**Remaining Competitive in an Evolving Power Landscape**
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Check Against Delivery

Thanks, Glen. It's a pleasure to be here this morning, and also great to hear the Conference Board of Canada's economic outlooks. Not many people know this, but one of my very first jobs when I was just starting out after university was as an economic forecaster for TransAlta. Back then it was quite a big deal for me to have a chance even to listen to the Conference Board's economists, so it's very special to have a chance to speak at one of your events and to serve on your Board of Directors.

Now, we all know the more proactive we are, and the more planning and development work we do in business, the more successful we will ultimately be—provided this planning is based on the right information. As John F. Kennedy once said in a state of the union address, "the time to repair the roof is when the sun is shining."

But we also know that despite having what looks to be the right information, it's difficult to predict exactly how our business landscapes will change. And I would argue that with intensifying public and regulatory scrutiny, it's becoming increasingly challenging to see around corners. Since I'm no longer a forecaster, I thought what I'd discuss this morning is some of the different trends I'm seeing in the power industry and how TransAlta is looking at future investment. I'll also touch on the importance of a competitive power industry for a competitive Canada.

But first, I can tell you that as a 103 year old power company, TransAlta has done its fair share of planning through major industry transformation. Our company has essentially been built on the application of new technologies. When we first started out in 1909, the industry was in its infancy and was based on hydroelectric power—and our hydro facilities in the Bow River Basin are the first ones we owned and operated. In the 50s, the new power generation technologies were coal-based—and that's what we invested in, building our large coal plants up in Central Alberta around Wabamun Lake. And then in the 90s the focus switched to gas and we built that, too, in Alberta—mainly co-gen power plants on the sites of our industrial customers. In the 2000s we saw a rise in renewables—particularly wind powered generation—and we developed wind farms here in the south of the province and in Central and Eastern Canada. Today, we still operate many of our very first facilities and we're essentially a collection of all those investments.

In fact, it turned out that although each new technological advance that came along was expected to replace the older generations, what you'll actually find when you look at the power industry in Alberta, is that we need them all. We need the hydro, the coal, the gas, the wind and whatever else we can get. We need a mix of generation technologies to supply the market—partly because Alberta is growing at breakneck speed and we need all the generating capacity we have, and partly because there are still trade-offs among the fuel types. Some bring cost benefits to consumers like our coal plants; some bring environmental benefits like our wind farms down by Pincher Creek; and some are quickly dispatched, like our gas and hydro plants. Diversity in power technology could be compared to diversity in an investment portfolio: it's essential. You never want to have all your eggs in one basket.

So, after 103 years, I like to think that TransAlta has gotten to where it is today mainly because we've been forward looking, we've kept our focus on customers and we've never been afraid to adopt new technologies or enter new markets. And we're no different today. We're looking to grow in ways that will make our company and our customers competitive on the global stage.

One of the key challenges we face is predicting what kinds of assets will best serve our markets in the long-term, while also ensuring we remain profitable in the short-term. And what's new here is that in the past, technology choice was largely based on location. If you were in B.C. and Quebec, you built hydro; if you were in Alberta, you built coal. If you were in Ontario, there really was no inexpensive source of fuel, so you built nuclear. And having a population that would accept nuclear power actually became one of that province's strategic advantages.

So, those were the options. The challenge in terms of staying competitive was basically to take what was cheapest around you and turn it into power. But what we're finding now with the increased cost-convergence among different technologies, is that there are lots of options—and the decisions are more difficult. And this difficulty is compounded by the fact that the investments we make in the electricity industry are large ones—we own and operate plants worth hundreds of millions of dollars. And we have to make our investments in new supply early if we want to ensure the necessary electricity infrastructure is in place to support the economic growth on the horizon—both here in Canada and in our other markets.

In addition, our assets are long-lived—when we build them, we expect them to be in the market for 30 to 50 years. So, for example, when we build a large natural gas fuelled power plant like the 800 MW Sundance 7 facility we are developing West of Edmonton, we expect it to serve Albertans for decades to come. This means we need to make sure the demand is going to be there and the plant will be both economically and socially viable long into the future. And what *this* means is that we need to develop the right kinds of assets not only for the marketplace today, but also for decades down the road—both for our customers and our shareholders. Because in terms of developing a successful project, stakeholder considerations and public policy decisions are now as important as economic considerations. Indeed, stakeholder considerations now form a part of our economic considerations.

To complicate things further, we are facing this increased choice at a time we are approaching a period of rapid change in the power industry driven by technological progress and public policy reform. The federal greenhouse gas rules introduced in 2012 have resulted in Canada—and Alberta in particular—having a large amount of coal-fueled generation slated to come offline within the next 20 years. In Alberta this will lead to the retirement of about 40% of today's baseload generation and a need for about $6 billion in new investment to replace it. And today the province is experiencing the greatest load growth in North America at about 3%. If we add in the new capacity needed to support our thriving economy, we're looking at an investment of $10-$15 billion needed to serve Albertans. So, the questions are: what will replace the retiring coal generation? And how much will it cost?

The technologies we turn to will ultimately be determined by the complex interplay of technology, government policy, environmental considerations, the ever-present risk of intervention, subsidies and economics. I can tell you it's hard to untangle this knot and plan through it, especially when you are making one-billion-dollar-plus investments in assets that need to remain profitable for decades to justify the investment.

But, basically, that's the challenge—and I'll talk more about the specific choices to be made and trends we are seeing in a minute. But, first, in terms of Canada's competitiveness or Western Canada's competitiveness, why does it matter to Canadians and Canadian businesses that we have a strong electricity infrastructure in place? Or put even more simply, why do you care if Canada's electricity industry is competitive?

**The Importance of Electricity Prices to Canadian Economy**

Well, to begin with, electricity is an enabler for the entire economy. If we look at Alberta, the province's economy is over $300 billion and electricity generation and transmission accounted for $7.5 billion in 2013. Each megawatt hour (MWh) produced in Alberta translates into over $4,000 of Gross Domestic Product (GDP) and the cost of power, including transmission and industry overhead, is around $100/MWh. So, essentially, every dollar spent on power is translated into about $40 to $50 of GDP.

But even more important than the GDP contribution, the generation and delivery of electrical power is a key part of our national infrastructure and an important input in almost every sector. It's no secret that for Canada to remain competitive globally, Alberta and British Columbia's natural resources need to remain competitive. And for Canadian resources to remain competitive in the global marketplace, input costs to produce those resources must also be competitive.

Today, low cost power is a key competitive advantage for Canadian companies. You can see on this chart that Canadian industry enjoys one of the lowest average costs of electrical power per megawatt hour, and our industry wants to keep it that way. We know that the more advantages Canadian business have, the more investment we'll see in the country and the more load growth will follow. So, we're working hard to make that happen.

**Electricity costs are important to Canadian Industry**

So far, Canada has generally enjoyed power pricing low enough to attract investment and support economic growth. So, overall we've had it pretty good. But cracks are beginning to show and there are questions about the low pricing continuing. Due to a number of factors specific to each jurisdiction, forecasters are now predicting prices increases in the short to medium term in Ontario by 40%, in Saskatchewan by 25% and in British Columbia by up to 20%. And we have already seen a few instances of rising energy costs and the damaging impact they've had on Canadian industry. For example, earlier this year, some of Ontario's industrial load customers balked at the increasing electricity prices they were being asked to pay. At between 7.6 and 9.4 cents per kilowatt hour, Ontario industrial customers were paying more for electricity than any other jurisdiction in North America. Some businesses were reportedly forced to relocate to neighboring provinces and the United States in order to remain competitive. Worried about losing more industrial load to provinces such as Quebec and Manitoba where power prices are about half of Ontario's, the province was forced to respond by providing energy incentives and reducing the global adjustment fees for large customers.

So, there is no doubt that power pricing is critical to the competitiveness of Canadian industry and our own industry works hard to support customers with affordable power. But as I mentioned earlier, ensuring that we are able to provide the necessary infrastructure far into the future, depends on us developing in the right direction today.

So, let me tell you about three major trends we're seeing in our sector.

**The Gas Evolution**

The first trend is that coal retirements and baseload demand growth are being met mostly with new natural gas-fuelled generation due to its low cost and high efficiency. Gas is being largely treated as "the answer" for electricity growth and retiring coal plants. You can see on the next graph that in the United States gas is the most built asset—and in Western Canada it is no different.

The transition to gas makes sense for a several reasons: it has about half the carbon footprint of coal fired generation, it maintains costs at current levels since gas is plentiful and relatively inexpensive, and it does not require any technological innovation, since gas is a mature, low-cost technology. Right now, it does seem like the obvious solution.

But there are also some uncertainties about just how dependable the transition to gas over the next 10 years will be, if gas demand continues to grow rapidly. Many energy intensive sectors are moving back to North America to take advantage of lower natural gas prices, such as the LNG export sector and the growing chemicals sector—but natural gas power plants are expected to be the largest source of new demand for the gas industry. This leads us to question whether the current infrastructure and storage facilities are adequate for future gas generation growth, and what will happen if the low, stable gas pricing we are predicting doesn't last.

Natural gas demand for power is tied to weather in the same way gas demand for space heating is tied to weather. This slide illustrates the impact last year's cold winter had on storage. I can tell you that I was on a panel a few months ago with executives from some of the largest Eastern American power companies, and they had some stories to tell about last winter's polar vortex. Not only were the gas pipelines at full capacity in many cases, but the United States completely exhausted their gas reserves—essentially running out of natural gas. In some states, it was so cold gas was freezing in the pipelines. They had to turn on virtually every form of power generation they had just to meet demand. They had gas running, coal running, hydro running, wind running, everything they could run they were running so that customers didn't have power outages in -40 degree weather. And they were lucky to still have those other forms of generation available. Think what would have happened if they had already mothballed their coal plants. And even now, they're not sure if they're going to be able to replenish their gas reserves by this fall. What this shows us is the vulnerability of any one fuel type. There is no magic bullet.

Now, if cyclical demand is increased further by gas-fired electricity, the potential impact of cold winters on storage capacity could grow—and this could exacerbate these problems. Increased power use also strains natural gas delivery infrastructure. Some regions, for example, do not have sufficient pipeline to meet demand at peak times and more power plants will increase the issue. So if natural gas becomes the power industry's fuel of choice, there may be more challenges with infrastructure than we were initially anticipating.

And what if gas is not as plentiful or cheap as currently expected? Expectations change—as we know. In 2002 the forecast for natural gas forecast was for prices to be $4 to $5/GJ for the next 15 years—so the signal was build gas, but coal was still competitive. In 2008 the 15-year-out view was $7 to $10/GJ for the next 15 years—so the signal then was build coal and wind—stay away from gas. Today, the forecast for gas prices is back to $4 to $6 for the next 15 years. So, build gas is the clear signal again, although renewables are closing the gap partly on economics and partly on policy/subsidy.

The bottom line is if we continue on the path we're on, the Canadian and North American economies will be more leveraged to natural gas prices than they are today—and we can't predict how its pricing might change.

**The Green Revolution**

That brings me to the second trend we're seeing. At the same time as most signals appear to be pointing industry to develop natural gas fuelled generation for the short and medium term, we are also seeing an increase in investment in renewable energy driven by environmental factors and increased scalability. In fact, some are predicting that renewable technologies, such as solar, will displace all thermal generation and oil usage by 2050. This might seem like a long ways away, but when we're building plants for the next 3-5 decades, it's actually not that far.

Right now renewable generation is rapidly making inroads in the power market. We've seen the cost of developing and operating wind and solar power generation reduce rapidly, and storage is being developed to help manage the challenges presented by variable generation. Today, these technologies are still more expensive than gas generation. However, as these technologies advance and become more economical, there is a real possibility that natural gas generation will get squeezed out by technologies that have near $0 variable cost. Thus, the rise of renewable generation—if and when it happens—will inevitably disrupt market designs, generator economics and grid reliability.

One of the problems with assessing the cost-competitiveness of renewable generation is that in most markets renewables are still highly subsidized, resulting in higher costs to consumers. In some cases, they are subsidized directly via power bills and tariffs; in other cases they are subsidized indirectly via taxes and other cost recovery mechanisms. So higher costs are there, but customers don't always see them.

And there are other costs, as well. For example, while wind is getting close on pure cost in Alberta and has no fuel cost risk, it is intermittent and thus cannot be dispatched. In other words, wind and also solar do not provide reliable power and must continue to be backstopped by gas, coal and hydro. You can see on this slide that more than 20% of the time wind production across the province approaches 0 MW and only about 35% of the time is it over 50% of installed capacity.

So, right now when we look at true cost, the renewable energy technologies aren't there yet. When we look at renewables, the big questions are: when will the technology be cost-competitive? And will public policy push their implementation before they are? There's no question that renewables are socially and environmentally desirable. We all want power that is generated and delivered with the smallest environmental footprint possible. But what we've seen in countries like Spain and Germany who have rushed to build renewable power is that if you don't take into account these extra costs and you introduce a bunch of highly subsidized renewable capacity, you're going to effectively create inefficient markets. Spain, for example, rushed to build renewable capacity and then had to backstop it with additional gas and coal generation. This was not only expensive, but turned out to be carbon intensive. Germany has experienced similar unintended consequences of their energy policy.

The lesson we can learn from those experiences is that in terms of evaluating technologies and setting public policy, reality should take precedence over public relations. The real challenges today are to figure out how to bring down the cost of today's generation through technological innovation, to find a way to solve the intermittency issues and also to ensure that public policy decisions are based on a full understanding of the limits of technology, and their costs and reliability. Because if government pushes down the path to incenting the implementation of renewable energy without the technological improvements that will solve these issues naturally, we have seen that costs will rise and this could affect the country's competitiveness. So, again, it's not smart to put all of our eggs in one basket. It is critical to cast the net wide and encourage diversity with regards to power generation technologies.

I'm pleased to say that Alberta is one of the few jurisdictions that hasn't bitten on subsidies for renewables and the market has still managed to deliver a lot of wind generated power at a price that's not inflated. And I'm really grateful for that, because what we've found when we've asked regular Albertans and our industrial customers what they want is they want power that is reliable first, affordable second and environmental third. They want all three, but if they have to prioritize that's the order. So that's what we as a company are aiming to provide.

**Distributed Generation**

And finally the third major trend that we are seeing today is a rise in distributed generation—so power that is not connected to the grid. If this kind of generation reduces its costs to the point it is competitive with grid generation, transmission and delivery, it will cause a very disruptive change to the industry, as it would reduce the role for the large-scale centralized power market.

One of the trends within distributed generation is large industrials increasingly building their own generation rather than buying power from the grid. Co-generation is a perfect example of this, but we are also starting to see other industrials involved, such as Alberta Newsprint. While co-gens are highly competitive, unsubsidized and supply Alberta's industrial applications, grid connection is still necessary for reliability and back-up. A key driver for distributed generation is rising transmission costs—and the following chart shows that delivery costs in AB are expected to grow over the next 10 years—making this trend more likely to continue.

The second major trend in distributed generation is small-scale residential consumers in high cost jurisdictions such as California installing solar panels on a cost-competitive basis. Given the current state of battery and storage technology we do not see smaller customers getting off the grid right away. However, advancements in solar technology appear to be taking place quickly. Advancements in energy storage technologies could also be a real game changer. If self-supply and self-reliance becomes feasible, the entire industry would be altered from the centralized generation and large-scale transmission model to an independent or much more local grid system.

**Conclusion**

So, those are a few of the trends that we are seeing in today's electricity sector in both Canada and around the world. It's difficult to predict which technologies will ultimately dominate in the long term. What we do know is the success of the Canadian economy is tied to low cost reliable power and this power will best be supplied by a variety of fuel types.

At TransAlta we are managing the shifting power landscape by investing in a wide range of technologies across numerous jurisdictions, building strong partnerships to distribute risk, entering into long-term contracts for our power, and working with regulators and government partners to lead discussions on public policy. We are also supporting important initiatives such as the new Partnership for Resource Trade (http://powerofcanada.ca) that has been created to

educate the general public about the importance of natural resource development for Canada's economy.

Right now TransAlta is also working to further diversify our own company by investing in a wide range of technologies across numerous jurisdictions. Like everyone else, we're building gas generation, such our large 800 MW natural gas-fired Sun 7 plant here in Alberta slated for commissioning in 2018, and our behind-the-fence plants in Australia and Canada. Today we have the largest wind fleet in the country, and we're targeting more wind in the United States. We are also moving into other forms of electricity infrastructure, such as a natural gas pipeline in Australia and pursuing transmission in Alberta. And, finally, we're working to keep low cost coal generation in the mix here in Alberta, because we believe it gives citizens and industry a competitive advantage. So, we are involved in all kinds of power infrastructure projects. We believe this pursuit is critical for keeping not only our company, but our regions and our customers, competitive in an evolving technological and public policy landscape.

With that, I'll now open it up to questions. Thank you.