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Securing the Energy Supply in North America - Canadian and U.S. Speaker

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SECURING THE ENERGY SUPPLY IN NORTH AMERICA

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Canadian and U.S. Speaker

MR. CLELAND: Dave and I spoke about this several weeks ago and decided that we should try to do something jointly. I think that reflects the underlying nature of the topic we are dealing with today. Canada and the U.S. have a very close energy relationship going back a long way. Consequently, it makes sense to do something, at least coordinated, if not precisely integrated.

We will start off with a few of the key things we want to leave you with. One may be a bit overstated or always true is that energy certainly is a key to the North American economy, remembering the North America economy is one of the most energy-intensive in the world. That is true of both Canada and the U.S. Energy in and of itself is a very important industry and that the integration of energy, the commonality of our energy systems is extremely important to our joint economic security.

Although we do produce a lot of energy and a diverse range of energies, we are getting less and less of it from North America. We import about 50 percent of our oil. Most Canadians do not realize we import about 50 percent of Canadian oil supplies into Canada from offshore. We are going to be importing an increasingly large part of our natural gas in the future. What that means is, yes, we have North American cooperation, but not a North

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America fortress. We have to think about how we work with the rest of the world on energy.

The environmental file and energy. This could be written the other way around if you were an environmentalist or someone wanting to give the environmental perspective, but it is a simple fact that the two agendas are butting up against each other. This is happening in part, because of some serious policy failures in both countries. This is something where it is in the interest of everyone to figure out how we bring together the economy, security and environment around energy issues.

The energy security issue is about supply. It is also about infrastructure. It is definitely a more complex file then it was in the 1970s when we were preoccupied with energy security.[1] This one issue has come up in discussions over the last couple of days. The issue is how do we maintain an open North American society and economy, while at the same time protecting our infrastructure? There will be failures. There will be disruption from time to time. Not all of them, by any means, as a result of terrorist activities. The game here is for the policy makers and for the industry to ensure that we maintain public confidence by minimizing the disruptions, by managing them when they do occur, and by restoring service as quickly as possible, so we do not have to go overboard in our security activities.

A bit of a snapshot on energy in North America. These are literally some snapshots. What we think are some of the key things you need to look at. If you are going to think about energy security, and I apologize, this is about a five-minute version of probably a yearlong course. But these are just some things we need to think about. These are the four facets of energy security. The first is clearly physical resources. That is the 1970s-style energy security that we used to worry about. Beyond that there is deliverability, getting it to market; reliability, making sure the systems actually function in the face of all sorts of causes of disruption, by no means all of them; and then, actually protecting our physical infrastructure and cyber infrastructure as it affects energy. Finally, going forward, some policy directions that David will talk about at the end.

MR. MANNING: First of all, there is the world energy picture. There is a correlation between the growth in Gross Domestic Product[2] (GDP) and the

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[1] Energy Security Act of 1980, Pub. L. No. 96-294, 94 Stat. 611 (1980); *See also,* Dept. of Energy National Security and Military Applications of Nuclear Energy Authorization Act of 1980, Pub. L. No. 96-164, 93 Stat. 1259 (1979).

[2] World Bank Definition of National Accounts: Outputs and Expenditure, Gross Domestic Product is "the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources," WORLD BANK, *available at* www.worldbank.org/data/working/def7.html

use of energy consumption. Your energy consumption rises with the GDP. The good news is as those two lines are converged over time, there is efficiency coming into our system.

There is now a cross over. Energy use is no longer increasing as quickly as the GDP growth. However, when you look at the North American situation, this comes as no surprise to anyone who got here in a Suburban, the U.S. GDP and energy use is relatively high on a world scale. Both in terms of GDP and given those rules per capita, the amount of energy used per capita is extraordinarily high relative to countries which have a very high population and also are starting to use energy more rapidly. When you look and see where China, India, Thailand, or even Brazil are on the scale, these countries are getting much more intense in terms of their energy use.[3] When you take those populations numbers in combination with their transportation and the fuel choices, the amount of energy will increase.

TRENDS AND SOURCES

As you can see, with incremental economic growth, while it is less energy intensive because of technology, overall energy use continues to increase. That is going to become a very real issue. On the Canadian side, the good news is that the trend in Canada, the overall intensity is declining. However, there has been a lag on the electric side. A lot of the electricity produced in Canada today, is still being produced with the same technology of a number of years ago. There is a much greater use of hydro, coal, in some of the countries and that technology has not become more efficient.

On the U.S. side, there is a very interesting story of increased consumption, but also increased diversity. There is continuing GDP growth. Nuclear energy began cutting in during the early 1970s and continues to show an increase. While coal has been relatively consistent, there has been very significant increase in the use of petroleum and natural gas. This kind of diversity is the good news. The bad news is that there is some real success being demonstrated in slowing the growth in any kind of nuclear generation. Clean coal technology budgets have been shrinking each year and natural gas supply is tightening. I will talk about that more in a moment.

Historically, the North American trend was that one single fuel was featured. There, of course, was wood, coal had its day in the sun, and then petroleum. Fortunately, now with the increasing use of other fuels, we have fuel diversity, making us less dependence on any one fuel. Because every

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[3] Gwynne Wiatrowski Guzzeau, *Indoor Air Pollution: Energy Problems in China's Residential Sector*, 11 GEO. INT'L ENVTL. L. Rev. 439 (1999); *See also,* Diane Preston, *Privatization of Energy in Argentina and Brazil: A Roadmap for Developing Countries*, 48 ADMIN. L. REV. 645 (1996).

one of those fuels brings with it a very real challenge in terms of economics or the environment.

There is recent energy demand by sectors in the U.S. Coal is still King when it comes to power generation providing about 54 percent. Only a third of power plants in the U.S. are not scrubbed in any way. With this you have major mercury issues; major nitrous and sulfur oxides issues. No offense to our hosts, of course, but it takes about 24-hours with the jet stream from the emissions of the coal plant from the Ohio Valley to travel to New York, where no coal is allowed to be used. This is creating tensions between regions. There is litigation contemplated by the eastern provinces, maritime provinces, and eastern states. That litigation is filed and continuing, trying to slow the environmental impacts on the Adirondack Lakes and lakes of Eastern Canada, which stems from sulfur dioxide emissions.

On the industrial side, what is happening is that here is an increase in the use of natural gas within the power generation market. Natural gas does not have any mercury emissions and is much lower in NO_x and SO_x, and even somewhat lower in CO_2. The trouble is the price of the industrial processes that use natural gases, and have to use them, has gone up. The increase has been pretty severe. In many cases the industry does not have alternative choices.

The automotive section, for instance, uses natural gas for dryers, because other fuels are not of quality. There is a massive bakery in our district that uses propane because you cannot shift to anything else. You have quality issues. Transportation is obvious, but on the residential side, that is the trap market, because once you are committed to a choice of fuel it is difficult to switch. In the U.S. it is natural gas and electricity. The electricity primarily being in the U.S. South's reliance on heat pumps.

In terms of trends and sources, you have oil. Oil is an international liquid fuel set by a world market. There is a decline in the domestic supply. Coal is for power generation. It may see its day, even though we have a CO_2 issue. There is hope for clean coal technology, because there is a lot of coal and it is really cheap.[4] The difficulty is that Canada has endorsed or ratified the Kyoto Protocol to the United Nations Framework Convention on Climate Change.[5] This raised a conversation going on between the U.S. and Canada on that story.

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[4] *See, e.g., Enhancing the Use of Coals by Gas Reburning-Sorbent Injection,* LOS ALAMOS NATIONAL LABORATORY, ENERGY AND ENVIRONMENTAL RESEARCH CORPORATION, Feb. 1997, *available at* www.lanl.gov/projects/cctc/resources/pdfs/eer/00000079.pdf

[5] Kyoto Protocol to the United Nations Framework Convention on Climate Change, Conference of the Parties, 3rd Sess., U.N. DOC. FCCC/CP/1997/L.7/Add.1 (1997).

Natural gas, I will talk about in a moment. We are going to be shifting, because of some supply issues, supply demand strains here. It is going to be moving more and more to an import market.

The U.S. Government is continuing to embrace nuclear as a clean alternative because of its greenhouse gas impacts. However, I can say that the Indian Point Plant located just north of New York City has been closing emissions for the last 30 years. These two megawatts are in a very tight market. There is a real question as to whether that plant is going to be able to continue to operate. Nuclear does not have a great deal of opportunity. That of course, is the issue.

With hydro there is still optimism within Quebec that they may be able to serve the northeastern market. However, there are still issues to work out. The economics of solar and wind are so despaired. We have been working probably 20 percent of my time in the last three or four months has gone into a wind farm project, it is very difficult to do, and the economics are such that you really have to want to do it.

SECURITY: SUPPLY & INFRASTRUCTURE

The issue back in the 1970s was supply. As Mike pointed out earlier there are really two issues: there is the actual security of supply and actual security of the infrastructure itself. In the 1970s, it was very straight forward. When someone turned the tap off, there were long lines within the major consumption areas for gasoline. Everybody got very focused and the size of vehicles reduced. The technology was there to conserve, however, all that technology is now given way to 300 horse-powered engines instead of 120s. The real issue is fuel diversity. How much can you substitute, because the economics are going to be such it is going to be tough?

MR. CLELAND: Just another snapshot. Just a couple things that we are picking up on. One, if you look back to the 1900s, the long term price of oil that is unsupported by a cartel was less than ten dollars a barrel. If you did not have OPEC, it would probably float back in that general direction.

But we have the crisis in the 1970s and we saw the big spikes. They had a great big fall off in the early 1980s. A couple things that are worth noting on this: consumer and market responses to those price shocks took about 10 to 15 years for those to work their way through; demand responses. We got a lot more energy efficient; substitutability, we got off oil and brought other fuels; and we also found other sources of oil. That is when the North Sea and Alaska started to come online.

The basic point here is that we are thinking about what is the key energy security. The first line of defense is comprised of well-functioning markets. The functioning markets will do quite a lot to move you in the right direction.

As David pointed out earlier, as we look forward, there are going to be restrictions. For example, we see increasing restrictions on substitutability. We need to think about what that means for greater energy security.

A shorter-term perspective focuses on natural gas. What we are finding in the deregulating world is that the prices of natural gas are spiking largely in response to weather and in response to storage. In both the U.S. and Canada you see big price spikes that corresponded to severe weather conditions and very tight storage. You are almost certain to see continuations of that kind of behavior as we look forward. Those price spikes do not do much except cause a bit of a flap for a couple of weeks. They do not have a lot of economic affect, but sustained higher prices do.

Keep in mind the interaction between oil and gas. The two markets still interact because there is still considerable substitutability. In the face of high gas prices or in the face of actual curtailment non-firm customers will go to other sources. Sometimes it is propane. Sometimes it is refined petroleum products.

As we look forward, how oil markets go, how gas markets go, and their relative pricing will have a big impact on what will happen to a particular gas demand. To sum that up, there are really two geographic markets: a world market for oil and still largely a North American market for gas and electricity. Looking forward, you are going to see an increasing world effect on gas, because, now liquefied, natural gas might well be the price setter. Substitution effects across fuels, but emerging environmental rules increasingly restrict the potential for substitution.

Generally speaking, we have not seen real supply curtailments, except in electricity. The 1960's brown-outs, the ice storm in the northeast in 1998. What you have seen is tight supply and consequent price effect. In terms of the effect on the economy, that can have a real impact. It is probably contributed to the early 1980's recession. I do not think it contributed to the 90's recession. It has not had affects on other industries and it certainly has had effects on consumer confidence. It is important that we ensure that we do maintain physical supply and that we have ways of managing the price effects when you get tight markets.

MR. MANNING: When we talk about energy security, as we started to say in the 1970's there was an issue in terms of supply. Now, we have a much larger issue, which is just the availability of supply, coupled with all the uncertainty that has been generated in the last one to two years throughout the entire system.[6]

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[6] *See generally*, Tracey A. LeBeau, *Energy Security and Increasing North American Oil and Gas Production*, 16 NAT. RSESOURCES & ENV'T 193 (2002).

The first question is what have we got. I think, fundamentally, while many of you do not work in our industry, there is no doubt that energy, the availability of affordable energy, is a key economic driver in the economy. The very high costs over the last 12 months have not been helpful to the North American economy generally. The first issue is, we have native resources, we have those resources available within North America, and resources outside of North America. The question then becomes what have we got in terms of availability and how reliable is the energy that we do not have at home? You have lots of abundant coal, but there are problems with that. Natural gas is abundant, but we are getting the gas at a much higher cost now and oil is already supplemented 50 percent by offshore supplies. That number is more like 60 percent and trending higher. You have certainly seen that while oil is a fluent wide world market, not all are stable.

Alberta has more oil than Saudi Arabia, but it is in an oil sands formation. It is affordable. You can get it out, but it is generated with heat. So, there is a CO_2 issue. We have KYOTO coming into the oil supply debate and into the reliability of off-shore supplies. Russia, Romania, Saudi, Kuwait, and even the Venezuelan economy of the last 12 months have had a significant impact on the North American market. One of the largest retailers of gasoline in the United States is Beta Basin, the Venezuelan government. They acquired a number of retail gasoline companies. They can buy their oil from home, so that shifts the economics and they are also the sole supplier of oil emulsion for one of the major power plants in New Brunswick.

There is this integration of the market place, which has created new dependencies. This is fine until you have some geopolitical shifts in reliability and the coming out of the current Middle Eastern conflict. There is no doubt that this is playing into it. While we have a lot of oil in Northern Alberta and I should point out that the U.S. is starting to take a much greater interest in the availability of Alberta oil, but when you have these price considerations, how much will the Canadian consumers start to pay attention to the dependence that the United States has on Canadian supply? Even though as Mike pointed out much of Canada's oil supply is imported from Venezuela and the Middle East. That gives you a quick breakdown of the regional sources of oil for North America, where we are drawing it and where the proven reserves are. As you can see, if there is not more and more technological shift, the location of the resources is very significant.

What we have is the traditional supply in Western Canada, but it is maturing. You have the major basins of the U.S, which are quite mature. Meaning they are not producing as quickly and as cheaply as they used to. You have got a tremendous amount of gas bottled up in Alaska. Now we have the opportunity off the east coast of Canada, but the real issue is going to be how much will liquefied natural gas take hold of the market?

Here is your traditional supply, which is not exactly located in high population areas. That will lead us to the whole discussion of pipelines, which is one of the issues of energy security today. It is a very complex and elaborate system. It works, but it is getting the energy from where it is found to where it is used that opens up all those vulnerabilities.

There is not a lot of energy in California. Not a lot of energy close to the 25 million people who live near me in the northeast. You have a huge western basin. You have all the controversy around the arctic, the wild life refuge, and the northern coast of Alaska. Alaska right now is producing gas with oil. There are eight billion cubic feet a day of gas being bottled up there. They are having to re-inject it into the ground because there is no pipeline up there. Will we see a continuing drive to build a pipeline to the United States market having come off some very high gas prices in the last couple of years? Probably so.

How is the Canadian government going to feel about that when they are trying to build a pipeline in the McKenzie Delta? If the U.S. offers a bunch of subsidies, that is going to be an issue. There are other issues because the U.S. would very much like to use a domestic source of steel. The pipe that is required for that plant is only available, at the moment, offshore.

There you have the dynamics of the politics. But this is really what is going on. There is the arctic basin, which is kind of the John Wayne movie part of the U.S. supply basin. Then you have got the next great future, you have a coal bed and methane below that. This is gas trapped down with coal, which we have all been counting on as a major source of energy going forward, as the stuff that is really easy to get out. It is becoming harder and to harder to find. Then there is the Canadian side.

A CONFERENCE PARTICIPANT: Can you tell us what those colored lines mean?

MR. MANNING: The red line is something called the expected ultimate reserves. That is kind of the total amount in the jug. The green line is your initial decline rate. As you drill natural gas wells in these areas and you hit a big deep well you will get a lot of gas and there are fewer of those around, or you can drill in the shallower pockets. When that gas starts coming and it flows at a very high rate, this is your initial decline rate. You want that rate to sustain for five or ten years. You want that whole well to last for 40. That was the old days. That is the way it used to work.

What you are seeing now is the decline rates going up. In green is how fast it is falling off. So, initial well hits, and in 1990 the decline rate, once it started pumping was in that 25 percent range. This means that within the first year it ran about X, second year it was X less 25 percent, and it would kind of fade down. Then the other scale, on the blue side is the initial volumes. While you have got a lot more drilling going on, that red line is going the wrong direction. This is what is going on. This green line going up

means the speed with which these wells get tired is getting faster because we already produced a lot of the easier stuff. That is the story in one of the major U.S. basins.

Here is the Canadian story, those wells in the 1990's that were reducing at 20 percent once they started, they are now already declining at 50 percent once they are in. We are going after a lot more stuff that is a lot shallower. We are drilling with water well trucks, with coil tubing not with giant drilling rigs. The nature of the business is changing in those two basins. Looking at the reserves you are generating, even though more wells are being drilled the actual increase in the reserve numbers is lower in many of our traditional areas of supply.

Moving to coal seam gas; this has been completely untapped in Alberta. The first wells are now just a year old. It is relatively new in the U.S. in the last 10 years. Those wells produced. They had a production life. Beginning in 1990, it was pretty sustained for eight years. The first wells were the easy ones, but each year since, they are getting tired faster.

There are other areas of growth. The oil sands are largely an oil play, not a gas play. You have lots of gas in Alaska and lots of gas in the Gulf of Mexico. You can not get there without liquefied natural gas (LNG). LNG is now being received at several points. Shell bought all the tankers for around five million dollars each. It costs you $200-300 million to build a tanker today.[7]

What we are now seeing is the opportunity for a liquid market in natural gas, just like oil. Where is it going to come from? Nigeria. Some of the geopolitical issues in the oil supply are also coming into the LNG market. In Boston, we are the largest gas distributor of New Hampshire and New England. On a very cold day, we evaporate 50 to 55 percent of our load. More than half the gas we distribute in Boston on a winter day comes from Trinidad by tanker. When that ship leaves Boston Harbor empty, it clears the bridge by less than ten feet. Needless to after to say 9-11, we had a different kind of conversation.

It is a full cycle discussion of security. It is not only how reliable is international supply, but it is also the security issues that are coming up along the route. Now the LNG we are purchasing up here in Everett, the competition for that LNG is South Korea. South Korea right now and Japan will pay any price for LNG because that is what happened to the market place.

Coal is as coal is. Eastern coal is pretty soft and brown and has very high sulfur content. The western coal is much cleaner. The reality is that coal is

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[7] *Toxic Air Pollutants Trade Tankers Present and Future,* Washington Dept. of Ecology, Sept. 2003, *available at* www.ecy.wa.gov/programs/spills/prevention/bap/TAPS%20Trade%20Tanker%20Report.pdf.

always there. There are buckets of it. It is cheap and it eats like a sparrow and performs like a Canada goose. In other words, once you got a coal plant running, your fuel cost is very small. You can make a lot of money on a coal plant, unless you have to comply with KYOTO because coal has a major CO_2 issue.[8]

MR. CLELAND: The death of coal has been greatly exaggerated. If you look at this in a security context, I think the likelihood of seeing coal disappear from North America in the next 20 years is very small. Therefore, the strategic imperative is getting clean and dealing with the CO_2. So, what about other sources?

Hydro is going the other way in the U.S. Hydro capacity is declining. In Canada there still the possibility of maybe 10 to 20 thousand megawatts of new hydro. That makes a contribution, but keep the amount in perspective. The whole North American and Canadian electricity system is around 850 megawatts, another 20 thousand helps, but it does not solve the problem.

Nuclear could come back. There are a lot of issues with this fuel source, spent fuel storage probably being the biggest. If we do not solve that one, we will not solve the public perception issues. Nuclear has to become faster to build, cheaper to build, more inherently safe. Bottom line, there are a lot of issues that will have to be dealt with before nuclear can make a comeback.

One of the key things that is affecting all of this, and this is something that David certainly knows well, is the effect of air regulations. Again, you want to be careful. These are real issues. Urban air quality is a real issue. Mercury is a real issue. They are things we have to get at. It is just unfortunate that it interacts with our energy supplies and with the location of electricity load the way it does, high pollutant areas, high population areas are high generation areas. Dealing with nitrous oxides, sulfur dioxides, the consequent ground-level ozone and particulate matter, and dealing with mercury are things that need to be done, but need to be done mindful of the consequences for the energy system overall.

Next I want to look at the whole sequence of controls on the major air pollutants coming in or under existing rules or potentially coming in under the new rules and the Clear Skies initiative. The question there in the U.S. is whether or not the Clear Skies initiative is a better and appropriate way of dealing with these issues. We are looking at emerging alternatives. People say, it is not all gas. What about the other things like solar and wind? Yes. The likelihood is, even given the economics that are facing wind right now,

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[8] Carbon emissions account for 83% of all U.S. greenhouse gas emissions, and more than 98% of all U.S. carbon emissions can be traced to the burning of fossil fuels such as coal. Michael F. Duffy, *Prometheus Re-Bound: How Adoption of the Kyoto Protocol on Climate Change Would Devastate the Western U.S. Coal Industry*, 77 DENV. U. L. REV. 265-267(1999).

that the probable physical limitation would be something like 10 to 15 percent of the electrical generating system. Again, it helps. It increases diversity, but it does not solve the problems.

People talk about hydrogen as the nirvana, but hydrogen comes from hot air sources. It is an energy carrier, not a primary source. It has to come from natural gas or has to be generated from water using electricity. People talk about things like distributed energy, but you are using natural gas for that fuel cell. Lots of potential for fuel cell powered cars to reduce air pollution associated with air transportation, but you have to think about where hydrogen comes from and then ethanol, primarily driven by farm policy. In the past, ethanol driven by security policy and the rationale for it today now includes its security effect. Grain-based ethanol does not make any sense for the long run. The land impacts are unsustainable, whether or not cellulosic.[9] In other words, ethanol based on waste, such as straw, can make it economically and technically likely.[10] Yes. It is a supplement, not a replacement for the other resources.

MR. MANNING: Let me speak to that for one second. From the U.S. perspective there has been a recent provision in the State of the Union,[11] that

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[9] Cellulosic ethanol is a liquid fuel derived from renewable resources. In contrast to corn ethanol, the starch-based fuel produced from the most valuable and nutritious part of corn, cellulosic ethanol is derived generally from waste products. Cellulosic ethanol can be blended with gasoline or used as a pure fuel. *Ethanol Climate Protection Oil Reduction*, The Environmental and Energy Study Institute Newsletter, Issue I, Sept. 24, 1999, *available at* www.eesi.org/publications/Newsletters/ECO/ECOI.rtf; *See generally*, Norman D. Hinman, *Biomass: An Ideal Feedstock for Ethanol Production*, 28 CAL. W.L. REV. 113 (1992).

[10] U.S. Gov't supports research into cellulosic ethanol development. Biomass Research and Development Act of 2000, Title III of the Agriculture Protection Act of 2000, PUB. L. NO. 106-224, 114 Stat. (2000); *See also*, National Emission Standards for Hazardous Air Pollutants: Cellulose Products Manufacturing, Proposed Rule, Aug. 28, 2000, Vol. 65, No. 167, 52165-52210 (highlighting environmental concerns over emissions from cellulose products manufacturing). This was followed by the release of national standards for cellulose production, which encompasses Cellulose Ethers Production. National Emission Standards for Hazardous Air Pollutants: Cellulose Products Manufacturing, 67 Fed. Reg. 40043-40097, June 11, 2002, *available at* www.epa.gov/EPA-AIR/2002/June/Day-11/a12770.htm; *See also*, *Ethanol Production: Sustainability Issues, Socio-Economic Sustainability*, Saskatchewan Eco-Network *available at* www.econet.sk.ca/pages/issues/ethanolsustainabilityissues.html

[11] "In this century, the greatest environmental progress will come about not through endless lawsuits or command-and-control regulations, but through technology and innovation. Tonight I'm proposing $1.2 billion in research funding so that America can lead the world in developing clean, hydrogen-powered automobiles. A single chemical reaction between hydrogen and oxygen generates energy, which can be used to power a car -- producing only water, not exhaust fumes. With a new national commitment, our scientists and engineers will overcome obstacles to taking these cars from laboratory to showroom, so that the first car driven by a child born today could be powered by hydrogen, and pollution-free." President George W. Bush Addressing the State of the Union, Jan. 28, 2003, *available at* www.whitehouse.gov/news/releases/2003/01/20030128-19.html

we would have a hydrogen economy.[12] For those of you who follow the press, the hydrogen economy is probably some distance away. Hydrogen either has to come out of the water, which is very expensive to do with electricity or it has to come from natural gas. There have been some cynics. The point about the ethanol is that it will be an ethanol mandate. There will be ethanol, which will be an additive in gasoline. That is a great benefit to farm states in the central U.S. However, when you grow the corn, you mill, haul with a diesel engine, and cook it into alcohol and gasoline it emits more CO_2 full cycle than gasoline does.[13]

MR. CLELAND: David talked about the issue of the infrastructure. Two things, deliverability, which is the actual physical infrastructure and reliability, being how does it work and does it work when we want it to work? That is largely an electricity issue, although not only that. There are lots of strategies for dealing with reliability and there are policy issues that flow from that. These include how you manage the systems and how you do it jointly across jurisdictions.

It is fairly straightforward. You have to get it there. Most people do not think about that when they think about energy at all. They think about the lights being on or occasionally they hear about the power plants and oil wells. They do not think about water wells and pipes that cause the two to come together. Building new infrastructures includes a lot of challenges, including financing, regulatory, and sighting. There are lots of strategies you can follow: redundant systems, looping back, stopping, and storage. All of those are being used now. The question is have we got the right mix? Have we got enough to ensure the reliability of the system?

A real loss of a major facility can have catastrophic affects. We saw that with the ice storm in Quebec in the northeast U.S. and Ontario in 1998,[14] but they are rare. We need to keep it that way. Just a little bit on the interconnection of the systems. This is something that Canadians have been working on in Washington. Trying to remind our American friends the

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[12] *Hydrogen Economy,* Fact Sheet, THE WHITE HOUSE, June 25, 2003, *available at* 2003 WL 7517772; *See also, Joint Statement on Hydrogen Cooperation,* THE WHITE HOUSE, June 25, 2003, *available at* 2003 WL 7517774.

[13] When considering the use of corn-based ethanol both the fuel used in growing, harvesting, processing, and transporting the corn as well as the environmental effects of the fertilizer used must be taken into account. Jonathan B. Wiener, *Something Borrowed for Something Blue: Legal Transplants and the Evolution of Global Environmental Law,* 27 ECO. L.Q. 1295, 1323 (2001); *See also,* Richard Bishop, *Why make ethanol from corn?,* SIERRA CLUB (2002), *available at* www.econet.sk.ca/pdf/ethanolsierraclubarticle.pdf

[14] *An Icy Mess Northeast and Canada Reeling From Storms,* SUN-SENTINEL (Ft. Lauderdale), Jan. 10, 1998, at A1. (reporting that a severe ice storm resulted in 19 deaths leaving more than three million Canadians and hundreds of thousands of Americans without power for days).

systems are interconnected and we need to work together to ensure reliability standards and market rules that work together. They are interconnected, but it is a dispirit set of systems that governs them. There is a lot of work to do there to make sure that the system actually does work. Electricity is a top priority because it is the one source in which a breakdown in any part of the system cascades through the whole thing, as we saw back in the 60's. The natural gas system is a different story because it is better integrated, there are more common market rules and it is highly evolved because of the earlier process of deregulation. The key thing with natural gas is ensuring the financing capability for expansion, finding credit where the shippers are who will support new pipeline capacity.

In one sense it is an advantage because the networks system is regulated. It is a natural monopoly. You have regulatory solutions, if you can get the regulators in the right frame of mind, as well as the shippers, who do not always fully agree with the views of the regulated pricing industry. Finally, particularly with electricity there is the issue of reliability standards.

MR. MANNING: We will do this very quickly so we have some time for discussion. Obviously, what I talked about was the lifeblood of the American economy, and it probably is.

MR. CLELAND: It comes from Cambridge Energy Research Associates and it is in their interest to say that.

MR. MANNING: Absolutely. Every one of those quantified pieces of infrastructure is an opportunity for mischief. Now, the good news is that we are all interconnected.[15] We have all sorts of duplication. There is redundancy within every system. If you have a power line go down, you can usually get there from the other side. But there is quite a focus within the United States government on Internet security. Specifically, looking at energy infrastructure security, they want to know how vulnerable those various elements are.[16] You have very large power plants, which are very visible. There is also the fact that those plants are all supplied by fuel making the fuel supply another issue. Again, I am not going to dwell on that because

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[15] *See generally*, Joshua Z. Rokach, *The Invisible Hand Will Secure the Electric Grid*, 16-WTR NAT. RESOURCES & ENV'T 183 (1994); *Country Analysis Brief: Canada, Electricity*, U.S. DEPT. OF ENERGY, ENERGY INFORMATION ADMINISTRATION, July 2003, *available at* www.eia.doe.gov/emeu/cabs/canada.html

[16] EXEC. ORDER NO. 13,231, 66 Fed. Reg. 53,063 (Oct. 18, 2001), *available at* www.whitehouse.gov/news/releases/2001/10/20011016-12.html; In May 2002, the U.S. Dept. of Energy's Office of Energy Assurance was created to assess the nations energy system vulnerabilities, threats, critical assets, and interdependencies, as well as recommending actions to correct or mitigate vulnerabilities. 68 FED. REG, NO. 18, 4122, Jan. 28, 2003; *See generally*, Dana A. Shea, *Critical Infrastructure: Control Systems and the Terrorist Threat*, CONGRESSIONAL RESEARCH SERVICE, July 14, 2003, *available at* www.usembassy.it/pdf/other/RL31534.pdf

I want to get to the continuation of the conversation that Michael and I had last year on his panel, which is when we had just come through ten-dollar gas.

For those of you do not know, normal gas prices have been in the $2.00, $2.50 price range forever when all of a sudden, the price of gas hit $10 in January and February.[17] A lot of people in the audience knew that and wanted to know why. What happened is we had a very hot summer. A lot of the hydro reservoirs were not there. California went totally onto natural gas. A lot of these very hot regions produced power with natural gas because they cannot use any alternatives due to environmental standards. Even those who can burn a different fuel can only do so for a brief period of time. We may be heading for the next perfect storm as we stand, because we have the most brutal winter. In our business, we have a design winter. You design for the coldest day in 60 years, and you have to build your system to meet that. We had pretty close to a design winter in many parts of the U.S. all year long.

Right now, in April it is miserable in the northeast. It is cold and rainy. We are sucking our natural gas out of storage, at a time when we should be putting it back in. Normally, you fill gas into the storage cabinets over the summer when it is cheap and then you burn it during the wintertime. If we have a very hot summer, which is possible, we are going into the summer with reduced storage. That would put us into next winter with even more reduced storage.

You may have read or heard that throughout the conflict in the Middle East, the oil field was secured. You would normally hear, they secured that oil field. As you know, the price of oil on the way into this conflict was $35 U.S, which is not sustainable. Predictions were it could have gone much higher. You have all the geopolitical risks of oil market. Now, you have the possibility with the wrong combination of weather and shortage of fuel, you could have some very high prices this winter. Of course, you have the Canadians paying those high prices, asking where their fuel is going. It is a non-renewable resource, so you have to start thinking about trade conversations.

Just to wrap up, it is a very critical supply demand balance. It is an integrated North American economy, integrated North American Free Trade Agreement that gives you free flow of energy with a couple of qualifiers.[18] The questions related to the declining physical resources and deliverability, which is always an issue and is critical when you are evaluating

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[17] In December 2000, natural gas prices exceeded $10 per Mcf.. At the same time the previous year natural gas prices were just over $2 per Mcf. Matthew R. Simmons: *The cost of energy goes up*, WORLD OIL 37, Feb. 1, 2001.

[18] North American Free Trade Agreement, Dec. 17, 1992, Can.-Mex.- U.S., 32 I.L.M. 289 (entered into force Jan. 1, 1993).

vulnerability. Reliability is not only whether you got the supply, but how you are going to get it there.[19] That is the picture we have right now. It has the opportunity to become a much larger discussion and anyone that thinks that energy was not part of the discussion of the Middle East stability, I think is being naive.

MR. CLELAND: The larger message, which came out yesterday, is that in Canada we have ignored energy policy for 20 years. It has been driven by environmental policy, not always very well or effectively. We need to come back to looking at energy patterns in the economy, security, and the environment. We need to do more collaboration with our colleagues in the U.S. because the systems work together. That is not the same as creating as a North American energy plan. It is a North American energy something. Canadians need to get over their hang-up on that and start thinking about how we work together. At the same time, it is not fortress North America. We have to think about how we are going to work together in the larger world context that we are inextricably tied into.

[19] *Reliable, Affordable, and Environmentally Sound Energy for America's Future*, Ch. 7 America's Energy Infrastructure, A Comprehensive Delivery System, NATIONAL ENERGY POLICY DEVELOPMENT GROUP, *available at* www.whitehouse.gov/energy/Chapter7.pdf.