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Chair

Mr. Lee Richardson

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● (1540)

[*English*]

The Chair (Mr. Lee Richardson (Calgary Centre, CPC)): Thank you for being here on time—as best we could.

We're going to hear further today on our oil sands research project and the role of the federal government in the development of the oil sands.

We're going to hear witnesses: from Energy Alberta Corporation, Wayne Henuset, from Calgary; the Bruneau Resources Management Limited, Angus Bruneau, president and corporate director, from Newfoundland; and David Keith, professor of the department of chemical and petroleum engineering in the department of economics at the University of Calgary.

I think you're familiar with the procedure. We're going to ask you to provide a little background information for the committee, the members will ask questions, and we'll hope we can conclude. I'm going to ask you to try to keep your presentations to close to 10 minutes, if you can. We started a little late today because of the vote.

Dr. Keith and Dr. Bruneau, have you coordinated your presentations, or were you planning on doing 10 minutes each? I'm sorry, I didn't confirm that with you before the meeting.

Dr. Angus Bruneau (President and Corporate Director, Bruneau Resources Management Limited): We have not coordinated, but I can make my opening remarks fairly brief.

I assume I've been invited because I chaired the panel—powerful connections—and I don't know if—

The Chair: Yes. I think it was that you had looked at this whole area. There were members on the committee who felt your expertise might be useful in terms of answering questions. I would appreciate a short opening statement too.

Why don't we start, perhaps with Dr. Keith, and then we'll go to Dr. Bruneau. Then, Mr. Henuset can tell us about the private sector initiative.

You can begin, Dr. Keith.

Dr. David Keith (Professor , Department of Chemical and Petroleum Engineering and Department of Economics, University of Calgary): Thank you very much, and thanks for being here.

Angus and I will be pretty complementary. I'm going to start by saying some general things about climate change, and then what I think might be an appropriate structure for the government to get involved in to enable innovation in the oil sands. But I won't say much in detail about the blue ribbon report. I think we can leave that for questions.

Canada has what many nations lack: abundant and secure energy resources. I think the two most important challenges our energy system faces are to access these resources while protecting the climate, and maximizing their economic value to Canadians. To meet these challenges we must accelerate the pace of innovation in science, technology, and management throughout the system.

I will address the climate challenge first. I may preach at you a little, but that's what I feel I should do. I'm going to frame the story around three important dates. The first of those is the end of the Eocene, which isn't a historical date, if you'll forgive me; it was 35 million years ago. This was the last period in which CO2 concentrations stood above 1,000 parts per million. That's about four times their value in the 17th century, before humans started messing with them.

The Eocene climate was a lot warmer than the climate now. Crocodilians walked the shores of Axel Heiberg Island, in what is now the Canadian High Arctic. Within one century—not 25 million years but 100 years—the lifetime of my kids if they're lucky, human actions may push CO2 concentrations to the same level as we saw in the Eocene. We cannot accurately predict the results of this planetary-scale experiment, but it's safe to say that if we continue our present course we will be committing our children to climate changes that will be large and rapid, in comparison to those humanity has seen since the invention of agriculture.

It is completely plausible, for example, that sea levels will rise more than five metres within one or two centuries. A sea level rise of just a few metres is enough to dramatically alter coastlines, as seen from space. So a sea level rise of just a couple of metres makes Florida look half as long as it does now, and erases the Fraser Delta.

There is nothing wrong with the Eocene climate, and no inherent reason why we should prefer our crocodiles in Florida rather than Axel Heiberg Island. But our infrastructure, crops, and the very locations of our coastal cities have evolved for this climate. While it is beyond the ability of social scientists to predict accurately the exact economic cost of this action—I don't believe exactly what's in the Stern report, I can tell you that—it's clear there will be some winners from climate change, but it seems very likely the losers will outnumber the winners enormously.

The second date is 1965. That was when the most powerful politician in the world got the first high-level scientific report on climate change. President Johnson's report from his senior advisory panel said essentially the same facts we know today. Carbon dioxide concentrations are rising due to human action, and if left unchecked, substantial climate change is to be expected within a century. We've known this a long time. I mention the 1965 report to emphasize the consistency of scientific judgments on this topic and to illustrate the absurdity of claims made by some of the so-called climate skeptics, such as Calgary's own Friends of Science.

The last date I will mention is 1994, the year the Framework Convention on Climate Change was negotiated. This event marked the emergence of climate change as a high-profile political issue. I'm not claiming any great merit for the convention or the subsequent Kyoto Protocol. Indeed, my personal view is that the Kyoto Protocol may represent a dead end in international action on climate change. My point is that after more than a decade in which this has been high on the agenda, we have achieved essentially nothing. I don't just mean in Canada; the Europeans have said a lot of words, but they haven't achieved much in reducing emissions.

In the years since 1994, the growth of carbon dioxide concentrations has only accelerated. The most measurable direct result of all the politicking and international negotiations has been the CO2 emissions from participants' air miles.

Substantial uncertainty about the climate's response to our meddling will remain unresolved for decades. Uncertainty is not justification for inaction any more than uncertainty on the battlefield is justification for delaying decisions about the movement of troops. This issue will be uncertain for a long time. You folks need to find a way to regulate in the face of that uncertainty, understanding that climate change may turn out to be a little worse or a little better than our best estimate projections. If you wait for us to be certain, you'll wait forever.

It's not yet too late to act. There are many steps we could take today that would take a substantial bite out of our CO2 emissions at a cost of a few percentage points of GDP—comparable to the amount we spend on our military, and much less than what we spend on health care or education. The use of wind power, coal with CO2 capture and storage, and nuclear power would allow us to make deep reductions in emissions from electric power systems and heavy industry. Improvements in the efficiency of our buildings and transportation infrastructure can reduce downstream emissions.

● (1545)

Innovation must be a cornerstone of our energy strategy, yet Canada does not do enough energy R and D. Canada spends less as a fraction of GDP, and significantly less in relationship to energy production, than do our major competitors. The Canadian energy industry invests only about 0.75% of revenues in R and D, less than one-fifth of the Canadian industrial average. Federal spending on energy R and D is down 70% from its peak in the 1980s, and this when we face big challenges in the energy business.

Money alone is not enough, as we argued in the blue ribbon report. Management of R and D funding is too diffuse, both within the public sector and the private. Funds are divided into so many pockets that we have difficulty reaching critical mass in any one of them. The report recommended that federal R and D be restructured around a few core areas within which managers would be responsible for decisions across the entire innovation chain, from research to commercialization.

A more innovative energy sector could position Canada to meet the climate challenge. Equally important, more innovation could increase the economic productivity of our energy resources. Our goal ought to be to move up the energy value chain, to maximize the value added to the Canadian economy per unit of energy extracted. Sustainable high-quality jobs are created by innovations that capture the most value in Canada, not by maximizing the rate of resource extraction.

How can we make our energy system more innovative? As an academic, you might expect that my prescription would be more money for university research, and I'd be happy to take the cheque. But while focused government funding would certainly help, I don't believe it can be effective on its own. Innovation in energy technologies works when R and D push is matched to market pull. In the case of environmental innovations, such as new technologies to enable deep reductions in carbon dioxide emissions, governments must play a central role in creating that market pull. One may debate the merits of a cap-and-trade system, a carbon portfolio standard, or a tax, but without transparent economic signals that put a price on carbon, we will not enable the private innovation and private capital that are necessary to solve this problem.

I'll say a few more words about oil sands. Tools to manage CO2 emission from the oil sands are available today. Doing research so that we have these tools sometime in the future is not an excuse for inaction. The industry will continue to improve the energy efficiency and cost-efficiency of the process, but efficiency improvements alone cannot reduce emissions. Reducing emissions requires technology that produces heat and hydrogen with minimal CO2 emissions. The most important technology is probably CO2 capture and storage, although nuclear power, biomass, and deep geothermal could also play significant roles.

Oil sands are an unusual niche market in the global energy system, and our strategy must take account of the specific character of that niche. For example, gasification with capture and storage is relatively more competitive in oil sands operations—because they need both heat and hydrogen—than it is in the rest of the electricity sector. Likewise, nuclear power is conversely, in my view, slightly less competitive in oil sands operations than it would be competing directly against CO2 capture and storage of the electricity sector, because of the need for heat and hydrogen. Finally, deep hot-rock geothermal, if it could be developed, would be particularly competitive in the oil sands niche because of the need for low-grade process heat.

Increased funding for R and D may produce innovations that will eventually reduce the cost of managing emissions from the oil sands. Nevertheless, in my judgment, the single best way to stimulate new technologies is to put a price on carbon. Several large CO2 capture and storage projects, for example, are near reality. Some, such as Shell's Quest project, would likely move ahead rapidly if there was a serious signal from government.

The history of power plant sulphur controls is instructive. Passage of the U.S. Clean Air Act amendments in 1970 stimulated innovation, as evidenced by a burst of patenting activity and private R and D. Government set the rules, but private industry delivered the innovations. Over the next two decades, the cost of sulphur scrubbers fell by more than 50% as regulation created a strong competitive market for these technologies. In the wind power industry, in contrast, early U.S. government R and D helped start the modern wind industry, but without stable incentives, the U.S. lost leadership to Europe in the 1990s. In Europe, stimulated by government incentives and now by carbon regulation, a $10 billion a year industry has emerged, based in part on early research funded by the U.S. government.

● (1550)

Canada had an early lead in CO2 capture and storage technologies. In my judgment, we have now lost that lead, and without decisive action, we will soon lose any chance to regain it. Let us not repeat the mistakes of the U.S. wind power program. If our goal is to reduce emissions and capture the economic benefits of new technology for Canadians, then R and D push must be matched to market pull. For CO2 technologies, these markets must be created by government regulation.

Funding for research in universities and government labs or incentives for research and demonstration by industry will be at best inefficient and at worst ineffective without a clear market signal from government. You need to do both. We have had at least a decade of consultation on this topic in Canada. We've had enough. Now is the time to make decisions, the time to act.

Thank you.

The Chair: Thank you, Dr. Keith. That was very helpful.

Dr. Angus Bruneau.

Dr. Angus Bruneau: Mr. Chair, now that I've heard him, I am going to do something quite different from what David has done. I want to start by standing back a bit and dealing with some of the very fundamental issues.

Often there is confusion in people's thinking about the role of energy in climate change. I think it is very important to understand that it is not the energy we use that gets us into trouble, it is the material byproducts of the conversion processes that we use to put energy into forms useful for ourselves.

If you run the numbers, mankind could use 150 times as much energy as mankind uses today, and if it all became heat—which is a pretty good assumption anyway—150 times today's use would only raise the temperature of the surface of the planet by 1° Celsius. The energy does nothing.

We're in trouble because we haven't paid attention to the byproducts of our processes and because somebody discovered three millennia ago that if you got a lump of coal hot, it would burn in air, and subsequently oil and gas and so on. We've been doing it for millennia, and we think it's our God-given right and privilege just to do this in air.

We weren't doing very much until fairly recently. We're now doing a lot, and there's not another industry in this country that expects, with impugnity, to dump the material byproducts of its conversion processes freely into the atmosphere. If you go back thirty years, the paper industry knew it couldn't keep doing it.

So be very clear. The object is not to figure out how to use materially less energy. It is taking charge of the byproducts and working on the technologies that can change what the byproducts are. We do nothing with energy in extraction, in development, in processing, in refining, in using, that does not involve technology.

People will say I'm just one of these people who says the solution is always with technology. In energy, you have nothing if you have no technology. Every step is a technology, so it is important, if you want to change the system, that you make investments in good minds that can be innovative, that will help us understand science and changes in the technologies that will deal with the issue that is central for all of us, and that is the unfettered dumping of our byproducts into the atmosphere.

Let me say something about the tar sands. I think one of the most important things that came out of our panel discussions and thinking was the observation that we could take real steps forward if we began looking at those components of our energy systems in a systematic way. In other words, you don't simply look at one bit here and see how we optimize this or how it works best in today's economy. You have to look at a broad system.

I'm going to talk about one system. That's a geological system and it's called the western Canada sedimentary basin. We have an extraordinary layer cake, and the trick is whether we can have it and eat it too. That layer cake is unique to Canada. Nobody else in the world has the same overlying layers of coal, bitumen, heavy oils, conventional oil, liquid gases, and gas. We have them all together.

● (1555)

Historically we had an oil industry. It wanted conventional crude and light sweet crude. You pumped it and you put it down their system. Then a gas industry grew up. They had their own system and their own infrastructure. We can go through all the stages.

Today we have an oil sands industry. They're hardly connected. One might be a market for another, but we have never sat back and said that we have a unique opportunity in this country in the western Canadian sedimentary basin; if we are really smart about how we manage this basin, with the optimum use of the resources available to us, and recognize that for all practical purposes we can also store safely in that basin an infinite amount of carbon dioxide in terms of Canadian production, a thousand years of Canadian production at the present rate, and we take the constraint and make it clear that we have to change what we're doing to the environment, and we look at what we have in that basin—nobody else in the world is going to do that for us—then that's a Canadian opportunity.

A lot of people will say that we've gone so far now, how can we possibly change? But listen, when we've done the mining that we're committed to today, and are building today, and are thinking about building in the next few years, we will have dealt with only about 20% of the resource in place.

Now, how do Canadians realize the maximum value of this extraordinary resource? It will only ever happen if we stand back and start getting very bright minds looking at how we can optimally use these resources to yield the products that we need and want, and at the same time take responsibility for the byproducts that we simply cannot continue to dump freely into the atmosphere.

Mr. Chairman, that's only meant to challenge and perhaps engender some discussion. I'm going to stop right there. Obviously I'll deal with questions in time.

The Chair: Thank you, Dr. Bruneau. I think that's a pretty good start.

We'll now hear from Mr. Henuset, who has a possible solution to some of that problem.

Mr. Wayne Henuset (Energy Alberta Corporation): I have 10 minutes. I had a little speech to give for 10 minutes, and I could actually throw it all away after listening to my partners here. I'm going to go through it, though, as I would probably go on and on forever.

Energy Alberta was started as a corporation to be profitable as an energy provider at the lowest cost, utilizing nuclear power in Alberta. The need for alternatives to natural gas as a source of energy becomes apparent when you examine only the small area of Alberta energy demands, and that's in the oil sands.

The National Energy Board and others have forecast that oil sands productions could increase fourfold by 2015 in the SAGD projects alone, using natural gas cogeneration systems. We can see natural gas demand in the region skyrocket to over five billion cubic feet a day by 2015. This scenario is on the graph. You can see the graph on the side. It gives you an idea. Our strength allows us to provide a long-term competitive advantage for the off-takers.

First of all, we are an environmentally superior hedging alternative to natural gas. Nuclear energy emits nearly zero CO2 emissions over the life cycle of the facility. This can provide the oil sands off-takers with continued compliance with future environmental legislation and a long-term competitive, stable price.

Second, nuclear energy has a long-term stable fuel cost, contributes about $550 million per year for a single CANDU 6, where gas is at about $650 million per year at $7. So price-wise we're competitive, and as far as the CO2 emissions go, it's definitely a positive.

Our business plan reinforces nuclear energy's unique ability to act as a hedging tool. Our technology choice is best for the industry. AECL has a track record of building nuclear power plants on time, on budget, with a fixed turnkey price contract: this will be the model that we're proposing in Alberta.

Our business plan uses various insurance programs to mitigate the risk of unexpected cost overruns or project delays which would impact off-takers' revenue. This will ensure our ability to provide a long-term hedging option for energy output costs. Our energy outputs are stable for in situ development, be it SAGD or carbonate for upgraders and other interested parties.

Within the Clean Air Act, which was proposed legislation seeking to reduce greenhouse gas emissions by 65% of 2003 levels by 2050, a component of the emissions reduction strategy is to provide emission intensity targets to the energy industry. While this is not completely defined at this point, companies will be required to lower their emissions on a per unit of output basis.

Nuclear energy's proposed contribution to the Clean Air Act for the oil sands is based on a nuclear power plant's ability to drastically reduce nearly all the emissions required in the production or upgrading of bitumen. This would result in a project's having a near zero emissions intensity level over the life of the project.

Nuclear energy will result in displacement of nearly 3.3 million tonnes of CO2, amounting annually to about $70 million Canadian in savings, and it's expected to rise as values associated with carbon increases.

The nature of nuclear energy aids in its ability to act as a hedging tool against inflation and input fuel price fluctuations. Nuclear energy is a capital-intensive project with over 74% of the $550 million annual revenue requirement for the facilities related to the repayment of capital for the construction of the facility, including 2% for the decommissioning and spent fuel management; 26% of the revenue requirement is subject to inflation, including $8 million for nuclear fuel.

Comparing natural gas production, to produce the same amount of energy, natural gas fuel costs amount to 94% of the total annual revenue requirement of the facility. Energy Alberta brings to the table a long-term hedging option contract for nuclear energy at a stable and predictable price over the next 20-year period.

● (1600)

The inflation components have little impact. A doubling of the commodity price of uranium would only increase nuclear energy costs by about 3%. The ability to hedge is not only helping to develop the concept in Alberta, but is one of the reasons why nuclear is expanding across the globe.

We are living in a nuclear renaissance. There are over 442 reactors open around the world today. There are 28 new reactors under construction, and another 62 are in the planning stages. It is anticipated that the new Ontario reactor will be built by Atomic Energy of Canada using the CANDU technology. This will produce advantages for the new builds in Alberta.

A question that is commonly asked of us is whether or not Alberta is ready for nuclear. Before starting this project, we commissioned an Alberta-based public opinion poll. The results supported the project; 40% of Albertans favoured the proposal, and 36% were neutral to the concept. Over the past few months, Alberta has seen a strong public shift in the provincial mood towards nuclear power.

In early October, Alan Greenspan spoken about the need for alternative sources of energy to an audience of over 2,000 businessmen and businesswomen in Calgary. He made it clear that nuclear is an option Alberta could see in the oil sands.

In August of this year, we entered into an exclusivity agreement with Atomic Energy of Canada to market, own, and operate a CANDU 6 to support oil sands development. AECL is providing us with their nuclear experience.

AECL's track record for building CANDU 6 nuclear power plants is excellent. Since 1996 all six of the reactors have been built on time and on budget, and the current project in Romania is on time and on budget.

Spent fuel will be safely managed in accordance with Canadian regulatory procedures. Spent fuel management costs are built into the energy output prices, so we look after our waste. Long-term storage will be based on the recommendations that have been submitted to the federal government by the Nuclear Waste Management Organization.

This will likely be outside Alberta, and we would like to see the federal government provide clarity on this issue. We've spent about $1 billion so far, and the federal government have come up with a program, but they haven't passed it.

Since then, spent fuel is physically a small amount and the transportation of stored spent fuel is a fully insurable process happening around the world today. The off-takers are not responsible for it.

Working with consulting experts in the Lloyd's of London insurance market, Energy Alberta has developed a plan that will provide additional insurance against any risks associated with nuclear accidents. In addition to this, we have developed a plan to insure against unexpected cost overruns.

That being said, we understand we are facing labour and infrastructure challenges that are being experienced by oil sands operations in the regions. Given the importance of the oil sands to Canada and the delays associated with inadequate infrastructure, developing reliable infrastructure in the area should be an issue of national importance to the Canadian government.

The CANDU 6 reactor power plant will provide three streams of energy: steam, hot water, and electricity. Through electricity, hydrogen can be produced. In situ operators need steam and electricity for SAGD, and they need electricity to extract bitumen from the carbonate deposits. Mining operations require large quantities of hot water and electricity. All upgraders require large quantities of electricity and hydrogen. Last, and equally important, is the need for electricity by the non-oil sands sectors in Alberta for residents and the industry.

The federal regulatory process is well defined, and we will require Energy Alberta to apply for licensing for the site, construction, and the operator. These applications could be reviewed by the Canadian Nuclear Safety Commission in accordance with the process defined by the federal licensing process for new nuclear power plants in Canada.

The process also requires Energy Alberta to complete an environmental assessment. We hope we can use some of the existing ones to help us as well.

● (1605)

Combining the federal regulatory process with the provincial requirements is an issue that needs to be clarified. Various organizations may be involved in the federal process as stakeholders or may be unsure about how they could be involved in the process. It is important that there is regulatory clarity provided by the federal government to the provincial government. Such clarity should help ensure a reliable and effective regulatory process for all stakeholders.

In July 2005 the business concept to deploy nuclear power to support the oil sands develop was formed with Energy Alberta. Today we have an exclusivity agreement with the AECL to market, own, and operate a CANDU reactor power plant in support of the oil sands. The energy from this facility will either be contracted with direct agreements with an off-taker or will be an open season process to go for bid. By March 2008 we should be in a position to initiate the regulatory process and by 2016 the facility could be operating at full capacity.

Thank you.

● (1610)

The Chair: Thank you, Mr. Henuset.

With that, I think we'll just get right into questions. We're going to keep the first round, as usual, to 10 minutes for questions and answers for each of the questioners, and then we'll move into the second round at five minutes for each question and answer.

We'll begin the first of the 10-minute rounds with Mr. Cullen.

Hon. Roy Cullen (Etobicoke North, Lib.): Thank you, Mr. Chairman, and thank you to all of the presenters today.

I'd like to start with Dr. Keith. First of all, congratulations on your award as environmental scientist of the year from the *Canadian Geographic*. Well done.

You talked about the need to accelerate the pace of innovation and the need for economic market signals. You also noted the need for other initiatives, but the market signals were quite important. You talked about a price on carbon. Would a cap-and-trade system fit within that rubric or be a proxy for a price on carbon?

Secondly, the government has, with the Clean Air Act, talked about intensity-based reductions. I have some difficulty with that in terms of whether it's the appropriate market signal, but I wonder if you could comment on that.

On value-added, the use of natural gas in the oil sands raises some questions about whether this is the highest and best use of our natural gas resources. The petrochemical industry is looking for feedstock and having to chase it. We saw in the presentation from Mr. Henuset that we're going to be importing natural gas. When we raise this question, people say the market will decide. Apparently we're told the market is going to decide a lot of things, but I'm not sure it will decide all these things or whether it should.

So in terms of value-added and the best use for our natural gas and moving up the value chain, what sort of market signals or policy environment do you see as appropriate there? And I wonder if you could talk about the economic signals question and expand on your thoughts on that.

Dr. David Keith: Thanks very much.

Well, first of all, let me start with the comments about intensity-based regulation. I don't think that's the big issue. You could do a fine job solving the climate problem based on intensity. The issue is where you set the knob, how tightly you ask intensity to decline. If you ask intensity to decline at one percent per year, then you won't get real reductions in CO2, because the economy will grow faster. If you make it decline more quickly, you could easily achieve the results you want with intensity.

My view is that this is sort of a false debate. I have no problem, personally, with that part of the Clean Air Act at all. I think the big choice is whether we make a system that is really transparent, that talks to the engineers in companies instead of one that talks to the lawyers in companies.

I want to relate an example of what I mean by that. The U.S. Clean Air Act for sulphur is in some ways really simple. The basic rule is that you have a designated set of facilities, and at the end of each year, each of those facilities has to have the right number of permits to match its emissions, and if it doesn't, the plant gets a lock on it.

The way you make a market is that you make it simple and you make the enforcement so strong that nobody ever breaks the rules. So nobody breaks the rules, because the enforcement's very hard. There are very high penalties if you don't comply, so everybody complies. Other than that, it is completely the industry's business how to handle this. They can use whatever technology they want; they can use a futurist market if they want. It's their business. And I think it really is important to stick with that.

The fact is that people in the energy business understand how it works—I hate to say it—better than people in the Canadian government probably do. The government's role is to set the overall objectives. So I'm not at all claiming that the carbon market will happen just by free enterprise. No. Emissions of carbon to the atmosphere, using the atmosphere as a free dumping ground for the material products of our combustion, is an environmental risk, and the parameters of dealing with that risk need to be set by government. But after that, I don't think government should be involved in the details.

The current way we look at regulating is nothing like that. So if you look at the details of the large final emitters scheme, there's going to be enormous complexity at the facility-by-facility level, which is a recipe for a huge number of consultants and lawyers getting a lot of money, and it won't speak to engineers.

Let me tell you one anecdote about how well this works when it works. There were various stages of nitrogen regulation in the U.S. —I spent most of my career in the U.S., so that's what I know best— and there was a stage when you had to put a certain kind of combustor on your power plant called an overfire air combustor. It was a command-and-control regulation that said, “Put this widget on your power plant,” so people said they would put the widget on their power plants. But it didn't say, “Tune the widget up,” because that wasn't anybody's responsibility.

Then we moved from that regulation to a newer set of regulations, where we now have tradeable permits for nitrogen emissions. And suddenly what happens is that people at the head office phone up people in the local power plant outside Pittsburgh, where I used to live, and say, “Can you do something about these nitrogen emissions, because they're costing us a bunch of money?” What well-run businesses know is how to do cost control, because that's what makes good businesses run.

Then it turns out that there are little things you can do that actually cost you zero money—just adjusting this enormous fire you have inside the giant gigawatt coal-fired power plant. It turns out that with no new capital at all, that just by tuning up that fire, you can cut your NOx emissions by a few percent. So a bunch of plants have done that.

The lesson of that story is that you want something that speaks unequivocally clearly to the guy operating the plant. The kinds of regulations we're now discussing, the kinds of regulations that the last government put forward and that this government is now in the middle of discussing, are so complex that there are an enormous number of people who I deal with every day in Calgary in the oil patch who are in the middle of hiring teams of lawyers and senior vice-presidents on environmental compliance and what not to figure out how to manage them. They don't just put a price on carbon. There's talk about how we'll pay for the difference between our target and what we actually emit on a facility basis by buying a technology fund. But of course, actually counting emissions on an industry basis is not easy. There are all sorts of complexities about what is and isn't in your business.

So that's my overall comment on that. You really need to look for simplicity. That's my biggest single comment on that.

● (1615)

Hon. Roy Cullen: Okay, thank you. That's useful information.

In terms of the intensity targets, I agree with you that theoretically, if you ratchet up the levels of the intensity of reductions, you're going to get to the same outcome, but I'm not so sure that that's where we're headed.

What about the question of value-added and natural gas? What sorts of market signals do we need to make sure we're getting the highest and best use out of our natural gas resources?

Dr. David Keith: When I think about value-added and what our committee thought about value-added, the key thing is really to move our energy system up market. Canada has enormous resources, but in the long run I don't think we provide really productive jobs for Canadians by just pulling those resources out at minimum cost, so what I really mean by value-added is putting a lot more R and D money into being the developers of some of the newer higher technologies that provide both more value-added jobs in Canada and more exports. Whether it is advanced fuel cells or advanced ways to make hydrogen from natural gas or gasification technologies that replace natural gas in oil sands—such as the OPTI/Nexen plant in the oil sands—or advanced nuclear power plants for electricity, those are the kinds of things that move us up the value chain.

I don't think the government only should set the prices; there are things we need to do to encourage innovation. I would like to get more funding for R and D in universities and in industry and so on. We need ways to encourage that, and ways to provide incentives for early risk-takers.

On your question about natural gas, there are methods now for reducing natural gas use in oil sands operations and replacing it with other technologies. Nuclear power is certainly a possibility, and gasification of residuals is more than a possibility; that is what OPTI/Nexen is doing at Long Lake. They are actually cutting metal today, but they're taking some big risks to do it. I think we need to set up schemes that make it easier for the company to take the first big risk.

Hon. Roy Cullen: That is a good segue into Mr. Henuset's presentation. Thank you.

On the nuclear option, could you comment a bit about the issue around spent fuel and nuclear waste and how that would be dealt with? I think that would be a question people would have.

We hear about this idea of a nuclear reactor up in the Fort McMurray area, but we hear the other side of it: when the producers there can get cheap natural gas, there is no incentive for them really to promote this. Unless someone takes some leadership, it's not going to happen.

Could you tell me where you're at with your proposal? Are you waiting for some shoe to drop to say you're going to proceed this way or for perhaps the private sector to come up with a funding package to allow this to proceed? It's a good idea. We're hearing a lot of good ideas, but we're not hearing a lot of action. Where is it?

● (1620)

Mr. Wayne Henuset: Initially we went directly after the steam producers in the SAGD. The SAGD processes in operation today aren't large enough to take the amount of steam that the nuclear reactor produces. Right now, until we get a SAGD operator that is planning to do something in excess of 200,000 barrels a day in a radius.... None of them are stepping up. They've made plans for it, but those are just long term, and they are all staged plans.

Right now we've backed away a little from straight steam operators and we are looking more at the electrical side. Right now we have a surplus of electricity in Alberta, but with the demand that's coming with the hydrogen and with the need for electricity from Shell and Husky, we feel that's probably the direction we have to take.

I'm a little worried for some of the operators in terms of the amount of gas they're using in cogeneration and the carbon dioxide that is being put into the air and how much they're using. The graph there shows that 10 years from today, we're going to need imported gas in order for these facilities to operate. I think it is up to you, the federal government, to put some policies in place so that we use the gas for the right process, and you're not burning gold to produce coal. We've got that problem right now as we're burning good gas.

The operators up there are actually taking it on themselves. As we've said, they're trying some different processes because they've got the concern that they're building these big infrastructures to produce this oil and they won't have the fuel to maintain those processes, so they're looking at other ways. Right now they're looking at cogeneration of bitumens, but we're trying to show them the cost-effectiveness of nuclear.

Nuclear for Albertans is a strange and winding road. In the last year we've got them around that, to the point that now they're looking at it and entertaining the idea, but at first it was just really scary for them, because these guys are oil guys, and they didn't want to talk about a competitive industry in their backyard.

The Chair: Thank you, Mr. Cullen.

And thank you, Dr. Keith and Mr. Henuset, for that response.

We're now going to go to Mr. Ouellet of the Bloc.

[*Translation*]

Mr. Christian Ouellet (Brome—Missisquoi, BQ): Thank you, Mr. Chairman.

Dr. Bruneau, I quite liked the way you explained the problem. Clearly, I felt you had taken a holistic approach but I didn't really understand where this approach took you. In other words, I understood your analysis, but I didn't understand if you had drawn a conclusion or if you had summarized your analysis.

Does this analysis lead us to the depletion of greenhouse gases, as was just mentioned? If not, should we move towards CO2 sequestration in the soil? You talked about layers. Should we simply forget gas and use another form of energy such as nuclear energy?

[*English*]

Dr. Angus Bruneau: Thank you.

In saying what I had to say, my intentions was not, in any sense, to summarize anything said in the report, but rather to make it very clear that we're not going to get to where we want to go simply by trying to use less energy.

Ultimately, when we have benign energy systems, we will have a far more energy-intensive society than we have today. If you want to clean up a coal plant today, you have to spend energy to do it. And I'm just talking about using the technology that's available today.

The intent in talking about this was to suggest that we don't get drawn in by those who say we should be using less energy. Understand that where we are creating a problem for ourselves is in the uninhibited use of the atmosphere as a free dump of materials. That's the problem we have to address. If we address that problem, many things will come from it.

I don't know if that answers the question that you were phrasing, or if you would like me to say more.

● (1625)

[*Translation*]

Mr. Christian Ouellet: If you were to evaluate how to resolve this problem, where would you start? We use all the energy we need, we use lots of it, but how can we protect our planet from greenhouse gases, which are produced by increasing energy consumption?

[*English*]

Dr. Angus Bruneau: Greenhouse gases are produced when we use mostly carbon-based fuels. What we suggested in the report is that one of the very important technologies that we think Canada should really focus on, right from very basic research through to demonstrations of commercial-scale operations, is a technology broadly described as gasification. What this means is taking these materials and breaking them down into constituent parts in a contained, closed system and reassembling those parts with other materials—you may put more oxygen in, or whatever—to produce different products. When we do that, we have technologies that would allow us, if we produce a lot of CO2 in that gasification process, to separate that stream of CO2.

Following from that, the second major technology push we talked about in the report that we think Canada should focus on was one David spoke about in his address, and that is how we can essentially store that CO2. We have to separate it, we have to transport it, and we store it. We talk about sequestration, and that's storing it.

I suggested that we have more room to store CO2 than we will ever produce of CO2, in the western Canadian basin. What we need to do is to find those principles that the government and the private sector can agree on as to where we want to drive this system. It could be in part by regulation.

I would cite an example of very effective regulation that was also brought in, and in a very effective way. That was for sulphur in gasoline and sulphur in diesel. It took over a decade to do it. Industry was involved, a timetable was worked out, the investments were made in R and D and in new processes that allowed it to happen, and everybody got there. In fact, the interesting thing is that every industry in the country was using a target lower than the target agreed with government, because they knew that eventually, if it was possible to do it, they'd be required to do it anyway.

To do these things, think of the energy we're using up all of a sudden to collect, transmit, compress, and store the CO2. The system gets more energy-intensive, but it's cleaner in terms of the things we think we need to do to clean it up.

● (1630)

[*Translation*]

Mr. Christian Ouellet: Does anyone know, Mr. Bruneau, how much additional energy we would need per barrel of crude for CO2 sequestration?

[*English*]

Dr. Angus Bruneau: I wouldn't put a number out here, but the purpose is simply to suggest that if we clean up the process, as we know we can do today, it will become more energy-intensive.

Of course, my original premise was that it doesn't make any difference whether it's more energy-intensive, because we will never run out of energy. We just run out of some of the forms of materials we use—or we may—but we have always stopped using energy sources not because of running out of them, but because there was a better technology and a better source. We didn't stop using coal to heat our houses because we were running out of coal. It was a whole lot easier to put an oil burner in, or an electric.

[*Translation*]

Mr. Christian Ouellet: If I understand correctly, you prefer CO2 elimination through increased energy consumption, which would come from other sources, in order to eliminate greenhouse gases.

[*English*]

Dr. Angus Bruneau: I'm not advocating any particular process here. I'm citing that as something that, given the processes we have and can manage today, if we want to make a difference with them, we have to start sequestering the carbon dioxide. If that costs more—and it will cost more—but if it costs significantly more, smart minds will start figuring out different ways to do those processes. That's where the investment in research and development and science technology is absolutely vital. You make those investments, often targeting a particular expectation, but usually it's the surprises that you learn along the way, that are created along the way, that really change the way we do things. It's the investment in intellectual capital that I am arguing for, but only to say, if you start with the premise that we have to use less energy, we're not going to get there.

[*Translation*]

Mr. Christian Ouellet: So financial incentives are essential. The government could offer incentives to ensure that this would work.

Thank you.

[*English*]

Dr. Angus Bruneau: Yes.

[*Translation*]

M. Christian Ouellet: Good. Thank you.

[*English*]

The Chair: Thank you, Mr. Ouellet. That was quite remarkable today.

We're going to move on to Mr. Bevington, from the NDP.

Mr. Dennis Bevington (Western Arctic, NDP): Thank you, Mr. Chairman.

Thank you, gentlemen, for joining us today.

First, to Mr. Henuset, I'm curious about some of the numbers you're using here. A 200,000-barrel-a-day plant would be serviced by how large a nuclear facility?

Mr. Wayne Henuset: A nuclear facility, if you use a CANDU 6, produces about 740 megawatts of electricity. If you convert that to steam, rather than producing electricity, if you use the steam for SAGD, it will produce about 220,000 barrels a day. We don't have a SAGD process at this time to actually that size. It's about 220,000 barrels.

Mr. Dennis Bevington: But we're looking at a tar sands expansion of 15 times that size.

Mr. Wayne Henuset: Yes.

Mr. Dennis Bevington: You're proposing a single plant for 2016. It's not rationally going to cover the expansion that's going to take place in the system.

Mr. Wayne Henuset: That's correct.

Mr. Dennis Bevington: If we're going to be investing in other systems to make that expansion, is that not correct?

Mr. Wayne Henuset: Each system is different. In the SAGD process, we were talking about just using the straight steam. In the mining processes, they use electricity as well as hot water; they don't use as much steam. For the mining operations, one facility could be used for multiple facilities. You can transport hot water about 50 miles, whereas you can only transfer the steam about 15 miles.

Mr. Dennis Bevington: That's fine.

That doesn't cover the upgrading of the bitumen.

Mr. Wayne Henuset: No, it doesn't.

● (1635)

Mr. Dennis Bevington: That doesn't cover the hydrogen addition to the bitumen, and that would require probably what in terms of nuclear capacity to produce the electricity, through electrolysis, to produce the hydrogen required for the upgrading?

Mr. Wayne Henuset: That's correct. Right now, the natural gas usage comparable, using electricity to hydrogen, is about $12 a gigajoule. So we're not cost-effective right now, because natural gas is cheaper.

Mr. Dennis Bevington: I'm just worried about size right now.

Mr. Wayne Henuset: Okay, the size of the facility.

Mr. Dennis Bevington: Yes, isn't it about 600 megawatts for a 60,000-barrel-a-day upgrading facility?

Mr. Wayne Henuset: Yes, roughly there.

Mr. Dennis Bevington: Okay. So in reality, if you were going to use nuclear in the tar sands industry in the future to provide synthetic oil at the end of the day, you'd have an enormous number of nuclear reactors.

Mr. Wayne Henuset: You do.

Mr. Dennis Bevington: Yes. This would be on a scale of—

Mr. Wayne Henuset: Twenty.

Mr. Dennis Bevington: Twenty?

Mr. Wayne Henuset: Nineteen.

Mr. Dennis Bevington: So it's quite a big investment in that direction now.

I was very interested in your declining natural gas supplies. Certainly Natural Resources Canada has something similar to what you're saying, but this is pretty dramatic. To a natural resources committee, I think this is almost a disaster in the making if we don't look at this more carefully—the supply of natural gas in Canada. We're talking about ourselves as an energy superpower, yet you're saying we're not even going to be able to meet the export commitments that we have under NAFTA within the next five to ten years.

Mr. Wayne Henuset: We didn't make these numbers up.

Mr. Dennis Bevington: I know. We do have a serious situation with natural gas.

Mr. Wayne Henuset: You guys have seen these numbers before. There is an issue.

Mr. Dennis Bevington: That's good, because CAP came in here about a month and a half ago to tell us we had lots of natural gas and don't worry about it. This was a statement that came from that outfit. I think we've heard some different evidence here today.

Mr. Wayne Henuset: The producers in the tar sands are now looking at alternative measures for fuel. They have to find an alternative measure, because they have these numbers themselves. With natural gas being so unstable, they have to have a stable fuel source, and that's why they're going to the different fuel sources in order to substantiate their development.

It's like buying a car and knowing you're not going to have gas for it in 10 years. Those guys are building cars up there, and they're not going to have any way of getting them out in ten years, with their demand requirements and the depletion rate they're looking at.

Mr. Dennis Bevington: I'll go on to Dr. Bruneau, who suggests we don't have an energy issue; we just have a pollution issue in our energy use.

Also, Dr. Keith spoke to the sense that we could go with energy intensity rather than limiting industry's size. Maybe I'll get you to comment on those with this evidence.

Dr. Angus Bruneau: Let me speak to the energy intensity thing.

The problem we're trying to deal with when we're dealing with greenhouse gases is a global problem. Some of you will have seen recently that Alcan has decided to build a million-tonne-a-year aluminum refinery in South Africa, because of the power contract they could write with Eskom, the big utility—bigger than Ontario Hydro. I don't know what it is today, but 10 years ago it produced 85% of all the electricity produced on the continent of Africa. They do this with dirty coal.

If the world wants another million tonnes of aluminum a year, and if you do it in Canada and supply half, two-thirds, or all of it from a new hydro source, the Canadian economy is very much more energy intensive, but you've dealt with the international problem.

Canada should never apologize for being energy intensive. The things we do that make us an energy-intensive country are things that we do better than most other people on the planet, and we do it with less greenhouse gas burden on the environment.

When you look at the country, if you're really trying to deal with a global problem, then you have to look at what you're doing in a global context. Deciding to make the aluminum powered by dirty coal in South Africa is a step backwards, not a step forward in the cause.

● (1640)

Mr. Dennis Bevington: Right now I'm more concerned about heating our homes with natural gas in 2015, if these are the numbers we have in front of us.

Dr. Angus Bruneau: People are not drilling because the price of gas isn't high enough to justify the drilling.

Mr. Dennis Bevington: The price of gas is four times higher than it was a decade ago.

Dr. Angus Bruneau: I can remember a speech when a guy said, if the price of gas ever got to $1 Canadian for 1,000 cubic feet, Alberta would collapse because it couldn't sustain the cost.

Mr. Dennis Bevington: We drilled 15,000 wells in Alberta last year.

Dr. Angus Bruneau: It was 22,000.

Mr. Dennis Bevington: Fifteen thousand *gas* wells in Alberta last year, and where did we go with that?

Dr. Angus Bruneau: They would have drilled a lot more. I'm on the board of a petroleum company, and we're not going to run out of gas. Cost is going to reshape how we use it.

Mr. Dennis Bevington: These figures are based on our going to two billion cubic feet of coalbed methane by 2010 and four billion cubic feet by 2025. Those are significant issues as well. If you want to start drilling and developing that much coalbed methane in southern Alberta, I think you had better start the permitting process pretty quickly.

Dr. David Keith: I really share Angus's view that a shortage of energy is not our problem. It is important to take a historical view. We began to have serious conversations in Pittsburgh about running out of oil in 1880, about twenty years after the oil industry began. Consistently over the last hundred years, we've seen reserve-to-production ratios that have been roughly flat, and we've seen people continuously thinking they're going to run out of resources in twenty or thirty years. There are some long-run reasons why we haven't, and we're not going to this time. We have a serious environmental problem of climate change. We don't have a serious problem of running out of fuel.

Mr. Dennis Bevington: I'm not talking about oil. I'm talking about natural gas. These are the figures that have been presented to us. If you question the figures, please let me know.

Dr. David Keith: I certainly do question the figures. I was just questioning them.

Mr. Dennis Bevington: But Natural Resources Canada has similar figures showing that we're going to be into a natural gas crunch within a decade.

Dr. David Keith: Understood. And they had similar figures twenty and forty years ago.

Mr. Dennis Bevington: Forty years ago, we maintained a 25-year reserve of natural gas in Canada. We did not have a crisis in natural gas.

Dr. David Keith: So you're convinced that we do, but in general, most people I know in the energy world are not convinced we have a crisis and are running out of energy. We have enormous reserves of various fuels and we have ways to turn one fuel into another. You ask how to heat our homes. If climate wasn't an issue, we'd have lots of ways to do it. You can turn coal into synthetic gas at costs that are roughly competitive with today's gas prices.

There are plenty of different routes that we have with energy supply. We have to supply the fuels that we need to run our society. The problems that dominate our energy system, given the extraordinary resources that we have, are the environmental consequences of using those fuels, not the availability of the fuels. There are systematic reasons, well understood, for why forecasts by central governments underestimate the long-run conversion of resources to reserves, and those are that central governments don't account for the change of technology.

Unconventional gas reserves—either tight gas, hydrates, etc.—are not assumed to exist until they're turned into reserves, which means things that are economic. There are plenty of people sitting beside me in my department who are thinking very seriously about how to produce unconventional gas reserves from Mackenzie Delta or from offshore, and most assuredly those things are going to go. Whether production in Alberta goes up or down in the next little while I can't really predict, and I don't think it's really my job to predict. But in the long run, I think the idea that we're going to run ourselves out of gas is wrong. We're going to run ourselves out of atmosphere before we run ourselves out of gas.

● (1645)

The Chair: Thank you, Dr. Keith. I think we got the answer to that question.

Thanks, Dr. Bruneau.

We do have to move on to Mr. Trost.

Mr. Bradley Trost (Saskatoon—Humboldt, CPC): Thank you, Mr. Chair.

To build a context from my questions, I look at this committee's role as being, as you know, that we have to decide what the government can do and can't do. But we also have to know what the options are.

Forgive me, but my eyes are still blurry from an eye appointment that I just had, so I haven't been able to read all the notes that have been going back and forth here. If I ask something that's in the notes, you'll have to forgive me on that.

Mr. Henuset, when you get into this and you begin to look at it, there are other options, of course, and competitions. You're only looking to build one of maybe twenty-odd nuclear power plants, but what are the other options for the customers out there? They're looking at the same data as we are. They're looking at the energy costs of natural gas and they're thinking of different ways they could use it. Could you give us an overview of what their other options are? You have looked at building a plant up there and you've analyzed the competition, so what are the other options that are currently available for the oil sands, to produce the steam, electricity, water, etc., that they need and would get from nuclear power?

Mr. Wayne Henuset: Right now, most of them are using gas. The gas is highly volatile, so they're looking at using bitumen. They want to reburn the bitumen.

Mr. Bradley Trost: Is it Suncor that's doing that?

Mr. Wayne Henuset: Yes.

With burning the bitumen, there's the problem of the CO2 gases, because burning bitumen produces substantially higher amounts than does burning natural gas. But for them, natural gas is a scary commodity because of the price fluctuations. They're looking at their concerns with how much gas is going to be readily available. We're talking about gas and oil right now. The prices have changed and the cost of getting those products has changed substantially.

Mr. Bradley Trost: So there's bitumen, gas, and nuclear. Is there really anything else? I've heard presentations. I don't know how serious they are. Hydro's possible from the NWT. There are just a lot of ideas out there. Are there any other substantive serious ideas to compete with your proposal?

Mr. Wayne Henuset: I think there are about twenty, aren't there, David?

There are about twenty different processes that they're looking at. They're all looking at different ways right now.

Dr. David Keith: Coal is the major one. Hydro is not serious.

Mr. Wayne Henuset: Yes, they're looking at coal. Hydro is not enough.

Mr. Bradley Trost: The next question, then, is this. How serious has been the interest of the customers, and what is the role of the government from a regulatory perspective or whatever? From your perspective, what could we do to help move the decision process along, if that's necessary? Right now, as you've noted, with the price fluctuations, they're under a lot of pressure to make big decisions for the future.

I'm thinking, honestly, what can we do? Right now, they're highly motivated to make a major decision for various reasons. Is there something substantive that the government can do or should do, in your opinion, to move decisions along or to help to influence the policy in that neighbourhood?

Mr. Wayne Henuset: We would love a tax on CO2 so that we would get those credits. It would make our plant a lot more economical, because we'd get those tax credits back.

The nuclear power commission has made the licensing for this very complicated, so we would like to get the licensing a little more streamlined. Then it wouldn't take three or four years to get a licence to build a nuclear plant.

We need more clarity on the regulations. That would be the number one issue. As a federal government, you should have clarity just so other people can come into the business, because obviously it's a problem right now in terms of energy in the sense of how much CO2 has been in the emissions. Nuclear is basically part of the renaissance, and we, as a country, if we want to stay as an energy superpower, need to look at the alternative energy sources as well as the tar sands.

To get the oil out of the tar sands has, nationally, really helped the whole country. Nationally, you guys have to put that at the forefront to make sure those facilities up there are running at a feasibly economical price, so that we can get those products out to the rest of the world, because they're definitely helping our economy.

● (1650)

Mr. Bradley Trost: I saw some body language. Do the other witnesses want to comment on my question or not?

Dr. David Keith: I'd say the serious alternatives for producing heat and hydrogen in the oil sands now are what we're doing now: natural gas straight combustion; and other heavier fuels, meaning coal, asphaltenes, or residuals. If you don't care about climate, you just burn it. Indeed, part of the reason we have a natural gas issue is that, in a sense, everybody is assuming there is going to be a carbon price.

The cheapest way to make steam in the oil sands, if you want large amounts of steam, is the way to make steam that Angus told us about. We've been doing it since the 18th century, and that's to burn coal. The reason people aren't moving to open new coal burners now —I've been involved in a bunch of discussions with industry—is that they're assuming there will be a carbon price.

So the real competition is between nuclear, which provides heat without CO2 emissions, and other technologies that can provide heat without CO2 emissions. I would say the most serious competitor is CO2 capture and storage, using coal or asphaltenes or residuals as a fuel.

First of all, it's important to say that the oil sands are not the dominant CO2 emission source in Alberta. The coal-fired electric plants are. The oil sands get a lot of press, but if you wanted to manage the climate problem effectively, what you would do is focus on those coal-fired power plants, not on oil sands.

This speaks to my comment earlier about the fact that we need even-handed regulations. Government obviously tends to focus on particular things, but if you were to just put a carbon price on, what you'd see is much more action in the coal-fired power plants in Alberta, and maybe the ones in Ontario, than you would see immediately in oil sands.

In the long-run, for the oil sands, those are the options. I would say CO2 capture and storage is actually, in my view, more competitive against nuclear in the oil sands than is straight electricity to electricity. The reason is that CO2 capture and storage naturally makes hydrogen, which nuclear doesn't make so cost-effectively. If the competition is between a coal-fired power plant with CO2 capture and storage and a nuclear power plant for electricity production, in my view, they're pretty even competitors right now—and I take nuclear power very seriously.

For the oil sands, I wish Wayne well, and it would be great if he proves me wrong, but my guess is that nuclear in the oil sands is intrinsically less competitive because it doesn't make hydrogen so cheaply, and the oil sands need both. But on the other hand, because we're building so much capital, the reason Wayne actually might prove me wrong is the enormous rate of new capital construction in the oil sands.

Mr. Bradley Trost: To summarize, then, the recommendations on what could be done would include a carbon dioxide tax, from your perspective, and basically moving the regulatory framework in a more intelligent and efficient direction.

Mr. Wayne Henuset: Correct.

Dr. David Keith: And that's true for both. Just as there's a regulatory framework to get rid of nuclear waste, this regulatory framework would dispose of carbon dioxide. Both of those need to be clear in order for either technology to work.

The Chair: Dr. Bruneau, do you want to make a comment?

Dr. Angus Bruneau: Yes, I'll make a very brief comment.

The talk around natural gas and the fear that we would run out of it as a fuel is associated with the fact that in a single molecule of natural gas, we move four hydrogen atoms. Nature connected them all up. What you want at the point of eventual use is the highest ratio of hydrogen atoms to carbon atoms in your fuel. And you can't get higher than four hydrogens to one carbon, which is methane.

So you should be using natural gas at final points of use rather than in big industrial processes, where everything is.... You can contain it, process it, and take out the carbon dioxide. When you have diverse uses, get the hydrogen as high as you can, hydrogen to carbon. That's the preferred use for natural gas.

You can make steam, you can make hydrogen, you can make all the heat you want with the coal in the tar sands. That was the whole point. We have a layer cake here, and we have to start thinking about looking at this in non-traditional ways. What is the best combination, and what are the technologies that allow us to do this?

Mr. Bradley Trost: Thank you very much.

The Chair: We'll now go to five-minute rounds, if we can, and we'll start with the Liberals.

Mr. St. Amand.

● (1655)

Mr. Lloyd St. Amand (Brant, Lib.): Thank you, Mr. Chair.

Thank you, gentlemen, for your presentations today. We've heard over the last several weeks various presentations from experts like you. If I may, I'd like to summarize some of the highlights.

First, with some embarrassment or at least bemusement as a Canadian citizen, I learned that with respect to solar energy, the village of Gleisdorf in Austria, 35,000 strong, has as much solar capacity as all of Canada. We're way behind, it seems, with respect to solar.

I was also surprised at the amount of revenue generated for oil companies in Alberta. Billions and billions of dollars—a surprising amount.

Last, and I guess most relevant for our purposes today, I am concerned that seemingly nothing done or nothing proposed by government to date is seriously tackling the problem of greenhouse gas emissions.

I'm triggered to comment on that, Dr. Keith, by your presentation particularly. I'll just parse together snippets of what you said earlier:

> Tools to manage CO_2 emission from the oil sands are available today....Canada had an early lead in CO_2 capture and storage technologies. In my judgment, we have now lost that lead, and without decisive action, we will soon lose any chance to regain it. Let us not repeat the mistakes of the U.S. wind power program.

Perhaps this has already been asked in a somewhat different fashion, but Mr. Henuset talked about a tax on carbon. Can I ask each of you, if there were one single decisive step the federal government should take as soon as possible, what would that significant step be?

Dr. Angus Bruneau: This is not a recommendation for policy, but you could have a form of carbon tax within the country, one that we manage, where we know that we're not simply transferring wealth out of the country to some organization that had to shut down their dirty old polluter ten years ago and has a credit. You can also meet, or essentially pay, your carbon tax by investing in science and technology.

The real issue is the creation of intellectual capital that is focused on unique Canadian opportunities and challenges.

Mr. Lloyd St. Amand: Dr. Keith or Mr. Henuset.

Dr. David Keith: I completely agree. I think there is a lot of private money sitting there just about ready to commit to really pushing new energy innovations and putting new low emissions technologies in place, and they're waiting for a clear signal, like a tax.

I'd say something about solar. I think we have a range of things. We have a bunch of technologies we really could build today, like nuclear power, large-scale wind power, coal with capture, and then we have a bunch of things that might play enormous roles in our energy future thirty or more years out. I think we need to have different strategies for the two of them. In my view, say, for wind power, what you need is just incentives to do it.

The wind power industry is going flat out, and we just need to give them market incentives, and they'll drive the cost down. I think the same is basically true with CO2 capture and storage. There are a bunch of serious operations in the world where people are already doing this. We have failed to execute a single major one in Canada yet, but we certainly could, and you don't need research to get ready to do it.

Solar is very different. Right now the cost of solar is 10 times roughly the cost of the competition in electricity. I don't actually think it makes sense to invest in the current generation of solar, because I don't think we're going to get to cheap solar by going down the learning curve from the current generation of solar PV. But I actually think that solar is one of the potentially most important energy sources in the long run, and there is an abundant set of options that could, with advanced research, drive the cost of solar down by a full factor of 10, making it competitive.

Nobody can tell you when those will work, but my recommendation on, say, solar would be very different from a recommendation on nuclear, which is to try building it. My recommendation on solar would be don't push it into the market now, spend a lot of money on research that offers high-payoff long shots, and a lot of money on basic solid state physics that could potentially revolutionize the way we build solar cells to make them enormously cheaper. There are plenty of ideas out there.

● (1700)

The Chair: Mr. St. Amand, we're at 3:35 on the second round. I'm sorry, we have to cut that out. Do you want to do a quick one to conclude?

Mr. Lloyd St. Amand: I will summarize it this way, and you can agree with me or disagree with me. I'm not paranoid about the oil companies. Of course, the bottom line is critical to them, but I think there's a significant part of them that wants to be good corporate citizens and progressive. Having said that, is it now to the point where they've been talked to for a heck of a long time, and there have been ideas, but they need a tax imposed or some such thing in order to push them into doing it?

Dr. David Keith: Yes.

I'm a liberal university professor. I've talked to a bunch of CEOs of the biggest companies in Calgary, and it is clear that a bunch of Calgary companies are moving pieces around the table that are already making in some cases major investments today to prepare to operate under a carbon-constrained world. Some of them are now publically calling for regulatory clarity, so I don't think this is a radical view at this point.

Dr. Angus Bruneau: Put the plan on the table and engage in discussion the way they did for the sulphur and gasoline, and sulphur and diesel. It's a good model. It works, and you get the intellectual capital of industry working for you.

The Chair: Thank you, Mr. St. Amand.

Welcome, Mr. Lussier, who is going to I think speak now for the Bloc.

[*Translation*]

Mr. Christian Ouellet: Mr. Chairman, before I give Mr. Lussier the floor, I would like a small clarification.

I have 30 years experience as a solar energy expert, and I can say that we are quite familiar with passive solar energy. We don't need to do additional research.

We need to use this form of energy, and it will not be more costly, it will not cost 10 times more than any other type of energy. In fact, this type of energy costs the same as energy we don't use. When you talk about solar energy, you need to specify whether it is active or passive solar energy. We all know how passive solar energy works. In my opinion, you don't really know what is happening, when you say that.

[*English*]

Dr. David Keith: For the record, I'm actually retrofitting my house in Calgary with one of the more serious passive solar systems of any house in Calgary, and in every case I've got a cost plus contractor for my personal house. I'm doing the exact numbers, comparing the real cost in dollars per tonne carbon, and I care enough about it to put my own money on the line to do it. But the claim that it is cost-effective today, in my view, is not a real claim.

The Chair: What about solar thermal energy?

Dr. David Keith: Solar thermal is much less expensive than PV, but it's not there yet.

Dr. Angus Bruneau: The real issue, and we speak to it surprisingly in this report on technology.... The final recommendation is that we get serious about social science, because in things like this, passive solar and so many other consumer-related choices, we don't come close to what we could achieve with the technology available today. Passive solar is a perfect example. What we're saying is get some smart sociologists and others looking at the decision-making processes that leave us so far back from what we could achieve with what's available out there today. Let's find out why.

The Chair: Monsieur Lussier is next. You have three minutes.

[*Translation*]

Mr. Marcel Lussier (Brossard—La Prairie, BQ): Thank you.

Mr. Keith, I was very surprised to hear you criticize the European Union's efforts to reduce greenhouse gases. If I understand correctly, you are saying that Europe has not succeeded in reducing its greenhouse gases. Did I understand correctly?

[*English*]

Dr. David Keith: There have been reductions, but most of the reductions have happened for reasons other than policy, so whether there have big reductions below business as usual is at issue. For example, Britain has made substantial strides in reducing emissions, and those had very little to do with policy and were not plentiful. They had to do with Mrs. Thatcher's desire to confront the coal unions, the collapse of coal mining and coal-fired electricity, and the replacement of coal by cheap gas from the North Sea. That had a big impact.

Similarly, the collapse in the former East Germany has had a very big effect, but in terms of actual reduction of emissions below baseline from climate policy, results have been...not zero, but not very much yet.

● (1705)

[*Translation*]

Mr. Marcel Lussier: My reference point was England, which has had good results in the past. I am referring to the British delegation that appeared before the Standing Committee on the Environment and Sustainable Development. It shared very concrete results with us.

I come back to the issue of investment in intellectual capital, which Mr. Bruneau referred to. What is your reaction when you hear that some types of technology could cut gas consumption by cars by 60%? Such technology has disappeared, been hidden or withheld by scientists or by the oil and gas industry.

Are we talking about real solutions? Few people talk about energy efficiency. Should smart investments also be made in the area of energy efficiency?

[*English*]

Dr. Angus Bruneau: Let the economics engender the savings. Efficiency is a two-edged sword. If somebody invented a light-emitting diode, you'd get this bright light and almost no energy. What are we using here? It didn't displace very many lights, but every billboard in the airport is a sheet of these things, which uses a lot of energy because there are a lot of LEDs. Why are there a lot of them? They are so cheap, and each one uses so little.

The way you make automobile engines more efficient is you make them bigger and run them faster. That's how you can make them more efficient. That's what you do. Look at the size of engines in vehicles today. You look at the efficiency of just the vehicle system and you're maybe around 20%, but now you want to move a single body that weighs 150 pounds, and that's only one-thirtieth of the mass of the total vehicle, so now you're down to an overall efficiency of three-quarters of a percent. The efficiency is how much energy it takes to move me from where I am to where I want to go. If the vehicle weighs one-half, you've doubled the efficiency of the actual system.

Anyway, those are just two examples. Efficiency is a two-edged sword.

The Chair: Thank you, Mr. Bruneau.

I'm sorry, Mr. Lussier. We'll give you a chance to start next time. We're going to have to move on to Monsieur Paradis.

[*Translation*]

Mr. Christian Paradis (Mégantic—L'Érable, CPC): Thank you, Mr. Chairman.

Mr. Keith, let's clarify something. In your presentation, you said that the Kyoto protocol had serious flaws and that its implementation could put us in an impasse. You made a connection to concrete actions that need to be taken. Did I properly understand the connection? Are the flaws you mentioned related to the fact that we need to go beyond incentives and truly implement energy sources such as wind energy or coil coupled with sequestration devices? You also talked about carbon.

I would like you to expand on this in order to ensure that I have understood you correctly.

[*English*]

Dr. David Keith: I may not fully understand you. I think those are pretty separate questions.

The Kyoto Protocol leaves lots of room for countries to figure out inside their borders how they want to regulate emissions. In fact, sometimes people's claims about how you need it made in Canada as opposed to Kyoto aren't really fair, because you can make your own rules under Kyoto quite substantially. There's no big collision with intensity-based targets that I'm aware of.

I think there are many weaknesses of Kyoto, but one of them is the inclusion of the clean development mechanism credits, which are facility-based credits where you get a credit for the difference between what your emissions were at some facility, say, in China and what you say they would have been had you not got some lump of money in a certificate 10 or 15 years down the road. The fact is that is fundamentally private information, and I don't believe we can build an accounting system that is able to manage that. I think letting that into the protocol represents letting in a kind of fuzzy math accounting that will not serve us well in the long run.

The framework convention, the overarching convention on which Kyoto was negotiated, is more likely to stand the long-run test of time. But currently—maybe it's because I don't focus myself on the international negotiations that much—I don't think it matters that much. I think what matters is what we actually do, and what we do for ourselves in North America, because of the importance of the U. S.

I think the U.S. is quite likely to act very seriously in regulating carbon dioxide, probably more seriously than Canada or Europe. The U.S. has been the leader in most environmental regulations since the Second World War, and if you go to Washington today—I was there yesterday—you can smell that it is close to a deal on this topic, a deal that will probably make what we're doing look not so serious. And the U.S. will not rejoin Kyoto. If I'm right and the U.S. ends up regulating carbon dioxide emissions and doing it outside Kyoto, then Kyoto will have simply become not very relevant to the problem.

The problem will go on, international negotiations will go on, but whether the Kyoto Protocol ends up being an important tool for harmonizing international action on this is, I think, an open question. There are other tools out there, such as the WTO.

● (1710)

[*Translation*]

Mr. Christian Paradis: Thank you.

Mr. Bruneau, this morning I had the opportunity to visit the Canada Centre for Mineral and Energy Technology here in Ottawa. Your presentation was very real to me because I saw what you were talking about, such as energy loss and some other matters. We talked about analyzing district energy systems. In short, I saw a whole series of examples, and I found your reference to them extremely interesting.

For the committee's purposes, I want to ask the following question; perhaps you have an opinion on this matter. With regard to science and technology, what should be our government's priority in relation to supporting tar sands extractions? How do you see this situation?

[*English*]

Dr. Angus Bruneau: That was one of the questions we were asked to address when we did the panel activity that resulted in this report. We make many suggestions in many areas, but there are four areas we identified that we think should be priorities for the government, where the government has an important role to play—different in each of the four.

The first of them was gasification technologies, and we talked about that. This has to do with creating those intermediate materials that we can reassemble to more efficiently use all the energy in the tar sands. But we can use the same kind of technology on wood wastes—three million tonnes a year created around the fringes in rural Canada. It can be applied there. We need to have technologies that we can package in the appropriate sizes to function commercially.

That's one, gasification technologies. There are many different applications, and if we really invest in that area, there will be ideas come out of it that we can't imagine today.

The second thing is sequestration. Government has to take that on as a priority, because there is no economic framework to handle CO2 today. We have to create one, and it's going to have to be done with government participation in one way or another—encouragement, participation in the research. CANMET, the lab out in Alberta, will in particular be involved in that.

That is another priority, because we are moving towards more large, central sources of CO2 emissions, and it's the central sources that we can capture. Use the natural gas out there in the diffuse ones.

The third is that we have to find a way to break through the provincial walls in our electricity system. It is utter madness. This is a system that at best is suboptimized within provinces. We have incredible resources which, if you sat down today and said what an optimal electrical power system would look like in this country, if we could design it today with the resources we have....

I'll give you one example, close to home. I was a director of Churchill Falls. Churchill Falls is the best peaking plant on this continent. It can store in its reservoir three and a half months of full plant capacity of 5,500 megawatts—a single plant—and it is run as a baseload plant at an 80% load factor. As we start talking about a system with a lot more wind or even solar—intermittent supplies, not centrally controlled—the value of having stored electrical power sitting there is greatly increased.

There is not a country endowed with the same set of resources as we have in this country, when we add in our nuclear, and we could build the most elegant system. But the system today has been under-invested in, almost everywhere across the country. We didn't design the systems to accommodate intermittent, dispersed, diffuse generation. There is a lot of control technology, optimization technology, redesign of this system needed, and if we really decided we were going to get at this, everybody could be a winner.

All of these new constraints are being imposed on that system at the very time that everybody wants a better electricity product: better voltage control, better wave form. Why? Well, I got a number from somebody. He told me the largest single load on the electric power system in Calgary, by end use, is the microprocessor. By the time the electricity is actually used in the central storage unit in that computer, it is a highly refined product, and we've discarded a whole lot of energy along the way to get it to that refined form.

● (1715)

When you have somebody looking at your eyes and the person does laser eye surgery, the energy coming out there represents about a 1% efficiency from what started inside a steam plant with the boiler. To get to the control and the fine feature of what we have—and we want more and more of what we do to be finely controlled—we're loading up the system, and have to find a way to rationally rebuild our electric power system in looking to the future.

Finally, address the social sciences. Why do we as a country fall so far short, based on the decisions of consumers, in making wise energy choices—be it in our houses, our vehicles, or anywhere? Why do we fall as far short as technology would allow us to go today?

Those are the four subjects—the four major ones. David talked about the basic science to do with.... I'm not going to go into the list, but there are many others. It's a long story.

The Chair: If we didn't think you two had to get back and find solutions for us, we could stay all night.

We're going to wrap up with Mr. Tonks today.

Mr. Alan Tonks (York South—Weston, Lib.): Thank you very much for being here.

Dr. Bruneau, I'm sure the committee enjoyed your metaphor with respect to this extraordinary layer cake that our geological character is made up of in this country, consisting of coal, bitumen, oil, and gas, and your clarion call of whether we can have our cake and eat it too. I think that is really the mission statement with respect to sustainable development, and the lens through which this committee is attempting to make decisions with respect to the sustainability of our energy vis-à-vis the various available technologies that would be part of an overall strategic plan. All of you have helped us here.

My question is very specific, and it's to you, Dr. Bruneau. You had said—and I wrote this down—that there's a tremendous opportunity to store carbon in the basin—I assume you're talking about the Athabasca Basin—that it's a Canadian opportunity, and that we are to stand back and determine how we can optimize use of products while using technologies that would focus on the byproducts that are created.

I wonder if you could give us some examples of those byproducts and the technologies. You talked about the interface. It appears to me to be a huge challenge that this committee is attempting to deal with.

● (1720)

Dr. Angus Bruneau: There's been a lot of talk about what energy sources are used in the tar sands. We've talked about the fact that there is coke, which comes out as a byproduct of the system. That byproduct is relatively stable and can be stored. It doesn't go off into the atmosphere very quickly. I'm sure some does diffuse, but very little. It's relatively stable, but it's also an important energy source.

What we're saying is that there are gasification technologies that would allow you to start with that coke and water and produce hydrogen, carbon monoxide, and some carbon dioxide. The hydrogen and carbon monoxide you can use again as fuels. The hydrogen is particularly useful. You get some heat out of that process, but what you need is the ability to filter the carbon dioxide out of this hot gas stream coming out of the gasification process, and then collect it, transmit it, compress it, and put it underground in a safe, well-regulated, monitored way.

To be able to do that sort of thing, we need regulatory frameworks. We need to set up experimental programs in which we test diffusion of the underground reservoirs in the western Canadian basin. We have hardly started that. As David said, at one point we had a lead because we were actually starting to do some of it, but others have taken over, and we've sat passively.

I don't know whether that answers your question.

Mr. Alan Tonks: It does, and it's a very good illustration.

My simple response is, would part of your dissertation or does the advisory report deal with the interface between technology and the commercialization that uses those byproducts?

For example, when we were in Fort McMurray, we saw the sulphur that was being stacked in pyramid fashion. What is going to be the use with respect to the sulphur? It's very market-related, and so on. I think the committee would be interested in illustrations where technology is being commercialized that focuses on those byproducts that are, in fact, problematic for the future development of the sands.

Dr. Angus Bruneau: Let me say that we did not do that in a detailed way. We had six months, literally, from the time we were first convened until we last met. So we had to get very focused, early on, on the main themes that we felt we had to address. But what we did address, because we were asked as well to talk about the processes to assure, or to encourage if not assure, was commercialization.

One of the things that have marked the federal support system is that it tends to be organized in vertical silos. You start with NSERC—basic research, universities. Then you move to NRC, the PILP and IRAP programs, and you start to attempt some demonstrations. Then you start looking for a little private money and fall into a ditch usually. Then if you've been able to demonstrate something in the laboratory, you might get as far as to put together a proposal that SDTC, Sustainable Development Technology Canada, will help fund to do a demonstration. But you have to have brought together a group of people, including those who have the ability and are interested in commercializing it, taking it right into the market.

So you have to sing one song to NSERC, and then you have to develop new music for NRC, and on it goes. What we're saying is, if a technology is a priority, ensure that the support is available in that priority area, from beginning to end, from a single source. We're not saying to do everything that way. We need to cast the net broadly. But if you have a priority, restructure this so that in fact the control of the people making the decisions follows right along with the natural processes that go from the science to commercial application.

● (1725)

Mr. Alan Tonks: Thank you.

Mr. Wayne Henuset: Can I talk a little bit here?

The Chair: Sure.

Mr. Wayne Henuset: We've been talking a lot on different new technologies that we're hoping to get and to find. We have a technology now in nuclear power that's there. It has been around for 30 years. It has been made so cumbersome with regulations that it has now almost become not cost-effective. It is becoming more cost-effective with gas prices and oil prices going up, so now, all of a sudden, nuclear is becoming more cost-effective.

If we could just clean up our regulatory process, if you federal guys could just clean up your process, we already have the technology. We already have the carbon dioxide fixed. We already have all these things. So just clean up your act on your regulatory process, and nuclear will become the way to be.

We don't have to burn more coal and try to pump it into the ground, and hopefully it stays in the ground for another 100 or 200 years. We have the technology. We have the energy source. We have the product. We have the technology. We have the people. It's all here.

I'm not trying to get mad at it; I'm just saying, if we want to fix this, it's all here. We don't have to go and do more R and D or anything else. Just let me get to work with what we have already, and just clean up your regulatory process so I can go to work. Right now, I don't know...I'm asking you, just clean up. Make a process so I can get to work.

Mr. Alan Tonks: That's not madness; that's passion, Mr. Chairman.

The Chair: Thank you.

[*Translation*]

Mr. Christian Ouellet: This one time, I would ask that you grant me another minute.

[*English*]

The Chair: No. Thank you. It is now 5:30, and I think we'll call it a night.

Thank you very much, gentlemen.

The meeting is adjourned.

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