

**Building Sustainable Value**  
A Canada-US Energy Roundtable  
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Discussion Paper





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**Ottawa Office**

1405 - 130, rue Albert Street  
Ottawa, ON, Canada, K1P 5G4  
Tel/Tél: 613.238.7160  
Fax: Téléc: 613.238.7990

**Toronto Office**

MaRS Discovery District  
401 – 101 rue College St,  
Toronto, ON, Canada, M5G 1L7

[www.ppforum.ca](http://www.ppforum.ca) | [@ppforumca](https://twitter.com/ppforumca)

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## Introduction

One of the greatest challenges of our time is balancing energy demands and environmental considerations. According to the U.S. Energy Information Administration, global energy consumption is expected to rise by 56 percent, and global energy-related CO<sup>2</sup> emissions will increase by 46 percent over the next 25 years if policies and regulations remain unchanged.<sup>1</sup> Rather than simplistic trade-offs, environmental challenges can present opportunities for energy innovation and sustainable growth. From improving energy efficiency to advancing clean technology, government and industry are creating sustainable value by focusing on where economic and environmental interests converge.

Around the world and across sectors, energy efficiency and diversification strategies are being driven by economics as sustainable practices today can help ensure competitive advantage in the transition toward a low-carbon future. For instance, China, Germany, India, and Brazil are ahead of the curve in clean technology, with investments in solar and wind energy, as well as biofuels.<sup>2</sup> Global energy companies are also shifting their focus from conventional energy sources to low-carbon innovations.<sup>3</sup>

The interdependent relationship between Canada and the U.S. provides an opportunity to harness collective expertise, resources, and capacity to transform North America into a global leader in clean energy. Canada and the U.S. make up the world's largest energy market, with trade exceeding USD 130 billion in 2013.<sup>4</sup> Canada is the leading supplier of oil and gas to the U.S., which is the primary market for Canadian exports.<sup>5</sup> Canada is also the top destination for U.S. solar, ethanol, and hydropower exports.<sup>6</sup> While the prospect of U.S. energy self-sufficiency creates uncertainty in future bilateral relations, growing global demand for low-carbon energy solutions may encourage further cooperation between the two countries.

## The state of energy innovation

From renewable sources and efficiency measures to energy storage and environmental conservation, clean technology encompasses a diversity of industries, practices, and products. Finding new strategies for sustainable energy development and consumption has become a common priority as countries must respond to the effects of climate change, the risks to energy security, and the pressures of global competition.

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<sup>1</sup> US Energy Information Administration, *International Energy Outlook 2014*: <http://www.eia.gov/forecasts/ieo/>

<sup>2</sup> EY, *Tracking global trends: How six key developments are shaping the business world, 2012*: <http://www.ey.com/Gl/en/Issues/Business-environment/Six-global-trends-shaping-the-business-world---Cleantech-becomes-a-competitive-advantage>

<sup>3</sup> Tyler Hamilton, Total SA's pullback from oil sands a sign of economic times to come, *Corporate Knights*, 04 June 2014: <http://www.old.corporateknights.com/article/total-sas-pullback-oil-sands-sign-economic-times-come>

<sup>4</sup> Government of Canada, Canada and the United States – Energy Relations: <http://can-am.gc.ca/relations/energy-energie.aspx?lang=eng>

<sup>5</sup> Paul W. Parfomak and Michael Ratner, The U.S.-Canada Energy Relationship: Joined at the Well, *Congressional Research Service*, June 17, 2011: <http://fas.org/sgp/crs/row/R41875.pdf>

<sup>6</sup> US International Trade Administration Industry & Analysis, *Market Intelligence Brief: Opportunities for U.S. Renewable Energy and Smart Grid Exporters in Canada's Electricity Market*, April 2014: [http://www.export.gov/build/groups/public/@eg\\_main/@reee/documents/webcontent/eg\\_main\\_075391.pdf](http://www.export.gov/build/groups/public/@eg_main/@reee/documents/webcontent/eg_main_075391.pdf)

Improving energy efficiency is a key approach to reducing greenhouse gas emissions, moderating energy prices, and ensuring responsible resource management. The International Energy Agency found that improvements in energy efficiency across 11 member countries over the past four decades saved over 1 336 million tonnes of oil equivalent in 2012, which is more than total final consumption from any other single fuel source.<sup>7</sup> The benefits of energy efficiency also extend across industries, creating greater cost savings, enhancing competitive advantage, and generating a growing global energy efficiency market valued at over USD 300 billion.<sup>8</sup>

From the supply side, clean energy development has expanded significantly around the world. In 2013, renewable sources contributed over 56 percent of net additions to global power supply, with China, the U.S., Brazil, Canada, and Germany as the leaders in total installed renewable capacity.<sup>9</sup> Despite ongoing expansion in hydro, wind, and solar energy, global investment in renewable energy has declined for two consecutive years.<sup>10</sup> In addition to the lack of clear policy direction, OECD countries continue to face such barriers as infrastructure constraints and the dominance of conventional sources. Other challenges in advancing clean energy include limited innovation in end-use sectors, rising electricity demand from networked devices, and inadequate data on overall progress.<sup>11</sup>

To effectively curb global warming, dramatic reduction in overall energy demand must be combined with accelerated growth in clean energy capacity. With more countries introducing policies for renewable power, the global market for clean energy continues to expand. Ongoing dependence on fossil fuels presents opportunities for carbon capture technology. Increasing urbanization drives further innovation in sustainable city planning. Industries across sectors also have a key role to play as 44 percent of emissions reductions over the next decade can be achieved through end-use efficiency.<sup>12</sup>

## Clean technology in Canada and the United States

Global trends in energy innovation demonstrate both progress and decline. In the North American context, clean energy investment has remained strong although signs of waning momentum are present. Canada and the U.S. have introduced policies and increased funding to boost clean energy development. Both countries have also established bodies at the national and sub-national level to support innovation. However, common issues and objectives suggest that opportunities exist for further collaboration.

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<sup>7</sup> International Energy Agency, *Energy Efficiency Market Report 2014 - Factsheet*:  
[http://www.iea.org/media/news/2014/press/EEMR14\\_Factsheet.pdf](http://www.iea.org/media/news/2014/press/EEMR14_Factsheet.pdf)

<sup>8</sup> Ibid.

<sup>9</sup> Renewable Energy Policy Network for the 21<sup>st</sup> Century, *Renewables 2014: Global Status Report*:  
[http://www.ren21.net/portals/0/documents/resources/gsr/2014/gsr2014\\_full%20report\\_low%20res.pdf](http://www.ren21.net/portals/0/documents/resources/gsr/2014/gsr2014_full%20report_low%20res.pdf)

<sup>10</sup> International Energy Agency, *Tracking Clean Energy Progress 2014*:  
<http://www.iea.org/publications/freepublications/publication/tracking-clean-energy-progress-2014.html>

<sup>11</sup> Ibid.

<sup>12</sup> Ibid.

## The Canadian context

Based on the current rate of growth, the clean technology sector in Canada will become a CAD\$28 billion industry in less than a decade.<sup>13</sup> With revenues reaching over CAD\$5 billion, Canadian clean energy export markets are now destined for a number of emerging economies, in addition to the US and the EU.<sup>14</sup> Across all sectors, businesses are prioritizing sustainability by integrating clean technologies that improve economic and environmental performance.

Some of the major innovation projects underway include the [Alberta Carbon Trunk Line](#) and the [SaskPower Boundary Dam Project](#), both of which will utilize carbon capture and storage technology to reduce the environmental impact of conventional energy. An example of potentially game-changing clean technology is [Hydrostor](#)'s development of the world's first underwater compressed air electrical storage system in Toronto.

In 2013, clean energy investments increased by 45 percent, placing Canada at seventh place among G-20 countries.<sup>15</sup> Financing for wind energy totaled US\$3.6 billion, followed by solar energy at US\$2.5 billion.<sup>16</sup> A combination of provincial and national policy incentives have contributed to the growing clean technology sector. Key commitments at the federal level include the [Venture Capital Action Plan](#) and additional funding for [Sustainable Development Technology Canada](#), which supports the development and commercialization of clean technology projects.<sup>17</sup>

A number of provinces have also made significant strides in advancing clean energy. British Columbia launched a clean energy vehicle program, while Ontario introduced green bonds and a feed-in tariff program. Alberta is another leader in energy innovation, implementing a carbon tax strategy through the [Climate Change and Emissions Management Corporation](#).

While Canada's clean technology sector continues to grow, further progress can be achieved through more investment, better collaboration, and greater market diversification. In particular, inter-jurisdictional energy cooperation, public-private partnerships, and Aboriginal community engagement are some of the key recommendations for advancing clean energy development.<sup>18</sup>

## The U.S. context

The clean energy sector in the U.S. remains the second largest world market for investment at US\$36.7 billion.<sup>19</sup> In 2012, renewable energy made up almost half of the country's added

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<sup>13</sup> Analytica Advisors, *2014 Canadian Clean Technology Industry Report*: <http://www.analytica-advisors.com/sites/default/files/Stand%20alone%20ES.pdf>

<sup>14</sup> Ibid.

<sup>15</sup> The Pew Charitable Trusts, *2013 Who's Winning the Clean Energy Race?* <http://www.pewtrusts.org/~media/Assets/2014/04/01/clenwhoswinningthecleanenergyrace2013pdf.pdf>

<sup>16</sup> Ibid.

<sup>17</sup> Natural Resources Canada, *Energy Innovation Roundtables – Discussion Paper*, 2013: [http://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/files/pdf/2013/Energy\\_Innovation\\_Roundtables\\_e.pdf](http://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/files/pdf/2013/Energy_Innovation_Roundtables_e.pdf)

<sup>18</sup> MaRS Discovery District, *Canadian Energy Innovation Summit – Summary Report*, 2014: <http://www.marsdd.com/wp-content/uploads/2014/05/SUMMARY-aec-summit-EN-screen.pdf>

<sup>19</sup> The Pew Charitable Trusts, *2013 Who's Winning the Clean Energy Race?*

electricity capacity, with wind power emerging as the largest source.<sup>20</sup> Similar to Canada, much of the progress has been spurred by developments at the subnational level. For instance, Iowa and South Dakota are global leaders in wind energy, which provides close to a quarter of their utility-scale electricity.<sup>21</sup> In addition to wind and solar power, biofuels and technology subsectors continue to attract high levels of investment even though overall interest in renewable energy has declined.<sup>22</sup>

Some of the noteworthy demonstration projects jointly funded by the Energy Department's Office of Fossil Energy include [FutureGen 2.0](#), a clean coal repowering program and carbon storage network, and the [Petra Nova Project](#), the first commercial-scale post-combustion carbon capture retrofit project. A pioneer in the clean technology sector is [EnerG2](#), a Seattle-based company that manufactures advanced carbon materials for energy storage solutions.

Tax credits, as well as renewable portfolio and fuel efficiency standards, are some of the key policy levers that have encouraged a greater focus on low-carbon solutions across sectors. The availability of venture capital and the level of cross-sector collaboration in such technology hubs as the Silicon Valley have also helped catalyze and commercialize energy innovation.

Several recent developments in U.S. clean energy policy have been instrumental in promoting energy innovation. Additional funding to the [Advanced Research Projects Agency-Energy](#) has helped advance the development of early-stage energy technologies. [Energy Innovation Hubs](#) are bringing together top scientists across sectors to tackle such challenges as enhancing the efficiency of buildings and nuclear reactors, producing biofuel from the sun, and creating battery and energy storage systems. The U.S. Department of Energy is also undertaking a [Quadrennial Energy Review](#) to provide a more comprehensive infrastructure strategy to ensure energy and climate security.

Although policy uncertainty may have slowed investment activity overall, recent progress has also resulted in a plateau effect, especially since many states are already meeting renewable portfolio standards.<sup>23</sup> Clearer policy directions for research and investment and a more collaborative approach within government and across sectors may help facilitate ongoing energy innovation in the U.S.<sup>24</sup>

## Shared opportunities

As Canada and the U.S. continue to move toward a low-carbon future, the interdependent relationship between both countries presents opportunities to align efforts and leverage resources to achieve common objectives. Some of the promising areas for collaboration include policy harmonization, infrastructure modernization, and knowledge sharing. Increasing trade in clean energy and technology, coupled with growing global demand for energy innovation, may also provide the impetus for an integrated North American energy market.

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<sup>20</sup> Clean Edge, *2013 US Clean Tech Leadership Index: State & Metro*, June 2013: <http://cleanedge.com/sites/default/files/CTLI-2013-Report.pdf>

<sup>21</sup> Ibid.

<sup>22</sup> Ibid.

<sup>23</sup> The Pew Charitable Trusts, *2013 Who's Winning the Clean Energy Race?*

<sup>24</sup> Belfer Center for Science and International Affairs, *Transforming US Energy Innovation*, November 2011: <http://belfercenter.ksg.harvard.edu/files/uploads/energy-report-january-2012.pdf>



### **Policy harmonization**

The recent climate change deal between the U.S. and China reinforces the global shift toward a low-carbon economy. To support this transition, greater policy harmonization in North America may help to maximize energy innovation and minimize unintended consequences. For instance, many state governments have enacted laws that favour newer forms of renewable energy, placing Canadian hydropower exports at a disadvantage.<sup>25</sup> Differences also exist in the promotion of alternative fuel vehicles.<sup>26</sup> By developing energy policies that are mutually beneficial, both countries can continue to advance clean energy and support economic growth. The integration of Quebec and California's cap-and-trade programs for reducing greenhouse gas emissions serves as an example of how policy harmonization can drive greater impact.

### **Infrastructure modernization**

Energy infrastructure between the two countries is highly integrated given the use of interconnected power grids and pipelines, as well as joint ownership of certain assets. With increasing interest in energy innovation across emerging economies, a greater share of global investments may move away from oil and gas infrastructure to those that support clean energy, such as smart grids and distributed generation. Working together to modernize energy infrastructure may enable Canada and the U.S. to not only leverage clean technology, but also find global markets for their innovations.

### **Knowledge sharing**

With the development of new policy mechanisms, clean technologies, and investment vehicles, knowledge sharing is another way for both countries to build on best practices and achieve better outcomes. Furthermore, both countries may benefit from shared learning given similar challenges around policy coordination and cross-sector collaboration. Established in 2009, the U.S.-Canada Clean Energy Dialogue (CED) signaled progress in bilateral collaboration across a range of priority areas, including carbon capture and storage, the electricity grid, energy efficiency, as well as research and development. The CED has strengthened bilateral networks in clean energy technology and provides a valuable platform for exploring further collaboration.<sup>27</sup>

## **Questions to consider**

As Canada and the U.S. continue to build a low-carbon future, renewable sources and clean technology may gradually make up a greater share of bilateral trade in energy. With increasing global competition, some have suggested that a more integrated North American energy sector may provide advantages for the entire region, such as economies of scale, improved efficiencies, and growth opportunities.<sup>28</sup> Current negotiations under the United Nations Framework

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<sup>25</sup> David Biette and Andrew Finn, Changing Energy: Canada and the United States, *Wilson Center Policy Brief*, January 2013: [http://www.wilsoncenter.org/sites/default/files/changing\\_energy\\_canada\\_and\\_the\\_united\\_states.pdf](http://www.wilsoncenter.org/sites/default/files/changing_energy_canada_and_the_united_states.pdf)

<sup>26</sup> Alan J. Krupnick and Raymond J. Kopp, Attaining Sustainable Development of Oil and Gas in North America: A Review of the Environmental Regulatory Landscape, *Resources for the Future*, June 2014: <http://www.goldmansachs.com/our-thinking/our-conferences/north-american-energy-summit/reports/rff-attaining-sustainable-development.pdf>

<sup>27</sup> Government of Canada, Third Report to the President of the United States of America and the Prime Minister of Canada: US-Canada Clean Energy Dialogue, 2014: <http://www.climatechange.gc.ca/dialogue/6ECF361C-B0F6-46A6-92E8-B845B0DE0C50/Third%20Report%20.pdf>

<sup>28</sup> Christian Gómez, Jr., North American Energy Integration: The Canadian Perspective, *Americas Society and Council of the Americas*, February 2014: <http://www.as-coa.org/sites/default/files/NorthAmericanEnergyReport.pdf>

Convention on Climate Change may also present an opportunity to advance a more coordinated approach to climate policy across the continent.<sup>29</sup>

Given changing dynamics in the global energy landscape, this is an opportune time to explore the future of Canada-U.S. relations in the context of energy innovation. To help identify new areas for further collaboration, some questions for consideration include:

- Which global trends will have the greatest impact on North America's clean energy sector?
- How can Canada and the U.S. leverage new opportunities to build a low-carbon future?
- Where should Canada and the U.S. focus their collaborative efforts to ensure mutual benefits?
- What role can the public, private, and the not-for-profit sectors play in energy innovation?
- How can Canada and the U.S. build on successful partnerships within and across sectors?

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<sup>29</sup> Alan J. Krupnick and Raymond J. Kopp, *Attaining Sustainable Development of Oil and Gas in North America*.



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