
# Second Report to the President of the United States of America and the Prime Minister of Canada

The Honorable Steven Chu
Secretary of Energy
United States of America

The Honourable Peter Kent
Minister of the Environment
Canada

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**President Obama and Prime Minister Harper:**

As the delegated co-leads for the U.S.-Canada Clean Energy Dialogue, we are pleased to take this opportunity to update you on the activities that have been undertaken to advance this important bilateral initiative.

Canada and the United States share a common vision of a low-carbon North American economy powered by clean energy. Achieving this vision is key to addressing the challenge of climate change, enhancing energy security, and fostering sustainable economic growth. In order to meet these goals, both countries are taking significant steps domestically to accelerate the development and deployment of clean energy technologies. However, strong bilateral collaboration can play a significant role in the transition to a low-carbon economy, given the interconnectedness of our economies and energy systems.

Since establishing the U.S.-Canada Clean Energy Dialogue in February 2009, our two countries have made real progress in building cross-border clean energy networks and advancing key projects aimed at accelerating the transition to a low-carbon economy. We have created joint working groups, focused on the following three priority areas:

- Developing and deploying clean energy technologies, notably carbon capture and storage (CCS);
- Building a more efficient electric grid based on clean and renewable generation; and
- Expanding clean energy research and development.

In September 2009, the joint working groups presented a comprehensive Action Plan aimed at establishing a strong foundation for bilateral collaboration on clean energy. The twenty Action Plan initiatives seek to advance strategic demonstration projects, promote collaborative research and development (R&D), align key regulatory standards, and enhance public awareness and outreach on clean energy technologies. The first Report to Leaders on the Clean Energy Dialogue provided an overview of CED progress and highlighted several initiatives from among the twenty projects.

Since last fall, the Clean Energy Dialogue working groups have made significant progress towards implementing the Action Plan commitments. Below you will find a summary of working group activities and accomplishments to date, and a brief update on each of the Action Plan commitments. Information sheets providing more detailed information on each of the twenty projects will also be made available on our respective departmental websites (please see: www.ec.gc.ca and www.energy.gov).

## Carbon Capture & Storage Working Group

The Carbon Capture and Storage Clean Energy Technology Working Group is seeking to put in place framework conditions that will further enable the rapid development and deployment of Carbon Capture and Storage (CCS) in the United States and Canada. The activities laid out in the Action Plan provide the initial building blocks to facilitate collaboration on CCS as well as to contribute to the overall objectives of the dialogue.

## 1. North American Carbon Storage Atlas

Canada, the United States and Mexico are developing an atlas of major carbon dioxide ($CO_2$) sources, potential $CO_2$ storage reservoirs, and estimates of capacity for storing $CO_2$ in those reservoirs, based on compatible methodologies. The objective is to foster and enhance data gathering and information sharing on carbon sources and sinks among the three countries to support a uniform geographical information system. The atlas will be particularly relevant for cross-border sinks to eliminate international 'fault lines' and ensure compatible sinks in North America.

Work on this project has been accelerated under the Clean Energy Dialogue. The digital database is expected to be completed in 2011 and the atlas in 2012.

## 2. Collaboration on Next Generation CCS Technologies

Canada and the United States are developing a plan to advance collaborative research on next generation CCS technologies. The plan will engage research institutes and universities that play a critical role in advancing collaborative opportunities. It will support activities to promote excellence in science and complementary research, and accelerate CCS development through research exchanges, joint research projects, and other collaborations. Cooperation between our two countries on CCS next generation technologies is key for these technologies to become more efficient and cost-effective over the medium to long term.

A discussion paper identifying priority areas for collaboration has been developed. The next step is to hold a series of webinars to explore expanding collaboration in targeted areas of existing research and identify joint research projects.

## 3. $CO_2$ Injection and Storage Testing

Canada and the United States agreed to expand existing collaboration in $CO_2$ injection and storage testing by expanding the International Energy Agency Greenhouse Gas Weyburn-Midale $CO_2$ Monitoring and Storage Project. The Weyburn-Midale Project studies $CO_2$ injection and geological storage in depleted oilfields in southeastern Saskatchewan.

The injection of $CO_2$ into underground storage reservoirs and the monitoring of the behaviour of the $CO_2$ plume in the reservoir provide an opportunity for Canada and the United States to collaborate on:

1. Developing monitoring, measuring and verification methods that help to confirm the safety and efficacy of $CO_2$ storage;
2. Determining the information needed to increase the understanding and the confidence in risk assessments and storage mechanisms; and
3. Demonstrating the integrity of the injection wells and the storage reservoir.

Canada and the United States have committed $5.2 million to fund an expanded wellbore integrity research program that will examine the suitability of current oil and gas well completion practices as applied to $CO_2$ geological storage projects, assess how these completion practices can be improved to reduce the long-term risk of $CO_2$ leaks, and provide valuable input into the risk and performance assessments of long-term well integrity. The Petroleum Technology

Research Centre in Regina, Saskatchewan, as the Technical Manager of the Weyburn-Midale Project, is the responsible party for implementing the research and has begun the work.

## 4. Collaboration on CCS Demonstration

Canada and the United States have agreed to share information and disseminate best practices and lessons learned in large scale injection tests and demonstration projects involving CCS technology.

Gaining a better understanding of how to approach knowledge-sharing in a way that will advance CCS technologies from demonstration to broad deployment by 2020 as quickly, efficiently, and cost-effectively as possible is a key prerequisite for greater market penetration of CCS projects.

The first Bilateral National Conference noted below successfully brought together leading CCS project proponents and governments to discuss what knowledge is relevant and essential, and the ways it can be shared in order to advance CCS in and across our respective jurisdictions, and internationally. Key areas of knowledge-sharing identified included: project management, environmental impact, health and safety, cost and technology performance.

The outcomes of that exchange are: to establish immediately an informal process that begins the sharing of knowledge and, over the longer term, to develop a formal framework for the collection and dissemination of knowledge on CCS. Future work will consist of determining a process by which the information can best be collected and updated, identifying stakeholders and level of detail in the information shared with each stakeholder type, and identifying existing networks and CCS 'knowledge' databases established in both countries, for widespread dissemination of any new information, and for building upon existing initiatives.

The knowledge-sharing will also support CCS outreach, public engagement and capacity building programs, and it will provide an opportunity to assess the effectiveness and impact of the public investment.

## 5. Public Outreach Strategies

Public awareness of CCS is an important factor in the development of a CCS project and the broader deployment of CCS as a greenhouse gas mitigation option. Both governments and CCS project proponents need to work to gain public support. Work is being done in both Canada and the United States in this regard, and we are seeking opportunities to further share information.

In 2003, the U.S. Department of Energy initiated the Regional Carbon Sequestration Partnership Program to identify and test the best approaches for public engagement with regard to CCS projects in each of seven regions spanning the United States and part of Canada. These experiences were presented at the 9th Annual CCS Conference. Since the onset of the partnership program, outreach teams have collaborated and shared their regional experiences through the RCSP program's Outreach Working Group. The lessons learned from the first six years of outreach efforts are now available in a U.S. Department of Energy report entitled "Public Outreach and Education for Carbon Storage Projects Best Practices Manual." The manual is intended to assist project developers in applying public outreach techniques to support carbon dioxide storage projects.

This manual has also been distributed through the Canadian CCS Network to provincial governments and companies for their use. At the 9th Annual CCS Conference, a presentation was also given on the application of the Best Practices Manual by the Petroleum Technology Research Centre's communications team in the development of a communications strategy for the Aquistore Project in Saskatchewan.

## 6. Working Towards Compatible Rules, Standards and Practices

Canada and the United States are working toward developing compatible CCS regulations and standards to minimize business barriers to CCS due to potential differences in regulatory requirements and to facilitate possible future cross-border CCS projects.

In this regard, the United States and Canada have agreed to share information and lessons learned from ongoing regulatory development processes at the federal and provincial/state levels. The two countries are also working together to explore opportunities to develop compatible regulatory approaches, including those related to emissions measurement, reporting and verification with respect to CCS projects.

Over the last several months, the CCS working group was able to identify key regulatory responsibilities for CCS projects within Canadian and United States jurisdictions. Work was also carried out to compare and contrast existing and anticipated approaches to the legal and regulatory treatment of CCS in the two countries. The results of this work were presented at the Canada-U.S. session of the 9th Annual CCS Conference. At this session, the U.S. Environmental Protection Agency also gave an update on their rulemaking process for CCS under the Underground Injection Control program.

Additional areas of collaboration include:

- Sharing updates of ongoing CCS-related rulemaking in both countries
- Sharing updates of CCS provisions in proposed U.S. or Canadian climate and energy legislation and regulations

## 7. Annual Bilateral National Conference

The Bilateral National Conference is to be an annual forum for the exchange of experience and knowledge among governments, academics and CCS project proponents, as well as other stakeholders. Holding this event annually provides a mechanism for advancing the working group's activities under the Clean Energy Dialogue Action Plan. The next conference will take place in Canada. The sharing of information facilitated by this annual conference will help reduce challenges for the next wave of projects and CCS initiatives and further support the ongoing commercialization of CCS.

The first Bilateral National Conference was held in Pittsburgh on May 10, 2010 on the margins of the 9th Annual Conference on Carbon Capture and Sequestration. Participants included representatives from the U.S. Department of Energy, Natural Resources Canada and Canadian provincial governments of Alberta and Saskatchewan, as well as large-scale CCS project proponents and academics. The purpose of the conference was to bring together those entities engaged in large-scale CCS tests and demonstration projects, both in Canada and the United States, to share knowledge gained from developing and implementing such projects.

Both countries presented an overview of their large-scale CCS projects and tests. In the short-term, the United States and Canada have agreed to develop an informal framework consisting of site visits and participant driven agendas to initiate knowledge sharing in North America, and, over the longer term, to develop a formal framework for the collection and dissemination of knowledge on CCS.

Furthermore, both countries will continue to explore an appropriate way for North America to engage with other multilateral initiatives in knowledge sharing. A technical session, focusing on initiatives under the U.S.-Canada Clean Energy Dialogue, was also held at the Conference. Canadian and American authors presented papers on the North American carbon storage atlas; the next generation of CCS technologies; updates on rules and standards for CCS projects; collaboration on large scale CCS activities; and public outreach on CCS projects.

## Electricity Grid Working Group

The Electricity Grid working group is focused on bilateral collaboration to facilitate the long-term transition to a modernized electricity system.

As detailed in the Clean Energy Dialogue Action Plan, this includes identification of options for increasing Canada–U.S. trade in clean electricity, including examining the role that increased use of energy storage technologies might play in helping to accommodate increased penetration of renewable sources in that trade.

It also includes the sharing of best practices, and engaging industry and stakeholders in the increased application of communications technologies, sensors and computer software to the electrical system—a concept known as the smart grid.

In the Clean Energy Dialogue Action Plan, the Electricity Grid working group committed to the following five priority actions:

### 1. Increasing Opportunities for Trade in Clean Electricity

Free trade in electricity between Canada and the United States contributes to a number of important energy policy objectives, including enhanced reliability and improved asset utilization of generation and transmission infrastructure. Both countries also recognize the potential for enhanced trade in clean electricity to contribute to shared renewable energy and greenhouse gas emission reduction goals.

On May 19-20, 2010, the working group brought together leading experts, governments and industry to identify potential clean electricity resources and markets that could provide a foundation for increasing trade in clean energy. The "Increasing Opportunities for Trade in Clean Electricity" Conference took place in Chicago, Illinois. The discussion explored a range of issues, including regulatory constraints, such as permitting processes for transmission lines, as well as the extent to which provincial- and state-level renewable power procurement policies act as barriers in clean energy trade.

Outcomes from this event, including recommendations for solutions to the challenges presented, were documented in a report that is being shared with key stakeholders with an interest in developing and marketing clean energy resources.

Some key conclusions of the report included:

- existing electricity trade, while only accounting for a small percentage of either country's net generation, is vital for electric reliability and meeting seasonal peak demands on both sides of the border;
- Canada has the potential of producing significant new amounts of clean electricity, some of which could be economically exported to the United States, however, this will require extensive collaboration among United States federal and state governments and Canadian federal and provincial governments;
- in the United States, states are developing their own lower-carbon generation resources in order to encourage domestic commercial development and job creation – trade will become a more viable option as the most economic in-state resources are fully developed;
- lower cost clean electricity trade will ensure that carbon goals in both nations can be achieved while still keeping electricity rates affordable; and
- continued U.S.-Canada collaboration can help to achieve these goals.

## 2. Advancing Smart Grid and Clean Power Technologies

The transition to a smarter electricity grid holds substantial promise for the achievement of a number of energy policy goals, including facilitating the integration of renewable energy resources into the electricity supply mix and allowing consumers to better manage their energy consumption.

Both Canada and the United States have an interest in collaborating on the advancement of technologies that will contribute to a smarter electricity grid. The North American Synchrophasor Initiative is an example of such collaboration in which utilities are collaborating on the installation of phasor measurement units, a technology for measuring power quality, across the North American electrical grid. Through this initiative, Canada and the United States are strengthening collaboration on power system standardization issues, including those related to electric reliability and cybersecurity, and around smart grid interoperability.

Technology standardization is particularly important in the context of transitioning to a smarter electricity grid. Natural Resources Canada, together with the Standards Council of Canada, established a Smart Grid Standards Task Force to respond to, and provide Canadian input into, standardization efforts being spearheaded by the U.S. National Institute of Standards and Technology. This process is bringing together key utilities, equipment manufacturers and regulators to improve alignment of smart grid standardization activities in Canada and the United States.

## 3. Realizing the Potential of Power Storage

Both Canada and the United States share a common goal of increasing the proportion of renewable energy in their electricity supply mix. While such sources can help reduce the carbon intensity of the electricity system, they present integration challenges because the electricity they

produce is not dispatchable (i.e., renewable energy sources cannot always be made available on demand).

Power storage technologies can assist in the integration of renewable sources by storing the energy they produce on an intermittent basis for use when it is required to meet demand. Power storage technologies, however, face a number of technological, economic and regulatory barriers that are obstacles to their wider deployment.

In order to further understanding of these barriers, and to provide a foundation for addressing them, the working group undertook research and analysis on possible solutions to addressing market barriers to the adoption of storage projects, including existing hydroelectric storage, for renewable energy integration. In order to support this work, a scoping report was commissioned in early 2010 to explore barriers to the adoption of energy storage projects that can assist in the integration of renewable energy projects. It found that while storage projects can have numerous benefits that accrue across the electricity value chain, the viability of such projects is frequently hampered by market and regulatory issues. Potential solutions will be governed by the nature of electricity market structures, a domain under exclusive provincial and state jurisdictions. With that in mind, future activities are being considered that would engage key provincial and state officials and their regulators on possible solutions.

## 4. Building the Power Workforce of Tomorrow

Approximately 30 percent of the electricity sector labour force is expected to retire over the next five years. This is principally a demographic challenge—one which is common to other sectors—but it presents particular challenges in the electricity sector, which requires substantial infrastructural renewal and reinvestment, and adaptation to new technologies.

On February 17-18, 2010, the working group, together with Canada's Electricity Sector Council, brought together leading experts from industry, government, and academia in a forum called "Building the Workforce of Tomorrow" in Toronto, Ontario. Participants at the forum recognized the pressing need to overcome human resources challenges, including the impending labour shortage and the introduction of new technologies and systems that require workers to complete increasingly specific and demanding training programs. Several best practices and recommendations were provided, which are presented in the report *Clean Energy: Clear Opportunity*. This report presents suggestions that could guide policy-makers and industry stakeholders to address the human resource challenges that threaten to comprise North America's ability to capitalize on clean energy, including increasing public education about the electricity profession and increasing training and apprenticeship programs with colleges.

## 5. Canada–U.S. Smart Grid Forum

There is growing interest among stakeholders and technology suppliers in the ongoing transition to a smarter electricity grid. Stakeholders in Canada are currently collaborating to inaugurate a Canadian Smart Grid Alliance which would be modeled on the U.S. Gridwise Alliance, an industry lobby group aimed at engaging policymakers on the benefits of a smarter electricity grid. The Canadian Embassy in Washington, D.C., hosted a bi-national forum on March 17, 2010 in which they brought together a number of leading Canadian and U.S. experts to discuss smart grid issues, including areas of mutual collaboration by governments and industry to

implement smart grid technologies while maintaining the safety and reliability of the North American grids.

Thus far, technology suppliers are largely driving discussion on smart grid, which they believe presents a major growth opportunity. The working group believes that what has been largely lacking to date is discussion among governments and regulators on policy and role of government issues. Therefore, the working group is co-hosting a Policy Leadership Forum with the Ontario Independent Electricity System Operator (IESO) and University of Waterloo in early 2011 focused on these issues. The Ontario IESO is the leading Canadian entity in the area of smart grid and will bring substantial expertise garnered through the Ontario Smart Grid Forum process for a productive discussion among key players in government and industry.

## Clean Energy Research and Development (R&D) Working Group

Research and development (R&D) drives technological discovery and innovation, which are key ingredients in developing the low-carbon energy system of the future. The Clean Energy R&D working group aims to facilitate greater cross-border R&D collaboration by connecting Canadian and U.S. experts and institutions in priority areas for the Clean Energy Dialogue, including future-generation biofuels, clean engines/vehicles, and energy efficiency (homes and buildings). Strengthening collaboration in these areas through joint research, development and demonstration (RD&D) will help reduce greenhouse gas emissions while strengthening both countries' economies and creating new jobs.

### 1. Clean Energy RD&D Collaboration Framework

The Framework aims to spur and support collaborative RD&D activities by identifying resources and offering mechanisms to help experts, institutions and companies connect and share information and infrastructure.

In order to assess the current state of clean energy R&D collaboration between Canada and the United States, the working group has undertaken and completed a scientometric study of international clean energy R&D activities. The study analyzes the three priority areas and identifies top global performers, as well as key institutions within Canada and the United States. The study finds that both countries perform above the world average in terms of the quality and the impact of their clean energy R&D. The study also confirms that the two countries are strong collaborators, in particular in the area of future-generation biofuels. These and other findings will inform Framework activities over the coming year.

The working group is also advancing the Framework by supporting a series of Partnership Development Workshops in order to connect researchers, share information, and scope future opportunities for collaboration. Workshop topics have so far included advanced biofuels, algal biomass, multi-material lightweight vehicles, and the measurement, reporting and verification of emissions reductions from clean energy technologies. As an example of a workshop output, at the advanced biofuels workshop Canadian and U.S. researchers agreed to pursue the development of a sustainability assessment framework for biofuels as an area for future collaboration.

Next steps for implementing the Framework are expected to include the following:

- producing a laboratory access guide to facilitate cross-border sharing of unique R&D facilities,
- supporting additional Partnership Development Workshops,
- compiling a database of Canadian and U.S. funding opportunities for clean energy RD&D, and
- initiating additional collaborative R&D agreements.

## 2. Clean Energy RD&D Roadmap

Canada and the United States have set ambitious targets for reducing greenhouse gas emissions between now and 2050. In order to explore the significant changes to the energy system that those targets require, the two countries agreed to collaborate on developing a Clean Energy RD&D Roadmap. This roadmap will explore options for short and medium-term investment and policy decisions that could boost North America's burgeoning clean energy economy and cut emissions from the energy system by 2050.

The U.S. Department of Energy has already embarked on a major roadmapping initiative of the U.S. energy system which models the effects of various energy policy options on emissions from the energy system in 2050. Expanding or replicating this effort to include the Canadian energy system will create the components for developing the CED Roadmap.

Agreement in principle on Canadian engagement in this initiative has been secured. Next steps include formalizing this collaboration and launching a series of energy modeling and roadmapping projects needed to expand this effort into Canada.

## 3. Collaborative Projects and Initiatives

The R&D working group has been supporting a series of collaborative R&D projects in priority areas. Achievements to date include:

- Signing of a Declaration of Intent on Energy Science & Technology between Canada and the United States on April 15, 2010. The Declaration of Intent will help advance cross-border collaboration on **bioenergy** and **carbon capture and storage**.

- Signing of a Cooperative Research and Development Agreement between the National Research Council Canada and the U.S. National Renewable Energy Laboratory in February 2010 to undertake collaborative research on **algal biofuels** aimed at yielding improved productivity and harvesting methods. Analyses of algae strains and potential sites for algae production are already underway. Planned future work includes capturing $CO_2$ from a coal-fired power plant to grow algae for biofuel at a demonstration-scale facility.

- Signing of a Memorandum of Understanding (MOU) between Natural Resources Canada CANMET Materials Technology Laboratory and the U.S. Department of Energy's Oak Ridge National Laboratory on June 30, 2010. The MOU will support cooperative R&D on **materials for clean energy**. Specific areas of collaboration include developing

materials and manufacturing processes for lightweight, energy-efficient vehicles and clean energy production.

- Development of a new process to greatly increase the efficiency of low cost **organic (carbon-based) solar photovoltaic devices.** This R&D is part of a collaboration between the National Research Council Canada and Konarka Technologies, Inc. and to date has led to a world leading power conversion efficiency for this technology.

The working group will continue to support collaborative R&D projects. Priority projects for the coming year (in addition to those mentioned above) include analyses of **converting mountain-pine-beetle-killed trees into biofuels,** and evaluating the **electricity demand response potential of buildings** to help them become integral components of the smart grid, and **expanding cooperation on the ENERGY STAR program**.

## Next Steps for the Clean Energy Dialogue

Our initial efforts to promote collaboration on low-carbon technologies under the U.S.-Canada Clean Energy Dialogue have been very promising. We expect that the activities being supported by this initiative will bring long-term benefits by helping to reduce our impact on the environment, improve our energy security, and foster the innovation that will put North America at the forefront of the world's economy for generations to come.

We will continue to encourage the working groups to implement the Action Plan commitments and explore next steps for the collaboration. We are planning to hold a second Clean Energy Dialogue roundtable meeting with key stakeholders later this year, to take stock of progress and discuss new clean energy opportunities that our countries could pursue jointly.

In the meantime, we are pleased to report on the progress we have made and look forward to providing you with recommendations on next steps for the Clean Energy Dialogue in our next update to you in spring 2011.