BUILDING A SUSTAINABLE ELECTRICITY FUTURE

A key principle of Sustainable Electricity is to provide electricity to customers in a safe, reliable and cost-effective manner that meets current and future needs. This section of the report highlights the issue of increasing demand and the need to replace aging infrastructure to meet the needs of current and future generations.

POWERING THE CANADIAN ECONOMY

Existing electricity infrastructure in Canada is aging, while demand for electricity continues to grow due to population and economic growth. At the same time, the electricity industry is facing a wide range of other challenges, including managing the effects of climate change and protection of biodiversity. These are challenges that Canada's electricity industry must address in a sustainable manner if Canada is to maintain its current standard of living and continue to enjoy reliable, cost-effective electricity in the decades ahead. Sustainable development, encompassing environment, society, and the economy, will be a cornerstone of the industry's strategy for replacing existing electricity infrastructure and building new electricity infrastructure. The current economic downturn, while potentially causing a reduction in power consumption in some provinces in the short-term compared to forecast needs, is not expected to substantially affect long-term requirements.

Electricity is a fundamental driver of the Canadian economy. It constitutes almost one-quarter of all the energy used by Canadians; in most applications, there is no viable substitute. Reliable, cost-effective electricity supply is vital for the economic growth and future prosperity of Canada. For example, the August 2003 electricity blackout in Southeastern Ontario and the Northeastern United States contributed to a 0.7 percent decline in Canada's gross domestic product (GDP) during that month, along with a net loss of 18.9 million work hours.[1] This illustrates the importance of a reliable electricity system, both to the economy and to the quality of life of every Canadian.

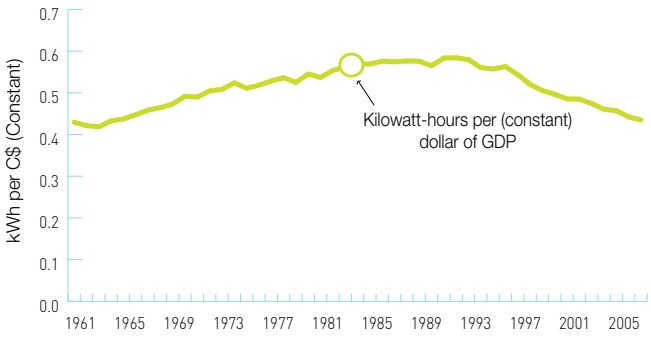
Modern demand for electricity is changing, due in part to a recent structural shift in the Canadian economy. Prior to the late 1980s, consumption of electricity per dollar of GDP was increasing, reflecting the more industrial and energy-intensive nature of

1 US-Canada Power System Outage Task Force, Final Report, Natural Resources Canada and the US Department of Energy, Sept, 2006

Note: This article is based on publicly available electricity industry data, which captures all electricity generation including independent power producers, and other generators not part of the Canadian Electricity Association.

Canada's economy. In the 1990s and continuing through today, the amount of electricity required per dollar of GDP has declined, reflecting a shift from an industrial based economy to a more energy-efficient and service-oriented economy (Figure 1).[2]

Figure 1 – Electricity Consumption and GDP



Source: Statistics Canada, Surveys 1901 & 2151

Despite the shift from an industrial economy to a service-oriented economy, economic and population growth continue to create new demand for electricity every day. Although household appliances have become more energy-efficient, the number of electrical devices per household continues to grow. While business and industrial processes have gained efficiency, computing and internet technologies have created new and growing forms of electricity demand, such as server farms and data centres. Plans to electrify traditionally fossil-based technologies, particularly in the transportation sector (e.g. electric cars and other hybrid vehicles), will result in further increases in electricity demand. As part of the sustainable development strategy, CEA members will continue to push for greater conservation and efficient use of electricity among industrial, public and residential customers. The development of a conservation culture is important as we move forward with modernizing Canada's electricity infrastructure.

Regardless, Canada will still have to invest in new infrastructure to keep pace with growing demand and aging generation, transmission and distribution infrastructure. Canada's National Energy Board (NEB) projects that electricity demand in Canada will grow by roughly 17 percent between 2009 and 2030, at an

2 Statistics Canada, *Surveys 1901 & 2151*

average of roughly one percent per year.[3] The International Energy Agency (IEA) estimates that Canada will need an additional 74 gigawatts of capacity by 2030 to meet both system demand growth and plant retirement needs[4] — an addition equal to more than half of our existing electricity capacity (Table 1).

Table 1 – Canada's Future Infrastructure Investment Requirements

	Capacity (GW)	Generation ($C billion)	Transmission ($C billion)	Distribution ($C billion)	Total ($C billion)
2007–2015	23	40.3	15.2	32.8	88.3
2016–2030	51	93.7	17.6	38.0	149.0
Total to 2030	74	134.0	32.8	70.8	237.6

Source: International Energy Agency, World Energy Outlook 2008

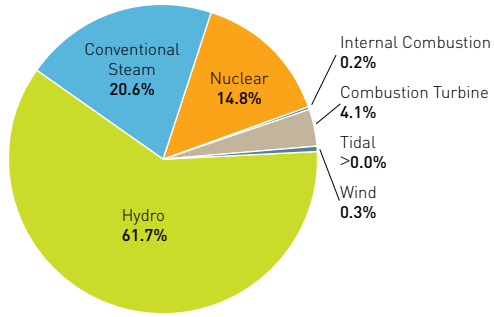
BUILDING FOR THE NEXT GENERATION AND BEYOND

Today, nearly three quarters of Canada's electricity generation comes from emission-free hydro and nuclear power, accounting for a combined 76 percent of generation. Thermal sources such as coal, oil and gas constitute most of the remainder, with emerging renewable generation, such as wind, tidal and solar, responsible for a small but growing contribution (Figure 2). Electricity resources for the next generation and beyond must be built in a sustainable manner and will require strategic capital investments that meet the needs of all stakeholders, including households, businesses, manufacturers, and electricity producers.

To meet these goals, the electricity industry will need to explore and invest in all available and emerging generating technologies. These will include advanced fossil fuel

Figure 2 – Canadian Electricity Generation by Fuel Type, 2008

Total Electricity Generation in Canada, 2008 = 598.8 TWh



Note: numbers may not sum to 100 percent due to rounding.
Source: Statistics Canada, Survey 2151

technologies (including ultra-supercritical coal combustion and carbon capture and storage), large and small-scale hydroelectric capacity, nuclear power, and emerging renewable (biomass, wind, solar) technologies. Equally important, Canada's transmission and distribution systems will need to be expanded and modernized. Modernization is required for a number of reasons: to accommodate new load; to allow for increased trade between provinces and with the United States; to allow for the integration of renewable and distributed generation; and to incorporate smart grid technology, including superconductors, power electronics and smart meters to reduce line losses and increase energy efficiency. All of these technologies must be part of an integrated and sustainable electricity system.

The International Energy Agency estimates that in order to meet electricity demand in 2030, Canada will require total investment in electricity generation, transmission and distribution of roughly $CAN 238 billion (2007 dollars) (Table 1).[5] This amounts to nearly $12 billion per year for the next 20 years — roughly equivalent to the amount of annual investment that occurred during the investment boom of the 1970s and 1980s.

3 National Energy Board, *Canada's Energy Future: Reference Case and Scenarios to 2030*, 2007
4 International Energy Agency, *World Energy Outlook 2008*
5 International Energy Agency, *World Energy Outlook 2008*

CHALLENGES TO NEW INFRASTRUCTURE INVESTMENT

Although the Canadian electricity industry has made significant advances in the deployment of highly efficient electricity production, transmission, distribution, and end-use technologies, a number of challenges remain. First and foremost, Canada has entered a period of significant global economic downturn. In January 2009, The Bank of Canada announced that it expects GDP growth to decline by 1.2 percent in 2009,[6] while Canada's unemployment rate jumped to 7.2 percent in January of this year.[7]

Notwithstanding the global recession, Canadian utilities must invest now in sustainable electricity solutions for the future if resources are to be available when they are needed. Large-scale electricity infrastructure takes many years to build, often requiring upwards of 10 to 15 years from project design to actual commissioning. Thus, the current regulatory process must be upgraded to meet critical investment timelines.

Siting of new infrastructure also presents a challenge for utilities, as a result of NIMBY (not in my backyard) sentiments and concerns about environmental and health implications. Choosing locations for transmission and distribution infrastructure is particularly difficult, due in part to public concerns about electric and magnetic fields (EMF) generated by power lines, despite the fact that research has concluded that current evidence does not confirm the existence of any health consequences from exposure to low level electromagnetic fields.

Uncertainty surrounding climate change mitigation policy, both domestically and internationally, represents another investment challenge related to the future of coal-fired generation. There is an opportunity for the government to establish a carbon policy framework to encourage the uptake of new low- and non-emitting

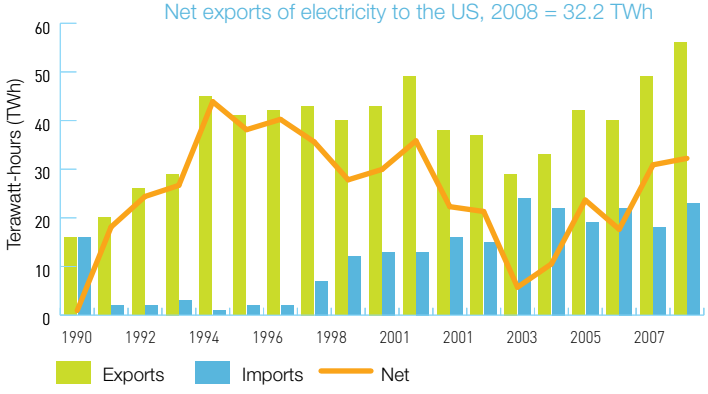
6 Bank of Canada, *Monetary Policy Report for January 2009*

7 Statistics Canada, *Labour Force Survey, January 2009 Release*

technologies with the orderly turnover of existing capital stock. Technologies such as Ultra Supercritical Coal Combustion, Integrated Gasification Combined Cycle (IGCC), Carbon Capture and Storage (CCS), and emerging renewable technologies could play a significant role in maintaining diversity of generation in the Canadian system. However, continuing uncertainty surrounding carbon policy may impede new investments, given the possibility of stranding assets.

Uncertainty regarding US energy policies also poses a potential challenge. In 2008, Canada exported 55.7 billion kilowatt-hours of electricity to the US and imported 23.5 billion kilowatt-hours (Figure 3).[8] Given this important electricity trade relationship, any US policy decisions that impact the flow of electricity between these two countries could have significant implications for infrastructure investment in Canada. For example, returns on investment (ROI) for many electric infrastructure projects in Canada rely in part on the strength of power purchase agreements (PPAs) with US utilities and accessibility to US spot markets. Policies such as a national US renewable portfolio standard (RPS) or increased government subsidies for US electricity infrastructure could make Canadian electricity exports less attractive. This could make Canadian infrastructure investment more risky, and drive down projected ROI.

Figure 3 – Canada-US Electricity Trade Volumes
Net exports of electricity to the US, 2008 = 32.2 TWh



Source: National Energy Board, Electricity Exports and Imports

Finally, Canada is not the only country requiring infrastructure investment. Countries around the world are taking stock of their electricity systems and recognizing that massive amounts of modernization and investment are needed. According to the International Energy Agency, cumulative global power-sector investment needed between 2007 and 2030 is $US 13.6 trillion.[9] This means that Canada will be competing globally for scarce resources, including capital, construction materials, and skilled labour. Recent run-ups in commodity prices have tapered as the global economic downturn has set in, but increasing demand for these resources will drive up prices until the global supply chain has time to catch up.

ROAD MAP TO A SUSTAINABLE ELECTRICITY FUTURE

It is clear that Canada needs to invest in its electricity infrastructure to meet the electricity needs of future generations in a sustainable manner. But the question remains: how do we get there from here? Four key policy areas are critical to enabling large-scale investment in Canada's electricity system:

1. Regulatory streamlining – Electricity infrastructure projects are generally time and capital intensive. This means that during their long development periods, large amounts of capital are expended with no offsetting revenue stream. Regulatory delays can make these development periods even longer and can result in additional project risk. Streamlining of applicable electricity infrastructure regulations, including the Fisheries Act, the Canadian Environmental Assessment Act (CEAA), and the Species at Risk Act (SARA) would increase project certainty in terms of development period and risk.

8 National Energy Board, *Electricity Exports and Imports, 2007*
9 International Energy Agency, *World Energy Outlook 2008*

2. Investment incentives – Although access to capital has not historically been an issue for Canada's utility industry, this may be an issue for new small-scale utilities. In addition, Canada is competing with the US for investment capital. In many cases, the US offers more attractive investment incentives for electricity companies, including higher allowed rates of return, accelerated rates of depreciation, and other more generous tax incentives. Similar incentives in Canada could improve access to capital and help level the playing field.

3. Public education and awareness – Public concerns surrounding the siting of electricity infrastructure projects often result from a lack of stakeholder understanding and awareness. Public focus groups have indicated that a large portion of the population is uninformed about the current state of Canada's electricity system and does not believe large-scale investment is needed.

4. Carbon policy certainty – Uncertainty surrounding climate change and carbon policy in Canada and abroad has resulted in a delay in the uptake of new electricity technologies. The interdependent nature of the US and Canadian economies and electricity systems means that harmonized North American carbon policies should be undertaken. Foresight and transparency with respect to future North American carbon policy would allow clean energy technology investment to move forward more effectively.

BENEFITS OF A SUSTAINABLE ELECTRICITY INVESTMENT

The challenges to investing in Canada's electricity sector seem daunting. However, the benefits of building a reliable, cost-effective electricity system in a sustainable manner far outweigh the risks. Investment in electricity infrastructure and programs that promote energy conservation and the efficient use of electricity will ensure a stable supply of electricity to support Canada's economic and demographic growth. Growing our electricity supply responsibly, with investments in sustainable electricity technologies, will mean a reduction in our environmental footprint as well as economic and social benefits to our communities.

Most importantly, electricity infrastructure investment presents an opportunity to reshape the industry in a more sustainable fashion. Substantial capital investment will be necessary — utilities will likely need to increase rates to support the huge capital outlays required to reshape our electric system. But these investments will also mean economic growth and a cleaner environment for current and future generations of Canadians.