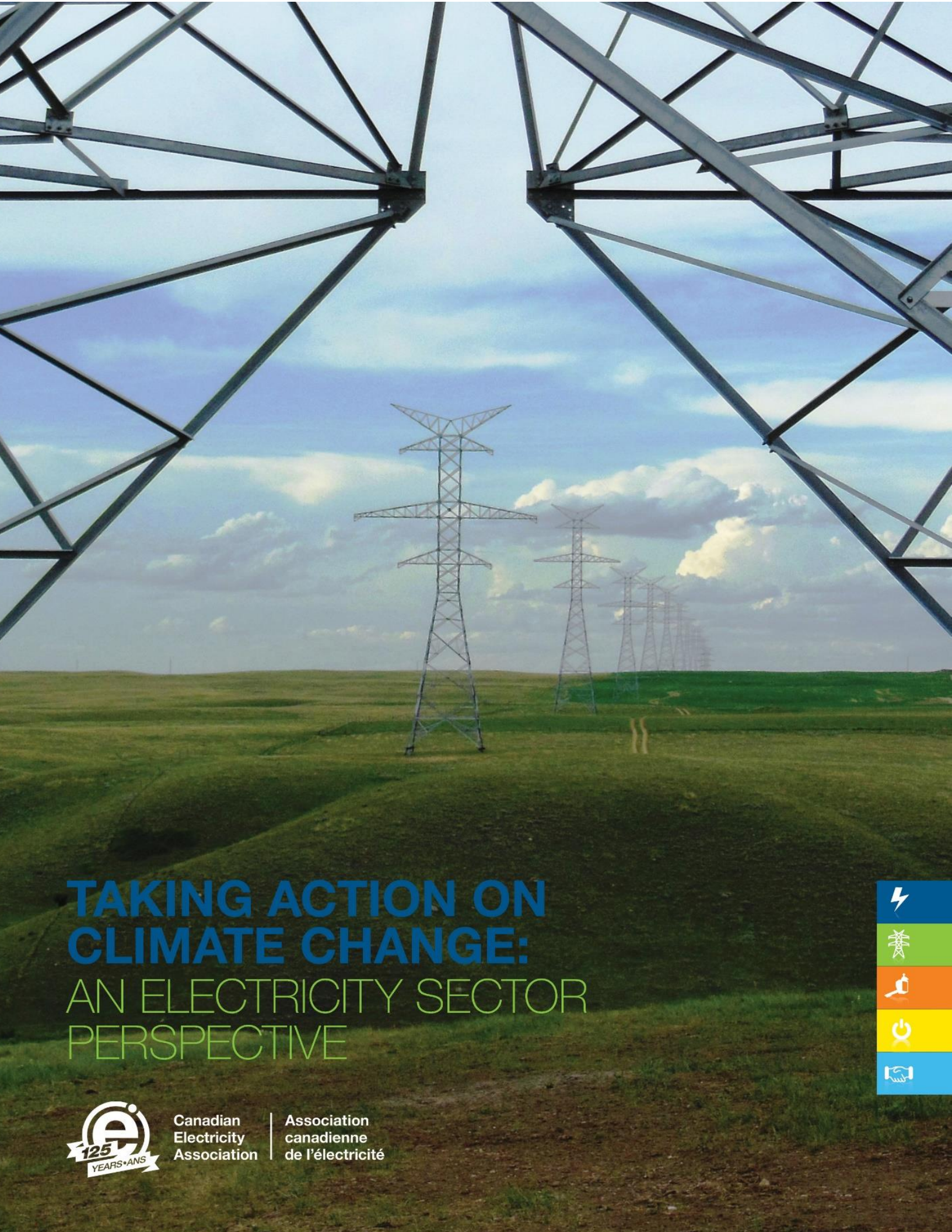

TAKING ACTION ON CLIMATE CHANGE:
AN ELECTRICITY SECTOR PERSPECTIVE

Canadian Electricity Association | Association canadienne de l'électricité

Foreword

The Canadian Electricity Association (CEA) offers this short paper to Canadian governments and other stakeholders as the nation comes together to operationalize the Paris Agreement, close the gap between our climate aspirations and our greenhouse gas emissions trajectory, and identify the opportunities to be had in marrying environmental performance and economic development.

The document covers the electricity sector state of play, puts that achievement in a broader context, and offers several process, policy and investment recommendations that will help move Canada towards a more sustainable future. The ideas and recommendations are meant to strike a balance between ambition and pragmatism.

A brief word on CEA itself: CEA is the national voice and forum for the electricity business in Canada. Our members comprise the leading electricity companies across the country, including generators, transmitters, distributors and fully integrated utilities. Members reflect diverse ownership structures and the full range of generation sources. This year, CEA is celebrating its 125th anniversary. The industry is proud of its record of accomplishments over those years, but the focus remains on the future and the transformational changes underway.

CEA looks forward to discussing these issues further with policy makers and Canada's business, ENGO and Indigenous leaders. In fact, we think it is critical to engage on the technologies, ideas and frameworks that will shape Canada's energy future. Email us at mccarthy@electricity.ca to continue the conversation.

The Honourable Sergio Marchi

President and Chief Executive Officer
Canadian Electricity Association

Devin McCarthy

Director, Generation and Environment
Canadian Electricity Association

"As a business leader in the energy sector in Calgary, I believe our organizations have an opportunity to step up and lead the way to a greener future for every Canadian.

For too long we have heard the debate of extreme views by those who sought to shut down our resource sector against those who sought to develop it at any environmental cost. Neither is reality — the real world works on pragmatic solutions that create fundamental change."

Scott Thon, AltaLink President & CEO, and
Chair of CEA's Board of Directors (November, 2015)
Cover page photo courtesy of AltaLink.

I. Introduction

At last year's COP21 Climate Conference, Prime Minister Trudeau, together with the Premiers, renewed Canada's commitment to addressing climate change.

"We view climate change not just as the challenge it is but also as an historic opportunity to build a sustainable economy based on clean technology, green infrastructure, and green jobs," he said. "We will not sacrifice growth. We will create growth."

Canada's electricity sector is aligned with this approach. We are clean technology; we are green infrastructure; and we are green jobs. Investment in Canada's electricity system is an investment in sustainable growth. In short, we are a key enabler of Canada's climate change aspirations.

With a generating mix already 81% non-greenhouse gas (GHG) emitting, our country's electricity sector gives Canada a head start over all but a handful of countries. It is the one sector in Canada to achieve significant emissions reductions since 2005 (about 30%). It will likely achieve the same again by 2030, while cutting emissions in other sectors via electrification. Past, present and future - electricity is Canada's clean energy solution.

Electricity is also a critical and strategic enabler of modern life. It is, in a word, indispensable. A safe, reliable, affordable supply of electricity is essential to Canada's economic and social prosperity and to the quality of life Canadians expect. This core mandate must be protected as Canada knits together its climate change strategy.

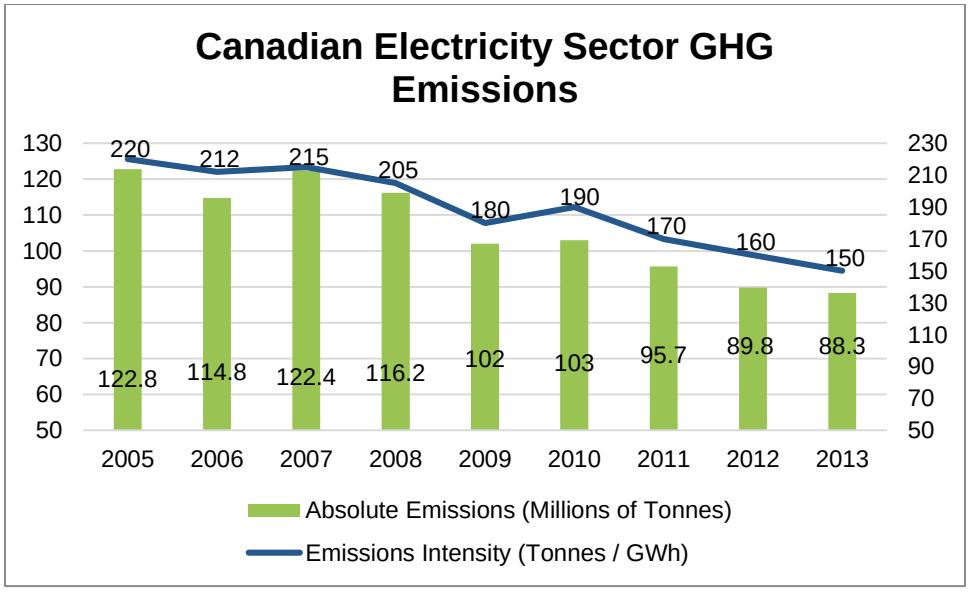

Figure 1. Canadian Electricity Sector GHG Emissions Trend Lines, 2005 to 2013.
Source: National Inventory Report 1990 – 2013: Greenhouse Gas Sources and Sinks in Canada.

II. Moving Forward Together

According to current Environment Canada projections[1], national GHG emissions will be 815 megatonnes (Mt) of CO2 equivalent in 2030, 55% higher than Canada's current target of 524 Mt CO2 eq. This projection does not include provincial commitments made since September 2015 (e.g. accelerated coal phase-out in Alberta, renewables target in Saskatchewan), but the overall trend line is sobering: the gap continues to widen between Canada's climate aspirations and its GHG emissions performance.

At the same time, Canada's economy is flagging. Oil sits at $30 per barrel and GDP growth is anaemic. To spur economic activity, the Federal government has committed to investing in "the projects our country needs and the people who can build them."

Electricity sector investments support both environmental and economic imperatives, including good-paying, long-term jobs. The sector is keen to work with all levels of government to identify infrastructure projects, promising technologies and export opportunities that "do well while doing good."

III. Forging a National Strategy

For Canada's electricity sector, a top priority is to understand how federal and provincial governments will operationalize climate ambitions in the weeks and months ahead. In other words, i) what will the targets be?; ii) what approaches will be taken to realize them; and iii) how will ongoing engagement and consultation occur with industry, NGO's, Indigenous leaders and Canadians?

The national GHG emission reduction target is an important signal to Canadians, stakeholders, policy makers and the international community that Canada is serious about achieving results-but a credible strategy cannot be built on one number alone. **CEA's recommendation is to let the current emissions target stand for the time being.** Once a credible strategy is in place to achieve the target – once the path from 726 Mt CO2 eq[2], the most recent national GHG estimate, to 524 Mt CO2 eq is set – Canada will be well placed to increase its national ambition and lead the world in the fight against climate change.

More important than setting a new climate target, at this moment, is devising a national strategy to guide the policies and actions needed to achieve it. Bending the national GHG emissions trajectory will require a sustained, robust and focused effort. CEA agrees that moving towards a

[1] Canada's GHG emissions projections in 2020 and 2030, Ministry of Environment and Climate Change, 2016. http://ec.gc.ca/ges-ghg/default.asp?lang=En&xml=8BAAFCC5-A4F8-4056-94B1-B2799D9A2EE0
[2] The most recent total GHG emissions estimate reported in Canada's 2015 National Inventory Report of GHG Sources and Sinks in Canada (1990-2013) to the UNFCC.

cleaner future can create opportunities. There are however also costs involved which may, if not anticipated and mitigated, undermine both Canadian competitiveness and consumer willingness to support the transition to a low-carbon economy.

Most importantly, Canada's policy makers should take the time required to craft a credible, fair, least-cost climate strategy.

A. Ongoing Consultation and Implementation

Politicians will set the level of ambition, define the policy framework, and support key projects and initiatives. Industry will invest, innovate, and ultimately implement and deliver on those ambitions. A balanced and pragmatic partnership, between governments and industry, will lead Canada towards a greener and better future.

Transparent, inclusive processes empower real change. They give utilities like ours the policy and regulatory certainty to change business models and pursue radical innovation and transformational investments. In addition, they give government continuous feedback on their plans and aspirations. As evidenced by this submission, the sector is keen to inform an ambitious, yet realistic vision for what can be achieved.

Many observers believe that the Paris Agreement represents a watershed moment for the international community – one that will launch an intense period of work and set higher threshold for all countries. If true, this will represent a major and sustained political and business challenge.

In support of this work, **CEA believes that Canada needs to establish a new and permanent Government and National Stakeholder Climate Forum, which brings together federal and provincial government officials, industry, NGO's, and Indigenous interests.**

The mission of the Forum would be to help build common ground and a national consensus. To ensure a coherent, cohesive, and viable climate change strategy that will guide actions and pinpoint opportunities. The vision would be a sustainable economy for all Canadians, today and for generations to come.

B. Forum Responsibilities

Government should:	**Stakeholders should:**
• Provide a clear, stable, and viable market signal on carbon pricing to incentivize decarbonization. • Table policy ideas that develop and support the opportunities inherent in moving to a cleaner economy. • Consult industry and other stakeholders on an ongoing basis. • Communicate to society the value of GHG emissions reduction commitments and investments.	• Continue to engage policy-makers and regulators to identify the most valuable technologies, policies and projects. • Develop strategies and business models that exploit opportunities while minimizing costs to consumers. • With a keen eye to the unprecedented pace of change in the market place, take a proactive approach towards GHG emissions reduction efforts.

IV. Electricity Sector Opportunities

CEA believes that electricity – Canada's clean energy solution – is a core component of any emissions reduction strategy, both in terms of further reducing electricity system emissions and electrifying transportation, buildings and industrial applications.

Public policy can either help or hinder this contribution. Below CEA discusses six enablers that should be central to Canada's climate change strategy moving forward.

A. Leverage Public Funds to Bridge the Investment Gap

Provincial regulators tend to focus on immediate costs and needs in order to keep electricity rates as low as possible. This leads to capped infrastructure investment as well as an overall reluctance to support innovative pilot projects, renewable and/or green technologies, and the extend service to areas without sufficient ratepayer critical mass, such as Northern Canada. It can also undermine investments in multi-province, transformative infrastructure projects. These represent important policy "gaps."

CEA believes that the alignment between electricity-sector opportunities and national climate change ambitions should make electricity infrastructure a top priority for government investment.

Electricity infrastructure investment also supports economic development and jobs creation. A 2012 Conference Board of Canada report[3] estimates that every $100 million invested in Canada's electricity infrastructure boosts real GDP by $85.6 million and creates 1,200 person-years of employment.

In an effort to address the above-noted gaps, and in alignment with government agendas, CEA would welcome Federal and Provincial investments in the following areas:

1. **Off thermal/GHG emissions reduction and increasing renewables**
    a. Broader deployment of renewable energy technologies into the electricity system, including hydro, solar, wind and tidal expansion;
    b. Specific support for getting off coal-fired electricity in Saskatchewan, Alberta, New Brunswick and Nova Scotia.
2. **Green energy innovation**
    a. Distributed energy, grid scale storage, two way power flows, grid modernization and innovative conservation initiatives.

[3] Conference Board of Canada, Shedding Light on the Economic Impact of Investing in electricity Infrastructure, 2012. http://www.conferenceboard.ca/e-library/abstract.aspx?did=4673.

3. **Remote and indigenous community off-diesel electricity projects**
    a. Funding for connecting remote communities to the North American electricity grid;
    b. Funding for micro-grid applications and regional networks where interconnection is not feasible.
4. **Electrifying Northern infrastructure corridors to service economic development including mining:**
    a. Building northern development electrical infrastructure to facilitate investment in projects like the Ring of Fire or Plan Nord.
5. **Electrification of transportation**
    a. Electrifying rail (LRT's, commuter rail) and road vehicles (Electric Vehicles);
    b. Building out supporting infrastructure – charging stations, electric transportation corridors (i.e. Montreal to Toronto);
    c. Establishing targets for EVs in federal and provincial vehicle fleets.
6. **Regional grid and transmission ties**
    a. Promoting resource sharing through the expansion of high voltage transmission interconnections.
7. **Climate resilience**
    a. Storm hardening electricity infrastructure;
    b. Funding the development of better climate data tools and analytics.

B. Value the Role of Natural Gas-Fired Electricity

At 81% non-GHG emitting, Canada's electricity system is amongst the cleanest in the world. In 2014, the remaining 19% was generated from coal (14.7%), natural gas (4.2%) and diesel (0.2%). Coal and diesel are on their way out. 93% of Canada's 2010 coal capacity will be shut down by 2030, at which point it will be only a small percentage of Canada's total electricity mix.

Hydro, wind, solar and natural gas will replace this coal capacity and meet new demand as the economy grows. Natural gas, in particular, will be critical as the sector pivots away from coal.

Natural gas enables both environmental and system performance. It emits about half the CO_2 per kilowatt hour as coal, pairs very well with intermittent sources like wind and solar generation and is the lowest cost option in many parts of Canada.

Natural gas will remain an important source of electricity generation for the foreseeable future. This should be reflected, whether implicitly or explicitly, in Canada's climate strategy moving forward.

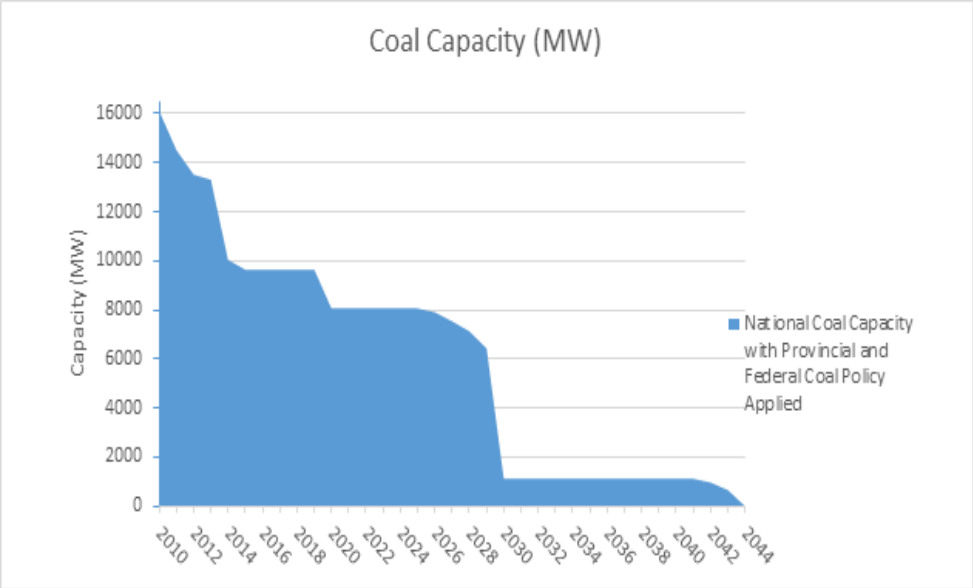

Figure 2. Canadian Coal-Fired Electricity Generating Capacity by Year. Source: CEA internal data.

C. Promote Electrification

According to a 2015 CMC Research Institute report titled *Pathways to Deep Decarbonization in Canada*[4], "fuel switching to decarbonized electricity is the single most significant pathway toward achieving deep emissions reduction globally." Decarbonize the electricity system, the strategy goes, and then electrify everything.

As one of only a handful of nations with an electricity mix more than 80% non-GHG emitting, Canada is in an enviable position. Further reductions to the electricity sector's GHG emissions profile as per existing provincial policies will solidify electricity's role as Canada's clean energy solution.

As the sector's GHG emissions profile falls, however, the cost of squeezing marginal GHGs out of the system rises. CEA believes that beyond the provincial policies already announced, further decarbonization of the electricity sector is unmanageable, both in terms of costs to customers and system reliability considerations. Rather than focus on electricity sector emissions (currently 12% of total GHG emissions and shrinking), governments should leverage the clean electricity system to cut into the other 90 to 95%.

CEA encourages Canada's Federal, Provincial and Territorial governments to pursue opportunities to electrify transportation, buildings and industrial processes. This will reduce emissions through 2030 and set Canada on a path towards deeper decarbonization between 2030 and 2050.

[4] CMC Research Institutes, Pathways to Deep Decarbonization in Canada, 2015. http://www.cmcghg.com/wp-content/uploads/2015/09/DDPP_CAN_v03.pdf

D. Support Innovation

Innovation is central to the modern electric utility mission. There are complex issues to be solved and Canada's young engineers are eager to explore innovative solutions and while its experienced engineers are committed to ensuring their success.

Too often, however, funding to develop, test and deploy new ideas, devices and processes is deemed by rate regulators to be discretionary spending and is cut from budgets.

This is not to say that CEA member utilities are not innovating. The textbox below highlights four particularly interesting projects. Canada's utilities can leverage their "in the real world" engineering know-how and explore innovative solutions to complex problems. They could be and should be doing more, but cost constraints often hamper out-of-the-box experimentation.

CEA believes that funding for innovative projects supporting provincial or national policy objectives should be fully or partially matched by public funds to mitigate risks and maximize rewards.

CEA welcomes innovation support, particularly in the following areas:

- **Carbon capture and storage;**
- **Grid integration of distributed energy resources;**
- **Grid scale storage;**
- **Grid integration of electric vehicles;**
- **Demand response;**
- **The optimization of asset use; and,**
- **Fault detection and mitigation.**

CEA supports the Federal commitment to *Mission Innovation*, which seeks to reinvigorate and accelerate public and private global clean energy innovation with the objective of making clean energy widely affordable. **Governments should incent Canadian utilities to provide the real-world 'sand box' in which technology use cases can be tested and refined. Successful projects can then be marketed to the world as high-margin, knowledge-economy products and services.**

Electricity Innovation in Action

The following four projects provide a coast-to-coast snapshot of the world class innovation being led by Canadian electricity companies.

1. **BC Hydro** is leading a smart infrastructure initiative, working with partners to deliver a public network of EV charging stations.
2. **SaskPower**'s Boundary Dam power station in Saskatchewan is home to the most advanced power station Carbon Capture and Storage (CCS) system on the planet.
3. **Ontario Power Generation** is converting its shuttered coal plants to biomass. Its Atikokan Generating Station is the largest 100 per cent biomass-fueled electricity plant in North America.
4. **Nalcor Energy** has built one of the world's first energy systems to integrate generation from wind, hydro and diesel. The project is located in the remote off-grid community of Ramea Island.

E. Encourage US Imports of Canada's Clean Electricity

The United States has committed to reducing emissions by 26-28% on 2005 levels by 2025. 31% of US GHG emissions originate from the electricity sector (compared to 12% in Canada), and coal is used to generate nearly 40% of all US electricity.[5]

Coal-fired electricity generation accounts for 24% of total GHG emissions in the US. To address this, the Environmental Protection Agency (EPA) has recently finalized regulations to cut carbon pollution from new and existing power plants. This plan, entitled the Clean Power Plan, recognizes international, non-emitting electricity imports as an acceptable GHG emissions reduction strategy.

In alignment with EPA targets, CEA encourages federal and provincial governments to promote new north-south interconnections and Canadian clean electricity as a means by which States may achieve their GHG emission reduction targets.

[5] United States Environmental Protection Agency, *Sources of Greenhouse Gas Emissions*. Last Updated May 2015. http://www.epa.gov/climatechange/ghgemissions/sources/electricity.html

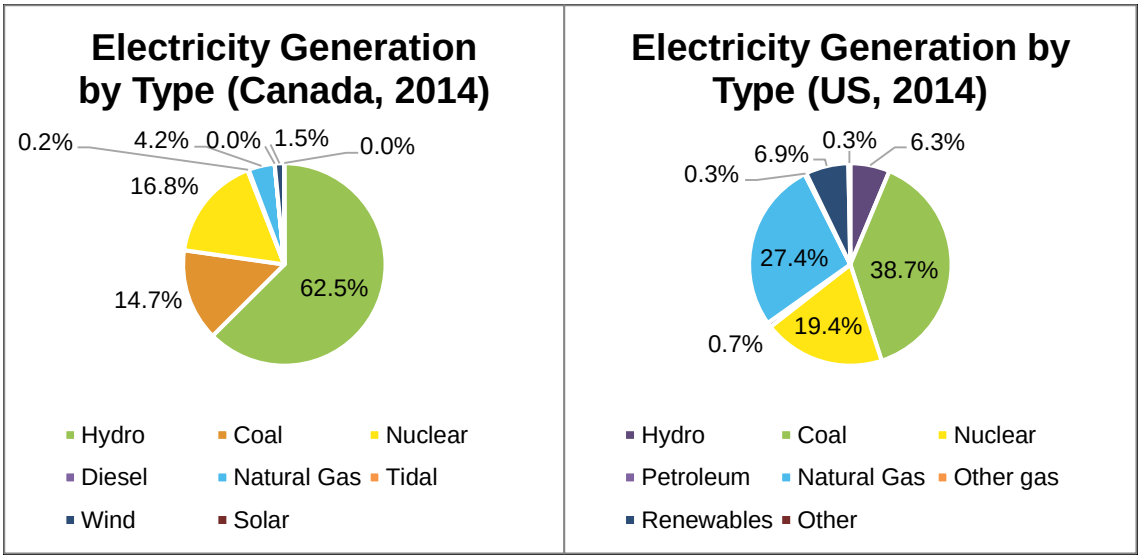

Figure 3. Electricity Generation by Type, Canada and the United States, 2014. Sources: Statistics Canada and the US Energy Information Administration.

F. Coordinate Carbon Pricing Mechanisms

The global movement to price carbon emissions continues to grow. In late October, the World Bank, the IMF, and the OECD together launched the Carbon Pricing Panel which encourages all nations to set up carbon markets or tax emissions. Canada is moving in step with this growing international consensus. Once Ontario and Manitoba's cap-and-trade systems come into effect, 90% of Canadians will live in a province with a carbon pricing system (BC, Alberta, Manitoba, Ontario and Quebec).

CEA has been very clear and consistent in its view that a carbon price applied economy-wide and continent-wide will allow for the greatest GHG emissions reductions at the lowest cost, and will avoid potentially duplicative or conflicting federal and provincial regulations. Provincial carbon pricing mechanisms must work in a coordinated fashion, and with U.S. mechanisms, so as to avoid economic leakage from one jurisdiction to another, or from covered sectors to those which are exempt.

If the system is not revenue neutral, governments should enable further carbon reductions by reinvesting funds generated into technologies and infrastructure that align with Canada's climate commitments, such as electricity infrastructure, renewable energy, energy efficiency programs, and the electrification of transportation, buildings and industrial processes.

V. Closing

Climate change has emerged as a global imperative. COP21 and the resulting Paris Agreement seized the attention of people in every corner of the world. Now, the real, hard work begins at home. Together we must transform the Paris Agreement into a meaningful and practical strategy that accounts for environmental, economic and social realities.

In this spirit, CEA hopes that this paper will add to the current climate discourse, and serve to inform all relevant actors of both the opportunities and the challenges that lie at the heart of our sector.

CEA also looks forward to continued discussion and engagement with policy makers and key stakeholders. In this vein, we have included below a short list of additional reading materials that support and broaden many of the themes found in this brief paper.

"We achieved the Paris Agreement in December together. With Indigenous leaders, representatives from municipalities, civil society, youth, and business, we were united in our commitment to the global fight against climate change.

[…] Our governments are now moving forward collaboratively to develop a framework and specific actions, including investments in green infrastructure, to meet the commitments we made in Paris."

Joint statement by Canada's federal, provincial, and territorial ministers of the environment (January, 2016)

Further Reading

Electricity Projects Dominate Canada's Top 100 Infrastructure Projects

ReNew Canada has released its 2016 list of Canada's 100 largest infrastructure projects. CEA members own 18 projects on the list, (including four of the top five) accounting for $50.7 billion of investment across the country. This includes 10 generation projects that represent approximately 7,500 MW of new or refurbished generation, and six transmission projects that add more than 5,000 km of transmission line to the network.

Electricity sector investments (the $50 billion plus about $5 billion worth of investments being made by independent power producers which are not yet members of CEA) make up over one third of the $161.3 billion total value of the 100-project list.

Electricity – Canada's Good News Climate Story

This short article posted by CEA from Paris during COP21 plays on the government's refrain that "Canada's back" to make the case that Canada's electricity sector is still here – we never left! The piece tells the story through three charts: Canada's current electricity mix as compared to that of the US; electricity sector emissions from 2005 to 2013; and the expected coal phase-out glide path.

Vision 2050: The Future of Canada's Electricity System

This CEA report has three purposes. First, it aims to inform its readers about the long lead times in electricity infrastructure projects and the importance of planning several decades ahead in support of desired outcomes in the shape and composition of the electricity system. Second, it aims to clarify the policy variables and decisions that must be made over the next five to 10 years on the path to ensuring the reliability and sustainability of a modernized Canadian electricity system in 2050. And third, it advances a vision for the future of electricity in Canada, and offers ideas for how to achieve this vision.

Electric Utility Innovation: Toward Vision 2050

This CEA report builds on Vision 2050. It adds to the innovation conversation with an overview of the specific areas that require action today, as well as a series of recommendations that will help ensure the full value of any innovation investments made in Canada's electricity sector is realized.

Adapting to Climate Change: State of Play and Recommendations for the Electricity Sector

This report, written and published by CEA with funding from the Natural Resources Canada, is the first national level discussion of climate change adaptation related to electricity generation, transmission, and distribution. The report discusses relevant climate data, assesses risks and opportunities for the electricity sector, presents tools that will allow for the integration of climate considerations in investment planning processes, and makes adaptation-related recommendations to utilities, governments and other stakeholders.