest producer of oil itself within a year or so. By 2020, our continent will be self-sufficient.

We are now in a world in which the US energy secretary is busily reviewing export licenses for some 17 Amer-

ican LNG facilities and is even musing about lifting the 40-year-old ban on oil exports.

This is a time of optimism and possibility. Given the pace of change, it is also a time of pronounced volatility. There have been regional and continental implications and we are now beginning to witness global changes, as energy flows, prices and competitiveness shifts.

In light of changes in the marketplace, we need principles to guide us:

I say this because quite simply—in a competitive global marketplace where countries, as well as companies, compete—we can’t afford to be cross-threaded with our existing or potential customers. This is not merely a question of morality: there is a highly practical element at play, as well. It’s about protecting our place in the global economic market—preserving jobs and investment for a country that relies on trade, and therefore very much relies on its international reputation.

**There are those who attempt to portray resource development and environment protection as competing interests. This is a false proposition. The more complex and nuanced truth is that we can pursue both and we can achieve both.**

**T**o my mind, there are eight principles that we should use, as conservatives, to define Canada’s approach to conservation in the 21<sup>st</sup> century:

First, we must continue to develop our resources—extracting from them the greatest benefit, for the largest number of Canadians, over the longest possible time. This is, in fact, the very foundation of Roosevelt conservationism. There is no shame in the development of our natural resources, so long as we are the best in the world at it, and it is sustainable.

Second, we will establish Canada as a world leader in the advancement of conservation and the protection of the environment.

There are those who attempt to portray resource development and environment protection as competing interests. This is a false proposition. The more complex and nuanced truth is that we can pursue both and we can achieve both. We can be a country that excels in the development of its natural resources—and in the protection and preservation of its natural environment.

Third, we enjoy an extraordinary environmental advantage and we should exploit it as an asset in North America's competitiveness.

Canada has one of the world's cleanest electricity systems, emitting little carbon and heading toward emitting virtually none. As a continent, the natural gas boom is providing North American industry with a competitive advantage.

**We must view the environment as a North American issue, because airsheds and watersheds don't respect boundaries and borders. We must pursue harmonization with our American neighbours.**

With that in mind, we must view the environment as a North American issue, because airsheds and watersheds don't respect boundaries and borders. We must pursue harmonization with our American neighbours. It is crucial that we as Canadians refrain from damaging our competitiveness by independently imposing costs, including environmental costs, on our domestic industries. But if we work together with the United States, we can achieve an even greater advantage by further harmonizing our environmental standards to make our continent an even more potent competitive force.

Fourth, as conservatives we will rely on free markets to develop the technology that will assist our pursuit of greater environmental responsibility.

We must avoid the lure of what I describe as subsidized environmental-

ism—the kinds of government-sponsored programs that funnel public money into schemes that, to be kind, have a dubious record of tangible success. As a nation, we poured billions into eco-subsidies without seeing any meaningful improvement in environmental outcomes. The Americans have done much the same with ethanol. Europeans have spent billions on renewable energy projects that have been singularly successful in damaging their industrial competitiveness.

Fifth, as conservatives we must believe in and establish and enforce world-class regulatory and monitoring standards.

**W**e must continue to define an environmental protection regime that is fair, clear, well thought out and well enforced. We must encourage responsibility by adhering to the principle of "polluter pay." We must ensure our regulators adhere to the imperative of investor certainty and the need to conduct reviews in a thorough yet timely fashion. As Roosevelt himself said: "Delay is costly. Nine-tenths of wisdom consists of being wise in time."

Our regulations must be smart, sound and forward-looking. They must also have teeth.

Sixth, we will enlist science and technology as our allies in responsible development.

We would not today be enjoying the economic benefits of oil and gas production were it not for the assiduous application of science. The oil sands, in particular, are one of Canada's great scientific successes. We need to embrace science and technology not only to understand the ongoing and emerging challenges to our environment—we need to embrace them as an integral component of a potential solution.

Seventh, as conservatives we must continue to lead the world in the conservation and in the protection of natural spaces.

Finally, as conservatives, we must build domestic and international partnerships and alliances and constructively engage with the world in pursuit of environmental solutions and progress on climate change.

Here at home, we must work more

closely with our First Nations and indigenous peoples to build economic partnerships, founded on sound environmental principles. It should surprise no one that Canada's indigenous peoples, who have been here the longest and are connected more closely to the natural environment, have strong views on these issues. We need to listen to their perspective.

**It should surprise no one that Canada's indigenous peoples, who have been here the longest and are connected more closely to the natural environment, have strong views on these issues. We need to listen to their perspective.**

Here's the simple fact of the matter: If you are in the energy business today, you are in the environment business. They are two sides of the same coin. And so if we are serious about being a major global energy producer, then we need to be a major global environmental leader. We need to be willing to work in good faith and in a spirit of co-operation.

**T**hose are the principles that can help conservatives take back the environmental debate. These are the principles that can guide us in the service both of today's Canadians and of those that Roosevelt called "the people unborn."

I consider myself a passionate conservationist. I ascribe to the view of Emerson, who wrote long essays about the natural world but whose guiding view can perhaps be summed up in one of his shortest but most powerful sentences: "Nature," he wrote, "is loved by what is best in us."

We will develop our resources for the good of the present generation. In doing so, we will protect and advance the public interest. And we will strive to prevent waste and loss as the embodiment of our obligation to future generations. **P**

*Jim Prentice is a former minister of industry and later minister of the environment in the federal government. He is a candidate for the leadership of the Progressive Conservative Party of Alberta.*  [twitter@jimprentice](https://twitter.com/jimprentice)





Compared to fossil fuels, vehicles running on bio-fuels have 99 per cent fewer GHG emissions. Veer photo

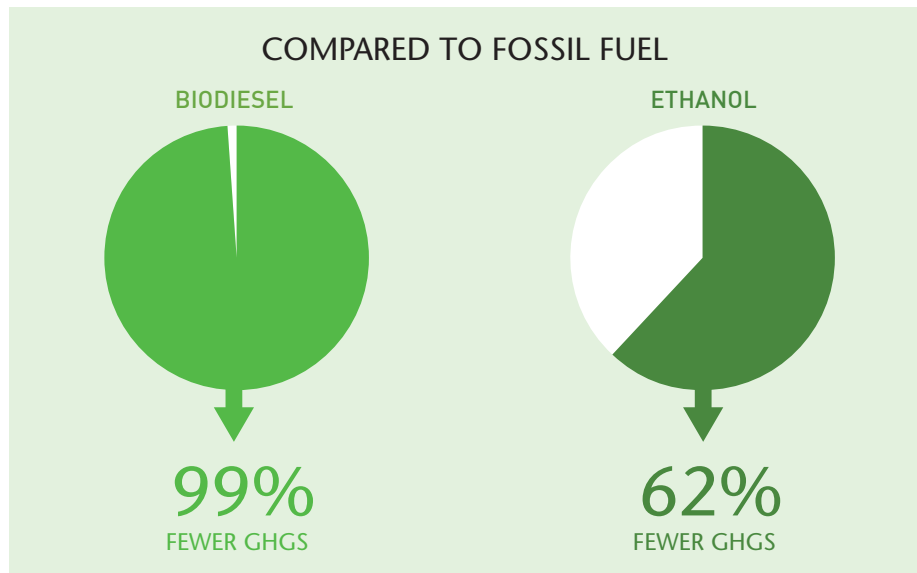
# A Road to Clean Renewable Fuels

W. Scott Thurlow

*With the world population soaring beyond 8 billion people—and Canada's population more than 35 million—there is a pressing need to conserve our natural resources and diversify our energy mix to include alternative, sustainable sources. The scientific consensus on climate change is that it is happening and that human activity is the cause. Protecting our environment is now one of Canada's most pressing challenges. Rising to this challenge is also one of our greatest opportunities.*

**I**t's no secret that renewable fuels burn cleaner than fossil fuels. On a life-cycle basis, biofuels can reduce greenhouse gas (GHG) emissions by as much as 99 per cent when compared to petroleum-based fuels and remove 4.2 megatonnes of carbon from our atmosphere every year—which is equivalent to removing one million cars from our roads. The Canadian government has committed to reducing our nation's GHG emissions by 17 per cent from 2005 levels by the year 2020. While biofuels are a key-stone to reaching this commitment, governments should be looking beyond meeting obligations and focus on *solving* environmental problems.

**FIGURE 1: Biofuels are the cleanest, most sustainable source of fuel available. To date Canada's biofuels policy remains the single most effective policy tool for reducing GHGs**



Source: *Evolution and Growth, From Biofuels to Bioeconomy*, Canadian Renewable Fuels Association 2014

**Today's ethanol and biodiesel plants are poised to become true biorefineries capable of using a wide-range of feedstocks to create renewable fuels and sustainable products.**

Since 2006, Canada's biofuels industry has expanded significantly and now returns billions of dollars in gross economic impact every year. Today's ethanol and biodiesel plants are poised to become true biorefineries capable of using a wide-range of feedstocks to create renewable fuels and sustainable products. Advanced biofuels technologies can convert agricultural waste, forestry residue and even solid municipal waste into cellulosic biofuels. This is already happening in Alberta, with the opening of the world's first industrial scale waste-to-biofuels facility operated by Enerkem and the city of Edmonton. However, Canada cannot fully realize its potential for such technologies and products without addressing the intense competition from other jurisdictions.

Around the world, strategic policy mechanisms and investment programs are already in place. Europe and the United States have recognized

the need for an integrated bioeconomy and have stepped up to make significant investments. The European Commission adopted its strategy in February 2012, including Horizon 2020, the biggest EU Research and Innovation program ever, with some €79 billion of funding available over 7 years (2014 to 2020). In April of 2012, President Obama unveiled the US National Bioeconomy Blueprint, which lays out strategic objectives to help realize the full potential of the American bioeconomy. The US also has a specific blender's tax credit for cellulosic fuels and a mandated requirement for its inclusion.

**The priority we place on sustainability and innovation will ultimately determine our long-term economic prosperity. The growth of today's Canadian bioeconomy is due in large part to renewable fuels technology.**

**T**he unfortunate result is that Canada is being left behind. Despite our natural resources advantage and having one of the strongest economies in the G7, Canadian renewable fuel and bioeconomy policies are not keeping pace internationally. (See figure 2)

The priority we place on sustainability and innovation will ultimately determine our long-term economic prosperity. The growth of today's Canadian bioeconomy is due in large part to renewable fuels technology. While the potential of these technologies is nowhere close to exhausted, new government policies and programs that advance these opportunities are needed, if not overdue.

Programs like the Sustainable Development Technology Canada (SDTC) TechFund™ and the SDTC NextGen Biofuels Fund™ (NGBF) have proven very successful but—unlike in Europe and the US—a transition fund for these new technologies does not exist. Tomorrow's bioeconomy relies on expanding emerging technologies and successfully bringing them to market. Creating a biorefinery fund to support innovative and potentially groundbreaking technology will not only accelerate progress in research, but help shape Canada's overall energy future.

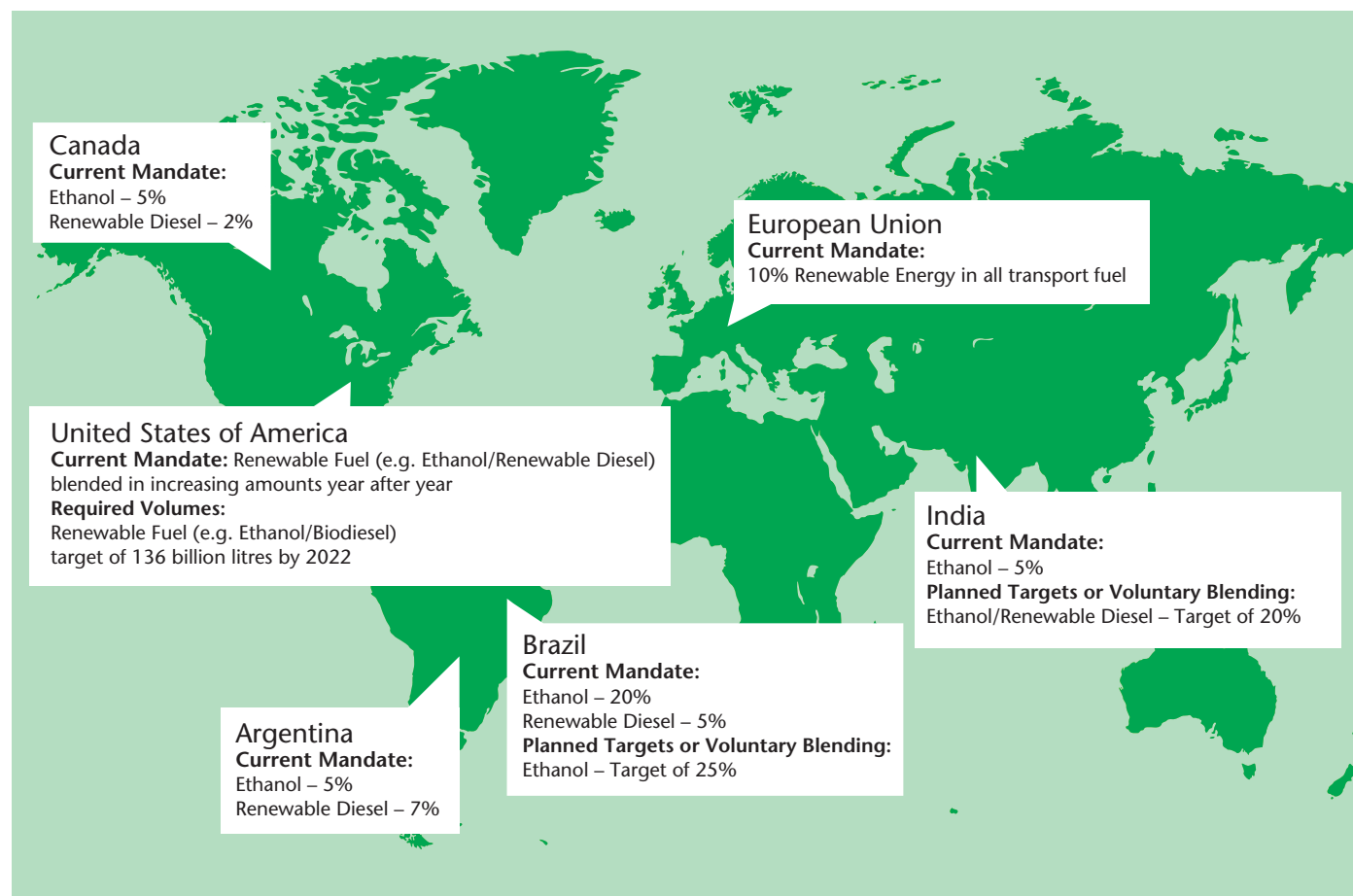
**E**xempting cellulosic biofuels from the current excise tax on fuel would also help advance the bioeconomy by driving production and consumption of cellulosic biofuels in Canada. As demonstrated with similar treatment for other commodities, this relatively small tax measure will encourage domestic production, retain cellulosic biofuels (as well as the associated economic and environmental benefits) in Canada.

Canadian biofuels also give consumers more choices and lower prices at the fuel pump. Renewable fuels diversify our fuel mix and extend our petroleum supply while delivering the environmental benefits many customers—and governments—are looking for.

Starting in 2017, North American automakers will be required to improve their fuel economy under the Corporate Average Fuel Economy (CAFE) standards. By 2025, vehicles in Canada will have to more than double their efficiency and run, over a fleet average, at 54 miles per gallon. The overwhelming consensus from domestic vehicle manufacturers is that higher octane fuels are necessary to drive the smaller, lighter engines that these new fuel economy standards

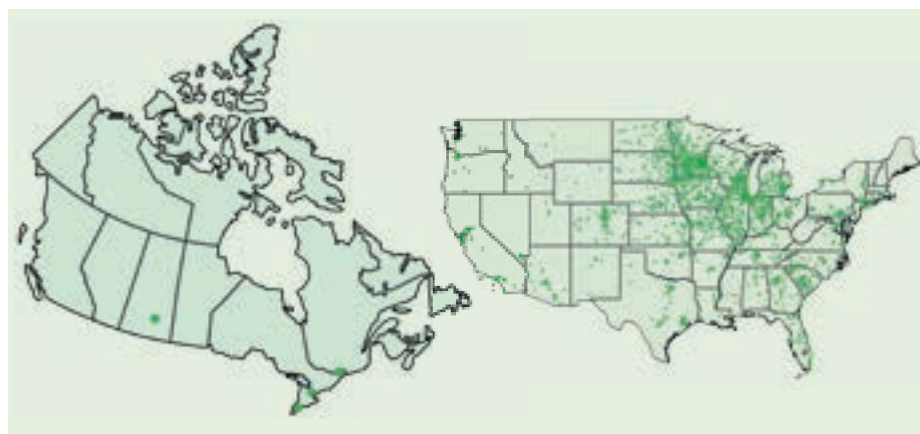


**FIGURE 2: There are no technical barriers to expanding inclusion requirements for federal renewable diesel from two to five percent by 2020, and doing so will encourage greater investment in Canada.**



Source: *Evolution and Growth, From Biofuels to Bioeconomy*, Canadian Renewable Fuels Association 2014

**FIGURE 3: Ethanol station availability in the United States vs. Canada. Canadian consumers simply do not have access to any alternatives to petroleum products.**



Source: *Evolution and Growth, From Biofuels to Bioeconomy*, Canadian Renewable Fuels Association 2014

will require. In fact, European auto manufacturers have already called for higher ethanol blends and Brazil has been using them for years.

There are over 3.5 million vehicles

on Canada's roads that can take up to 85 percent ethanol (E85). In the United States, there are over 3,000 E85 pumps, and thousands of others that offer mid-level ethanol blends and 10-

20 per cent biodiesel directly to consumers. In Canada, there are 5 pumps that offer E85 to consumers and none that offer higher biodiesel blends at commercial sites. (See figure 3)

Ethanol and ethanol-blended gasoline (like E20 or E30) is also the lowest cost source of octane available. Ethanol continues to be cheaper than gasoline. In 2013, the wholesale price of ethanol was, on average, 20 cents per litre lower than the wholesale price of gasoline. As the cost of production of crude oil increases, so too will its price, making all goods more expensive.

Consumers should have the choice to use lower-cost, cleaner fuels for their vehicles. This fueling infrastructure turnover will require significant time to build out properly. To facilitate this, governments should be encouraging existing pump turnover and new market entrants by providing tax incentives—through either a direct tax credit or capital cost al-



lowance depreciation—to those individuals who want to offer consumers these alternative fuels. It bears repeating that similar programs in the US successfully provide a much needed incentive to encourage the turn-over of thousands of pumps that offer higher renewable content to consumers. The reality is that if Canada does not make these investments, the fuel economy regulations put in place to improve fuel efficiency will be completely ineffective.

**Consumers should have the choice to use lower-cost, cleaner fuels for their vehicles. This fueling infrastructure turnover will require significant time to build out properly.**

**M**andated levels of renewable fuel content have succeeded in securing a market for a product that burns cleaner when compared to petroleum based alternatives. As a direct result of these mandates, Canada's renewable fuels industry is domestically producing almost 1.8 billion litres of ethanol

and the capacity to produce 700 million litres of biodiesel. The net result is that consumers receive the benefits of cleaner fuels, and Canada reduces its emissions while at the same time stimulating the economic growth that comes with domestic biofuel production.

Despite the economic and environmental benefits, misinformation based on outdated science and flawed logic persists. This is especially disappointing given the proliferation of such "features" in some national papers and by selected academics and public policy forums.

**Our domestic renewable fuels industry generates gross economic benefits in excess of \$3.5 billion to the Canadian economy every year and has delivered more than 14,000 direct and indirect jobs.**

In Canada, we are fortunate that the federal government—and many provincial governments—have rightly put renewable content regulations into place that are spurring economic growth and supporting agribusiness.

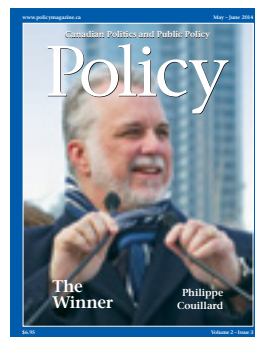
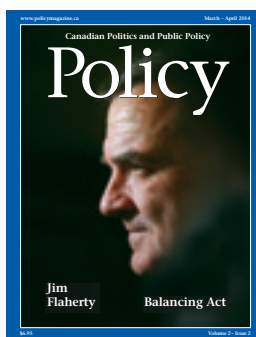
Our domestic renewable fuels industry generates gross economic benefits in excess of \$3.5 billion to the Canadian economy every year and has delivered more than 14,000 direct and indirect jobs. All told, the federal government will realize a net return on investment of more than \$3.7 billion. Characterizing this as a "failure" is untrue and does little besides insult the businesses, policy makers, and farmers who have built a thriving industry. If anything, now is the time to increase renewable fuel requirements and expand biofuels use to other sectors.

Today is a time of real environmental challenges and great economic opportunity. Our industry remains focused on capitalizing on these opportunities. As the recent past has shown, a thriving and fully realized domestic renewable fuels industry is more than possible—it is viable and working in Canada. Now is the time to build on this successful platform and do more. The results will benefit our immediate energy future but more importantly, lay the foundation for the prosperity of generations to come. **P**

*W. Scott Thurlow is the president of the Canadian Renewable Fuels Association. [s.thurlow@greenfuels.org](mailto:s.thurlow@greenfuels.org)*

# Policy

Canadian Politics and Public Policy



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Winter tree planting is an innovative technique used by the Algar Historic Restoration Project, a joint industry project conducted under COSIA's Land EPA to improve caribou habitat quality. Companies involved include ConocoPhillips Canada, Nexen Inc., Shell Canada, Statoil Canada, Suncor Energy Inc. and Total E&P Canada. COSIA photo

# Canada's Oil Sands Innovation Alliance: Collaboration for the Good of the Environment

Dan Wicklum

*In March 2012 the CEOs of 13 of Canada's oil sands producers sat in a room in Calgary, and did something no CEO anywhere in the world had done before. They signed an agreement to share intellectual property and collaborate with their competition for the good of the environment. That landmark agreement marked the formation of Canada's Oil Sands Innovation Alliance and began a new chapter in the history of innovation for the oil sands industry.*

Science and innovation have been companions of Canada's oil sands from the very beginning. The first scientific assessment of the oil sands was conducted in 1848, more than 150 years ago. Since then, the spirit of innovation and the application of science and technology have allowed Canada to become a world leader in the responsible production of unconventional resources like the oil sands.



Canada's oil reserves are the third largest in the world. Of the 173 billion barrels of oil in Canada, 168 billion barrels are located in Canada's three oil sands deposits in Northern Alberta and Saskatchewan.

The bitumen extracted from the sand and clay provides a secure source of energy for Canada and the world. It also provides economic benefits in the form of jobs, royalties and tax revenues that pay for public services across Canada.

We as Canadians value the benefits we see from oil sands but we also place great importance on the environment. With the global demand for energy expected to continue to grow, we will need to use all sources of energy—both conventional and unconventional—to meet it. Producers accept that operating in Canada requires high standards of environmental care and responsibility. They are committed to meeting those standards and continuously improving environmental performance through the development of innovative technologies as they develop this resource to keep up with demand.

Canada's oil sands producers have always been leaders in innovation. Their success in developing the technologies necessary to extract bitumen from oil sands in ways that are economically viable is testament to that. With every new project, individual producers have found ways to increase the economic viability and environmental sustainability of their operations. Now, through Canada's Oil Sands Innovation Alliance (COSIA) they are working together.

COSIA was formed by 13 of Canada's oil sands producers, representing about 90 per cent of Canada's oil sands production. It was formed on the powerful belief in the value of continuous innovation and collaboration to accelerate the pace of environmental performance improvement.

Through the development of globally precedent setting legal agreements, COSIA's members—fierce competitors in every other area—now collaborate at new levels. They can pool their knowledge and expertise to research, develop and implement innovative

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technologies in order to improve environmental performance in Canada's oil sands faster than they ever could on their own.

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The work COSIA's member companies are undertaking is broken into four environmental priority areas (EPAs); Land, Water, Tailings and Greenhouse Gases (GHGs). In order to articulate COSIA's vision and drive innovation, each EPA has developed an Aspirational Goal. They provide direction and alignment for member companies as they identify and develop new technologies that address key environmental issues for the industry. They also provide an important foundation for establishing measurable, short term goals for each EPA.

The aspirations are:

- We will strive to be world leaders in land management, restoring the land and preserving biodiversity of plants and animals.
- We will strive to be world leaders in water management, producing Canadian energy with no adverse impact on water.
- We will strive to transform tailings from a waste into a resource that speeds land and water reclamation.
- We will strive to produce our oil with lower greenhouse gases than other sources of oil.

These aspirations have allowed member companies to break new ground in what it means to collaborate. They play a significant role in guiding the

work being done within member companies to improve environmental performance.

If two minds are better than one, then better still are 13 of the most talented groups of minds; all working to solve some of the greatest environmental challenges facing not only the oil sands industry but the world. In many cases, the solutions we find for our industry will be transferable to other sectors. For example, as populations continue to grow, so too will the need for fresh sources of water. We will need to find low carbon intensive methods of desalinating brackish and sea water. COSIA companies are currently looking to reduce GHG intensity by increasing the energy efficiency of water treatment processes for in situ bitumen production. It is our hope that the solutions we find will improve water treatment technologies worldwide.

For that reason, COSIA has sought out innovative organizations from other sectors to collaborate with on solving these challenges. Through COSIA's Associate Membership (AM) program, we can collaborate with innovators around the world to find solutions to the environmental issues facing the oil sands industry.

For example, through COSIA's AM program, GE has contributed approximately \$18 million towards projects that will enable the development of new technologies to reduce water use and GHG emissions in Canada's oil sands. They are able to collaborate directly with COSIA's member companies, allowing technical experts from GE, Suncor Energy, Devon Canada, ConocoPhillips and several other member companies to share ideas and develop a new generation of environmental technologies.

While we take great pride in our ability to collaborate with some of the biggest energy players in world, we also recognize that sometimes game changing ideas come from small organizations or individuals—some



working out of their backyards and garages. For that reason, we have created the Environmental Technology Assessment Portal, or E-TAP. E-TAP allows anyone, anywhere in the world, to submit a technology idea directly to COSIA through our website, COSIA.ca.

**To date, COSIA's members have shared more than 560 existing technologies that cost over \$900 million to develop. In addition to those contributed technologies, COSIA has about 190 active projects that cost over \$500 million dollars.**

In addition to the AM program and E-TAP, COSIA works closely with government and academia to share knowledge and research in order to understand and mitigate the industry's environmental footprint. COSIA's Land EPA is working directly

with Alberta Innovates, Bio Solutions, Energy and Environment Solutions, the University of Alberta and the Natural Sciences and Engineering Research Council of Canada to establish the Alberta Biodiversity Research Chairs Program. The program, which currently includes two research Chairs at the University of Alberta in Edmonton, is intended to fast-track biodiversity science by providing funding and support to implement on-the-ground research in the boreal forest of Northern Alberta.

To date, COSIA's members have shared more than 560 existing technologies that cost over \$900 million to develop. In addition to those contributed technologies, COSIA has about 190 active projects that cost over \$500 million dollars.

Among the collaborative joint industry projects our member companies have undertaken are plans to build a Water Technology Development Centre (WTDC) at Suncor's Firebag in situ facility. The WTDC will allow Suncor and its joint industry partners

—Canadian Natural Resources Limited, Devon Canada, Nexen Energy, Shell Canada and Husky Oil—to test water treatment and further develop recycling technologies in real world conditions, shortening the time frame needed to develop and commercialize technologies.

COSIA, as both an organization and a concept, is new, just over two years old. But our members are beginning to see results. We look forward to continuing to work together to develop new, innovative ways of improving the environmental performance of our industry and finding solutions to the complex environmental issues that face this planet. **P**

*Dan Wicklum has been the Chief Executive of COSIA since March 2012. Prior to joining COSIA, he held various senior positions for Environment Canada and Natural Resources Canada. He is a board member of the Climate Change and Emissions Management Corporation. His first career was as a linebacker in the CFL. [info@cosia.ca](mailto:info@cosia.ca)*

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# Policy

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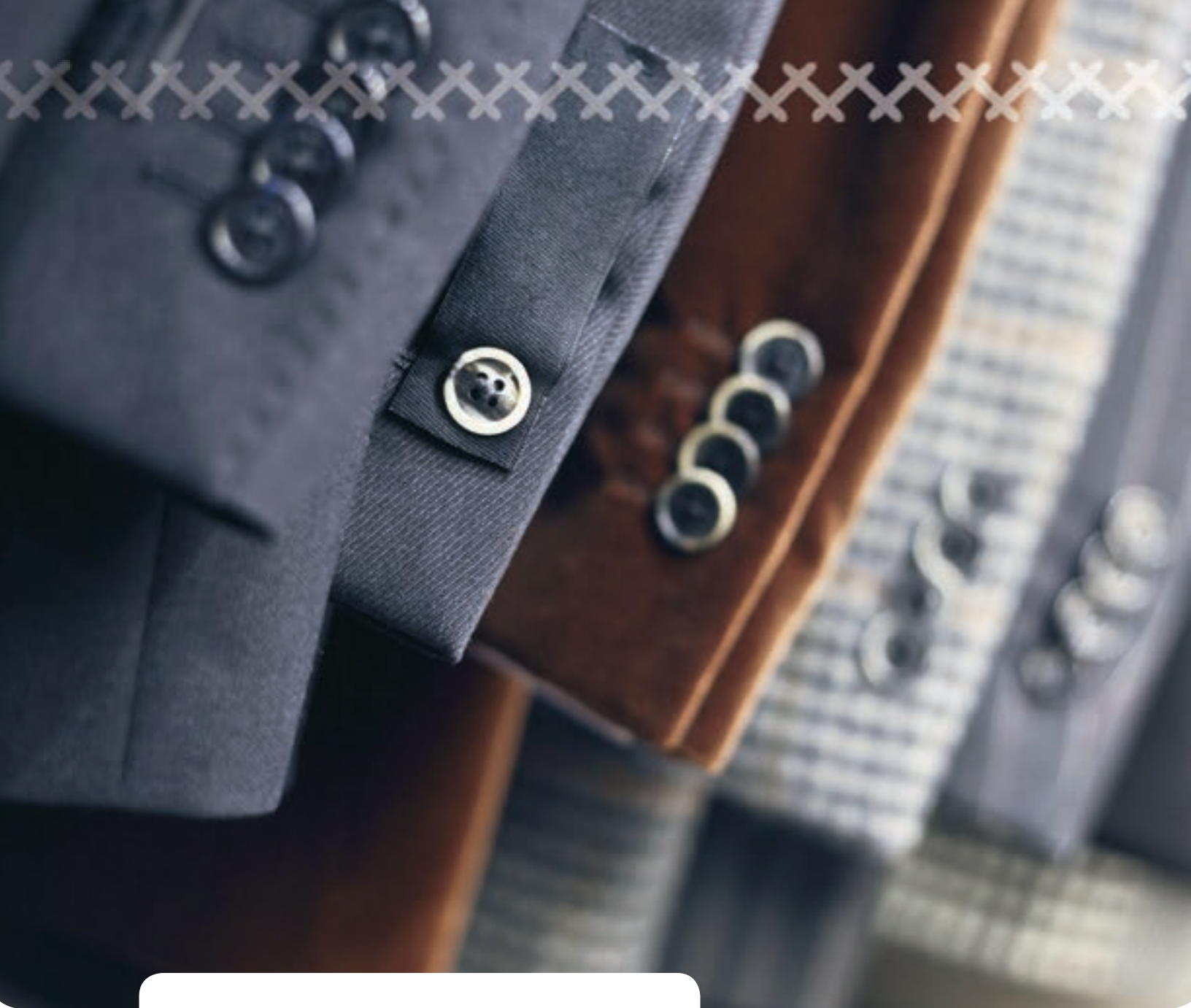
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