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Electricity: A Strategic Asset for a More Prosperous Future

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Economic Competitiveness through Power
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I am delighted to join you here today to share my views on the future of Canadian electricity, and the potential economic impacts of energy in the years ahead. I should point out that what you get this afternoon are my opinions: my comments today are my own, and do not necessarily represent the positions of either CEA or our member companies. My views have been shaped by my exposure to energy issues, first oil and gas then electricity, since the early 1980's.

What I plan to cover in the time allotted to me this afternoon are four broad topics:

- First, some of the big-picture scenarios for the future of electricity;
- Second, the investment picture for Canadian electricity, both Business-as-Usual and in a low carbon future, and the implications for the Canadian economy;
- Third, different models for financing the transition to a low carbon future, and implications for customers;
- And fourth, some musings on the kind of alignment we will need to successfully address some of the public policy issues that fall out of the three topics above.

So let's get started with scenarios for the future of electricity.

I have been honoured to work for the membership of CEA for the past three decades, and in that time, I have not seen the different visions for the future of electricity in Canada diverge to the degree that do so today: There have always been different narratives, but they have not been so polar-opposite as they are today: one is bleak, the other hopeful, and the likely path somewhere between the two.

Let me begin with the bleak scenario, the scenario some refer to as the utility death spiral: as grid maintenance and renewal costs go up and the capital cost of renewable energy decreases, more customers will be encouraged to move to distributed energy resources, and meet their own need for kilowatts. In turn, that pushes grid costs even higher for the remainder of customers, who then have even more incentive to become self-sufficient. Meanwhile, utilities are stuck with a growing pile of stranded assets, and this pushes companies into an inevitable death spiral. Bleak is an understatement.

The other scenario is a future where we live up to our aspirational goals with respect to reducing greenhouse gas emissions, of an 80 percent reduction by 2050. This deep decarbonization could only be achieved through a massive electrification of the economy. This would be electrification on a scale that almost defies imagination, and includes everything, from transportation to HVAC, from industrial processes to commercial applications. A number of studies have been undertaken to attempt to quantify

and qualify the scope and scale of what would be required to undergo this transformation, notable among them, the work of the Trottier Energy Futures Project. So what happens to the electricity sector in a deep decarbonization future? Electricity generation itself is further decarbonized through expansion of renewables and deployment of carbon capture and storage, energy efficiency is implemented throughout the economy, and the electricity end use doubles or triples.

So the end state of these two visions of the future are either a death spiral, or a doubling or tripling of the electricity system.

I believe that the likely future path for electricity will be somewhere between these two poles.

While the phenomenon of some customers seeking to by-pass the grid is a real concern in many jurisdictions, I believe that we will eventually find a solution in a new ratemaking model that will be able to accommodate the deployment of distributed energy resources. Customers today wishing to use distributed energy sources still very much want to remain connected to the grid, first and foremost for reliability, but also in some cases, to sell to the grid energy generated in excess of their requirements. As many of you are aware, figuring out how to accommodate this through a new approach to ratemaking, is a priority for many in the regulatory field, and there are a number of initiatives aimed at identifying solutions. Some of the more notable contributions to this policy discussion are:

- The New York Department of Public Service's "Reforming the Energy Vision", the REV strategy;
- NARUC, the National Association of Regulatory Utility Commissioners and their manual on "Distributed Energy Resources Rate Design and Compensation";
- The Rocky Mountain Institute's "Rate Design for The Distribution Edge: Electricity Pricing for A Distributed Resource Future"
- The Lexington Institute's "Challenges and Requirements for Tomorrow's Electrical Grid"
- And the MIT Research Study, "Utility of the Future".

With respect to the electrification that would be required to meet the aspirational goal of decarbonizing Canada, of reducing greenhouse gas emissions by 80 percent by 2050, I am completely supportive of the aspiration, and look forward to that greener future, but only cautiously optimistic that we will reach that target. Let me share with you a couple of issues that moderate my optimism:

First, an 80 percent reduction in GHG by 2050: that's a very big lift. Let's face it...if we are looking at this honestly, as a country, we don't have a great track record when it comes to achieving our

aspirational GHG reduction goals. We have been very successful on other air quality issues and related emissions, for example, in tackling acid rain, or addressing CFCs. But when it comes to greenhouse gas emissions reductions, the electricity sector is the only sector that has consistently reduced its emissions. If we were to consider current electricity sector emissions against the Kyoto Protocol baseline of 1990, we have reduced GHG emissions by 17 percent. At the same time, overall greenhouse gas emissions for Canada as a whole rose by 20 percent. And since 2005, now being used by many as the base year, and upon which Canada's current GHG targets are based, GHG emissions from electricity generation dropped a full 31 percent, and is the main driver pushing down Canada's GHG emissions by 2 percent in the 2005 to 2014 window.

The second reason my optimism with respect to deep decarbonization is held in check is the international reality within which we operate. While Canada has been challenged with meeting commitments to greenhouse gas emissions reductions, the international community has been equally challenged, and this goes to the heart of the sub-title of this session: competitiveness, and particularly with respect to our largest trading partner south of the border.

The asymmetry between Canada and the United States in our approaches to GHG reductions, both historically, before the Government of Canada moved forward with pricing carbon in Canada, and especially since, has led to a push-back in some quarters, and led some to counsel that Canada should move more slowly on climate change so as to avoid a competitiveness imbalance with the United States. Expect this pressure to increase with the recent change in administration in the US. However, we expect that much of the action on climate change will continue to occur at the subnational level, such as the Western Climate Initiative, which links California's Cap-and-Trade program with BC, Ontario and Quebec. But my optimism is bolstered as well by international developments and the role Canada can play.

In Paris, the world committed to keep global average temperature rise to 2 degrees or less to avoid catastrophe. Does anyone care to guess how much temperatures in Canada have risen? According to Natural Resources Canada, our own national average rise is already at 1.6 degrees. Canadians are feeling the effects of a warming climate right now, today, because our climate here in the north of the world warms up at a rate twice the global average. And while it is true that future generations will pay the price if we don't begin to take actions today, there is already plenty of financial incentive to put climate change as a priority in Canada now.

Let me illustrate this point...

According to the Insurance Bureau of Canada, the December 2013 Toronto ice storm resulted in \$200 million in insured losses, and pushed that year's severe weather-related insured losses to over \$3 billion – the highest in Canadian history.

In addition, some 60% of insurance claims in Canada are now due to flooding, with an average cost of \$20-\$25K per claim, and severe weather-induced damage can and do lead to mortgage defaults, which only augments the magnitude of the related financial risks.

Moreover, in the United States, severe weather is now the leading cause of power disruption, costing their economy between \$18 and \$33 billion every single year.

Let there be no doubt - we need to act today to address climate change and ensure a sustainable future for generations to come.

As we wrestle with the issue of carbon reduction, it is important to remember that our electricity sector is already among the cleanest in the world. Over 80 percent of our electricity comes from non-GHG sources.

Of the total Canadian carbon footprint today, electricity is responsible for only 12%. And by 2030, with the retirement of traditional coal facilities, that figure will likely shrink to between 5-7%.

So clearly, electricity is part of Canada's clean energy solution.

By comparison, Germany generates just 41 per cent of its electricity emissions-free. The United States...thirty-one per cent. And Japan, 15 per cent. Moreover, coal generation in Canada sits at 15 per cent nationally. By contrast, the U.S. figure is 40 per cent.

Speaking about the U.S., we also run a significant trade surplus every year with our exports of clean electricity to our friends south of the border.

Through grid interconnections, we can help our southern neighbour lower the GHG emissions of their economies by providing clean, low and zero emission Canadian electricity. By doing this, we'll also be helping reduce global GHG emissions, helping to meet our international climate pledges, and helping Canadians by incrementally lowering the risk of extreme weather at home.

Let me now turn to the second topic I wanted to touch on this afternoon: The investment picture for Canadian electricity, and the implications of these investments.

Five years ago, CEA funded a couple of studies undertaken by the Conference Board of Canada that sought to quantify the scope and scale of electricity investments required in Canada over the next two decades. The Conference Board looked at development and investment plans of Canadian electricity companies in the Generation, Transmission and Distribution businesses, and across the country. Their conclusion was that investment in electricity infrastructure in Canada from 2011 to 2030 will total an estimated \$347.5 billion, in current dollars.

While that may seem like a very large dollar amount, consider that there was a lull in investment in the Canadian electricity sector, following a significant wave of building in the 1960s and 1970s, and a peak again in the late 1980s, so we are playing catch-up.

Today, the sector is once again in a building mode, renewing ageing infrastructure and building to meet new demand, fulfilling the build which the Conference Board identified.

In fact, the build that has already begun is so significant that almost all of the top 10 projects in ReNew Magazine's Top 100: Canada's Biggest Infrastructure projects are electricity related. Nuclear sits atop the list, with the Bruce and Darlington refurbishment projects in first and second place, followed by four major Hydro projects, Muskrat Falls in third, Site-C here in British Columbia in fifth, Hydro-Québec's La Romaine project in sixth, and the Keeyask project in Manitoba in the seventh slot, with a transmission initiative rounding out the tenth spot with Manitoba Hydro's Bipole 3 Transmission Line project. And of the remaining three projects in the top ten, two of them, Toronto's Eglinton Crosstown LRT in fourth, and Montreal's Réseau électrique métropolitain, are projects that will electrify transportation.

The infrastructure life cycle has also caught up in Europe, where it's estimated that they'll need to invest more than \$2 trillion between now and 2035. In the United Kingdom, another \$100 billion pounds by 2020. And in the United States, it's \$2 trillion by 2030.

The electricity sector build described in the Conference Board of Canada research, of which these projects are the front end, are having and will continue to have massive impact on the economy. The Conference Board analysis suggested that the direct, indirect, and induced impacts of the 20-year \$350

billion investment will add an average of \$10.9 billion per year to Canada's real GDP and create an average of 156,000 jobs per year. In other words, for every inflation adjusted \$100 million invested in electricity generation, transmission, and distribution infrastructure, real GDP will be boosted by \$85.6 million and 1,200 jobs will be created.

Electricity infrastructure build is, and will continue to be a motor for economic growth in Canada.

Now, the projections of the Conference Board of Canada were based upon a Business-As-Usual scenario of the sector's development. But will our future be Business-as-Usual? Or will we begin taking steps towards a lower-carbon future? Will we start down the path of that 80 percent reduction in GHGs by 2050? The timeframe of the Conference Board study was to 2030, but the infrastructure build identified by the Conference Board is not aimed at meeting Canada's 2030 Greenhouse gas reduction target. The bottom line is that if we are to begin moving towards our aspirational GHG reduction targets, even in the 2030 timeframe, the investments required will be far in excess of what was predicted by the Conference Board.

This leads me to the third topic I wanted to raise this afternoon, namely the financing of the transition to a low carbon future and the implications for customers. The fundamental question, and while it may sound simplistic, the implications are important, and that question is this: Who should bear the cost of the transition to the lower carbon future? The ratepayer of the taxpayer? Yes, they are the same at the end of the day, but the customer sure sees a difference, and it plays out in terms of the perception of the competitiveness of different jurisdictions.

The title of this session on the agenda is "The Economics of Energy" and here is the only economic theory I will touch on today, from my macro-101, and it's a simple question: is the transition to a lower carbon future a "public good"? Is a lower carbon future something that an individual can benefit from without reducing its availability to another individual, and from which no one is excluded, in economic theory, is it "nonrivalrous" and "nonexcludable"? Or is a private good, something for example that only the electricity rate-payer benefits from?

In some jurisdictions, the move to renewables is being financed principally through tax credits, the costs of which are borne by society as a whole, which effectively treats the transition to a lower carbon future as a public good: it has an impact on the taxpayer but not the ratepayer. In other jurisdictions, for example those with feed-in tariffs, the cost of the transition is being shouldered by the ratepayer. I don't make a

judgement as to which is preferable, but I do point out that we need to be mindful of impacts in two spheres: competitiveness and poverty.

With respect to competitiveness, we need to recognize that comparing the electricity sectors, and electricity prices, in two jurisdictions that approach this differently, taxpayer versus ratepayer funding of increasing renewables, is like comparing apples and oranges. You cannot simply compare electricity prices between the two; you need to take into consideration other societal costs and benefits, a more fulsome calculation that goes to quality of life. One of my member companies relayed the story to me of a multinational company with North America operations in both Canada and the US. The company has maintained its Canadian operation because while the cost of electricity has been rising in this Canadian region, it is offset by lower healthcare costs compared to where they operate in the US.

With respect to poverty, much has been written in the media about energy poverty, particularly in jurisdictions which have seen significant increases in electricity prices. Yes, the media and stakeholders should ask questions about the rates charged to customer, and that is core to the role of the regulator. But to suggest, as some have, that rising electricity prices should be reduced, rolled back or subsidized because the poor are having difficulty to pay their bills misses the problem. And that problem is poverty, not energy poverty. We need to address the issue of poverty in society, and not use electricity rates as part of the social safety net. This is a fundamental public policy issue, not an energy policy issue.

This leads me to the final topic I wanted to discuss, and that is the alignment we will need to successfully address public policy issues.

Whether its energy poverty, how to fund the transition to a lower carbon future, or what our targets should be for GHG reductions, There are fundamental driving forces at play, and success in public policy solutions comes from seeking alignment among them. The four pillars I would submit for your consideration would be:

- Technology;
- Economics;
- The Environment;
- The Customer

Here is an example of how these interact, using a specific case: the wide deployment of Carbon Capture and Storage, or CCS. CCS has the potential to play a central role in moving us towards our long-term aspirational greenhouse gas reduction goals. SaskPower has deployed CCS at Boundary Dam and

notes that the technology is critical to securing the long-term viability of sustainable coal production. In Saskatchewan and around the world. Note also, as I mentioned earlier, CCS implementation is also central to meeting 2050 GHG reduction goals in the modeling which has been done by Trottier and others.

How does CCS align with the four pillars? Customers? Check: customers are supportive of deployment of CCS. The Environment? SaskPower's Boundary Dam project reduces SO₂ emissions from the coal process by up to 100 per cent and the CO₂ by up to 90 per cent. Technology? Check, SaskPower has now proven that the technology works on a generation plant scale. It's the fourth pillar that is being addressed at their research centre, their test facility, analysis of their ongoing operations and work by others in the CCS space: getting the economics right. Once this last pillar is aligned, I would expect wide deployment of CCS.

From an industry perspective, the pillars are technology, economics, the environment and the customer: when we are able to align all four, it creates the winning conditions for policy solutions. From governments' perspective, the same approach can be taken, simply substitute the voter for the customer: when they align technology, economics, the environment and the voting public, they have a winning solution.

So how far are we from alignment when it comes to electrifying our transportation? The customer and the environmental pillars are aligned. Each day, alignment improves with respect to the economics, getting the cost down so EVs are not just for the wealthy, and moving the technology forward, to address both range and range anxiety.

Clearly, the electrification of our transportation system must comprise the next wave of innovation. It is an obvious place to start the next phase of decarbonization, since this sector alone represents almost one quarter of Canada's carbon footprint.

By some estimates, there could be as many as 500,000 electric vehicles on our highways by 2018 – and even more hybrids.

In fact, to appreciate a sense of this momentum, Tesla recently started taking reservations for their new Model 3 car, and received more than 325,000 reservations, which corresponded to about \$14 billion in implied future sales. This made it the single biggest one-week launch of any product ever.

This is all good news.

But whether you buy an electric vehicle to save money or to save the planet, the bottom line is the same – we'll need more electricity to power those vehicles.

And to get that electricity to all those new charging stations along our highways and driveways, we will need infrastructure.

That means investing, investing today. And investing in *electricity* infrastructure now means supporting the *transportation* system of tomorrow.

We stand at the brink of change in the electricity system. Some call it an inflection point: Today, we are again at one of those transformative moments for Canada. A time to build something important. Something enduring.

And to leverage one of our critical assets --- reliable electrical power --- to build a brighter, cleaner and better tomorrow.

Thank you for the opportunity to join you today.