ENERGY TRANSITION AND CLIMATE CHANGE: AN UPDATE

Harold Kvisle

I'd like to start out by running through a few slides that will illustrate some of the points that Meghan has just made. We always have this obligation to put in this statement which I'll skip over fairly quickly. You all have copies, black and white copies of the slides that I'm going to run through, so those are in front of you there.

The first slide that I'd like to share with you is a slide on North American oil consumption and just exactly how do we go about consuming more than 20 million barrels a day of crude oil in North America.

It's interesting, if this slide had gone back to 1960 you would have seen many years when oil consumption grew by more than three percent per year, but since about 1998, when oil prices began to rise consumption in Canada and the United States, at least on a per capita level, it has been about flat. And in Mexico there's been a little bit more growth, but off a small base.

So if you look at this slide here, you'll see 23 million barrels a day in 2008. And we did see actually a bit of a downturn for the first time in decades. Annual consumption of oil went down in 2009 versus 2008, which illustrates that economics do have a major impact on the rate at which people consume oil.

Now, we've been living in a greenhouse-gas-focused world for about 20 years since the discussion started on that in earnest. And over that period of time in North America we have, other than 2009, increased our oil consumption every year. There's been very little reaction from consumers. And at the end of the day consumers emit 80 percent of the greenhouse gas from crude oil, sometimes 90 percent, depending on the type of crude, and the amount of crude oil consumed in motor fuels, which are shown at the bottom, gasoline for drivers, the second wedge being what the truckers consume in diesel, what the airplanes consume in jet fuel, and then a variety of others. You can see we've broken the United States out, but the split in Canada would be very similar, a little bit different in Mexico.

Canada, as usual, is about 10 percent of the U.S. in terms of crude oil consumption, but this is the reality. And most people who study this business closely would agree with the forecast that I've presented, which is not my own, but is the forecast of the U.S. Energy Information Agency as to how crude oil burning will continue over the next 20 years.

My second slide shows what we're able to do within North America. Now, you'll recall on the first slide 23 million barrels a day is what we've been consuming recently, of which we produce domestically in North America about 15 million barrels a day. And you can see that conventional oil production in the United States, the blue wedge, is forecast to remain flat or in fact slightly increase over the next 20 years. I would consider that to be an optimistic forecast. Again, this comes from the EIA. My own view would be a little more pessimistic than that. Meghan mentioned the dramatic slowdown in activity in the U.S. Gulf of Mexico and that will certainly have an impact on that blue wedge.

Mexico is the top bar, and you can see that we're predicting, the EIA is predicting, Mexican
production to decline as Cantarell continues to fade, some good news in Mexico from other sources. But just the sheer enormity of Cantarell will make it very difficult to replace that.

In Canada the big news, of course, is the oil sands, and that's the dark bar shown second from the top. Now, if you look at the United States, you'll recall on the first chart I showed about 15 million barrels a day that the U.S. consumes in transport fuels, and here's where the U.S. gets that. First of all, more than 8 million barrels a day of imports primarily from Canada and Mexico, but also from questionable places like Venezuela, certain parts of Africa and of course the Middle East. Those are the sources of crude oil imports. And you could just see by the sheer size of that, even if North America could dramatically reduce the oil intensity of its economies, there's still an awful lot of imports. Even if we cut that in half, you'd still have four to five million barrels a day of imports. And again, the source says 15 million barrels a day total that we consume on the motor fuel side of things.

Now, I just wanted to drill a little deeper in terms of Canada. Canada's been producing in the range of 2.2 million barrels a day, 2 to 2.2 million barrels a day for decades, but the conventional heavy and the conventional light in Canada, and pentanes, condensates, and things like that have been in decline for about 15 years now. And what Canada's been able to do to offset that decline is really grow the in situ oil sands that are shown in the blue wedge and then the mining projects which receive so much NGO and media attention, those are shown in orange.

And this is our prediction. The oil sands will grow to a total of around 3.2 million barrels a day by 2025. It's about 500,000 barrels a day in situ today. This is without excavation, we're steaming this oil out of the ground. And about 500,000 barrels a day from the excavation. And you see the rate at which we think that will grow. So those are my summary slides on oil.

I think the conclusion is that oil is going to continue to play a very large part in the energy supply picture in North America. There will be various legislative and policy initiatives, but it's going to be difficult to turn this very large source of hydrocarbons around in a hurry.

The next chart shows gas demand in North America. And you can see, just to quickly summarize, commercial, residential, and industrial we expect will remain about flat. The big story is going to be the amount of natural gas consumed in the power generation sector and that very much depends on policy. Only Mexico has been very clear. Mexico is committed to using significantly more natural gas to meet its growing electricity demand. The situation is much less clear in the United States. In Canada, places like Alberta and Ontario are moving heavily away from coal and into natural gas.

Now, the industrial component could in fact grow quite a bit more significantly than we show here. That really depends on the amount of shale gas that comes on and just how low the gas price is able to stay. That really does drive industrial consumption of gas.

I would hope that you might find this maybe the most interesting slide that I'll present. If you look until the period of 2005, we saw rising prices as total production capability in North America peaked out at just over 70 BCF a day.

You can see Mexico down at the bottom. Mexico's got very significant natural gas potential, but it's been a thoughtful policy decision in Mexico to use the available investment capital to maximize oil production and to get natural gas from imported sources. Mexico could dramatically increase its gas production doubling or tripling that amount, but that's not likely in the cards. Pemex is spending its money on crude oil instead and I think that's a wise decision on Mexico's part.

Rising prices continued until about 2006. And then you can see the shale gas, the wedge shown in yellow, started to come on in the United States. And it was that sudden surge of shale production which drove prices down. And just note that orange wedge, the degree to which conventional gas production in the
U.S. fell off as drilling slowed down. As gas prices fell, it drove drilling rates down and the daily production of conventional gas fell off fairly quickly. We saw a similar thing in Western Canada due to weak gas prices. But it's really this large wedge of U.S. shale gas. And you see BC unconventional I show. That's really Canada's contribution on the unconventional side, and those are significant.

Now, we do still show LNG being part of the picture because at relatively low gas prices we think demand will increase fairly significantly in North America. Natural gas just has so many advantages. It releases a third to 40 percent of the amount of CO2 per megawatt hour that you would see from a coal plant, it's half the price on a BTU basis today of heating oil, and it's the logical urban fuel for transportation and delivery vehicles. But the capital cost is enormous.

Just to put that in context, more capital is invested in the oil and gas value chain in North America every year than in any other industry. That's a number in excess of $120 billion a year that's invested every year just to maintain flat supply of oil and natural gas and refined products.

The second most significant capital investment chain in North America is in fact the power business, and I'll go into that now.

Focusing first of all on the United States, where the number is in the $70 billion a year range that's invested to keep the lights on in the United States, you can see I present two scenarios. This first one we call the enduring coal scenario, and it's the EIA official forecast at this time. And the EIA expects that continuing investment to maintain operations at coal plants will result in relatively flat electricity production from coal sources. You can see a little bit of growth in natural gas over time and some small growth, high percentage terms in renewables, but off a very small base, so the total amount is relatively small.

The next chart that I show is what we call the shift to gas scenario. This is a scenario developed by Cambridge Energy Research. And this is if there are actually incentives or regulations that would reduce reliance on coal-fired power. That would cause a shift to natural gas. Even with significant subsidies and other stimulus to promote wind, solar, geothermal, we don't see how it can amount to a very significant part of the total supply mix. And things like the initiatives in California are interesting, but it's just hard to see how the numbers work. So this scenario would be the one where we would see significant natural gas demand as a result of low prices driven by all the new shale gas.

Now just to show the difference, this slide shows how we think the United States electricity supply mix is going to unfold. You can see the real preponderance of hydroelectricity in Canada. It's interesting that Canada's misdemeanors on the oil sands front are pretty much offset on a per capita basis by our very large endowment of hydroelectricity largely in Eastern Canada, and we think that's going to be a significant part obviously of Canada's supply mix going forward. And notably a fair bit of that hydro is exported to the United States.

Finally, perhaps the most clearly thought-out policy on the electricity supply front in North America comes in Mexico. And the Mexicans have wisely decided to rely heavily on new-build, very efficient natural gas-fired power plants. And TransCanada is of, course, pleased to be a major pipeline builder to supply the natural gas to those plants in Mexico.

Now, you can see the rate of electricity consumption in Mexico is projected to be much more dramatic than in Canada or the United States. But of course today Mexico's power consumption per capita is only about 15 or 20 percent of what you see in Canada and the U.S. So as Mexico goes up the curve and electricity penetrates the economy to a much greater degree, there's going to be a very significant amount of natural gas consumed in Mexico that's primarily going to be imported LNG from overseas sources, but also we would foresee good economics for gas development in Mexico and of course imports from the U.S.

So, I'll leave it at that. I'll just close with one last slide. This is the company that I just retired from,
the largest energy infrastructure company arguably in the continent. And I'd just note that many of the projects that we seek to build these days are bedeviled by regulatory permitting challenges, notably everybody's heard of the Keystone Expansion which would move oil sands production to the Gulf Coast. It would be a direct substitute for overseas crude oil imported in, but we've run into very significant opposition and enormous cost on that.

Another interesting project, the Alaska Pipeline. TransCanada and Exxon Mobil are in partnership to develop that. We predict eight years of regulatory proceedings and a cost of roughly $1.5 billion that will have to be spent before we find out whether we get a regulatory permit to build that. Those are the kind of challenges and impediments that we face.

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