PROVIDING RELIABLE ENERGY IN A TIME OF CONSTRAINTS: A NORTH AMERICAN CONCERN

Canadian Electricity Association

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Canadian Electricity Association canadienne de l'électricité

The voice of Canadian Electricity. La voix de l'électricité canadienne.

Contact: Tim Egan
416-535-2815, tegan@highparkgroup.com

Contact: Eli Turk
613-230-9876, turk@canelect.ca

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sur le site Internet de l'ACÉ à l'adresse www.canelect.ca

Canadian Electricity Association
Association canadienne de l'électricité
www.canelect.ca

Providing Reliable Energy in a Time of Constraints: A North American Concern

Executive Summary

The North American electricity market is facing significant constraints today and for the foreseeable future that could negatively impact the reliability of the North American market. In terms of generation resources, government initiatives to control carbon and other emissions and to show preferential treatment to emerging technologies over conventional technologies, as well as uncertainty in regulatory processes, could lead to supply constraints in certain regions. Further, the lack of sufficient transmission investment over the last few decades has resulted in constraints on certain portions of the North American transmission grid, while the construction of a growing array of smaller projects has raised new concerns about the sufficiency of transmission capacity to accommodate a differently configured supply system. These issues and labour supply shortages are raising concerns about the long-term security of the North American electricity market. The economic health of both our countries requires the attention of decision-makers in both Canada and the United States to address these issues.

Given the close and extensive relationship between the U.S. and Canada, measures to address constraints should be considered in the context of the North American energy market. The North American electricity system, which interconnects Canadian and U.S. electricity markets, is among the most integrated and reliable in the world and combines a diversity of fuel sources, extensive transmission interconnects and two-way trading that benefits both countries. The integration between these two countries provides the framework for greater trade and greater market opportunities between our countries.

Increased integration of the U.S./Canadian marketplace and coordinated actions between the countries will enable Canada and the United States to provide reliable energy in a time of constraints. CEA believes that the following measures would reduce constraints across the North American market:

- Working cooperatively to increase generation supply, including both mature and emerging technologies;
- Enhancing the cross-border transmission grid by increasing transmission capacity, implementing bi-national transmission reliability rules, building transmission for new generation, and ensuring critical infrastructure protection;
- Avoiding barriers to cross-border electricity trade;
- Promoting demand-side measures and energy efficiency/conservation;
- Coordinating strategies to address environmental concerns; and
- Managing labour shortages.

As major players in the global energy market whose economies turn on a robust and reliable energy sector, both Canada and the U.S. must ensure a reliable energy supply in the future. Such energy reliability can be built on the existing energy trading relationship and the opportunities for enhanced trade between the countries. The continued emphasis on the integrated U.S. and Canadian energy markets provides an excellent means to ensure energy reliability for both countries and avoid constraints on the system. In both Canada and the U.S., long-term growth and the need to replace aging assets will require large - scale technology projects alongside smaller-scale emerging technology projects. Making generation, transmission and labour constraints a North American concern makes sense from both an economic and a political perspective.

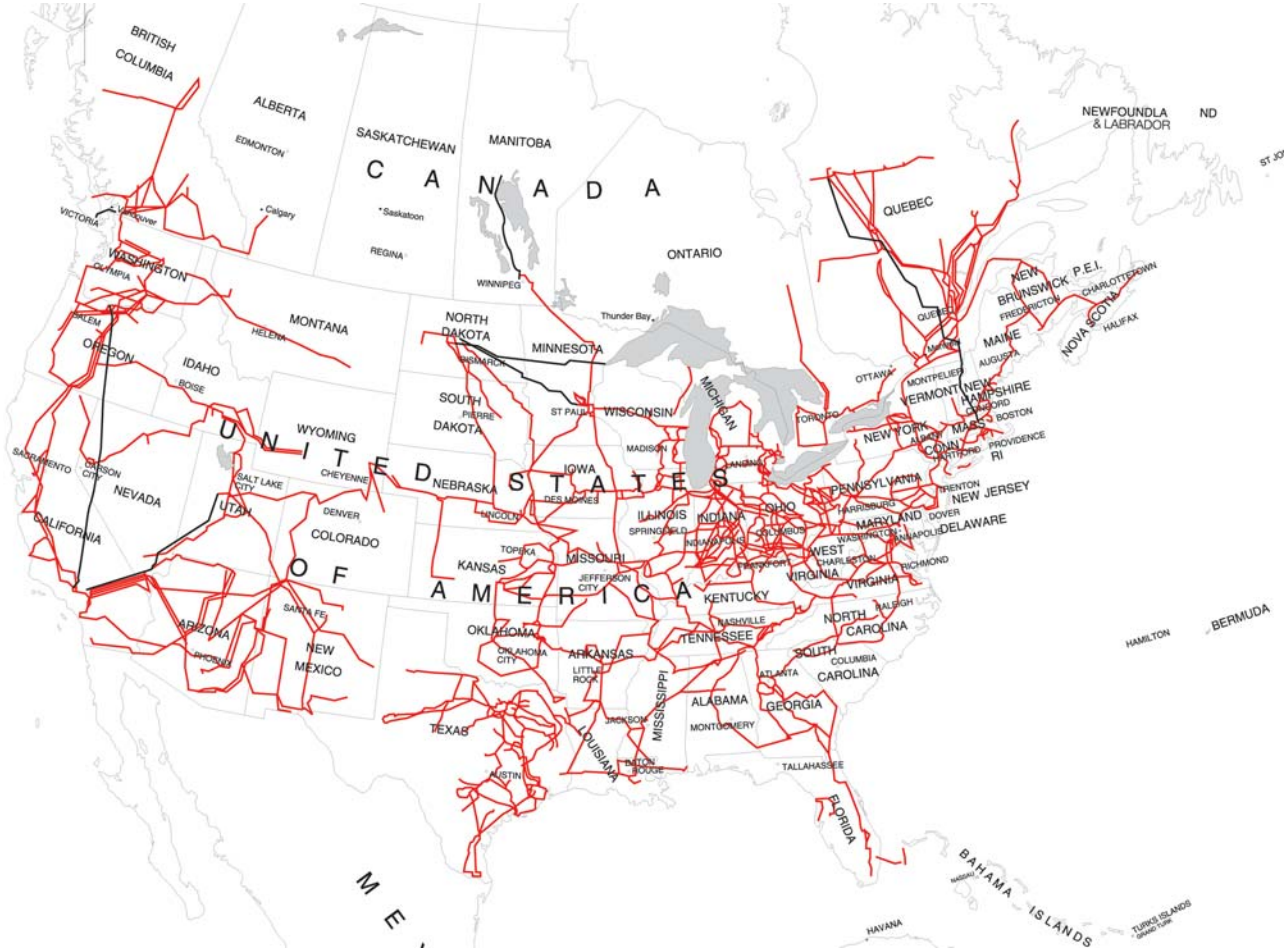
I. Market Overview: The Integrated U.S./Canadian Electricity Market

The diversity of the Canadian and U.S. electricity systems, the different balances of conventional and emerging technologies in our various regional generation mixes, and the differing market demands region by region over days, weeks, and seasons, have prompted a level of trade that benefits electricity consumers in every region across the continent. When linked across the international border, our diverse systems have created opportunities for efficiencies in regional systems management, reduced environmental impact, and improved reliability; these are vital achievements for all concerned.

A. Details of the Integrated Market

The map of the North American Transmission Grid below offers a clear visual indicator of the extent of current integration. Electricity trade occurs at a range of points across the Canada-U.S. border, as shown on page 3, reflecting the largely north-south nature of the Canadian grid, as it is integrated with the more dense web of transmission infrastructure in the U.S.

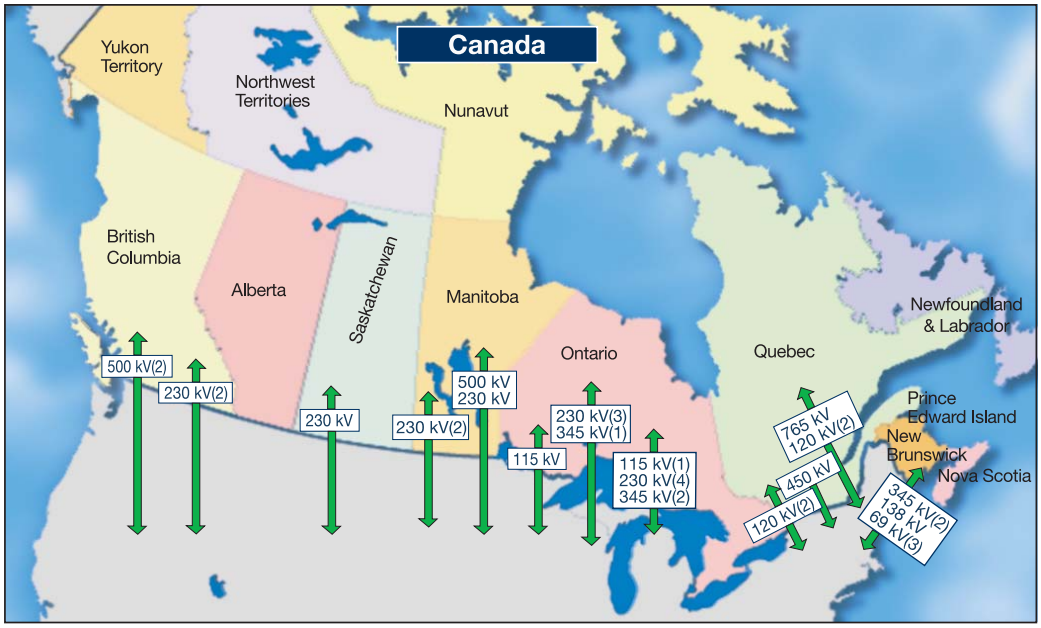
North American Transmission Grid



Map copyright CEA. Lines shown are 345kV and above. There are numerous interconnections between Canada and the U.S. under 345kV that do not appear on this map.

Cross-border trade enables market participants to take advantage of diversity between the Canadian and U.S. electricity systems. The diversity and complementarity of our systems are first demonstrated by the different balances of various mature and emerging technologies in our generation mixes. These differences primarily reflect availability of resources, as different geographic regions have access to different input resources. The pie charts show the generation mixes for Canada and the U.S.

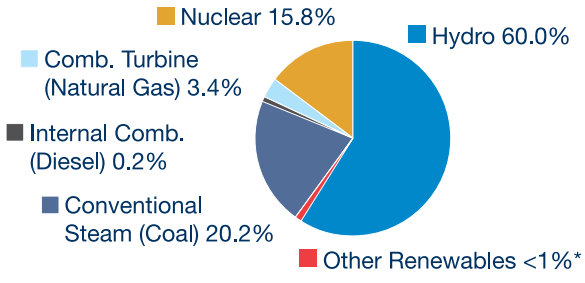
Major Transmission Interconnections between Canada and the U.S.



Note: The numbers indicate the voltage of the power lines from each province to the states.
If there is more than one line with a given voltage, the number of lines is indicated in parentheses.
Source: NEB, Canadian Electricity Association and Natural Resources Canada.

Electricity Generation by Fuel Source in Canada and the U.S., 2006

Canada
Net Electricity Generation, 2006

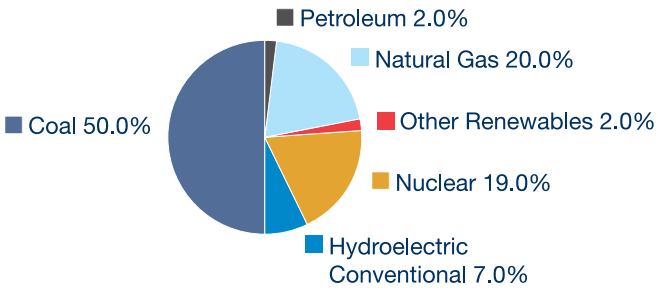


Total = 584.4 TWh

Source: Statistics Canada
Survey 2151

*2006 data was unavailable at the time of publication.
Numbers are based on 2005 data.

U.S.
Net Electricity Generation, 2006



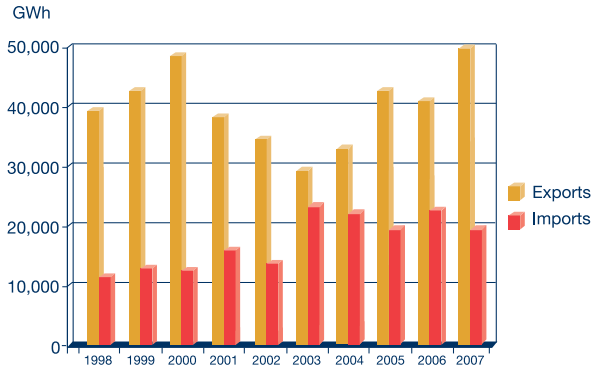
Total = 4,065 TWh

Source: Energy Information Administration
Electricity Power Annual

Electricity is now established as a key and growing part of the larger energy trade between the two countries, and it is increasingly two-way. Electricity trade between Canada and the U.S. stems primarily from two sources. First, generators in Canada are key suppliers to particular U.S. markets. In addition, generators in both countries take advantage of the trading relationship (for example the interaction between the competitive markets of Ontario, NYISO and MISO) to optimize the performance of their respective asset portfolios, which contributes to lower electricity costs and higher overall system efficiency and reliability. The bar graph demonstrates the extent of this two-way trading relationship.

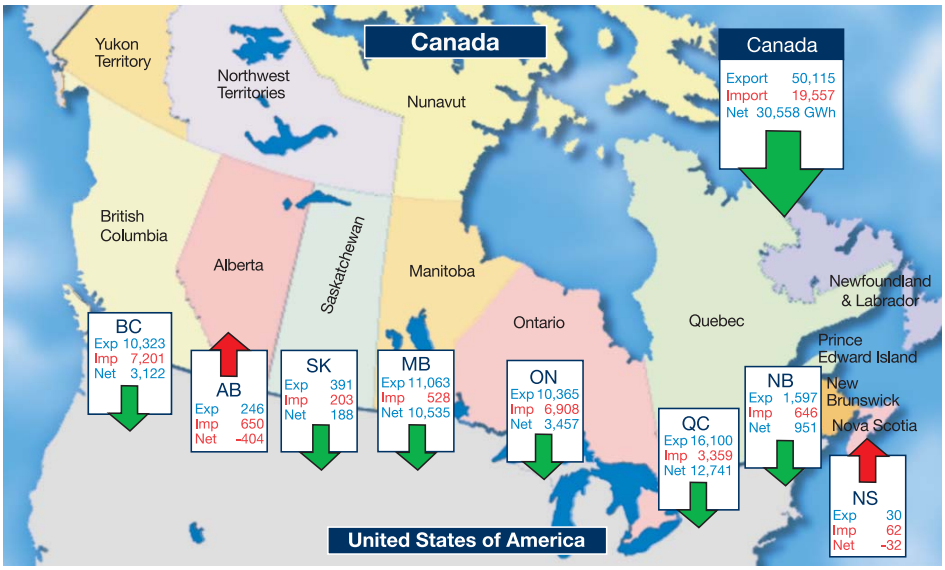
The quantity of electricity exported from Canada has typically been 6 to 10 percent of production. At the same time, electricity imports to Canada have increased over time. The fundamental point is that the market is a borderless one, and supply meets demand north to south or south to north as that market requires, to the advantage of consumers across the continent. Robust competitive wholesale markets in both the U.S. and Canada rely on integrated U.S./Canadian markets. As the markets continue to open, the importance of cross-border trade will only increase.

Electricity Exports from Canada and Imports from the U.S., 1998-2007



Source: NEB Electricity Exports and Imports, Monthly Statistics, various years.

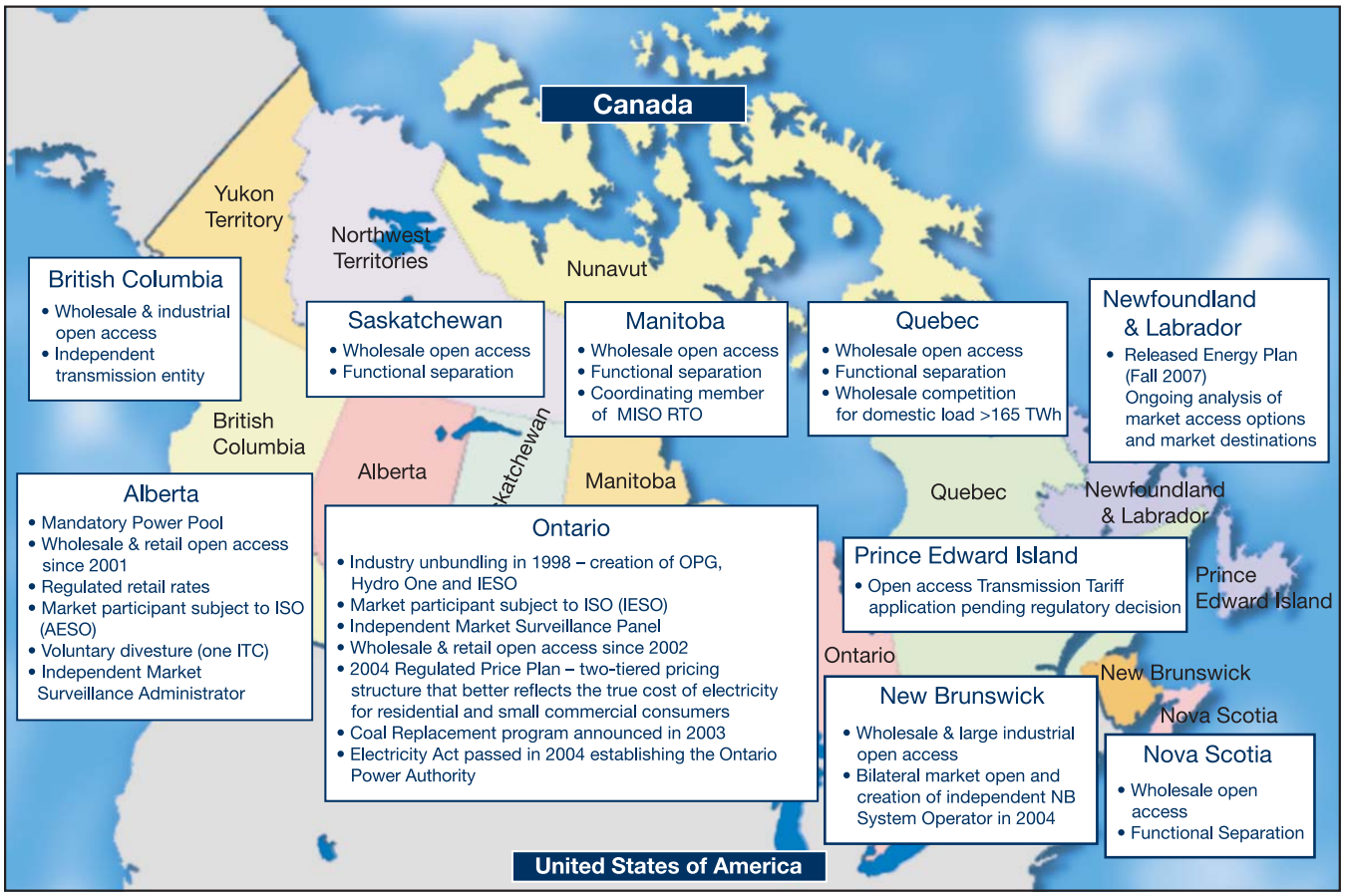
Exports and Imports between Canada and the U.S., 2007



Source: NEB Electricity Exports and Imports, January 2007 to December 2007.

Restructuring of the electricity industry has followed a similar pace in both Canada and the U.S., although the drive to open markets in both countries appears to have stopped. Currently, approximately 50 percent of Canadian retail customers are in open markets (although regulated rates remain available to retail customers in both Ontario and Alberta). The map on page 5 describes market restructuring in Canada.

Market Restructuring in Canada, 2008



II. Setting the Stage: Constrained Resources in the North American Electricity Market

Canada and the United States enjoy the most significant trading relationship in the world. On a daily basis, that trading relationship exceeds $1.3 billion in value, a significant portion of which is energy. Canada is America's largest supplier of energy, accounting for 94% of natural gas imports, nearly 100% of electricity imports, and more crude and refined oil products than any other foreign supplier. And in terms of electricity trade, in 2006, the U.S. imported 36.4 million megawatt hours from Canada and exported 18.5 million megawatt hours to Canada. More important to the U.S./Canada relationship, such electricity trade enhances the reliability of each country's transmission system, allows for the sale of surplus power, and mitigates risk by providing for power during times of emergency outages or periods of high electricity demand.

But the electricity market is facing significant constraints, today, and for the foreseeable future, that could hurt that trading relationship, and those constraints need the attention of decision-makers in both Canada and the United States. If not designed carefully various policies and government initiatives, such as those to control carbon emission, other emissions and those to mandate emerging technologies could lead to supply constraints in certain regions. Further, the lack of sufficient transmission investment over the last few decades has resulted in constraints on certain portions of the North American transmission grid, while the construction of a growing array of smaller projects has raised new concerns about the sufficiency of transmission capacity to accommodate a differently configured supply system. These issues and labour supply shortages are raising concerns about the long-term security of the North American electricity market.

A. Constraints in Generation Supply

Both Canada and the U.S. are experiencing growing economies and rising populations, with consequential increases in electricity demand. With such increases, as well as the retirement of aging or environmentally-underperforming facilities, increases in generation capacity will be required in our respective countries. Both the U.S. and Canada project the need to increase generation capacity by approximately 25 percent by 2025 to satisfy demand.

This need for new generation capacity in both Canada and the U.S., however, comes at a time when public concern about environmental issues is high. Mature generation sources such as coal, large hydro, or nuclear, remain important components of the North American energy supply mix, and measures to address environmental issues must not limit North America's ability to ensure reliable and adequate generation capacity through their use. For example, Canada and the US are both pursuing aggressive measures to address climate change that can have fundamental effects on generation supply choices. In both countries, some advocates suggest that the solutions to climate change are all associated with emerging technologies. Too often the roles for more mature technologies in a carbon constrained future are glossed over. Diversifying the generation portfolio is good for ensuring sufficient generation capacity in both countries, but limiting the options available will lead to constraints in generation supply – and ironically this could have an adverse impact on the environment.

B. Transmission Constraints

The North American transmission grid is experiencing constraints in several markets, and constraints will likely increase unless adequate investment in transmission capacity is advanced in the near-term. In the North American Electric Reliability Corporation's ("NERC") 2007 Long-Term Reliability Assessment, NERC maintains that significant investment in transmission is required in many areas of North America as projected transmission additions lag behind demand growth and new resource additions. According to this assessment, the total number of transmission miles is projected to increase by 8.8 percent in the U.S. and 4.8 percent in Canada over the next ten years. While this is more than a 30 percent increase in proposed transmission miles since last year's assessment, NERC maintains that more investment is still required, as each peak season puts more and more strain on the transmission system.

Adding to an already congested system is the growth of renewable resources and the need for transmission infrastructure to integrate these resources. As NERC noted in its Long-Term Assessment, such resources are often remotely located, requiring significant transmission links often over challenging terrain. Transmission is thus the enabling link to renewable generation and must be constructed in anticipation and in advance of renewable generation resources.

While the integrated U.S./Canadian electricity market enjoys the benefits of cross-border trade, constraints along the border and within large regional markets inhibit trade growth. Several examples exist of supply potentially available to constrained regions that cannot access the markets because of transmission congestion. This is true across the Canada/US border, particularly in the Pacific Northwest, Manitoba and bordering states, and in the northeast. Increases in electricity demand without corresponding increases in transmission investment will further inhibit this important trading opportunity.

C. Labour Constraints

The complex and expansive North American electricity system is facing significant labour force challenges in the years ahead. An aging workforce and pending retirements could have dramatic impacts on an industry already challenged by increasing demand and technology change. And these constraints are being felt in both Canada and the United States.

The Canadian utility industry currently employs 98,000 people. According to the *Canadian Electricity Human Resources Sector Study*, commissioned by CEA in 2004, almost 40 percent of the electricity sector's non-support staff will be eligible to retire by 2014. Retirement estimates show that the sector will need more than 17,000 people in technical positions in the next 8 years.

The problem is no different in the U.S.. According to the NERC Long-Term 2007 Assessment, the industry workforce is aging. At the same time, by 2015, there will

be a 25 percent increase in demand for industry workers. In a recent study performed by the U.S. Department of Energy, that agency projects, with anticipated retirements, the U.S. industry could see a potential workforce shortage of electrical line-workers of nearly 20 percent of the current workforce. And the situation is not much better for electric power and transmission engineers.

New construction and modifications to all aspects of the electricity systems in Canada and the U.S. are required, involving new technologies and a substantial increase in the workforce to accommodate such construction and modifications. However, the shrinking industry workforce is putting in jeopardy the ability of the industry to respond to increasing generation and transmission needs. In addition, training requirements pose a new set of challenges to the industry. The evolution of technologies in the electricity sector is constant, with developments such as increased distributed generation, the introduction of new software-based technology systems, and "green" technologies. These new technologies have created the need for new training and skills development, and "re-skilling" of the existing and future labour forces versed in both "old" and "new" technologies. A shortage of properly trained and skilled labour could have serious repercussions for the electricity sector, leading to reduced reliability, increased cost of production, infrastructure project delays, and decreased safety and productivity due to less experienced employees and worker shortages.

III. Measures to Address Constraints in the North American Electricity Market

The current energy trading relationship between the United States and Canada can be enhanced to expand cross-border trade, stimulate infrastructure investment, and develop efficient and sustainable technologies. This will provide the foundation for greater trade and greater market opportunities between our two countries. Increased integration of the U.S./Canadian marketplace will also help to reduce any uncertainty regarding energy supply in North American energy markets by relieving constraints between and within our two counties. In the following sections, the Canadian Electricity Association reviews a number of measures that we believe would relieve current and future constraints for both Canada and the United States.

A. Increasing Generation Supply

In terms of future generation investment, solutions will necessarily reflect the availability of resources, the viability of new technologies, regulatory and policy regimes, and to a lesser extent the availability of government incentives. Currently, in the U.S., coal is the predominant fuel source. In Canada hydroelectric power is the dominant generation technology. We anticipate that more coal and nuclear power plants will be constructed in the U.S. to take advantage of the incentives in the Energy Policy Act of 2005 and that new capacity in a range of technologies – but especially hydroelectricity and nuclear – will be added in the Canadian marketplace.

These differing fuel opportunities in our respective countries allow for a diversity of supply that enhances the U.S./Canada bilateral trading relationship. In the United States, 51% of electricity generation needs are met by coal-fired generation facilities, 20% by nuclear and 20% by natural gas, with hydroelectric capacity and other renewables accounting for the remaining 9% of generation capacity. In contrast, 60% of Canadian electricity generation capacity is hydropower, 24% is conventional thermal power, and 16% is nuclear. The availability and utilization of a range of supply options – different fuels, different technologies - will be fundamental to a cost-effective, reliable, and secure North American electricity system.

1. Mature Generation

Mature generation technologies supply much of the generation needs in the U.S. and in Canada. Governmental mandates that impose restrictions on continued use of mature generation technologies for various reasons could therefore result in constraints in available generation capacity. Notwithstanding recent fuel price volatility and environmental concerns such as climate change, conventional fuel sources will continue to remain important in meeting our respective demand requirements. The challenge is to use these supplies in a manner with the least environmental impact.

Given our common electricity market and our common air-shed, CEA supports a bi-national cooperative approach to research and development to enhance our mature generation supply. Cooperative cross-border measures

between U.S. and Canadian interests could help ensure an adequate and sustainable electricity supply in the future. This is true, for example, with regard to clean coal technologies, where companies in both the U.S. and Canada have expressed interest in siting large-scale clean coal units. Companies in both the U.S. and Canada have announced plans to invest in advanced coal generation facilities, relying on technologies such as integrated gasification combined cycle and supercritical circulating fluidized bed. Such companies will utilize applicable U.S. and Canadian incentives to overcome the relatively high capital costs of these facilities, at least in the near-term.

A bi-national approach to an electricity market also helps to minimize the effects of constraints in fuel supply. U.S. reliance on natural gas may prove problematic in the future, as natural gas prices continue to rise and the availability of supplies continues to fall. Low water years can have a significant impact on Canadian utilities that generate the majority of their electricity using hydroelectric facilities. The bi-national nature of the electric grid, however, provides the necessary diversity of supply to avoid shortages in electricity supply, even if there are shortages in fuel supply.

There are also opportunities to promote nuclear facilities on a bi-national basis. While no nuclear facility has been built in the U.S. in recent years, the Energy Policy Act of 2005 contains numerous incentives to spur investment in nuclear facilities. In fact, the Energy Information Agency (EIA) projects that nine gigawatts of new nuclear capacity will be built as a result of the incentives in the Energy Policy Act. In Canada, although no new nuclear plants have been built in the country since 1986, there is an explicit commitment to new build nuclear in Ontario, and strong interest in Alberta and New Brunswick. While nuclear may not be an option in every jurisdiction, due to specific policy decisions (such as in British Columbia, where the construction of nuclear generation facilities is prohibited), it remains a key part of the generation portfolio across the continent – now and in the future.

2. Emerging Technologies

Concerns regarding emissions, land and water impacts, and the sustainability of fuel supply are serving to promote the development of alternative generation technologies. Canada and the U.S. have an opportunity to work together to help secure an energy future while responding to environmental and sustainability concerns. For example, Canada will continue to have most of its electricity met by hydroelectric facilities, while hydroelectric power exported from Canada will continue to serve as essential resource in major portions of the U.S. Wind generation continues to grow in importance, both in recognition of its benefits as a contributor to fuel diversity and because of its low-emission energy production. And new technology opportunities continue to gain profile – for instance the Electric Power Research Institute is now projecting significant tidal energy potential in both the U.S. and Canada.

The U.S. EIA estimates that renewable generation, including combined heat and power generation, will grow by 2.1 percent per year, from 385 billion kilowatt hours in 2006 to 631 billion kilowatt hours in 2030. In terms of renewable generation potential in Canada, the Clean Air Renewable Energy Coalition, a group of corporate and environmental organizations and municipal governments, estimates that Canada's potential for low-impact renewable sources (defined by them as excluding large hydropower) is between 122 million and 398 billion kilowatt hours. And with respect to additional hydroelectricity production, Natural Resources Canada estimates a potential of 182,832 megawatts, with 34,371 megawatts considered practical for future development by electric utilities. Capturing this renewable potential will help to ensure an adequate – and environmentally preferable – electricity supply in the North American market.

In recent years, alternative generation investment in both Canada and the U.S. has increased significantly. For example, with respect to wind energy generation, Canada saw a doubling of its capacity during 2006, from 684 megawatts to 1,341 megawatts. According to the American Wind Energy Association, wind energy installations in the U.S. now number 16,818 megawatts and produce enough electricity on a typical day to power the equivalent of 4.5 million homes. Investments in this and other technologies are expected to grow in the coming years.

Efforts to diversify our current energy supply by promoting emerging technologies are important to helping ensure reliable and environmentally-sound energy. However, where technology support initiatives arbitrarily pick winners and losers among a range of technologies, such initiatives can result in more harm than good. And where such technology initiatives serve to exclude certain technologies from other jurisdictions (such as defining "renewable technologies" to

exclude large hydropower), the benefits from cross-border trade are compromised. Additionally, as new technology opportunities arise, it is important to ensure that they can be incorporated in an effective and efficient manner without compromising system integrity. CEA believes that our respective markets would benefit from common definitions of environmentally preferable power choices (renewable or otherwise) and from common approaches to supporting them.

B. Enhancing the Cross-Border Transmission Grid

In its most recent reliability assessment, NERC highlights the need for increased transmission capacity. In both the U.S. and Canada, transmission investment has seriously lagged behind generation investment. In order to effectively take advantage of the diversity of the bi-national generation market, there needs to be adequate transmission capacity across the border.

1. Increasing Transmission Capacity

Promoting the construction of the transmission necessary to relieve existing constraints on the North American grid and to ensure available transmission capacity with respect to new generation supply will help ensure a secure supply of electricity in the North American market in the future. A bi-national cooperative approach to encouraging the construction of such new transmission capacity would help to relieve constraints along the U.S./Canadian border, as well as help to assure the adequacy of electricity supply in the U.S. and Canada.

Opportunities to ease transmission congestion must first be identified. The U.S. Department of Energy recently designated two National Interest Electric Transmission Corridors, reflecting regions with significant transmission constraints or congestion problems. These National Corridor designations were based on an earlier National Electric Transmission Congestion Study. In the Study, DOE identified as a conditional congestion area the Montana-Wyoming area. Noting the significant potential of expanded generation in Alberta, DOE concluded that the U.S. would be unable to take advantage of such potential absent expansion of the transmission capacity in this part of the U.S. Encouraging the development of generation capacity in Alberta will require enhanced grid connections in the Montana-Wyoming area and between this area and Canada.

A cooperative approach between the U.S. and Canadian industries requires the identification of factors that could inhibit transmission construction, and identification of solutions to address such barriers to construction. One such barrier may be public opposition to the construction of new transmission lines, coupled with extensive regulatory processes for the approval of such lines. Transmission reinforcements may be more acceptable in regions where new generation construction is politically or logistically infeasible. The solution to regulatory delays would involve greater certainty in the process for siting transmission lines. Moreover, establishing this greater certainty in the process for transmission siting, by including, for example, a transparent and rigorous process and appropriate and clear deadlines, would allow for increased construction of beneficial transmission facilities within the North American transmission system.

Other measures should also be considered to promote investment in transmission infrastructure. First, action may need to be taken to ensure adequate returns. Rates of return on capital invested in transmission facilities are often too low, serving to discourage investment in such facilities. CEA believes that regulatory approaches that increase rates of return for transmission facilities would encourage greater investment in such facilities. To that end, Provincial (and State) regulators should observe FERC's lead in providing higher rates of return for investments in transmission infrastructure. In addition, measures to identify opportunities for merchant transmission facilities in our two countries could also be explored. Moreover, tax measures that would facilitate more investment in the development of new transmission infrastructure at key bottlenecks across the continental marketplace could be implemented. For example, aligning capital cost allowance rates with the useful life of the asset would encourage greater transmission investment. The U.S. Congress recognized the importance of tax incentives to encourage the construction of transmission facilities by including provisions in the Energy Policy Act that treat transmission facilities as 15-year property and provide an 8-year period for recognition of gains following the disposition of transmission property.

Opportunities for bi-national cooperation for both investment in advanced transmission technologies and transmission R&D – either through government programs, industry support, or government-industry partnerships – should also be explored to take advantage of the bi-national interest in a reliable and efficient transmission system. Advancements

have been made in transmission technologies both to reinforce the grid and to improve the management of the grid. Improvements to grid management, such as the utilization of real-time data and cooperation between balancing authorities in the development of consistent scheduling protocols and sharing of reserves, have allowed for the more efficient use of the existing transmission infrastructure. Nevertheless, in the absence of higher rates of return, there may not be sufficient incentives for such improvements to the transmission grid, or for the necessary research and development to pursue advanced transmission technologies.

2. Implementing Bi-National Transmission Reliability Rules

With the highly integrated North American transmission grid in mind, the U.S. Congress developed and passed reliability legislation that allows for the creation of an Electric Reliability Organization ("ERO") that can operate on an international basis. The ERO model ensures a balance of interests that protects the organization from being unduly subject to any one stakeholder or government, while respecting the sovereign right of authorities in each country to assure themselves that the interests of their citizens are protected through oversight and remand functions. And because only the ERO – as opposed to individual regulatory or legislative bodies – can develop reliability standards with continental application, the reliability system can be run effectively on an international basis.

The ERO's ability to operate effectively on an international basis requires close cooperation among the relevant governmental authorities. The need for this close cooperation led to the establishment of the Bilateral Electric Reliability Oversight Group ("Bilateral Group"), which is comprised of the Federal-Provincial-Territorial Working Group, the Federal Energy Regulatory Commission ("FERC" or "Commission") and the U.S. Department of Energy. The Bilateral Group developed the "Terms of Reference for Bilateral Electric Reliability Oversight Group" ("Terms of Reference"), which identified the appropriate cooperative approaches for the governments to ensure the effective operation of the ERO. Moreover, the Bilateral Group released the "Principles for an Electric Reliability Organization That Can Function On An International Basis" ("Bilateral Principles") to assist FERC in developing rules that would allow the ERO to operate effectively on an international basis. Both the Commission's Final Rules and the NERC ERO submission ultimately approved by FERC were consistent with the Bilateral Principles, thereby ensuring that the reliability organization ultimately approved by the relevant regulatory authorities will be able to operate effectively on an international basis.

On July 20, 2006, FERC certified NERC as the ERO in the U.S. FERC then issued a final rule approving 83 of NERC's proposed 107 Reliablity Standards on March 16, 2007. And on April 19, 2007, FERC approved NERC's compliance program, the pro forma delegation agreements, and the eight Delegation Agreements between NERC and the eight Regional Entities. NERC has been recognized as an ERO in the Province of Ontario and by the National Energy Board, and is working with the other Provinces to ensure that the reliability standards are mandatory and enforceable in the North American grid as a whole.

Looking ahead, it is important that the relevant regulatory authorities respect the integrity of the international organization, whose responsibility is to develop standards that reflect the interests and concerns of both Canadian and U.S. entities. General guidance from governmental authorities in addressing issues of concern regarding certain standards can be useful to the ERO in revisiting certain standards. However, specific and detailed directives from a governmental authority with respect to those same standards could limit the ERO's ability to effectively balance the interests and concerns of the North American utility industry and could limit the ERO's ability to craft a revised standard that would receive approval from the other governmental authorities. In fact, CEA had expressed such concern in recent comments to FERC, based on FERC proposals to require certain changes to Reliability Standards outside the NERC standards development process. An effective international ERO turns upon cooperation across the board in the agreed-upon standard-setting process.

3. Transmission for New Generation

Renewable generation, such as wind, is often located in remote locations, requiring new transmission to reach load. A number of recently announced proposed transmission projects are designed to connect this new generation to the grid. Such new generation offers significant benefits to the North American electricity system, but also brings with it challenges presented by generation technologies that are often less predictable.

In its Long-Term Assessment, NERC projects that wind generation will become a significant portion of the generation mix. NERC recommends that any mandate to build renewable generation be accompanied by active support for the development of, and investment in, the transmission infrastructure required to reliably integrate those resources into the bulk power system. NERC further recommends that planning be utilized to address issues relating to the intermittent nature of such resources.

CEA believes that building new transmission at an early stage is essential to the advancement of renewable generation resources. Addressing issues relating to queuing processes and other regulatory challenges will also help to promote renewable resources and avoid future transmission constraints. To further promote such generation, cross-border cooperative efforts in planning transmission investments should be studied.

A bi-national approach to transmission infrastructure could also maximize the benefits of generation diversity, particularly as it relates to greater wind development. For example, Canadian hydroelectric generation systems could act as a "battery," providing potential services through their ability to store surplus energy, returning it when required as a dispatchable product, resulting in balancing of prices in the energy markets. This would require additional transmission capabilities beyond that justified on a firm basis.

4. Ensuring Critical Infrastructure Protection

Since the terrorist attacks in the United States on September 11, 2001, the electricity industry has become better prepared for both physical and cyber attacks on the electricity infrastructure. Cyber attacks are of particular concern given the electricity industry's growing dependence on e-commerce and electronic controls. Moreover, the potential for physical threats to the electric infrastructure remains a reality.

In January 2000, following the successful Y2K transition, CEA members formed the Critical Infrastructure Protection Working Group (now the Security and Infrastructure Protection Committee) in order to coordinate activities, share best practices, and interface with the Canadian federal government. In its first year-and-a-half of activities, it established an effective information sharing Intranet site, implemented methods for coordinating activities with NERC and other partners, developed and implemented an Early Warning System for threats to electricity infrastructure, and worked closely with the federal government. The Early Warning System developed by the Working Group is a model being looked at by other sectors as a fast and efficient method of communicating information in times of high alert.

The North American electric power industry is currently working through NERC to develop approaches for safeguarding the North American bulk electric power system. This work culminated in the development of cyber security standards approved by the NERC Board of Trustees and submitted to the relevant governmental authorities for approval as Reliability Standards; FERC recently approved these standards. Such bi-national cooperation provides for an effective approach to ensuring the protection of North American electricity infrastructure and accordingly, should be encouraged.

C. Avoiding Barriers to Cross-Border Electricity Trade

CEA members are an integral component of the North American transmission grid, and the interconnected nature of our systems has allowed for the development of an important trading relationship with U.S. market participants. Efficient and rational supply choices in our respective countries can help to reduce constraints in the North American electricity market. Such supply choices require on-going monitoring to avoid or eliminate measures that might create seams within and between electricity markets. Identification and elimination of operational or business obstacles will help to ensure efficient and effective market decisions, helping to ensure a secure electricity market.

Seams affect electricity markets where the rules and conditions on either side of jurisdictional boundaries constrain the economic transfer capacity or flow of energy. Differences in market rules or operating and scheduling practices that inhibit the ability to economically trade energy or capacity between regions impact market liquidity. System operating practices, transmission access scheduling, certain pricing models, and rate pancaking are all examples of market rules and conditions that could result in inefficiencies in trade between regions. And without market liquidity, price discovery and long-term hedging of pricing become more difficult tasks. Measures that harmonize differing market rules and transmission scheduling and pricing systems improve market liquidity and enhance cross-border trade.

Addressing such barriers to trade requires an understanding of the differing regulatory responsibilities applicable to electricity markets. In Canada, electricity regulation is predominantly within the jurisdiction of the provinces, with a Government of Canada role in regulation of energy exports and facilities that span international borders. In contrast, in the United States, interstate electricity markets are regulated primarily by FERC. As such, different approaches to electricity markets may develop. Policymakers and regulators should work cooperatively among themselves and with industry to identify the impediments to efficient cross-border trade and to identify appropriate measures to address any barriers to trade. And governmental authorities, as well as industry, need to be mindful of the potential for additional barriers to robust electricity markets in working to address seams issues between electricity markets. Coordinated approaches to addressing seams issues will allow for greater efficiency and enhanced reliability in electricity markets.

CEA is presently participating in a U.S. Court of Appeals proceeding reviewing the impact of a FERC order on capacity imports over the Canada/U.S. border. The order, unless reversed, may have the effect of eliminating all capacity imports over a particular cross-border interconnection. CEA is participating in the proceeding to urge the Court to consider the impact of such an order on cross-border sales of capacity. Barriers to trade, such as this FERC order, would serve to limit the effectiveness of cross-border markets, particularly the ability of such markets to respond to potential supply shortages in the future.

D. Promoting Demand Side Measures and Energy Efficiency / Conservation

Adequate generation and transmission capacity are critical to both eliminating and avoiding constraints in the North American electricity market. Focusing solely on the supply side of the grid, however, misses opportunities for employing demand-side measures to address generation or transmission constraints. Investment in demand-side measures – particularly energy efficiency/conservation and distributed generation – can help to reduce the need for new generation or transmission facilities. Demand-side measures have been implemented both in Canada and the U.S. in response to various policy directives, but are likely to increase in importance, particularly where fuel prices continue to remain volatile and challenges to certain generation persist.

Demand-side measures can help to address constraints in generation supply. For example, according to a recent report issued by the U.S. Federal Energy Regulatory Commission on demand response, demand response and advanced metering programs have grown significantly in recent years. According to the report, demand response lowered the consumption of electricity by 1.4 percent to 4.1 percent during periods of peak demand in 2006.

Demand-side measures can also help to relieve transmission constraints. In its National Transmission Grid Study, the U.S. Department of Energy concluded that targeted energy efficiency/conservation and distributed generation could reduce electricity loads on the transmission system, alleviate bottlenecks, and delay the need for construction of new transmission facilities. But measures to relieve transmission constraints can often occur in places other than where the constraint exists. For example, transmission constraints in the U.S. caused by the Lake Erie Loop Flow could be relieved through distributed generation or efficiency measures taken in Canada, or vice versa. (Phase shifters may also help address this constraint). Bi-national coordination in incenting, planning and deploying demand-side measures could thus prove an effective means of addressing transmission constraints on the international grid.

E. Coordinating Strategies to Address Environmental Concerns

The climate change debate remains a continuing challenge for both the U.S. and Canada, but one that could benefit from cross-border dialogue. Canada and the U.S. have taken different approaches to the issue of climate change. Canada is a signatory to the Kyoto Protocol, while the U.S. is not. Nevertheless, recent proposed approaches in Canada and the U.S., as well as the involvement of each country in the Asia Pacific Partnership on Clean Development and Climate, suggest opportunities for coordinated approaches to deal with climate change.

The Canadian government has identified short-term and long-term measures to address climate change. In the short-term, the Canadian government continues to advocate a target-setting approach based on emissions

intensity for the 2010-2020 period. Longer term, the Canadian government commits to achieving an absolute reduction in greenhouse gas emissions between 45 and 65% from 2003 levels by 2050. Mature low-emission technologies such as hydropower and nuclear as well as new and emerging technologies (such as wind and carbon capture and storage) will be encouraged to help meet these targets.

Measures to mandate GHG reductions are currently being considered in the U.S. Congress. In fact, the Lieberman-Warner Climate Security Act of 2007, which would establish a cap and trade system, recently passed the Senate Committee on Environment and Public Works. These measures suggest opportunities for a coordinated approach between the two countries that would recognize the unique characteristics of North American energy production. As decision-makers begin to look at the post-2012 period, a coordinated and complementary approach becomes all the more important. In both countries there are a number of initiatives already at play at the state/provincial level to address climate change.

In particular, the NAFTA partners could work together on a coordinated approach to setting targets for emission reductions and possibly an integrated system for trading GHG emissions. As with energy trading, GHG emissions trading between Canada and the U.S. could offer significant benefits to both countries – building on already strong regional markets through new trading opportunities. And by providing businesses with the flexibility that trading provides, the NAFTA partners could help companies identify the most cost-effective options to reduce emissions.

As a first step towards this, a North American GHG registry could be established to monitor GHG emissions, and their reductions. Established protocols both for reporting emissions and for reporting emissions reduction would offer interested businesses across North America access to a uniform mechanism for the credit market. Such protocols could also encourage additional investments in greenhouse gas reduction measures. Finally, eligibility for a much broader range of projects for credits could encourage more businesses to participate in the registry.

In a similar fashion, other air issues would benefit from a coordinated approach and CEA encourages ongoing discussions that work towards bilateral solutions to these issues. Joint initiatives are an effective means of addressing concerns facing our common air-shed.

F. Managing Labour Shortages

Trained and experienced workers are essential to ensure the long-term stability of Canada's electricity supply. To address this significant challenge, efforts must be made to build the skills base of domestic workers, ensure that trained and skilled workers are able to work and flourish in their area of expertise, and attract and retain skilled foreign workers, especially within and between Canada and the U.S. markets.

Statistics indicate that the primary sources of power system engineering graduates – universities – are not graduating a sufficient number of engineers. And recent data shows a decline in the number of students enrolled in the power systems engineering disciplines, further exacerbating the problem. Efforts to encourage interest in power systems engineering and related disciplines must be made, both at the university level and at earlier stages. In fact, in a U.S. Department of Energy work force study, DOE suggests promoting math and science education in high school, or even grade school, to help prepare students for the more rigorous electrical engineering programs at the university level.

Increasing participation of under-represented groups and expanding and improving skills training and apprenticeship funding are also steps that could be taken to develop a skilled, educated and adaptable workforce. For example, in Canada, the Hydro Northern Training and Employment initiative was launched as a result of two proposed Manitoba Hydro hydroelectric projects in Northern Manitoba. This initiative is training and preparing over 1,000 Aboriginal residents for 800 Manitoba Hydro construction and related employment opportunities. Another example of a pro-active industry-Aboriginal partnership is BC Hydro's Aboriginal Employment and Education Strategy, established as a long term approach to building internal awareness and conducting recruitment outreach with Aboriginal communities in British Columbia.

In terms of training and apprenticeship programs, governments could help to promote the quality, efficiency and availability of apprenticeships, skills training programs, student aid and scholarships to help the industry meet its labour needs. Tax credits for employers hiring an apprentice

would also help to promote apprenticeships in the future. The government could also help to defer the financial hardships faced by apprentices while pursuing apprenticeship programs. Further, programs like "Trade Up," developed by Bruce Power and the Power Workers Union and comprised of a student guide, lesson plans, information on trades, and hands-on learning activities, promotes skilled trade careers in the electricity sector and encourages teachers, counsellors, parents and students to consider apprenticeships as an option.

To broaden their candidate pool, U.S. and Canadian utilities are increasingly turning to internationally trained workers, and are developing programs to ensure their successful integration. But barriers to retaining foreign-trained workers remain, including inhibitive security clearances and visa restrictions, foreign credential recognition, requirements for domestic work experience, and lack of relevant language skills. To address the qualification issue, Manitoba Hydro has been actively involved with the Internationally-Educated Engineers Qualification Program at the University of Manitoba, which allows immigrants with engineering credentials obtained outside of Canada to meet part of the licensing requirements for professional engineering practice in Manitoba. The Canadian federal government could support the establishment of internationally-educated qualification programs in educational institutions throughout Canada. In terms of foreign credential recognition, CEA supports the establishment of a comprehensive pre-qualification process for foreign-trained workers in their country of origin. CEA further recommends the easing of visa restrictions and better aligning the Immigration Point System with Canadian labour market information. Reducing the barriers to hiring foreign-trained workers, including cross-border hiring between Canada and the U.S., will help our respective countries prepare for the challenge of ensuring a healthy North American electricity system. Additionally, initiatives undertaken by organizations such as the Electricity Sector Council to assess the labour issues and investigate potential solutions are also a valuable resource in addressing the labour challenge.

Conclusion

A number of factors have led to concerns about constraints in the North American energy market, including a lack of adequate investment in generation and transmission assets, as well as a potential labour shortage. Given the interconnected nature of the North American grid and the strong trading relationship between Canada and the United States, it would be sensible to make constraints a North American concern and to focus on solutions that take advantage of our existing trading relationship and means for enhanced trade. Cooperative cross-border measures for developing increased generation supply could help to ensure an adequate, reliable and sustainable electricity supply in the future. Adequate transmission capacity across the border would allow market players to take advantage of the diversity of the bi-national generation market. The identification and elimination of operational or business obstacles will help to ensure efficient and effective market decisions, necessary for a reliable electricity system. Cooperative approaches to demand-side measures and energy efficiency could help to reduce our reliance on fossil fuels and relieve constraints on the transmission grid. Coordinated approaches to addressing climate change could help to identify the most cost-effective options to reduce emissions for both countries. And to manage possible labour shortages in the future, cooperative approaches can be taken to build the skills base of domestic workers, ensure that trained and skilled workers are able to work and flourish in their area of expertise, and attract and retain skilled foreign workers.

The U.S./Canada integrated electricity market provides the framework for greater trade and greater market opportunities between our countries, thereby addressing constraints and enhancing energy reliability for both Canada and the U.S.. That reliability has been the foundation of our common economic well-being. Ensuring its long-term stability is in our common interest.