I would like to start off with a map of the TransCanada System to give you some feel for the degree of our involvement in North American oil and gas and electric power. This map shows just our assets, but it also shows a lot of the typical flow paths the natural gas follows to get from Western Canada to markets in California, in the U.S. Mid-West and in the U.S. Northeast.

We also own and operate the ANR System which brings gas from the Gulf of Mexico and the mid-continent region of the U.S. and a number of interconnects that bring Rockies gas through to markets in the U.S. Interestingly, you will see at the very bottom of the map a short orange line. That is our Tamazunchale Pipeline in the Tampico area of Mexico where we move imported LNG into power generation facilities. I think that is indicative of some of the changing ways of generating electric power in North America.

I’ll just start out with a quick slide on oil, and I appreciate some of my fellow panelists will talk more about this later. First of all, I am comparing 2007 to our outlook for 2030. Let's start in the middle of the chart where the green bars show the U.S. today producing just over seven million barrels a day. We actually expect that to increase to about eight million barrels a day. We actually expect that to increase to about eight million barrels a day. It is a long-term sustainable business in the United States, and annual additions have been able to offset decline for a number of years, but the United States does import almost twice as much oil as it produces to meet its total demand, shown in blue, of 21 million barrels a day.

In Canada, the story is a bit different. We produce almost half as much oil as the United States and, as is typical, we use one-tenth as much oil as the United States, Canada being roughly one-tenth in almost every metric. That enables us to export very significant volumes to the U.S. market. We expect that to grow to more than three million barrels a day by the year 2030. In our forecasts, Canada exports crude oil virtually nowhere except to the United States.

In Mexico, we see production of 3.3 million barrels a day remaining roughly flat over time. As demand increases in Mexico, their ability to export to the U.S. market in our forecast would diminish.

As you look at where is this coming in Canada, increasingly it is from the in situ and the mining projects, both of which are at Fort McMurray. The big challenge we face from a free trade perspective is not one of demand. We know consumers and refineries in the United States very much want our oil production which, in every respect, is growing at Fort McMurray.
There is the issue of dirty oil, and I would just like to address that question because it is a contrived criticism of the production from Canada. I would make the bold statement that all oil is dirty oil. There is no such thing as clean oil — perhaps vegetable oil. But if you look at the average oil of light sweet crude, seven percent of the CO2 emitted in the full cycle comes from the production, transportation, and refining of that crude oil; 92 to 93 percent of the CO2 is emitted by all of us as we drive our cars — over 90 percent emitted from the end consumer of that crude oil.

If you look at Fort McMurray crude, about 14 percent of the CO2 is generated in the mining, in the upgrading, in the processing, transportation, and refining. But even at Fort McMurray crude, 86 percent of the CO2 is emitted by the end consumer. I would argue that people say Fort McMurray crude emits twice as much CO2 as conventional crude, but that is a very small part of the total chain. In either case, it is between 86 and 92 percent that is emitted by the end consumer.

Just to close on crude oil, if you look at the crude oil pipeline system in North America shown in green, you could see it is very extensive and highly integrated. In Canada, in the blue chart on the lower right, we exported 200,000 barrels a day to the United States back in 1980. Over the next 20 years or so, we have grown that to more than two million barrels a day, or we are approaching two million barrels a day, and by the year 2010 we expect that is roughly where we will be. This is very important business to western Canada, generating 41 billion dollars in export earnings in 2007, and, notwithstanding price weakness recently, I expect that number would be increased.

So our very logical and practical response to this has been to propose the Keystone System, which I think is a perfect example of North American energy integration moving Fort McMurray crude oil to the largest refining complex in the world on the Gulf Coast of Mexico. And there is an alternative: There are Canadian projects to move that crude oil from Fort McMurray to the Pacific for export to China. We think that may need to become a necessary project, if what I would call zaniness on the CO2 file persists, but TransCanada is not proposing that. We think the logical market is to supply Alberta crude to the Mid-West and Gulf Coast region of the United States.

So we initiated the Keystone Project, and it is not just a concept. This is not just stock promotion. We are actually out there building it. You see in the top slide the photos from this past summer construction season in the Dakotas and in the photograph on the bottom, one of the pump stations in very early stages. These are huge projects. We will, in total, build several thousand kilometers of large diameter pipe. The distance of pipe will be 50 percent greater than the Alaska Pipeline Project. The tonnage of pipe will be equal to the Alaska Pipeline Project, and there will be nearly 100 pump stations of several thousand horsepower at each station. So these are gargantuan projects. We are investing between 12 and 13 billion dollars to complete that system, and that is the kind of thing that is needed to get growing Fort McMurray production to the end market.
Turning to gas, you can see on this chart that total North American gas production has been flat at about 75 BCF a day since about 1997, and that represents the top of the line. Where is that gas consumed? If you look at the bottom, you will see, at the top of the blue bar, residential and commercial. There have been some ups and downs, but it has been reasonably flat between 50 and 60 BCF a day.

The big growth has been electric power generation. It is the kind of electric power gen plant we can get built quickly today in North America, and it emits only 40 percent of the CO2 per megawatt hour that a coal-fired plant would. So we would forecast going forward that as electricity demand continues to grow, albeit at a very slow rate and some old plants come off line, it is going to be natural gas that will fuel most of the growth in power generation in North America in the years ahead.

As we look at where this gas comes from, you could see that the U.S. basins have largely declined since about 1995. The one growth area in the U.S. has been the Rockies. We are predicting going forward with what we call “U.S. other,” which would include the shale plays, is going to increase in the years ahead. That, plus continued growth in the Rockies, will lead to a bit of a resurgence in U.S. gas production, but there are many delays and other challenges in getting that to occur.

Western Canada, we feel, peaked in about the year 2000 at 16 and a half BCF a day. We have seen a little bit of decline in the last couple of years. The pace of drilling picks up and slows down. As prices move, the industry responds very quickly, but we think Western Canada can hold its own for a long time and then Northern Gas and LNG coming in. Now, if we can move the Alaska Pipe Project forward, it would displace about half of that LNG import that is shown on the chart.

I just note Mexico at the bottom with significant hydrocarbon potential is a relatively small contributor, just six or six and a half BCF a day in the total supply mix.

So where does it come from? It is very widely distributed throughout North America. The green are the conventional gas basins. Western Canada is a very extensive basin but not as thick as you would find in the Gulf Coast, so total production from Western Canada is about equal to the Gulf Coast region of the U.S. The brown, tan-colored areas are where we see shale gas development throughout North America.

As a result of developments in the Rockies, gas coming down from Alaska and McKenzie, we hope, and the development of shale and LNG in the Gulf Coast region, we see a little bit of movement in the way gas flows occur. But generally you can see gas from the north and west heading towards markets in the east and then a resurgence of production of the Gulf Coast region.

In total, Western Canada has exported 25 to 30 billion dollars a year of natural gas to the United States. I think the blue chart, the bar chart here, is particularly impressive in that we have grown our gas exports from two BCF a day in the days when they were tightly regulated by the National Energy Board in Canada out of fear that we were literally going to freeze in the dark up here, and since the market has been deregulated, you see the terrific economic activity that has been created.
In the case of Canadian gas, we don't drill massive structures and highly prolific wells. The wells we drill in Western Canada are modest. They are very expensive. An incredible amount of the money from natural gas activity in Western Canada ends up in the pockets of truck drivers, rig hands, service companies, motels, restaurants, and that is one of the reasons the economy in Western Canada is so terrifically robust.

Mexico is relatively undeveloped from a gas point of view, and that is understandable. It is not cold in Mexico, so the space heating demand that has really driven gas supply in Canada and the U.S. is less of a factor. But as Mexico increases its electricity consumption per capita, which is only about a fourth of the United States, we expect significantly more gas production to be used in power gen in Mexico.

This chart shows the Mexican Pipeline grid. The green lines are the PEMEX System that moves most of the six BCF a day of gas around Mexico, but there have been a number of private sector pipelines built and proposed. First of all, starting from the north, the Chihuahua System brings gas from the United States into Mexico, and much of that gas, interestingly, comes into the United States over on the Baja peninsula just south of San Diego and then enters the United States. From there, it moves across and goes back into Mexico and down towards Chihuahua.

The Guadalajara Pipeline is a proposal at this stage. It will be built because Mexico is committed to an LNG import terminal at Manzanillo, and the Manzanillo to Guadalajara Pipe is required to do that.

Tamazunchale on the east coast moves gas from the Altamira LNG plant and our company, TransCanada, built that pipeline about a year and a half ago. It moves that gas into a big Mexican power station just inland.

Turning now to power, when we look at where electric power comes from in North America, it is interesting, as you work your way up from the bottom, hydro and other, which would include wind, renewables, biomass, solar, all of those kind of things, highly desirable from an environmental and consumer point of view but *de minimis* in terms of the resource space. It’s very difficult to see those sources amounting to much. Nuclear, very practical and desirable, but regulatory process means that we don't see any incremental nuclear in a meaningful quantity coming to the market in the next ten years. Coal is generally agreed to be highly undesirable but very dominant. Fifty percent or more of the power in the U.S. is coal-fired. That leaves us with gas at the top of the chart, where we think it is a compromise fuel. It is not perfect, but it is only 40 percent of CO2 per megawatt, and it is highly possible. These plants are very buildable, and people have been focusing on them.

Just to use our own company as a case study, this is our power base today. We have 11,000 megawatts of generating capacity of which 52 percent is gas-fired; 23 percent is nuclear, which we did not build, we bought it and are in the process of restarting part of that plant that was shut down; 15 percent is coal, which we don't operate, but we hold that coal-fired off take under long-term agreements; and then small amounts of hydro and wind.
Now our business is one percent of North America's power supply. The 11,000 megawatts we produce are about one percent of the total supply base in North America. Interestingly, our growth in power is about three percent, so we are building roughly three times as fast as the industry.

I am just going to very quickly run through a series of slides that illustrate for you what kind of things people are doing.

Portland's Energy Centre is a large urban power plant in the middle of downtown Toronto, six hundred million dollars, very complex, and a very painful regulatory process that added a year and 100 million dollars to the cost of the project.

The second one, Halton Hills, is a slightly larger plant, seven hundred million dollars in a rural environment just outside of Toronto where we very nearly missed the necessary kickoff date because of an extra year of unnecessary regulatory process. When I say unnecessary, I mean at the end of the process it resulted in nothing different than what we were going to do in the first place.

In the case of Ravenswood, we acquired 2500 megawatts of generating capacity right in New York City, right across from Manhattan. The reason we did is that it is very difficult to get anything built there, and so it is highly strategic to be able to acquire a huge asset like Ravenswood, 2500 megawatts.

In the case of Bruce Power, not well known in North America, but Bruce is the largest power station in North America. Not just the largest nuclear station but the largest base load station of any kind, 6200 megawatts on one site. We own about 40 percent of it. It is huge. It is complex. Anything that we need to do is a slow and painful regulatory process. And construction, we are restarting 1500 megawatts of shut-in reactors there. It is a three billion dollar project, and progress is slow and difficult because of the nervousness around nuclear activity of any kind.

I would like to finish by talking just a little bit about the greenhouse gas challenge that we face. This chart is the percent of total greenhouse gas emissions by component in Canada and the U.S., but you could think of it as per capita emissions because they are very similar in Canada and the U.S. At the bottom, transportation, you can see that Canada and the U.S. emit about the same amount of CO2 per capita in the transport sector, just a little bit more in the United States.

If you go to the top of the chart in commercial, residential, other, and agriculture, our emissions are a little bit more in Canada just by the nature primarily of our agricultural economy. Where the two countries are significantly different is in electricity, where U.S. emissions of CO2 per capita are about three times as high as they are in Canada and that just reflects our relatively heavier weighting on nuclear and hydro, particularly Hydro-Québec and Manitoba Hydro, and B.C. Hydro, very intensive water-based systems.

But the opposite is true in oil and gas, that our emissions are about two and a half times those in the United States per capita because our oil and gas production is two and a half times per capita, and we are, of course, a very large supplier. So Canada and the United State can point fingers at each other about the
dirtiness of Canada's oil and gas sector or the dirtiness of the American electricity sector, but the reality is we are highly integrated and we need to, I think, work on this problem together. We would applaud Prime Minister's Harper's commitment to work more closely with the United States on matters of CO2.

Solving the problem is going to be very expensive. Just one point of reference. Existing coal-fired plants can often generate power for $40 a megawatt hour. The blue bars show that if you go to build a new coal-fired plant of standard technology on the left-hand side of the chart, the resulting power cost will be about $85 a megawatt hour. As you move across to the right, where you limit or you eliminate the amount of CO2 per megawatt hour, the red bars go down. You can see the cost goes up to nearly $200 a megawatt hour, so we are not talking about a doubling of the power price that North Americans are used to, we are talking about a quadrupling or more. This would have a very significant impact on the economy, and we would just ask how quickly do we want to bring that economic burden onto the North American economy?

In terms of the challenge, the supply side, higher prices would help bring more supply but they are not popular among consumers. Regulatory expedition would allow us to get transmission built, but that is not the way it is going. It is getting slower, not quicker. Higher prices would help constrain demand but the clamoring is for much lower prices.

Jumping to the bottom of this slide, new infrastructure is very slow to build, very expensive, and generally adding dramatically to the cost structure. Greenhouse gas compliance, we would argue, has been a bit impulsive to date and is going to be very expensive and have a big impact on the cost of production.

We are not talking about investing a little bit of money here. This slide shows the amount of money that is needed to be spent on the energy sector, and the easiest way to look at this chart is across the bottom. Two hundred thirty billion dollars a year, this is the amount of spending that occurs in North America today. This is from 2007 to 2030, but the number today is around two hundred billion dollars and rising from there.

The dark blue part is what we spend on upstream drilling, on the supply of gas and oil, the development of Fort McMurray, and the building of power gen facilities. The crosshatch bars are the amount we spend to move that production to market, and you can see the relative size of the businesses. We actually spend less money on the crude oil value chain than either of the others. The largest expenditures are in the electric power sector. As I pointed out earlier, we are in a process of quadrupling the cost of electric power in North America.

What are the drivers of that? Well, world-wide inflation and steel prices and things like that are certainly part of it, but the single biggest driver of higher costs in North America is the regulatory process burden. We have gone from an era when in 1960 there was very little regulation, and engineers did what engineers did, and most of the time they did it pretty well. The middle of the bar in 1980, we were going from cost-effective regulation to something that was getting onerous and expensive. Today we are at the right-hand side where many engineers would take the view that you just can't get anything done.
I want to leave you with an example of a project in southern Manitoba. Today we are trying to build that crude oil system to move up to a million barrels a day of oil to the U.S. refining market. From 1960 to 1995, we installed seven large diameter pipelines across Southern Manitoba to move Alberta gas to U.S. and Canadian markets, ranging from 34-inch diameter to 48-inch diameter, seven of them in parallel. We did, over that period, deliver a perfect environmental performance. I would challenge anyone to find a single environmental impact that we had on Southern Manitoba as a result of the building of those pipelines.

In 2008, we sought to build a new section, 34-inch, to move some crude oil to the U.S. market. Our design was to go across a drainage ditch that was dry by using an excavator to cut a ditch across it and install a 34-inch pipe, and that crossing would cost a million dollars. That was the cost of the crossing.

Due to some quirk in federal mapping, that drainage ditch was declared a navigable waterway. The Department of Fisheries and Oceans got involved to determine what kind of impact on the fish population we would have, and Transport Canada scrutinized it to determine the impact on navigation. We thought about going through the logical argument as to why we should be able to regard it as a dry ditch rather than a navigable waterway, but, in the end, because we were tight for schedule, we decided to spend fifteen million dollars to bore 30 feet under the ditch, 100 feet long from one side to the other, without ever penetrating the ditch.

However, we were thrown in the ditch. Because it required federal permits, it turned out that the federal government was obligated to engage in Aboriginal consultation. That process took a full year, and the final outcome is that we have spent 25 times the necessary cost to cross the ditch, and the impact at the end of the day is about the same.

Turning to some really big numbers now, this is the McKenzie Valley Project where the first bar on the left shows that for the McKenzie Project, if it were built like a normal project like the one I just described in Manitoba, the regulatory cost would have been one hundred million dollars. People should be stunned that it could cost a hundred million dollars to go through the regulatory process, but McKenzie has its own unique regulatory challenges. These are not interventions or objections by the native people. The Aboriginals of the McKenzie Valley are very supportive of the project. They are partners in it, and they want it to go ahead quickly. Seventy-five percent of the adversarial interventions at the National Energy Board and before the Joint Review Panel were from other departments of the government of Canada intervening against our project. That added seven hundred million dollars to the cost. And during the six-year regulatory process, the interest expense on that, which does not come cheap, added eight hundred million dollars to that cost. During that period, we went through record inflation, and the project looking at being kicked off today in a much different environment added two billion dollars to the cost. We are now looking at spending eight billion dollars to build a pipeline that we thought was going to cost three-and-a-half to four billion. Those are a few of the challenges that we face as we try to build the infrastructure that North America needs.
Harold Kvisle is president and chief executive officer of TransCanada Pipelines Limited (TCPL) and TransCanada Corporation.