

ADDRESSING CHALLENGES TO ELECTRICITY INFRASTRUCTURE DEVELOPMENT

Brief submitted to the Council of Energy Ministers
by the Canadian Electricity Association

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Canadian Electricity Association / Association canadienne de l'électricité



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

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I. Introduction

The dialogue on electricity issues almost always begins and ends with infrastructure. The fundamental and underlying role of the electricity system is to provide safe, secure, reliable, sustainable and competitively priced electricity. For members of the Canadian Electricity Association (CEA), there is no greater challenge than that of building infrastructure to renew our existing system, accommodate load growth and meet the needs of our customers.

A recent survey of electricity sector CEOs ranked infrastructure development as the most important issue facing the Canadian electricity industry. Timely and coherent regulation was second on the list, followed by climate change. These results closely mirrored the output of a recent CEA strategic exercise in which the Association's Board of Directors identified the industry's most pressing issues and established a road map to address them. The ability to build electricity infrastructure was the top issue for CEA Board members. The other priority areas identified were: regulation, environment, energy efficiency, technology, and security.

Both the CEO survey and CEA's strategic priority development process underscored the magnitude of the challenge of building infrastructure to maintain the reliability and cost-effectiveness of our electricity networks.

In this submission to the Council of Energy Ministers (CEM), CEA examines challenges to infrastructure development and makes recommendations for government policy and action in support of this objective.

II. Canada's Electricity Infrastructure Advantage

Twenty four hours a day, 365 days of the year, Canadian utilities must match production from generating plants with customer demand at competitive prices, while maintaining system reliability, meeting environmental objectives and fulfilling safety and human resource needs. The result is a highly developed system that optimizes generation, transmission and distribution technologies. Competitively priced electricity services underpin and enable growth in all sectors of the Canadian economy, while contributing significantly to Canada's export revenues.

The costs of power interruptions can be significant, a fact highlighted by the Final Report of the U.S.-Canada Power System Outage Task Force that studied the August 14, 2003 Blackout in the United States and Canada. According to the report, in Canada, gross domestic product was down 0.7 percent in August, there was a net loss of 18.9 million work hours, and manufacturing shipments in Ontario were down \$2.3 billion (CDN).

The potential of the electricity system is maximized when it takes advantage of the broad range of natural endowments across the country and produces power with diverse fuels, including water, coal, oil, natural gas, uranium, wind, and biomass. Water resources have traditionally played the largest role in Canada's electricity fuel mix (Figure 1). About seventy five percent of Canada's electricity is generated from zero- or low-emitting sources, including hydro, nuclear and emerging renewables. In addition, coal-fired and other thermal power generation are important components of the generation mix, particularly in Alberta, Saskatchewan, Ontario, New Brunswick and Nova Scotia (Figure 2). With a growing economy and a rising population, jurisdictions and companies across Canada are looking to both traditional and emerging technologies to meet expanding

demand growth and replace or refurbish aging facilities.

Figure 1: Canadian Electricity Generation by Fuel Type, 2006

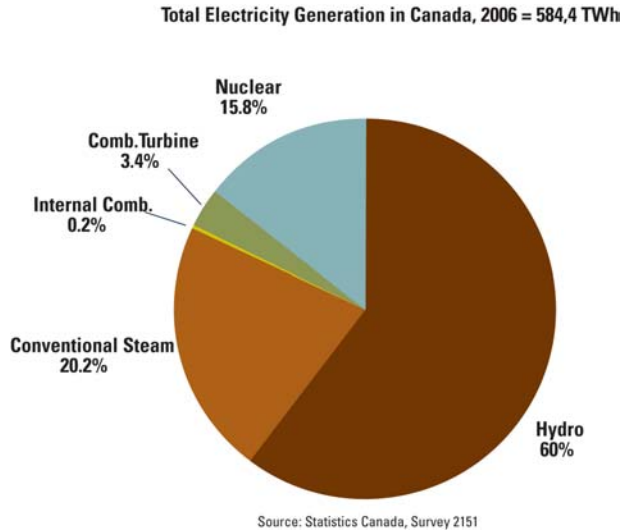
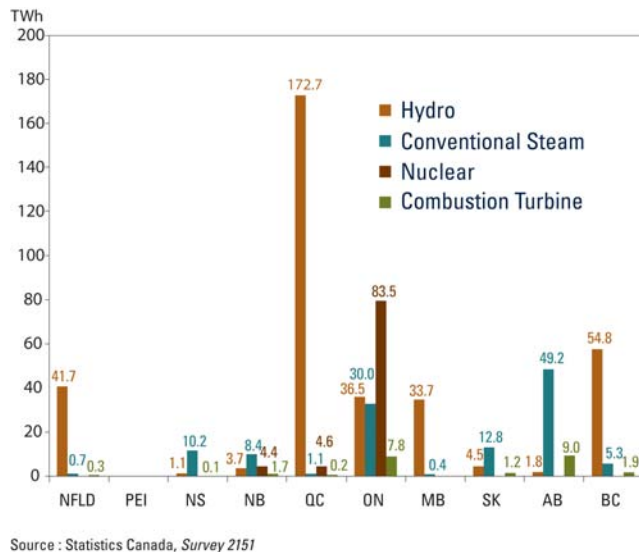


Figure 2: Canadian Electricity Generation by Region and Fuel Type, 2006



Transmission is the highway of electrical energy delivery. Providing reliable electricity to customers depends on a robust transmission system. The industry is focused on ensuring the ongoing reliability of the current transmission system while planning for the infrastructure expansion necessary to meet future demand. As the most accessible generation resources are typically already developed, transmission linkages are increasingly required to reach generation projects located further from load centres. For instance, the Ontario Power Authority (OPA) anticipates that 700 megawatts (MW) of additional hydroelectric power will come online in Ontario by 2015. The OPA believes there is potential to develop a further 2,200 MW of hydroelectric power at undeveloped sites in remote areas of the province in the 2016 to 2025 timeframe. However, developing these sites will necessitate significant new transmission.

Canada's transmission system is characterized by predominant backbones running north-south. This is partly because most major load centres in Canada are close to the Canada-U.S. border and it has traditionally been most economic to build reliability and trading interconnections to other nearby loads. The interconnected Canada-U.S. power grids help to ensure a more efficient, shared electricity system, benefiting customers in both countries. With advances in high-voltage transmission technology and an increasing focus on energy security and environmental issues, there is a growing focus in Canada over the merits of stimulating greater east-west connectivity. Challenges of geography and engineering must be overcome for such a linking of regional markets to occur in an economically viable fashion. In all regions of the country, transmission upgrades and new build are required to accommodate: greater load; more generation points and technologies; a more complex system-supply structure; enhanced trade between provinces and with the United States; greater energy efficiency; and, high public expectations for supply, reliability, and power quality.

At the distribution level, Canada is no different than other jurisdictions in its need to modernize the system to accommodate opportunities for enhanced efficiency, distributed generation, load control and the bundling of service offerings. Canadians' expectations for service flexibility, reliability and continued affordability will only be met through the deployment of ever more advanced technologies to provide greater customer control over the use and choice of energy resources. For instance, in Ontario utilities are installing smart electricity meters in 800,000 homes and small businesses by the end of 2007, and throughout the province by 2010.

Energy efficiency is an effective strategy to help mitigate electricity demand, moderate the impact of rising electricity prices, reduce energy use and emissions, and improve economic competitiveness. Electric utilities deliver programs to help customers better manage their energy use, while continuing to enhance their energy efficiency program offerings and increase their funding commitments. Across Canada, utilities are augmenting, ramping up or reconstituting energy efficiency programs. Utilities have an established relationship with consumers and are an effective delivery channel for programs. In fact, CEA research has shown that a vast majority of consumers expect their electric utility to provide energy efficiency information and programs.

Building a diverse generation portfolio, ensuring sufficient electricity infrastructure capacity, and providing customers with the means to use electricity efficiently, are all key to maximizing the potential of the Canadian electricity system and minimizing its environmental impacts.

III. Needed: Reliable Electricity Supply

Ensuring a safe, secure, reliable, sustainable and competitively priced supply of electricity will become increasingly difficult over the

coming decades. Issues of volatile natural gas prices, the future of clean coal and nuclear generation, the accessibility of new hydro and the potential of intermittent renewables such as wind are key to new generating capacity. The challenges of siting new transmission and modernizing distribution systems must also be addressed in a comprehensive manner. Critical to our industry's success will be greater public acceptance of electricity infrastructure as a vital component of our quality of life and the foundation of a sustainable and thriving economy.

Meeting the future electricity needs of Canadians will continue to demand high levels of investment to build new infrastructure and replace or refurbish aging assets. The early nineties saw a deterioration in public- and private-sector investment, resulting in tight supply-demand conditions throughout the country. The electricity industry is in the midst of an upswing in its capital investment programs. In 2006, electricity sector capital investment reached \$13.1 billion (Figure 3). Continued and sustained high levels of investment will be required.

Historical demand trends and future electricity use projections signal the scale of investment that might be required to meet Canada's electricity needs. Between 1990 and 2005, overall electricity demand in Canada increased by 24 percent, fueled in large part by a growing population, an expanding economy and greater use of electrical equipment (Figure 4). Despite improvements realized through energy efficiency and demand management, electricity demand is projected to increase by an annual average growth rate of approximately 1 to 1.5 percent.

The challenge of developing new supply quickly is particularly pressing in some jurisdictions. For example, in Alberta, demand growth outpaces the national average. Depending on the level of industrial growth, Alberta's demand for power is projected to grow by 3.5 to 4.3 percent per year. According to the Alberta Electric System Operator (AESO), the need for power in the province has grown at a rate equivalent to adding more than two cities the size of Red Deer each year. If demand and growth continue as forecast, the addition of up to 3,800 MW of new generation in Alberta may be required by 2016.

Figure 3: Canadian Electric Power Industry Investment

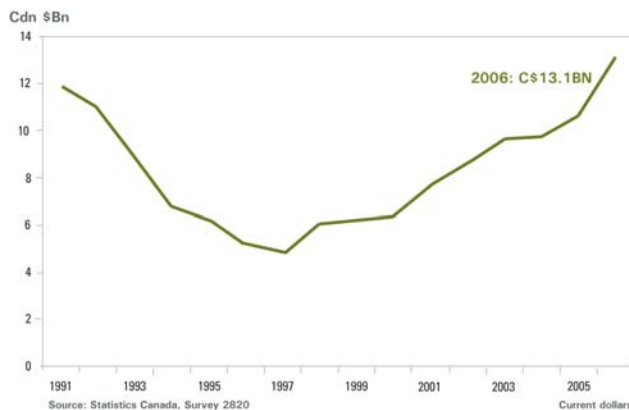
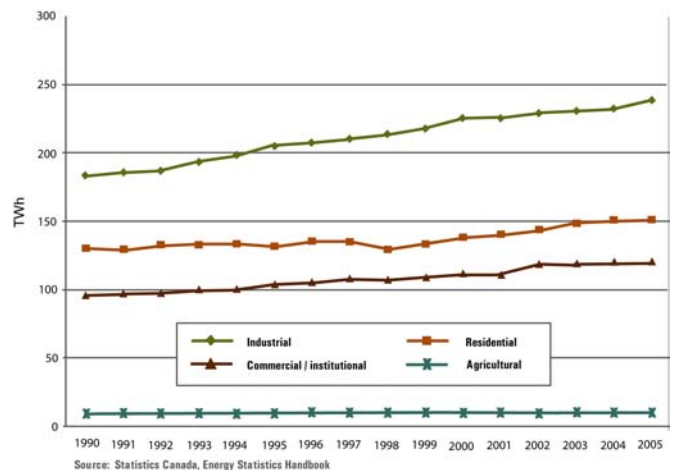


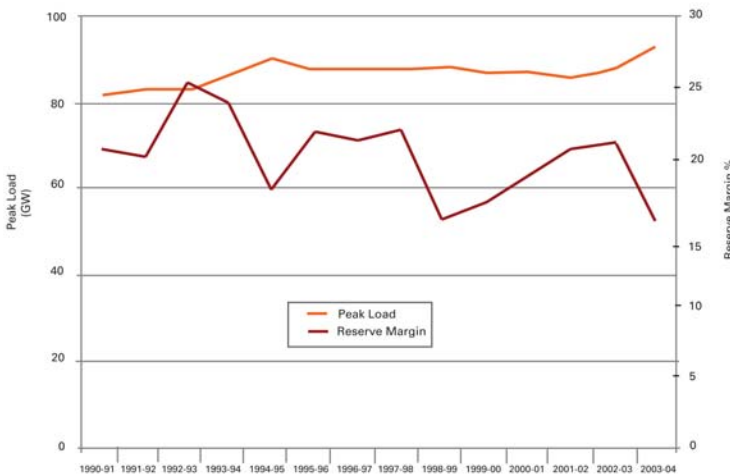
Figure 4: Demand by Sector 2005



Significant new and replacement requirements exist throughout the country. In British Columbia, BC Hydro has estimated that demand for electricity could grow by up to 45 per cent over the next 20 years. According to SaskPower, Saskatchewan could face a power supply gap of over 1500 MW by 2025. In Ontario, the OPA projects that generation capacity will have to increase by about 15 percent by 2025. Furthermore, according to the OPA, in addition to meeting net growth in demand, Ontario will have to replace the roughly 20 percent of current capacity now provided by coal, and the approximately 40 percent of total supply that now comes from nuclear plants that are reaching the end of their service lives. The OPA has projected that Ontario growth and replacement requirements could result in the province needing to build almost as much new generation over the next 20 years as currently exists in British Columbia and Alberta combined.

Peak demand within Canada is also growing, increasing 7.4 percent in 2003/2004 alone. Coupled with limited investment in new generation facilities, increases in peak demand are impacting reserve margins across the country (Figure 5).

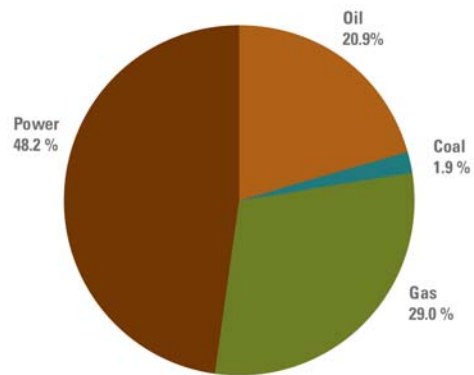
Figure 5: Demand & Reserve Margin



According to a projection by the International Energy Agency, approximately \$190 billion (US) of electricity infrastructure investment will be needed in Canada from 2005 to 2030 (generation \$95 billion; transmission \$27 billion; distribution \$63 billion). This is against the backdrop of total energy infrastructure requirements in North America of over \$4.1 trillion (US) over the same timeframe. The IEA predicts that of this total number, over 48 percent or approximately \$2.0 trillion (US) will be required for electricity (Figure 6). Given that there will be significant competition for capital, Canada must have in place the appropriate conditions to be an attractive destination for investment. In its 10-Year Transmission System Plan, the AESO projects that in Alberta alone, \$3.5 billion in proposed transmission development could be needed by 2016 to ensure reliable electricity supply if growth develops as forecast. This is in addition to about \$1.2 billion in transmission development projects already approved and underway in the province.

Figure 6: OECD North American Energy Investment Requirements to 2030

OECD North American Cumulative Energy Investment Requirements, 2005 - 2030 = US \$4.1 trillion



Source: International Energy Agency, World Energy Outlook 2006

Utilities are working hard to manage total supply capacity and peak demand to ensure that reliability is maintained. However, more power is needed to meet rising demand. The challenge is exacerbated given that once a decision is made to move ahead with the construction of a large electricity project, regulatory approval processes and construction times can be lengthy, in some cases taking more than 10 years.

The electricity industry and governments must work together on a sound public policy agenda so that Canadians enjoy a secure supply of electricity and competitive electricity rates. There are no simple solutions. Governments and industry have an obligation to future generations to chart a course that will ensure secure, environmentally and socially responsible electricity supply. Requirements will be met with new generation, transmission and distribution; refurbishments of existing assets; imports; technological innovation and energy efficiency.

IV. Moving the Agenda Forward

Issues of security and reliability stem from a convergence between forces such as:

- A rising demand for power fueled by a growing economy and population.
- Aging public and private infrastructure that is nearing the end of its life.
- A growing recognition of the need to conserve and be stewards of our resources for future generations, and to provide for ourselves in a way that is environmentally sustainable.
- Increasing interest in the opportunity for creative collaboration between public and private investment in responding to these challenges.

Understanding these forces is critical to addressing the challenges of achieving safe, secure, reliable, sustainable and competitively

priced power. Governments play an important role in ensuring that the following six fundamentals are in place to reach this goal.

Supporting timely investment in infrastructure

- We must overcome barriers to timely investment in infrastructure, including siting, rates of return, community acceptance, and public understanding of need.

Creating coordinated, effective and efficient regulatory regimes

- There must be stable policy and regulatory frameworks in place that provide investors with the certainty needed to develop much needed power projects. In the absence of clarity and predictability around market structures, the appetite to invest in Canadian assets will be reduced. The situation is further exacerbated by the generally lower rates of return accorded to Canadian utility investments than those available in the United States.
- Coordinated, effective and efficient regulatory regimes within and between governments, and more timely decisions to provide greater certainty for investors are essential to attracting investment in Canada's electricity system.
- In the case of major electricity projects, it is not uncommon that a proponent would be required to consult with and/or seek approval from multiple federal and provincial authorities before a project can proceed. In the absence of a single "facilitating" or "coordinating" entity for the federal responses to electricity projects, project proponents have been required to directly engage with each agency and, in cases where inter-

agency interaction is required, project proponents have been required to take the lead in coordinating the responses. To this end, CEA supports the work being championed by Natural Resources Canada and the Deputy Ministers' Task Force on Regulatory Improvement, to address system and capacity deficiencies relating to project approvals at the federal level.

- The Association believes that with an effective and realistic implementation plan, the Major Projects Management Office being developed at Natural Resources Canada has the potential to improve the federal project approval process, and could serve to facilitate inter-jurisdictional regulatory efficiencies. Energy Ministers can play an important role in championing more consistent inter-jurisdictional regulatory coordination. Simplified reporting mechanisms and increased coordination among federal authorities and the provinces and territories are key mechanisms to support improvements in regulatory efficiency.
- Given the significant new capacity that is needed to continue to meet Canada's electricity needs, further action is urgently required to support greater collaboration among governments in identifying areas of overlap and inconsistency, and to advance opportunities to make the regulatory framework more timely and efficient. NRCan estimates that over the next ten years, governments will be called upon to review over 30 moderate and large hydro projects and various large nuclear projects. Significant new thermal, wind and other emerging renewable projects will also require government review, along with the additional transmission infrastructure required to transport supply to load centres.

Coordinating environmental management

- A fragmented approach by governments to dealing with environmental issues, coupled with the lack of an integrated and coordinated federal/provincial environmental policy framework is a barrier to building needed infrastructure and deploying commercial technologies. CEA seeks a holistic approach and greater regulatory coherence on environmental issues, in a manner that results focused and preserves the widest range of options in a sustainable manner.
- Governments should pursue a balanced strategy that calls for the generation of power from a mix of fuel sources. Doing so captures the benefits each source brings, and reduces the risks that flow from an over-reliance on a single generation type.
- Significant changes to environmental regulations, such as the federal government's *Regulatory Framework for Industrial Air Emissions*, must consider capital stock turnover cycles. Policies and regulations should also be aligned across jurisdictions whenever possible.

Supporting the development and deployment of new technologies

- Maximizing the benefits of leading-edge technologies and deploying next-generation technology is essential to meeting industry and customer needs and to ensure an adequate and sustainable supply of electricity. A strong market based framework (including tax and financial incentives and regulatory reform) will advance investment in commercial technologies that better serve customer needs and meet expectations for sustainability.

- A promising area of research is the development of clean coal technology. One example is a project funded by the Canadian Clean Power Coalition (CCPC), EPCOR and the Alberta Energy Research Institute. EPCOR's Genesee site outside of Edmonton is hosting the study of front-end engineering and design of a utility-scale integrated gasification combined cycle (IGCC) facility. The goal is for this work to facilitate the potential construction of an IGCC plant beginning in about 2012. In addition, SaskPower's research into clean coal involves a detailed study to determine the feasibility of a near-zero emissions coal-fired cogeneration plant for Saskatchewan using Oxyfuel technology. Greater public support for innovative technology solutions is required.
- Transmission technology and infrastructure must remain at the leading edge and have the capacity to deliver power efficiently and reliably to meet growing demand. This will include ensuring there is adequate transmission capacity, ongoing investments in technology and infrastructure, and complying with evolving North American reliability standards.
- Distribution systems must also continue to be modernized, digitized, and made more amenable to the need for multi-directional flows and interactive control systems.

Supporting energy efficiency

- We must seek to achieve greater understanding among regulators of the business case for energy efficiency.
- More needs to be done to encourage Canada to achieve its energy efficiency potential. As we know, customers

expect their electricity supplier to provide options to assist them in using electricity more efficiently, to help manage customer costs and minimize environmental impacts. Accordingly, governments and stakeholders must increase efforts in support of energy efficiency information, programs and offerings. Also, governments and industry must focus on energy efficiency as a strategic energy policy that is supported by a long-term and sustained commitment to energy efficiency programs and incentives.

Protecting the system from physical and cyber threats

- Governments and industry must collaborate to ensure that the electricity system is protected from physical and cyber threats. Ensuring the long-term security, reliability and stability of the electricity system in Canada, considering its key role in powering other critical infrastructure sectors, is essential to the economy and quality of life.

V. Conclusion: Enhancing Awareness and Collaboration

In order to maximize the potential of Canada's electricity system, governments and industry need to collaborate on a sound public policy framework that will ensure adequate supply, encourage efficient use of our energy resources, and promote environmental sustainability. However, even with effective policy and regulatory conditions in place, the final arbiter and often the most significant hurdle to new infrastructure development is public opinion. While there is broad consensus on the importance of reliable and affordable electricity supply to our every day lives, there is a growing disconnect between individual views and the collective interest when it comes to energy infrastructure development. The costs of

infrastructure are often evident, while the benefits (reliable electricity supply that powers our homes, businesses and the economy as a whole) tend only to be top of mind during or in the immediate aftermath of power disruptions.

Building new supply, renewing and extending our transmission system to accommodate the new build and delivering output to key load centres will not be easy in the face of the pervasive “Not in My Back Yard” (NIMBY) syndrome. NIMBY issues are increasingly presenting project proponents with significant challenges in getting the job done.

Greater public awareness of the multiple aspects of electricity production and delivery is required. To help the public better understand what electricity generation entails, CEA has prepared *Power Generation in Canada: A Guide*. The guide is designed to explain the relative financial, technological, social and environmental issues for all sources of electricity – conventional and emerging. The guide offers an overview of the issues related to each technology and an assessment of the potential of each technology to be a contributor to Canada's generation outlook.

CEA also supports greater energy literacy through funding and in-kind support of the Canadian Centre for Energy Information. The Association believes that Canadians need a comprehensive source of energy information to support the development of high levels of energy literacy. Quality information supports policy discussions and helps to empower consumers to make informed decisions and optimize their energy choices. Through its print publications and web portal www.centreforenergy.com, the Centre for Energy delivers accurate, factual and current information about Canadian energy.

Governments must step up their efforts to support energy literacy. They must also be prepared to intervene when infrastructure projects are delayed due to incomplete or erroneous information in the public domain.

For instance, governments have a role to play in helping the public better understand issues surrounding electric and magnetic fields (EMF). Scientific evidence to date has not established a causal link between adverse health effects and EMF. However, public concern about this issue continues to be an impediment to transmission infrastructure project developments. CEA and its member companies are committed to the health, safety and welfare of the public and our employees. We take seriously our responsibility to work with all stakeholders – including regulatory agencies, the government and the public – to develop and implement appropriate EMF policies.

It is clear that critical to achieving a reliable electricity future is ensuring that the public understands that the cost of unreliable power resulting from a lack of infrastructure development presents significant challenges to the economy and Canadians' high standard of living.

The electricity industry welcomes the opportunity to work collaboratively with federal, provincial and territorial governments through the Council of Energy Ministers (CEM). This Brief presents policy recommendations that if implemented, will contribute to ensuring an electricity system that meets the needs of all Canadians in the near and long-term.