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Chair

Mr. Bob Mills

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● (1100)

[*English*]

The Chair (Mr. Bob Mills (Red Deer, CPC)): I would like to call this meeting to order and welcome our guests.

For the members' information, we have two people on teleconference: Mr. David Keith, who is in Cambridge, England; and Professor Malcolm Wilson, who's a professor at the University of Regina. Members can address questions to them, plus those on the long list.

I should also tell members that the level of interest in this subject has been great. Many agriculture and forestry groups want to be involved in talking about carbon sequestration.

I'd like to welcome all of you and thank you for being here on short notice to talk about this very interesting subject. We will go in the order listed and begin with Climate Change Central and Mr. Simon Knight, please.

Please keep it to 10 minutes so the members have time to ask questions. With so many witnesses it gets a little tough if you go over.

Mr. Simon Knight (Chief Executive Officer, Climate Change Central): That's not a worry. Due to the short notice, I don't have a long presentation to make.

Climate Change Central is a not-for-profit corporation in Alberta, and its mandate is to reduce Alberta's greenhouse gas emissions. We report to a board of directors and concentrate our efforts on energy efficiency and conservation around new technology, emission offsets, and communications and outreach to the public.

In that work we have not spent much of our time concentrating on the upstream oil and gas sector. There are quite a number of players there already. We spend most of our time working on the demand side. However, in reviewing our mandate last year and our strategic position, we did an exercise where we looked at using the Socolow wedges approach that was done at Princeton to look at what Alberta's emission profile might be into the future. We determined that the emission profile coming from industry is going to be considerable in its growth in the future, especially concerning the oil sands. Our efforts on the demand side were going to be overtaken by the work that's going to happen on the production side.

In part of that review, we came to the conclusion that things like carbon sequestration, capture, and storage were going to be an essential piece of the Alberta action plan and Canada's as well. We looked at what we could do around this issue, and we've determined that we're going to help educate the public and the industry players on carbon capture and storage: the benefits, the challenges associated with it, and what we need to do to move this forward as a technology.

We recognize that there are significant challenges to large-scale CCS. However, it is one of the major answers to the concern in Alberta. We recognize there is work and research already ongoing. There's a considerable amount of effort around the world. However, we need policy direction, government support at all levels, and support from the public to make this a large-scale, viable technology into the future.

That's my opening presentation. Thank you very much. I look forward to answering your questions.

● (1105)

The Chair: Thank you very much.

I have this little box that keeps track of how you went, and you took two minutes and 24 seconds. Very good. That's probably a new record.

We will go on to NOVA Chemicals Corporation. Will Grant or Mark be presenting?

Mr. Grant Thomson (Senior Vice-President, Olefins and Feedstocks, NOVA Chemicals Corporation): I'll be presenting, but I am joined here by Mark Lesky, director of environmental affairs for NOVA. I'm a senior vice-president with olefins and feedstock at NOVA Chemicals.

I'm just wondering, can I have Simon's eight minutes?

The Chair: We can negotiate.

Mr. Grant Thomson: Okay, I will keep it to 10 minutes.

Anyway, I want to thank you for the opportunity to speak before the committee today. There are four areas that I'm going to cover in my comments: a short introduction to NOVA Chemicals; some general comments on the CO_2 sequestration process and how it works; some specifics on projects that NOVA Chemicals is involved in, two particular ones in Alberta; and then some thoughts on the path forward and how we can work together to progress this opportunity.

NOVA Chemicals is a company that produces plastics and chemicals that are essential to everyday life. We focus on two product chains: ethylene and polyethylene, and styrene and polystyrene. As I think most people are aware, our industry is very capital intensive and has a tendency to be very cyclical. The key determinants of profitability within our industry, as in many, are just simply supply and demand of our products and the cost of the feedstocks used to make them.

Through an aggressive technology-based effort, not just NOVA but the chemical industry as a whole has dramatically increased energy efficiency over the last number of years. We promote end-use products that have reduced CO_2 emissions, which have resulted in significant emission intensity reductions. In fact, I think the submission we put in indicates that we have reduced greenhouse gas emission intensity by 50% since 1992.

As NOVA, we've been actively working at this since 1990. In fact, we have been reporting our information publicly since 1994. As we look over the last five years, our emission intensity has been reduced by 12%, and as we forecast forward, looking at what our plans are, we expect a further 8% reduction by 2010.

NOVA Chemicals has achieved these reductions by pursuing investments where they have made the most sense, meaning the most sense to the environment, and also optimizing returns to the shareholders of NOVA Chemicals. This is a theme you will hear me talk about over the next 10 minutes, that capital investment as we go forward is a key to more efficient operations. At the end of the day, it makes good business sense.

I'll give you an example. We have a new ethylene plant. We refer to it as “E3”. It was built in the year 2000. It's one of the most energy efficient plants in the world. E3, compared to plants on the U.S. Gulf Coast, is about 40% more energy efficient. The reason is that it's larger and it's new technology. So those are the types of things that capital investment can do.

In Sarnia, we have a flexi-cracker. We invested $300 million in this in late 2005, through the middle of 2006. Again, it managed to improve the efficiency by 15%. We improved operating reliability and we expanded manufacturing capacity. All these things improve GHG emission intensity.

Let me move on to the second point and just discuss briefly CO_2 sequestration. I'm sure you'll hear a lot about the process from a number of speakers today. I'm going to focus on enhanced oil recovery, because those are the projects that NOVA is involved in, in Alberta.

CO_2-based enhanced oil recovery is a technique primarily for what's known as tertiary recovery of original oil that was in place from a mature oil field. Some of the oil fields that we were involved in actually were drilled as early as the late 1950s. By the 1970s they had stopped producing, by using what you would refer to as primary and secondary techniques—primary basically just being the natural pressure that's under there; secondary techniques often involve water.

A tertiary recovery would be the CO_2. We use this in what's called miscible flooding. The CO_2 is injected at high pressure into the oil reservoir and acts like a solvent. It reduces the viscosity of the oil so that the oil will flow better, and that's why you can take a field that has stopped producing and get it to a point where it can start producing economically again.

You then, out of the producing well, get a mixture of CO_2, oil, and water. You recover that, you separate it, you re-inject the CO_2 and water again and continue to use it.

As you go through this process, though, large net quantities of CO_2 are sequestered in the reservoir. Obviously these reservoirs have a long lifespan. They're reservoirs where gas has been down there for millions of years, so I think they're very efficient in terms of capturing and containing CO_2.

We've been involved in CO_2 sequestration in Alberta for 20 years, and again, for the purpose of enhanced oil recovery. What we do is strip the CO_2 out of our feedstock—our feedstock is ethane. Then we take that CO_2 and sell it to customers, to producing oil companies. They take it and pipeline it—a relatively short distance because it's very expensive to pipeline this—a short distance to the adjacent fields, basically compress it, treat it, and inject it into the field at high pressure, as I said. In total, about 150 kilotonnes of CO_2 is captured annually by these projects.

● (1110)

Let me give a brief description of the two projects we're involved in. The first one is with a company by the name of Penn West. We have been supplying Penn West captured CO_2 since 1984. In fact, it was the first miscible flood CO_2 project in Canada. One of the keys when we started this in 1983 and started the research was that there was government support for key technological development, and that was really critical to the success of this project. One of the things I would commend is the innovation and foresight that the Alberta government had in funding this in 1983. When you think back, that was almost 25 years ago, and it was quite remarkable. This project continues to be an outstanding success, and it probably has another 10 or 20 years of life left in it.

The second project we have is with a company by the name of Glencoe, and this is more recent. We started in 2005 and reached an agreement with Glencoe for a similar type of process where we would sell them CO_2. They would collect it, purify it, transport it, and inject it. These fields actually have the benefit. They capture CO_2, not only from NOVA's operations in Joffre but also from the Prentiss site, which is a Dow operation. So in total, they sequester about 240 kilotonnes of CO_2 annually. Simply to give you a sense, that's about the same as taking 50,000 passenger cars off Alberta's highways during the life of the project.

These are two tremendous successes, but what I'd like to do is spend a bit of time and talk about the path forward. In other words, what can we do together?

NOVA Chemicals believes that technical innovation, combined with further infrastructure development and the appropriate incentives for capital investment, can enable significant future expansion of CO_2 capture and sequestration. We commend the creation of the Carbon Capture and Storage Task Force in March 2007. We think this could have great benefit going forward.

Now, what needs to be done? There are three areas I will touch on. One is technological innovation. Yes, we're already capturing and sequestering CO_2, but there is a lot of technical work that needs to be done. This technological innovation, the investment in this, I think could have numerous benefits in developing this technology. One, the technology is transferrable to other applications, so it's not only specific to the types of things that NOVA Chemicals does. The other thing is the transferrable nature of this, meaning that it can be used in coal-fired plants, other fixed-combustion facilities. It means it can have significant benefits for all Canadians across the country. Third, I think there's an opportunity for Canada to show leadership in this area. So as we develop this technology, it's not only going to be applicable in Canada but also outside of Canada.

The second point on what needs to be done after technology is infrastructure development. I think you heard Simon refer to this a bit earlier. These are expensive projects; they're long-term projects and they have to be evaluated over a long-term timeframe. With significant initial capital requirements for pipelines and compression equipment, it can mean limited returns on some of these projects. So the necessary pipeline infrastructure linking major emitters to compression equipment, etc., needs to be put in place. So facilitating further infrastructure development is going to be a critical next step, and I think it's something the government can help with.

The third point in terms of what can be done is a suggestion around capital cost turnover. As I had indicated before, large investments are required, so continuing the theme—the importance of capital investment in this area—I think an accelerated capital cost depreciation for CO_2 sequestration projects could have a significant impact on the economic viability and growth of these projects.

In closing, I want to leave you with two key messages. One, CO_2 sequestration can work. We've already been commercially successful on a modest scale in Alberta. We've shown that it can work, and I'm sure other people today will talk about projects that are working as well.

The second key message is that the key to significantly expanding the amount of CO_2 sequestration is twofold: one, the technical innovation I talked about to economically separate CO_2 and capture it from combustion sources; and two, further infrastructure development to gather, transport, compress, and inject CO_2. But it can be done.

● (1115)

I appreciate your time and attention, and I look forward to questions and comments.

The Chair: Thank you very much.

You're just about right on, so congratulations for that too.

Next we'll go to EnCana and Dave Hassan, please.

Mr. Dave Hassan (Former Vice-President, Weyburn Operations, EnCana Corporation): I may steal a little extra time, because I'm talking about the Weyburn project, and it's the biggest CO_2 storage project in the world.

Good morning, *mesdames and messieurs*, ladies and gentlemen. My name is Dave Hassan. I'm team lead of the Boyer-Provost property team at EnCana. Prior to this I spent five years in EnCana's Weyburn business unit, initially as group lead of development and finally as acting vice-president. I'm here today to present Weyburn as a case of a win-win scenario for enhanced oil recovery in the environment. I must remind the committee that I'll be talking about some forward-looking information today.

EnCana was formed in April 2002 by the merger of two major Canadian oil companies, PanCanadian Energy Corporation and Alberta Energy Company. We're headquartered in Calgary, and we are North America's second-largest natural gas producer and a leading oil sands integrated producer. We have strong corporate governance, including a constitution, which guides our organizational behaviour. Our people live and work in the communities where we operate, and we do our best to be a good neighbour.

We're also committed to making efficient use of resources, minimizing our environmental footprint and our emissions intensity, and increasing the energy efficiency of our operations.

EnCana believes that geological storage of CO_2 is one of the most pragmatic and technically viable near-term options to reduce greenhouse gas emissions. There are three types of carbon capture and storage. Natural carbon sinks are an integral feature of the natural carbon balance of the biosphere, and these can be augmented by human action, such as forestation projects and growing energy crops.

Enhanced product recovery includes oil recovery technology, which is well-established, gas recovery, and coal-bed methane recovery. Stand-alone waste storage is similar to enhanced product recovery, except there's no revenue stream to offset the cost of capturing, transporting, and storing the CO_2.

Carbon capture and storage presents an opportunity for society to use some of our heavier hydrocarbon resources, abundant supplies of coal, for example, in a less carbon-intensive fashion by stripping carbon from the fuel and geologically storing it. This is exactly what we do at Weyburn.

CO_2 for our enhanced oil recovery operations comes from a coal gasification facility located in Beulah, North Dakota, operated by Dakota Gasification Company. It is transported through a 325-kilometre pipeline to southeast Saskatchewan in the Weyburn field. Dakota Gas strips carbon from coal to convert it to synthetic natural gas. When burned, natural gas releases a little over half of the CO_2 per unit of energy production as coal does. By stripping carbon, DGC makes coal a less CO_2-intensive energy form.

Weyburn closes the loop on this carbon-stripping process by taking over 6,500 tonnes per day of waste CO_2 that was being vented into the atmosphere and injecting it almost a mile underground. This makes it Weyburn Canada's largest CO_2 enhanced oil recovery project and the world's largest geological CO_2 storage project. Every day that Weyburn injects CO_2, it's like taking 1,400 small to mid-sized cars off the road for a year.

The first one in this process is enhanced oil recovery. Enhanced oil recovery by CO_2 miscible flooding has been used in the U.S. for over 30 years, so it's not new technology. CO_2 is injected with alternating slugs of non-potable saline water. The CO_2 essentially acts as a solvent; it makes the oil swell, makes it less viscous and lets it flow more easily out of the nooks and crannies or pores in the rock space.

The CO_2 and water produced with the oil are recycled in a closed-loop system. CO_2 EOR makes heavy use of geologists, geophysicists, and reservoir engineers to understand and optimize enhanced oil recovery. There are also a host of other experts, ranging from operators in the field through our facility and construction specialists, to environment, health, and safety folks to ensure that our operations run smoothly, safely, and responsibly.

The payoff for this effort is demonstrated by the success of the Weyburn project. Weyburn oil field was discovered in 1954. Following primary production, a water flood was initiated in 1964 and production peaked at around 50,000 barrels a day. Then the field began a natural decline. There were a few drilling projects in the mid-eighties and mid-nineties that somewhat offset that, but then the CO_2 miscible flood began in the year 2000, reversed that continued decline, and boosted oil production to levels not seen since the early seventies. In fact, it's exceeding our forecasts right now.

● (1120)

Current production of about 30,000 barrels of oil per day is almost three times what EnCana predicts the field would have produced without CO_2 flooding. We project about 155 million barrels of incremental oil recovery from CO_2 miscible flooding, which will bring total oil recovery to over 40%, about 10% higher than we expect from water flooding.

The second big one in this is CO_2 storage. Really what we do at Weyburn is effectively to take those big stacks in North Dakota that were emitting CO_2, we turn them upside down, and we inject that CO_2 almost a mile underground, where it enhances oil production and will be stored for thousands or even millions of years.

From 2000 through 2004, a \$40 million research effort ran parallel to our enhanced oil recovery project in order to predict and verify the ability of the oil reservoir to securely store CO_2. And I see a few people around here who have been involved with that project.

Phase one of the IEA Weyburn project was the largest full-scale, in-the-field scientific study every conducted involving CO_2 storage. It was funded by the Canadian and U.S. governments, Alberta and Saskatchewan, the European Union, and several industry partners. During the study, 24 different research organizations completed extensive monitoring and computer simulation studies. In essence, they conducted a four-year external audit of the suitability of the Weyburn site for CO_2 storage. Phase one concluded that long-term storage of CO_2 at Weyburn is viable and safe. A copy of the phase one report can be downloaded from the Petroleum Technology Research Centre website.

EnCana was a significant contributor, providing the test site funding and thousands of hours of work by EnCana employees at a rough in-kind cost of \$15 million. We also opened our doors to over 200 field tours to tell the world the story of enhanced oil recovery and CO_2 storage.

Based on EnCana forecasts during phase one, the researchers concluded that about 23 million tonnes of CO_2 could be stored during enhanced oil operations and almost 55 million tonnes if injection continued post-EOR, given some other economic driver.

EnCana currently estimates that our most likely storage case during EOR is roughly 30 million tonnes. That's one tonne for every citizen of Canada, or equivalent to taking all of Montreal's vehicles off the road for two years.

EnCana is currently working with the research community to extend the project, with the primary goal of developing a protocol or cookbook that would provide practical guidance to others wanting to do CO_2 storage projects.

Unfortunately, you can't just pull CO_2 off the flue stack of power plants. Air is almost 80% by volume nitrogen. When we burn fuel with air, the resulting flue gas is only 10% to 15% CO_2. To be useful for enhanced oil recovery, CO_2 must be 95%-plus pure, thus the challenge and cost of CO_2 capture, which I'll talk about in a minute.

Once we have pure CO_2, we need to compress it to push it down a pipeline to the oil field or storage reservoir. The size of the oil pool is also a consideration in the economics of enhanced oil recovery. It's no coincidence that Weyburn is the third largest conventional oil pool in western Canada. Not every large oil pool is suitable for CO_2 flooding. That's where geologist reservoir engineers have to assess the properties of the field.

Capital investments for these projects are huge. EnCana estimates that over \$1.3 billion will be invested for the CO_2 flood at Weyburn over the life....

Adding to the mix of reservoir suitability and development costs are the often-volatile price of oil and the market price of CO_2.

IEA reported in 2003 that the single biggest cost for CO_2 is capture, at about \$25 to \$50 per tonne. That's the process of creating a pure, concentrated CO_2 stream, as opposed to the dilute flue gas I referred to earlier. Transport will add \$1 to \$5 per tonne per 100 kilometres, and injection adds about \$1 to \$2 per tonne.

EnCana was fortunate with our CO_2 supply from North Dakota, since Dakota Gas was already producing a pure CO_2 stream as a result of the coal conversion process. However, additional CO_2 capture from traditional flue gas sources will face high costs with current technology.

● (1125)

In summary, EnCana and the Dakota Gasification Company captured a CO_2 waste stream that was being vented to the atmosphere and used it to bring new life to a mature oil field. EnCana hosted a world-class research project that provided an independent audit of the storage capability of the Weyburn reservoir and concluded that it could safely and reliably store CO_2. We continue to work with the research community on the final phase to study and further refine the previous work and to prepare storage protocols and guidelines.

The cost of CO_2 capture is likely to be the single biggest impediment to widespread EOR or stand-alone geological storage applications. Weyburn is a commercial and environmental win-win that provides a leading example of a possible sustainable energy future for fossil fuels that allows energy to be extracted while minimizing CO_2 emissions.

Thank you for your attention, and I will be pleased to answer questions.

The Chair: Thank you very much.

Now we'll go to our witnesses who are with us in voice only. I hope you've been able to hear the testimony so far.

We'll go first to David Keith, who is a professor at the University of Calgary but presently working at Cambridge in England.

Mr. Keith, I hope you're there.

Dr. David Keith (Professor, University of Calgary, As an Individual): I am. Can you hear me?

The Chair: Yes, we can hear you very well. We will limit you to ten minutes, if possible, please.

Dr. David Keith: Understood. Okay.

Forgive me if I am a little bit slower or less coherent than usual. I just flew in this morning and I've already done a lot of work with only an hour or two hours' sleep.

Let me say a couple of words. I guess I want to make four points. First of all, I want to argue that CO_2 capture and storage is ready for prime time, in the sense that you could implement industrial-scale projects today, with industrial performance guarantees, in the clear understanding that they would work. Now, that's not to say they wouldn't be expensive—and "expensive" is a relative term, as we can argue about how much we want to pay—but I think it's essentially a statement of fact that we are ready to do this on a full industrial scale.

I want to say what the reason for that statement is. You might say, oh, this is some university professor saying this, and what does he know? The reason is the following: the underlying technologies all exist on the industrial scale in the commercial market already.

So you might ask what happened, given that CO_2 capture and storage incentives have moved very quickly from where we stood a decade to two decades ago, when there were some first meetings at MIT and there were only a couple of academics interested, and almost no serious interest, to nowadays when we have a major global R and D budget and interest from the G-8 and the IPCC, and various projects are being announced around the world. Why did we move that quickly? Was it because there was a bunch of innovation and laboratories? The answer is no.

The reason things moved quickly, essentially, is that we're talking about using, on a full industrial scale, the components we already had in a tool box. So with coal gasification, for example, while there are certainly issues about gasifying some of the coals in western Canada, there are 60 gigawatts of thermal coal capacity worldwide. The German government, during World War II, fueled most of its aircraft fleet out of coal gasification turned into liquid fuels. Likewise, hydrogen production from natural gas is a worldwide enterprise that's more than 1% of the global energy system. Similarly, CO_2 capture in aqueous amines is widespread around the planet. CO_2 is transported at distances of up to about 1,000 kilometres. Again, none of this was developed for the purpose of managing humanity's CO_2 emissions; it was developed for other, completely separate commercial reasons.

Finally, the injection of CO_2 into deep geological formations for CO_2 storage amounts to more than 30 megatonnes a year in the U.S., or something like 0.5% of the U.S. CO_2 emissions.

So it's the combination of these components, each of which already existed, at a full commercial scale.

CO_2 capture and storage is the opportunity to use these pieces of technology we have in the fossil fuel industry and assemble them in a new way—to assemble the parts in the took box in a new way—to enable us to use the benefits of fossil energy with greatly reduced emissions. Each of these things already existed. It's for that reason, with the megatonne and billion-dollar scale all around the world, that we can say for certain that if you want to build power plants with capture today, you can do it. There are many independent routes that would allow you to do it.

As a second comment, despite what I said—but not in contradiction to it—I think there still really is a need for more energy R and D in Canada. I don't think that doing more research should be an excuse for inaction. Indeed, as far as I can tell, it's the almost unanimous view now among the community of people who think about CO_2 capture and storage that at this point what we need to do is pull the trigger and get some major projects in the ground. Just doing more research without big projects won't even be an effective way of doing research, because the best way to do research is via big projects.

That said, it is still important to say that Canada's energy R and D is in many ways very, very small, as was demonstrated by the blue ribbon panel on energy R and D that reported back to NRCan and Parliament last year—which I was on. So if you see, for example, that the ratio of investment in energy R and D in Canada to the size of Canada's energy sector is one of the lowest of the major countries, you really get a sense that Canada is not aiming upstream; we're not aiming for the high-value-added clean technology, high-value jobs, that we would get if we were focused more on an R-and-D-intensive energy sector.

The energy sector as a whole invests something under 1% of revenue in R and D, which is tiny compared with the average of all the other sectors, or with the sectors that are more focused on R and D. You really have to scratch your head and say, how would the energy sector look if we did significantly more R and D?

● (1130)

I'm not suggesting that R and D should be done through some giant parcel of federal money going to federal labs and universities. Indeed, personally, although I am a professor, I think the opposite. I think this R and D needs to happen mostly, dominantly, in the private sector, but government policies can incent that.

I have argued, first, that it's prime time, and second, that even though it is ready for prime time, more energy R and D on this and other topics is really necessary if we're going to meet the challenge of living in a carbon-constrained world, if we're really going to do what we need to do to stabilize the climate, which is to make very deep reductions in emissions over just 50 years. The third point is that the risks of doing large-scale CO_2 storage are not zero, but they are small. There's a lot of background to understand on what those risks are, including background from the very successful Weyburn project, for example.

There are no really large-scale industrial technologies in the world that have zero risks, and this is no exception. If we really put gigatonnes of CO_2 underground, we can expect some local risks. If you're looking for a risk-free technology, you can go elsewhere—although I don't think there is an elsewhere. But a series of different lines of evidence give us real confidence that we understand these risks and that we can control them, given a suitable regulatory regime.

To harp on the regulatory regime for a minute, people often ask, almost point blank, what's the risk of geologic storage of CO_2? The correct answer to that question—and this is the answer the IPCC gave, I think quite wisely—is that essentially there is no answer. It's an engineering question. To some extent, if a politician asks me, "What's the risk?", the answer I'll give as a project engineer is, "Tell me what level of risk you want, sir." This is an engineering project design question.

So the risks of the upstream petroleum industry in Alberta are very small. The risks of the upstream petroleum industry in Nigeria are quite large. It's not due to some intrinsic difference in the hardware; it's due to the regulatory system in which these things are embedded. Similarly, flying commercial aircraft around Canada is very safe, whereas flying in parts of Africa is very dangerous. This has to do with the rule of law, high-quality regulatory systems, etc.

Much the same applies to CO_2 storage. If we set the guidelines appropriately, if we have a high-quality regulatory system that's adaptive, that's able to deal with new information and new techniques or managing the risks of CO_2 storage, the risks can be very small, I think quite comparable to or smaller than the risks of the current upstream petroleum industry.

Finally, I want to say a few words about policy. In that fourth set of things I want to say, I'll give a couple of my views on what needs to happen.

I think it is vital for this and any other technology that we put some kind of price on carbon. The merits of something simple...for instance, an economy ring-fenced carbon tax, which is exceedingly easy to implement. It does not require facility-based accounting systems and it puts an even price everywhere in the economy. It is hard to get away from the merits of such a system, because such a system has the government only telling the economy what we should do about releasing emissions. It gets the government out of the business of picking winners and losers, either between provinces or between sectors or within industries.

Second, I think that needs to be supplemented by something like loan guarantees that help to enable firms to buy down the risk of very large capital intensives and uncertain investments. I think that is as true for other new energy technologies as it is for CO_2 capture and storage.

Finally, I think it's time for Canada to think about what has already been implemented in British Columbia and is being now talked about quite seriously—suprisingly seriously—in the U.S. House and Senate, and that is something that comes close to, or *is*, a complete ban on the construction of new coal-fired power plants that do not have CO_2 capture and storage, because those are among the most carbon-intensive objects our society builds. They have very long lives, and they can mean very long emissions. Since we do have alternatives in Canada, both non-coal alternatives and the alternative of CO_2 capture and storage, I think we should think hard about whether we want to allow any more such plants to be built.

Thank you very much for giving me the time.

● (1135)

The Chair: Thank you very much, David. You kept it to nine minutes, and that's pretty good on a couple of hours' sleep. Well done.

We will carry on and go to Malcolm Wilson, a professor at the University of Regina.

Professor Malcolm Wilson (University of Regina, As an Individual): Thank you very much. I appreciate the opportunity to present to the committee, and I apologize for not being in Ottawa. I don't quite have David's excuse.

The advantage or disadvantage I have is being at the tail end, and certainly I concur with a lot of the statements that have been made, and I certainly concur with David and the viewpoints that he has raised.

I would like to make a few, if you like, clarifying comments here with regard to what we're looking at. The first of those comments is that enhanced oil recovery is extremely important, and, as Mr. Hassan said, it does provide a mechanism whereby there can be some return on investment. It should be noted, though, that enhanced oil recovery and probably many of the others, whether it's enhanced gas recovery or enhanced coal-bed methane, will be limited opportunities, and they certainly will not represent the major opportunity and certainly the major means of preventing carbon dioxide from reaching the atmosphere. So we have to be looking very hard at using what we learn from the enhanced oil recovery community to take us down the road of geological storage in saline aquifers, as is being practised currently in the North Sea, and in In Salah, with BP, in Algeria. This will be the large opportunity, and this does mean that there will be a cost to the consumer and to industry to implement that.

The second point I'd like to make is that it's not just an economic cost that we need to be looking at. Moving to carbon dioxide capture and storage will have a significant impact on the rate at which we use fossil fuels. If I look at the current SaskPower proposal, and SaskPower, the provincial utility here in Saskatchewan, is proposing to build what will amount to possibly the first fully integrated plant with CO_2 capture built from the ground up, the increase in coal consumption will be about 50%. So as Dave Hassan commented, in order to turn the stack from going up into the atmosphere and moving that CO_2 down into the ground, it will require a very significant increase in the size and fuel consumption of the power plant in order to maintain an electrical output, in this case of about 300 megawatts.

So I think these are points that we need to bear in mind as we move forward.

Having said that, the SaskPower project is extremely exciting, in that, as David Keith said, we have a very definite need to move from research and from pilot-scale, small-scale storage operations into the arena of full commercial demonstration. Without the demonstration, we're certainly not in a position to do the research that industry needs to drive down the costs further. I do believe there is an opportunity to drive down the costs further, but we need this demonstration. We need to see this actively in the field.

A few months ago there was a meeting held in Kananaskis bringing industry leaders together to talk about the opportunities and to talk about the challenges to the development of these commercial large-scale opportunities. There are certainly lots of opportunities in Canada, particularly in Alberta and Saskatchewan in western Canada. Many of those opportunities go south of the border.

● (1140)

One of the points that came out of that meeting was a need to look more broadly. Again, as David raised this, we're looking at a global issue. These opportunities are not restricted to Canada, and we need to have our policies, programs, and research programs in place to try to build off the opportunities that exist on both sides of the border, and indeed elsewhere in the world.

Again, sort of promoting from a university perspective, one of the issues in the future is that while we have significant intellectual capacity in Canada at the moment, and certainly there are companies —such as EnCana, Penn West, Apache, and others—to look at and undertake these projects, we will be facing a shortage of qualified people very rapidly, if we move out into the broader-scale adoption and implementation of these technologies. One of the areas we need to build is getting qualified people and having universities train people to meet the upcoming industry requirements for this.

I don't want to belabour any of the points that have been very eloquently made up to this point. Government certainly has a key role to play in providing the right direction and policy, and again I agree with David in terms of helping out in the private sector to drive the research agenda.

One of the points that came out very much from the industry people attending the Kananaskis meeting was that we should take lessons from the garbage disposal industry. At each step of the way, there have to be incentives to capture, transport, and store the CO_2.

As we look at the opportunities, and particularly as the federal government starts to look at the opportunities, challenges, and how we move forward, I urge you to look at a number of models that take into account the costs and make sure that the appropriate incentive is there to allow us to develop this industry at scale.

It's a recognition of the increased fossil fuel consumption and the overall impacts of this. The enhanced oil recovery is a learning opportunity, and we should use it as such. We need some firm policy direction, as David was saying, and we need the people in order to implement these technologies out into the future.

Finally, there are opportunities that cross borders, and we should make sure that the policies and programs are in place to allow us to take advantage of those cross-border opportunities.

With that, I thank you.

● (1145)

The Chair: Thank you very much, Malcolm. We appreciate your comments.

Now we'll go to Carolyn Preston, who has the main presentation for your group.

Then, Mark, if you have something to add after that, we'll go in that direction.

Dr. Carolyn Preston (Project Integrator, CANMET Energy Technology Centre, Devon, Alberta, Department of Natural Resources): Good morning.

I am the project integrator for the final phase of IEA GHG Weyburn-Midale CO_2 Monitoring and Storage Project. I work at the CANMET Energy Technology Centre of Natural Resources in Devon, Alberta.

This morning I'm going to make a brief presentation about carbon capture and storage in the Canadian context. I'll be pleased to answer any questions on the material covered in my deck during this meeting.

The first slide gives a brief summary of the need to store CO_2 over the long term. As we've all heard, the recent IPCC summary reports made it abundantly clear that we are having a real and measurable influence on the earth's climate by emitting CO_2 during fossil fuel combustion. In order to slow or reverse that impact we must decrease the emissions associated with human activities.

CCS, or carbon capture and storage, is just one in the basket of options we must employ to reduce CO_2 emissions that are accumulating in the atmosphere. Other options include energy efficiency, alternative and renewable fuels, non-emitting sources of electricity, and terrestrial sequestration. CCS offers us the opportunity to maintain economic growth while reducing emissions, and we are well on the road to its widespread deployment.

CO_2 can be captured from large stationary sources of either the flue gas stack or through modified combustion technologies. CO_2 capture, as we've heard, is the most expensive step in capture, transport, and geological storage.

History has shown us that research and development, and experience through doing, will bring down the cost as we develop new and innovative capture technologies. We have plenty of experience in North America with transporting CO_2 from source with a considerable existing infrastructure in the United States and a pipeline being proposed in Alberta. We are confident from past experience and pilot and commercial operations that we can store CO_2 in deep geological formations for a very long time.

In Canada we have identified a large total storage capacity in sedimentary basins. We have enough capacity to last hundreds of years. To put that in perspective, in 2003 Canada's large emitters vented just over 400 million tonnes of CO_2 into the atmosphere.

CO_2 can be stored in partially depleted oil reservoirs through enhanced oil recovery, depleted oil and gas reservoirs, deep unminable coal seams, and deep saline formations. The estimated volumes of storage capacity in Canada are shown in the figure on the slide labelled 3. Note from this graphic that storage will take place mainly at depths exceeding one kilometre below the ground surface.

A sedimentary basin not only offers pore space for storage, but provides several impervious regional trapping seals or layers of rock between the storage reservoir and the surface. This assures us that CO_2 will remain underground.

The slide of a map of the western Canadian sedimentary basin shows we have an ideal geology in western Canada for the storage of CO_2 underground. More than 50% of Canada's stationary CO_2 emissions are in close proximity to these storage locations. The western Canadian sedimentary basin extends from northeastern B.C. to southwestern Manitoba. There is also some storage potential in sedimentary basins in other provinces outside western Canada, namely in Ontario and Nova Scotia, but they offer considerably less than western Canada. The pipeline proposed for Alberta will consist of a network and backbone infrastructure linking sources to storage sites, initially connecting relatively pure CO_2 sources with nearby EOR fields.

Straight CO_2 storage without production of an economic resource such as oil is currently facing high-cost and technical uncertainty, making it prohibitive for industry to pursue this alone at large scale. I say “technical uncertainty” because we only have a few instances of large-scale CO_2 storage in deep saline formations to draw experience from. Statoil's Sleipner gas operation in the North Sea comes to mind as an exception. It's a fairly large-scale operation and has been running for about 10 years.

Provincial regulations exist for transport and injection of CO_2 into geological formations. Research and development is under way to further increase our confidence in the long-term safety, reliability, measurement, and validation of the storage of CO_2. We will likely find we need to enhance existing regulatory frameworks to account for the long-term nature of this activity.

● (1150)

Public acceptance of carbon capture and storage is key to widespread deployment. We must engage the public now rather than being perceived as holding back or hiding information.

We are a global leader in carbon capture and storage, as has been clearly shown by the previous speakers. We have a large number of nationally and internationally engaged technical and policy experts from governments, industry, universities, and NGOs. An example of our leadership is the Weyburn-Midale CO_2 monitoring and storage project, in which, as Dave Hassan has covered, we're taking CO_2 by dedicated pipeline from North Dakota and storing it in an EOR field. The associated international monitoring project has shown that the natural geological setting for that particular field is sound.

Canada is well positioned for widespread deployment of carbon capture and storage with the recent completion of NRCan's CCS technology road map and a number of key demonstrations and commercial operations at various scales. We anxiously await the findings and recommendations of the recently established Alberta-Canada Task Force on Carbon Capture and Storage concerning impediments to near-term widespread deployment.

In conclusion, all experts agree that fossil fuels will continue to be the dominant source of energy for many decades to come. Carbon capture and storage is one of the best ways to address both our growing need for energy and our environmental goals. Over time, technology and innovation will help to improve the efficiency and economics of CO_2 capture and storage systems.

Thank you.

The Chair: Thank you very much.

Mr. Tushingham, you have a deck, I believe.

Mr. Mark Tushingham (Senior Engineering Advisor, Department of the Environment): I have a small deck.

I'm Mark Tushingham. I'm with the oil, gas, and alternative energy division of Environment Canada.

Our deck goes over some of the positives and negatives of carbon capture and storage.

Carbon capture and storage is a very promising technology to reduce CO_2 emissions, particularly in western Canada, where there are favourable geological formations for storage. The storage potential will be more than 20 megatonnes per year in a decade or so, and the long-term potential is huge for this technology.

CO_2 capture and storage reduces the net CO_2 emissions by more than 80%. CO_2 at a plant does go up because of increased energy requirements of the capture and storage system, but the increased CO_2 is then captured.

Carbon capture and storage is likely the only way many facilities can significantly reduce their CO_2 emissions. Storage sites, however, need to be monitored for decades to ensure no CO_2 leakage.

There are some negative environmental implications of carbon capture and storage, but they can be managed. The extra energy needed to capture, transport, and store the CO_2 will cause emissions of other pollutants, such as nitrous oxides and sulphur dioxide. The International Panel on Climate Change found that the capture systems would result in increased emissions. They looked at particularly advanced, fairly low-emitting power plants and found an 11% to 31% increase in NOx and up to an 18% increase in SO_2 unless SO_2-removal equipment was installed, which is required by some capture technologies to work.

These emission increases are still well below the emissions from typical coal-fired plants found in Canada. These increased emissions can be managed through the installation of various emission control technologies and appropriate practices.

Under the clean air regulatory agenda, sectoral emission caps are being established for both nitrous oxide and sulphur dioxide for key industrial sectors, including those in the oil and gas sector and the electricity sector, which are two sectors liable to use CCS.

There is a remote health risk, if there is a rapid leak of CO_2; however, this can be carefully managed with the appropriate selection of storage site and through thorough monitoring.

There are also land disturbance issues regarding CO_2 pipelines. These will be managed through environmental assessment processes.

CO_2 storage in the open ocean was once considered; however, there are significant issues around the threat to ocean life. Amendments to the London Protocol on Ocean Dumping allow parties to issue permits for geological storage only; that is, not in the column water or on the ocean floor. This is not to be confused with storage of CO_2 in sub-sea geological formations. Amendments to the London Protocol allowed this option, but there are issues that remain to be settled internationally. These include the long-term monitoring of leaks, defining the purity of the CO_2 stream, export for disposal when it crosses international boundaries, and the liability issue. Storage in the sub-sea geological formation might be a possibility for facilities in Atlantic Canada.

Thank you.

● (1155)

The Chair: Thank you very much.

Now we will go to questions. The first round will give members 10 minutes; then we'll go to a five-minute round with whatever time we have left.

Just for the panel's information, you'd be interested that in a week to 10 days' time, at the G-8 plus 5, one of the main parts of the agenda is CO_2 capture and storage. Some of the lead questions that will be asked are from China and India, for which, with 800-megawatt power plants coming on stream every week, it's pretty critical that they capture their CO_2 and do something with it. So I think I can report that the interest in CO_2 capture and storage globally is very high at this time, and that's good for all of us.

We'll go to the first questions.

Mr. McGuinty.

Mr. David McGuinty (Ottawa South, Lib.): Thank you, Mr. Chair.

Thank you all, witnesses, for joining us, and those on the telephone, thank you for listening and being there.

My first questions revolve around the deck put out by Dr. Preston from NRCan. Page 5 in the deck talks about remaining challenges.

Dr. Preston, you rightly repeat that CCS projects face very high costs, and you go on to say that industry is unlikely to absorb this risk alone.

When I read that, because you follow that comment up with "Inadequate Incentive for Technology Investment" presently in place, it reminds me of the accelerated capital cost allowance measure announced in the budget, which is seeking to phase out ACCA for oil sands investments in eight years—not two years, not three, four, five, six, or seven years, but eight years—which had a lot of people asking why it couldn't have been phased out earlier and, for example, made available for CCS.

You also talk about higher-cost penalties required for emitting, to create the necessary incentive for widespread deployment. That actually fits very nicely with the IPCC report released in Bangkok just a week or 10 days ago. In response to that report, the head of the Climate Change Secretariat in the UN, having examined Canada's new plan, said that our cost of carbon was not going to be anywhere near where it needed to be under the plan to, for example, deploy this very technology.

Can you comment a little bit on...or perhaps even some of the front-line economic vested interests in this technology? Help me understand. What's required here? How fast do you need this to make this economic?

• (1200)

Dr. Carolyn Preston: I can begin by saying that in the first statement I made I was referring to pure CO_2 capture and storage, not CO_2 capture and storage with an economic product at the end. That is storage in deep saline formations, where it's straight disposal, and there are no incentives for actually doing that right now.

I defer any of the economic discussion to those from the commercial entities that are present.

Mr. David McGuinty: Can anybody from the front-line businesses here help us understand, help Canadians understand? What do you need to see in terms of ecological fiscal reform at the federal level to accelerate and to accentuate this investment?

Dr. Keith assures us that this technology is all shrink-wrapped. It's on the shelf. It's a question of just simply going into the tool box and putting it together.

What do you need to see, and how fast do you need to see it?

Mr. Dave Hassan: Maybe I could comment. I think Malcolm Wilson raised a very good point about the SaskPower project. EnCana has some discussion with SaskPower, looking at their project as a potential CO_2 supply for Weyburn and other enhanced oil recovery operations.

As Malcolm points out, that plant has about a 50% reduction in efficiency. So, basically, SaskPower has to build a 600-megawatt power plant to output 300 megawatts of power to consumers. Right there, the cost of power will double to consumers. That doesn't include the extra pots and pans, the equipment required in the plant to actually capture the CO_2. That's only the reduction in efficiency for the use of coal.

As I pointed out, the IEA estimates the cost of capture at about \$25 to \$50 a tonne. That's the kind of cost you're probably seeing on that SaskPower project. I think if there's one area that EnCana feels requires some dedicated research effort, it's in reducing the cost of CO_2 capture.

Mr. David McGuinty: Mr. Chair, this might be a tough question to answer.

I take it, then, nobody is really in a position to speak specifically to what measures you'd like to see and when you'd like to see them, to facilitate investment in this technology. Do I have that right? Is anybody in that position?

Let me move on to a second question, if I could, Mr. Chair, then, and that is to Dr. Keith.

Professor Keith, I think I heard you say over the phone that no new coal-burning electrical plants should be built until CCS is in place. Did I get that right?

Dr. David Keith: Yes.

First of all, I must be very careful here. I am on the national task force, but I am speaking as an individual, not giving the opinions of the task force. My personal opinion is, first of all—just an opinion, not even a policy—that we shouldn't build any more coal plants without capture, period.

Now, should you make that a policy, there are obviously issues about making a hard policy, because, as we know, there are some places where costs are higher and some are lower, so economists will argue, quite sensibly, that sometimes these hard command-and-control measures aren't as efficient as others. But given what I know about the kinds of coal plants people are talking about building in Canada and where they're building them, I think it makes sense for the Government of Canada to take seriously the idea of an absolute ban on any more coal plants without capture.

• (1205)

Mr. David McGuinty: Can I ask you, Professor Keith, would you apply the same logic then to the construction of the expansion of oil sands plants, and if you would not, why not?

Dr. David Keith: I wouldn't, because it's not so black and white and binary. With a coal-fired power plant, you tend, in practice, to build them only above a certain size. You build them only of several hundred megawatts, in practice, and capture or not capture is very much a black or white, yes or no, thing.

The oil sands have a spectrum of different kinds of plants, so there the arguments that say pure command and control wouldn't be effective probably make sense. In the oil sands there's a very big difference in the cost of capture in different facilities because of technical differences in the facilities. So a new plant that was going to do gasification of asphaltenes would have a relatively low cost of capture, whereas some other plants have higher costs because of different design choices they've made.

I think a one-size-fits-all law is less plausible for oil sands. I'm not saying oil sands should be off the hook; I just think it's less plausible to have an absolute rule like that.

Mr. David McGuinty: Professor Keith, can you help us understand? You're an economist, if I recall—

Dr. David Keith: No. I'm partially appointed to the economics department, but I'm really a physicist by training. I publish in *Econ Journal Watch* sometimes, but I'm not an economist, in all honesty.

Mr. David McGuinty: I want to go back to one of the first points you made—I alluded to it moments ago—which is that the underlying technologies to proceed with CCS already exist. I think you said we should be using these tools; they're in the tool box, and they are one tool. As an adjunct member of the economics department and as a physicist, have you come across any analysis that compares, from an economic perspective, all the other shrink-wrapped technologies on the shelf right now, for example, that deal with conservation?

The Minister of Natural Resources is fond of saying that the best kilowatt hour, I think he talks about...I forget how he puts it; it's a slogan of some kind. I think what he alludes to is that the best we can do is move toward conserving consumption, as opposed to moving to generating more energy. Have you seen any analysis along those lines?

Canadians who are watching, listening, or reading these transcripts, would like to get a better sense of the best way to proceed. If the technologies are on the shelf for massive conservation, for example, and we're going to be using public dollars in one form or another through either tax credits or other incentives or direct contributions, are we in a position to draw a conclusion right now as to which way to go?

Dr. David Keith: That's a great question, and I wish I could do it justice. First, I'm going to make a minor comment in response to something I heard earlier. One of the speakers mentioned that they would double the cost of the plant and therefore double the cost for consumers. Of course, that's not true because there are costs due at distribution and transmission, so if I double the cost of the power plant, it only increases the cost to consumers by more like one-third.

On your big question, first to dodge it a bit, I work mostly on the electricity generation end of the system, so I'm more confident comparing future capture and storage of, say, wind or nuclear power. Those are the three big ones in the electricity world, and I think they're roughly comparable, with big uncertainties.

It's natural to assume that conservation would be cheaper, but the evidence for that is weak. There are plenty of analyses that do the kinds of comparisons you're asking for, but the quality of them is mixed, and the answers are all over the map, depending on who did it. It's important to be a little cautious about new energy-conserving technologies. Over the last 150 years, the introduction of new energy-conserving technologies has often increased energy demand, not decreased it.

When Watt invented the new steam engine that replaced the older Newcomen steam engine, it was three times more efficient. That increased coal demand; it didn't decrease it. The same has been true almost every step of the way. This is what the economists call feedbacks or rebound effects. The problem is if I introduce some technology that in principle might reduce energy use, such as a lighter weight car body, consumers may use it to make cars safer with the same energy consumption, or faster, or whatever.

An advantage to pushing on the production end of the energy system, whether it's through CO_2 capture and storage or nuclear or wind power, or what have you, is that you actually get both, because of these costs. Let's say we passed a law that made all new coal-fired power plants have CO_2 capture. There would be real costs, as we've been discussing, and those costs would inevitably be passed on to consumers. That would help to encourage conservation.

If it's really true that conservation is cheap, we'd find it out, because consumers would conserve in response to those costs. The advantage of pushing on the big end of the system, the production end, is that for certain you reduce the emissions, where you actually reduce them, and you also increase the cost, producing more efficiency improvements downstream.

● (1210)

The Chair: Good. Thank you very much.

We'll go on to Mr. Bigras, please.

[*Translation*]

Mr. Bernard Bigras (Rosemont—La Petite-Patrie, BQ): Thank you, Mr. Chairman.

My first question is for Mr. Keith, from the University of Calgary. I hope that the interpretation is coming through.

[*English*]

Dr. David Keith: I can hear you.

[*Translation*]

Mr. Bernard Bigras: I read the June 2006 report of the National Roundtable on the Environment and the Economy that said that, in order to ensure the proper establishment of CO2 capture and storage, three elements were essential: incentives, clear prices for CO2 emissions and a cap and trade system for CO2 emissions.

This afternoon, Mr. Keith, you have told us that in order to have the best chance of success, we need a clear regulatory system. You also emphasized the fact that it might be worthwhile to impose a carbon tax. Are you in favour of a carbon tax or of a cap and trade system for emissions?

[*English*]

Dr. David Keith: I think they can both work, so this is an issue. Both of them are a lot better than nothing, and to be fair, the current government has introduced something that is a lot better than nothing. The current government's new rules really would restrict emissions, although in fact they are not quite either of those two things. There are many mechanisms that you could use.

I favour a tax because of the extreme simplicity with which you can implement it. Cap and trade generally requires you to keep track of every facility's emissions, and there are a bunch of complexities that come with that, especially regarding new facilities, so this often gets kind of sloughed off.

If you look at the current rules—and it's no fault of the current government, since every government that tries to implement this sort of system has a problem—you have to deal with what happens to new facilities. The current rules do this common thing of demanding the best available technology. The fact is that's an excuse for lawyering—with no offence to lawyers in the room—because it's not objectively possible in the real world to know exactly what the best available technology is, especially for something complicated like oil sands. So basically it's an excuse for backroom negotiation.

The advantage of something like a tax is that because carbon is a conserved quantity in the economy, it's actually pretty easy to put a ring-fenced tax on the economy with very little extra overhead in terms of accounting systems. You're sure of one answer that you're going to get, so I favour a tax.

I'll say one more thing. In backroom conversations I've had with people in government, NGOs, and the oil companies, I routinely hear people agree with me that a tax is the best thing, but it's politically unsellable. I put it to you folks in the room who are politicians that if a lot of people in the backroom are agreeing that something makes sense, and they say that it's politically unsellable, we have to think about how to sell it.

[*Translation*]

Mr. Bernard Bigras: Thank you.

Mr. Chairman, we have two departments represented here before us: that of Natural Resources and that of the Environment. Your department, Ms. Preston, seems to favour capture and storage technology.

As for you, Mr. Tushingham, who are here representing the Department of the Environment, you are telling us to be careful because there is no international consensus in this area. You alluded to the London Conference under which certain things remain to be clarified with regard to two elements: namely monitoring and export for purposes of disposal.

Ms. Preston, would it not be too bold and risky to adopt fiscal incentives for businesses too quickly, without there yet being any clear international consensus nor clear international rules?

Are we not putting the cart before the horse?

● (1215)

[*English*]

Dr. Carolyn Preston: No, I don't believe we're putting the cart before the horse, because we have a lot of experience in managing this type of CO_2 storage in enhanced oil-recovery operations. There's been over 30 years of operating history in the United States and no serious accidents. So the risk is fairly minimal. What we are missing is regulations to govern the long-term aspect of the storage.

[*Translation*]

Mr. Bernard Bigras: What do you say to Mr. Tushingham when he states that, internationally, there are still rules to be clarified with regard to monitoring? For you, the absence of monitoring rules does not pose a grave risk?

[*English*]

Dr. Carolyn Preston: We're doing monitoring at the Weyburn and Midale fields—rather extensive monitoring—and we aren't detecting any leaks. That is, granted, over a relatively short period of time. But we are developing cost-effective, feasible monitoring technologies that I expect would be built into a risk management strategy.

Mr. Bill Reynen (Director, Science and Technology, Clean Electric Power Generation, Department of Natural Resources): One of the big issues around CO_2 capture and storage, about which there is a lot of discussion, is long-term storage as one of the factors in liability. But the other thing is the monitoring and measurement and verification that you're referring to. In a lot of the international discussions around this area, there's almost violent agreement between both the petroleum producers and the NGO community about the need for monitoring, measurement, and verification. The only difference between those two groups is how much monitoring and measurement is appropriate over the long term.

So it's widely recognized that for any regulatory regime for safe storage and appropriate site selection for CO_2 storage, you have to have effective monitoring, measurement, and verification measures in place. I think that's what Environment Canada is saying, that if we're going to proceed with this technology, we have to have appropriate monitoring technologies in place, but also the appropriate mitigation measures if there is such leakage. That's the big factor here.

With respect to the London Protocol, there's been an agreement now that storage in geological media in the sub-sea can be permitted. Right now, there's a series of meetings in the scientific community to develop guidelines for any company or any organization that wishes to store CO_2 in the geological media under the seabed.

[*Translation*]

Mr. Bernard Bigras: I have another question concerning the financial aspects. I believe it is Mr. Hassan, from NOVA Chemicals, who told us this morning that in the absence of financial incentives, there is at present not a good enough cash position to be able to invest in plant upgrades or the improvement of plants' environmental performance, and that the implementation of accelerated capital cost allowance measures, long term, for CO2 capture capital costs, would have a considerable impact on economic viability.

Have you done an evaluation of what the implementation of such a measure would involve in terms of public effort and in terms of government expenditures? Has an evaluation of what this type of measure would represent in terms of public effort been carried out by Natural Resources Canada or the private sector?

Secondly, I am somewhat surprised today to see that you have not come forward on the part of 30 small energy sector companies demanding, for the energy sector, an exemption from the new tax on income trusts.

Do you think that an exemption for the energy sector from this new tax announced in the latest Flaherty budget would give you the oxygen you need to put in place this new technology?

[*English*]

Mr. Grant Thomson: I can give a couple of comments around that.

In terms of what is required going forward, we at NOVA Chemicals would be very pleased to work with the government to figure out what would be required. As we go forward, there is still a lot of uncertainty as to what these projects are going to cost. You heard a lot of people talk here today about the amount of capital that is going to be required, but there's also a great deal of uncertainty.

So without understanding to a great degree what it's going to require to technically separate the combustion sources...and I don't disagree with David; there are technologies out there today that do work. But whether they're going to work on combustion sources, whether they're going to work at a cost that is economic—those are the types of questions we need to look at. As well, what does it cost to transport it and so on?

The point is that there's a lot of uncertainty, so it's hard to come here at this point and say here's exactly what we need. What we do say is that it's so capital intensive, certainly a first step would be to look at the capital cost allowance and accelerate that.

You also raised a question around the proposed regulations that are on the books right now. I have just a couple of comments around that.

One, I think the government has set very tough-to-achieve targets. They're probably tougher than what we were hoping to see three or four months ago. I think they've also set an aggressive timeline in terms of this policy. At the same time, they're trying to walk a tightrope, perhaps, balancing between improving the environment and at the same time trying to make sure the economic growth in this country continues.

My last comment is that I like the fact that there is within that bill a focus on technology, because I still believe that is going to be one of the keys to moving forward.

● (1220)

The Chair: Thank you.

We'll go on to Mr. Cullen, please.

Mr. Nathan Cullen (Skeena—Bulkley Valley, NDP): Thank you, Mr. Chair.

To Ms. Preston, what is the cost of storage at Weyburn for every tonne we put in the ground right now?

Dr. Carolyn Preston: I can't answer that question. Dave Hassan would have to answer that.

Mr. Dave Hassan: I can't really give you direct costs. The investments in the project total about $1.3 billion to store 30 million tonnes of CO_2. You could divide that and do the math.

The Weyburn project did receive some incentives to proceed. It had a reduced royalty rate from the Province of Saskatchewan, 1% of gross royalties until the project paid out and then 20% of net revenue after.

Mr. Nathan Cullen: Just as a general comparison to what CO_2 costs on the emissions trading market right now in Europe, does it compare favourably in Weyburn?

Mr. Dave Hassan: The price at Weyburn is quite favourable in terms of industrial sources. It's comparable to the prices that enhanced oil recovery operators in the U.S. pay for CO_2.

Mr. Nathan Cullen: That wasn't my question. My question was with regard to the traded tonne per unit of carbon in the European trading system right now, which is somewhere in the $30 range, depending on the day. How does Weyburn compare to that?

Mr. Dave Hassan: Weyburn compares favourably to that.

Mr. Nathan Cullen: That's interesting, because we have research here that says it's about $60 a tonne for most carbon capture and sequestration models in the world right now. Weyburn's doing it at half the cost?

Mr. Dave Hassan: As I think I mentioned earlier, the Weyburn project took advantage of an existing purer CO_2 stream, so we didn't have to do that capture component that's at $25 to $50 a tonne. Essentially, all we had to do was pay for compression of pipeline to bring the CO_2 from North Dakota to Weyburn.

Mr. Nathan Cullen: How much CO_2 per tonne is created through the storage process? How much are we emitting, in terms of energy intensity, to store a tonne of carbon?

Mr. Dave Hassan: So the extra energy involved with compressing the CO_2?

We estimate that it's about a third of the total CO_2 stored.

Mr. Nathan Cullen: Then for every unit we put into the ground, another third is produced in the production process.

Mr. Dave Hassan: Yes. You reduce the efficiency of storage by roughly a third.

Mr. Nathan Cullen: Okay. It's just important for us to know the full cost accounting, I suppose, of how much is actually being put in the ground versus how much total net is being saved from going into the atmosphere. I couldn't see those numbers in your brief, but they're important for us to understand as we talk about these policy options.

To Dr. Keith, have we any concept of what a tonne of carbon dioxide costs in this country right now—or will cost in the next few years?

Dr. David Keith: Lots of people have concepts. All sorts of people in downtown Calgary have their own models. I don't know very well. I think it really depends on the details of the government's plans.

I'm sorry to dodge that question. My amount of uncertainty would be pretty big.

I'll say this. If you really wanted to reduce emissions to bring them back down to current emission levels in five years, which I believe is what the government said they would do, if I recall correctly, I think the sorts of carbon prices necessary to achieve that would be very high, over $100 a tonne of carbon, $100 a tonne of CO_2, that kind of number.

● (1225)

Mr. Nathan Cullen: Interesting.

I have two questions for Mr. Thomson in terms of the way you folks do your process.

First, when I was looking at your deck, I had some confusion. There was the ability of you folks in terms of processing the fuel, that 90% of the carbon emissions you produce are from the flue gas. That part, you're not able to capture carbon from. It's the 10% component.

Mr. Grant Thomson: Yes. What we capture is the CO_2 that is part of the ethane feedstock. The ethane feedstock is actually what we use to make the ethylene. So we extract the ethane out of the natural gas stream. The ethane actually naturally attracts CO_2, so we do end up with, not a large stream, but about 4% of that stream is CO_2. It is relatively straightforward technology to extract the CO_2 out of the ethane. So basically the way I would put it is that we've done the easiest first.

The flue gas, which is what comes out of our actual plant production, is much more difficult, because that becomes a combination. It's probably, in round numbers, 10% CO_2 and 80% nitrogen. There's water in there, there's oxygen in there, etc. So it's much more difficult, and that's where I'm saying I still think we need some work to figure out how to economically separate that stream.

Mr. Nathan Cullen: So when you folks are looking at the economics, what do you assume the price of carbon to be this year or in the next few years? What's the price per tonne?

Mr. Mark Lesky (Director, Environment, NOVA Chemicals Corporation): We've been assuming the $15- to $25-per-tonne type of number, which we've been talking about. The federal government has put forward $15 to $20 to $25 a tonne. There are a number of different places where you can purchase credits in that type of range.

When we talk about sequestering, capturing the CO_2 from the flue gas, the costs are much further north, the $50 type of number. The technology isn't clear at this point in time. So very quickly we would be looking to alternatives rather than capturing the CO_2 from the flue gas.

Mr. Nathan Cullen: Thank you for that.

I have a policy question for Mr. Thomson. You talked about the capital-intensive nature of this exercise. I'm confused as to why the government would pay anything to assist in the creation of this system, either the pipelines or the R and D. I mean no offence by this but only bearing in mind, in the public eye—and I think Dr. Keith hit a bit on this—when I talk to my voters and say we're going to pay for elements of the carbon capture and sequestration system on behalf of the oil and gas sector, my constituents don't understand that, at $60 to $80 a barrel.

Mr. Grant Thomson: Understood. One of the things I did talk about in my 10-minute presentation, though, is that I think there are numerous benefits. This is not just something where you came in and chose to help NOVA Chemicals with a project. This is not something that just NOVA Chemicals benefits from, or the oil company that may be choosing to do the enhanced oil recovery. Those benefits that I talked about, and I think what you could tell your constituents, are that investing in technology like this, investing in capital and projects like this, means the technology is going to be transferable; it's going to be able to be used in many different industries. The transferable nature of this means it benefits all Canadians.

Mr. Nathan Cullen: But why subsidize that technology development if there's benefit to the industry itself to go out and sell that technology abroad?

Is it not government's job to try to assign, or incorporate, or internalize the cost of this pollution—which we're now calling pollution—into the business decisions that you folks make and the upstream sector makes, rather than subsidize it?

Nowhere in your bottom line is there any factor for CO_2 right now, and EnCana would be the same. There's nowhere to look at the spreadsheets and find out what it's costing the companies right now, because there is no cost to it in Canada.

Maybe I'll direct my question to Dr. Keith and come back to you in a second.

With intensity-based targets, I'm trying to understand how it is that companies are going to make those capital investments not knowing what the cost of business is. Can you explain why companies are going to shell out hundreds of millions of dollars if they don't know what a tonne of CO_2 actually costs?

Dr. David Keith: There are a couple of answers. First, we certainly have to have technology pull and push. The pull is provided by a market price on carbon, a disincentive to emit carbon to the atmosphere, which is an incentive to spend money to reduce emissions. But we also need to provide some kind of R and D push to move things along.

Yes, one of the reasons I'm in favour of a tax is that it's less uncertain what the tax rate is. If you look at the European cap and trade system, one of the issues with it has been the extreme volatility of the cap and trade market, which is introduced by the politics of different countries adjusting where they set their set points. That uncertainty has made the European system remarkably ineffective in incenting major capital investments.

That said, that's maybe the economist side of me speaking, saying put on a tax and let industry do everything.

Let me say something different. Canada is a small country. To compete successfully in this big world I think we need to make some choices. We cannot do everything. There was real leadership in Canada in CO_2 capture and storage, and with all respect to Carolyn Preston, I don't believe we have it any more. You look at the projects that are being announced around the world. I wish I could say we do, but I don't think that's a correct statement of where the current lie of the land is.

I think Canada cannot do everything. We can't do tidal and wind and nuclear power and various advanced efficiency things and win them all. And we will have to make some choices about what we're going to do, which are beyond the level of a single company.

● (1230)

Mr. Nathan Cullen: I have a quick question around the monitoring acts, and this is for Mr. Reynen. I'm looking at an IEA report. What is the length of time required in terms of monitoring to be certain this is a viable system? They talk about 7,000 years. This is not exactly a left-wing organization. These folks are pretty conservative in their outlook on energy.

If they're saying that an acceptable level to limit risk is that we need to monitor some thousands of years into the future, if we monitor for 50 years and then it starts leaking and we've gone away and gone on to something else and it leaks for the next little while.... The scale and scope you folks have been talking about is absolutely enormous. Are we not running the risk of putting all our eggs in one basket if we're not willing to monitor nearly in perpetuity?

Mr. Bill Reynen: It's a huge question that comes up time and time again as to the long-term liability of storage of CO_2, and how long is long enough.

Mr. Nathan Cullen: Whose liability would it be?

Mr. Bill Reynen: The general consensus is that it would be the long-term responsibility of governments because governments endure and industry comes and goes.

In Alberta, for instance, an orphan fund has been established for abandonment of oil and gas wells. And something similar has been suggested for any sort of CO_2 storage project, that there would be a certain cost per tonne stored that governments would maintain for use in long-term monitoring and mitigation of any potential leaks.

Mr. Nathan Cullen: By long-term, do you mean perpetuity? I wonder what you mean by that.

Mr. Bill Reynen: No. This comes to the question of how long is long enough.

Right now we're facing a climate change challenge because of the higher degree of CO_2 going into the atmosphere. Let's say in 200 or 300 years we've established technologies that provide a balance between our CO_2 emissions and what the earth can absorb, and our CO_2 levels decrease in the atmosphere. There's nothing wrong with the CO_2 we're putting away now leaking in the future. It's just that we have to be in balance in nature with our CO_2 emissions and what the earth can take on.

Some people have suggested that, yes, we have to monitor this for 10,000 years. Our civilizations haven't even lasted that long, so far. I think the more common thinking is perhaps 500 to 600 years when we are more in balance with our CO_2 levels within the atmosphere.

● (1235)

Mr. Nathan Cullen: To stop it.

Mr. Bill Reynen: Yes.

Also, most of the media we're talking about into which we inject CO_2...a lot of it is depleted oil and gas reservoirs or saline aquifers. In the case of oil and gas reservoirs, this is rock. This has contained oil and gas for periods of 50 million to 200 million years. So the idea of it leaking.... I think a lot of people visualize oil and gas being in pools. This oil and gas is ingrained in rock, so the idea of having a catastrophic leak or the idea of it coming out very suddenly or in large quantities is fairly remote. That's not to say there are no risks, but we also have the technology to mitigate any of these emissions, so it's a fairly safe enterprise.

And in terms of the period and the extent of monitoring, that's a matter of discussion. It might require intense monitoring in the short term. There are tools in place to see where the CO_2 is going, and once we get to a comfort level that the CO_2 is staying where we expect it to stay, then the monitoring intervals can decrease until such time as you can put passive monitoring in place in the long term and have comfort with that.

Dr. David Keith: I'd like a very quick follow-up.

The Chair: Can we just carry on? We're considerably over time with Mr. Cullen. I'd like to go on to Mr. Warawa, and hopefully you can get your answer in during this next round.

Mr. Warawa and Mr. Harvey are next, I believe.

Mr. Mark Warawa (Langley, CPC): Thank you, Chair. Please cut me off at five minutes so that I don't cut into Mr. Harvey's time. I've done that before, and I don't want to do it today.

I want to really thank you, Chair. We're talking about solutions today, and I want to thank each of the witnesses who are here today. It's refreshing to have the environment committee working together, looking for what is realistic by way of solutions and learning what the options are for our government. This is a very refreshing day, at least from my perspective.

I'd like to ask some more about the costs. I believe it was Mr. Hassan who was mentioning the costs. For new facilities—the Weyburn example—it was approximately $1 to $2 per 100 kilometres of pipeline per tonne, and then injection was also about $2 per tonne of carbon. Are those the correct dollar amounts?

Mr. Dave Hassan: I'm quoting a study that was done by the International Energy Agency in 2003. They estimated transport costs at $1 to $5 U.S. per tonne per 100 kilometres, and $1 to $2 U.S. per tonne for the injection part of it. The big part of the cost is the capture part, getting the concentrated CO_2; that's the $25 to $50 a tonne cost.

Mr. Mark Warawa: So it really depends on how far the carbon dioxide has to be transported through the pipeline and where it's going to be going. The example we have in the studies and reports I've read say that British Columbia, Alberta, and Saskatchewan are an ideal area.

But as we consider carbon capture and storage as one of the many tools to deal with climate change in Canada, and Dr. Keith talked about that, how feasible is that technology for other parts of Canada, and what happens to the cost if we do not have geological formations to be able to store it deep underground?

Take Ontario, for example. If we require carbon capture and storage.... We have coal-fired generating plants in Ontario that need to be shut down and replaced, and that's the debate. If the new plants are required to have carbon capture and storage, which I believe is a good suggestion, how does it work out? What are the costs now that we have to build that infrastructure in new plants and capture it?

What happens to the costs, then, when we're moving away from B.C., Alberta, and Saskatchewan into Ontario? Do you have any idea?

The Chair: Go ahead. That's for Malcolm Wilson, I think.

Prof. Malcolm Wilson: We have looked at the Ontario situation, and you're absolutely right: the opportunities for geological storage in Ontario are very limited at best. However, there are opportunities south of the border, so if we could reverse the situation that exists in going from North Dakota to Saskatchewan, we could look at probably 300 to 400 kilometres of pipeline going down into the MIchigan basin, with large potential storage opportunities in that basin.

So it's not a case of shipping Ontario's carbon dioxide across to Alberta or Saskatchewan, or across to the offshore sub-sea sediments on the east coast. It would actually be looking at the opportunity south of the border and moving the CO_2 down there.

The Chair: Mr. Hassan, I believe you had a comment, did you?

● (1240)

Mr. Dave Hassan: No, actually, I was going to say that the Alberta Geological Survey, Stefan Bachu, has done an inventory of carbon capture and storage options all through Canada and has worked with the U.S. Department of Energy on a North American study, which was just released by the Department of Energy. You'll find storage estimates in there, and it will confirm what Malcolm has said.

Dr. David Keith: When businesses actually look and have money on the table to do a storage project, they often find opportunities. I'm personally working with a business in Ontario that has found them, so there may be more in Ontario than you think.

The Chair: Great. Thank you.

We'll go on to Mr. Harvey.

[*Translation*]

Mr. Luc Harvey (Louis-Hébert, CPC): I only have five minutes. I will move right away to my last question: how much should a ton of CO_2 cost on the market? I am giving you four minutes to think about this.

Mr. Thomson, you carried out a project that allowed you to capture 150 kilotons of CO_2. What distance did you have to cover, in kilometres, between the point of emission and the point of capture?

[*English*]

Mr. Grant Thomson: We gather and capture the CO_2 right at our Joffre facility. The ethane is piped from our extraction plants, which are in a number of different places in Alberta. Joffre basically sits right on top of the western sedimentary basin, so to go from Joffre to the Viking pool we have with Penn West, it is basically right underneath us. So we had build pipelines over a very short distance. That's one of the reasons why the economics worked.

[*Translation*]

Mr. Luc Harvey: How much time is required to build these facilities and put them into operation?

[*English*]

Mr. Mark Lesky: The time it took to negotiate the agreements was longer than the time it took to put the facilities in place. We're talking about a year to put the facilities in place, whereas sometimes the negotiations of the agreement take several years, if not longer.

[*Translation*]

Mr. Luc Harvey: Mr. Hassan, you stated that you carried out a $1.3 billion project to treat 30 million tons. I made a quick calculation, and the result I get is $43 a ton. That is just for capture and none of the previous elements.

How much does the part preceding the work that you did cost?

[*English*]

Mr. Dave Hassan: The $1.3 billion investment is not just for capture; it's for an enhanced oil recovery operation. With that $1.3 billion we'll be recovering an extra 155 million barrels of oil, so that will help offset the cost. A lot of the cost is related to oil production facilities, but during that process we will store 30 million tonnes of CO_2.

[*Translation*]

Mr. Luc Harvey: We know that gases have a tendency to dissolve in water. Is the same for CO_2? Does it tend to dissolve in water?

[*English*]

Mr. Dave Hassan: Yes, CO_2 dissolves in water. In fact, many of us have a favourite carbonated beverage that contains CO_2 dissolved in water, and when you open the cap on the bottle, those bubbles of CO_2 come out. At the IEA Weyburn project the researchers concluded that the pressure from the CO_2 that's injected into an oil and gas reservoir will dissipate within about 100 years—the excess injection pressure that's required to push the CO_2 in there. The CO_2 will dissolve in oil and in water, and some of it will actually carbonate and turn into minerals. So that enhances the security of the storage. You don't just have a big bubble of gas sitting underground.

[*Translation*]

Mr. Luc Harvey: Quickly, Mr. Knight, how much in taxes should a ton of CO_2 cost?

[*English*]

Mr. Simon Knight: How much should it cost ?

[*Translation*]

Mr. Luc Harvey: How much should it cost?

[*English*]

Mr. Simon Knight: You're asking a professional whose job is to reduce climate change effects on the planet. I think carbon should be as cheap as we could afford it to be.

It is, in Alberta, likely going to be set around $15 a tonne, because the technology fund that is in place now, with legislation coming forward, is not going to be enough to do carbon capture and storage. That's why we need to look to the respective governments and the companies and industry involved to invest heavily in carbon capture and storage. At $15 a tonne you're not going to get major CCS projects, especially along geological sequestration lines.

I just want to leave a couple of points, since you've mentioned my name.

First, carbon capture and storage is one of the tools we need. Energy efficiency is just as important—David and I have had numerous discussions around this—but carbon capture and storage is one of the major tools we need in the future. The cost will come down as we make major investments in this, especially in how we capture. There are multiple streams of R and D going on concerning how to capture CO_2 at less cost than we're doing it currently.

I also think we have to consider that the CO_2 that's being produced is not always where you want it. When you're producing it in the oil sands.... We're not talking about storage in central Alberta—not where the oil sands are located—but about a large backbone moving CO_2 from Fort McMurray down into central Alberta.

That is a place the government should be investing its money, because it is costly. It is something we know how to do very well, very quickly. If there's nothing else in Alberta we know how to do, we know how to drill and how to build pipelines, but it has to be done where we need it. If it is for enhanced oil recovery or enhanced gas recovery, there is an opportunity to recover costs. But if it's straight geological sequestration, I believe that is an area where governments need to be investing.

Thank you.

● (1245)

The Chair: Thank you very much.

We'll now go to our second round. I'd ask members to be really tight on this to get the maximum number in.

Mr. Regan.

Hon. Geoff Regan (Halifax West, Lib.): Thank you very much.

When Mr. Knight talks about the capacity for storage not being where you want it, I think of my own province of Nova Scotia, which may face some challenges in this regard. We obviously have great production of coal-produced electricity, and we've heard today there is some capacity offshore in sub-sea reservoirs where there is now gas being produced, and perhaps elsewhere in saline deposits. But it is something that concerns me.

I want to turn to another point. You mentioned that $15 is not enough. I don't know whether others agree with that, but let me put forward a scenario and get your reaction, particularly those from industry, on how this would work.

If you put an absolute price on carbon levels above a certain point and said that if you were above that point you'd pay a certain amount into a fund and could get it back if you actually had projects that would reduce your carbon production, and we'd also give you an accelerated capital cost allowance and place a price on carbon of around $30, as opposed to $15, for example, what would you see as the advantages and disadvantages of that kind of system?

I want to ask the people here from industry.

Mr. Mark Lesky: Let me simply take one point or part of the question. When we start talking about a $30 or a $15 or a $50 cost per tonne, we are starting to talk about impacts upon the competitiveness of the chemical industry specifically. Our competition now is more and more becoming competition from India, China, clearly the United States. Europe is clearly there, and they are looking at this process, but much of our competition is global, and it's the global market we're competing in. As we start pushing up the cost of a tonne, anything above $15 starts significantly impacting our competitiveness on a global scale.

Hon. Geoff Regan: Does someone else have a comment? Mr. Thomson, Mr. Knight? Nobody else wants to talk about this?

Dr. Keith, would you like to comment on this?

Dr. David Keith: Obviously, it depends what our competitors do. If Canada were the only place in the world acting, it might well be that prices much above $15 would affect competitiveness. But the fact is other countries are acting and may act soon. Right now, my expectation is that the U.S. will end up with higher carbon prices than we have, given the current pace.

It is also important to say that it is very rare to see companies actually move because of environmental constraints. Companies choose locations based on labour costs, access to raw materials, etc., and despite the talk, you don't very often see companies really move because of environmental regulations.

Hon. Geoff Regan: Well, it strikes me that the public is becoming more and more concerned about this, and we're seeing more and more evidence that the problem is one that we have to face and that the world has to face. So we have to be cognizant of these concerns of competitiveness, obviously, because people want to have jobs and a strong economy, yet we also have to face, as a planet, this very difficult challenge, which is one of the reasons why we have you here today to help us figure out some of these solutions.

There are tonnes of questions here that come to mind. One of them is about the kinds of reservoirs that are suitable. I mentioned that I'm from Nova Scotia, and it sounds like the best reservoirs are in the west, that there's not much opportunity for sequestration, relatively speaking, east of Manitoba.

● (1250)

Dr. David Keith: No, offshore Nova Scotia looks good.

Hon. Geoff Regan: Does it? Well, that's good to hear.

Is that a high cost, relatively?

Mr. Simon Knight: The problem right now I think is that there is high potential, both on the Atlantic shelf and the Gulf of St. Lawrence, but we just haven't done enough exploration to determine what is that potential at this point. The western Canadian sedimentary basin has had a lot of exploration done on it, and they have a very good understanding of what the potential is for that. What the potential is around Nova Scotia requires a lot more research. But you do have a lot of deep coal that could be used for storage as well.

Hon. Geoff Regan: Good. I have half a minute?

Are the current policies sufficient to spur development? I really wanted to ask about what kinds of incentives in particular would work. I guess we have a few seconds for someone to offer an answer to that.

Mr. Mark Lesky: I'm just going to share a couple of key thoughts. One of them is research in terms of efficient membrane technology associated with stripping CO_2 out of the flue gas and concentrating it. That's a type of work that needs to be done. It is breakthrough technology. It's technology that the Dutch and some Canadian companies are involved in. But we need to find a cost-effective method of capturing combustion, flue gas, CO_2.

Mr. Simon Knight: I think one of the things that David had talked about was that we could already capture CO_2. We need a lot more deployment, so that we're talking about R and D on the large scale. So I think one of the places that we are talking about investment or incentive is on that large-scale deployment initiative, and that is putting a backbone out there to move that CO_2 where you need it, and looking at how we can subsidize that or incent that. It may require at some point that the various levels of government just decide they're going to be an investor in that pipeline, and we'll look down the road to whether they can get a return on that direct investment as the CO_2 gets used for enhanced oil and enhanced gas and coal-bed methane.

Dr. David Keith: I can't speak for the national task force, but I think it's fair to say that there is a legitimate argument...you may want a pipeline in the long run, but the other choice is point-and-shoot projects near Fort Saskatchewan or Lake Wabamun near Edmonton. So one should not fall into the trap of thinking that you must have the pipeline network in order to get very large projects going.

The Chair: We will go to Mr. Vellacott now, please.

Mr. Maurice Vellacott (Saskatoon—Wanuskewin, CPC): I'd like to get a quick answer from everybody, from our witnesses, aside from department people. Simon already mentioned...I think you said you thought $15 per tonne was what the cost for carbon should be. Can the others give me some quick idea of what you think the price per tonne of carbon should be?

I think, Simon, you were saying $15.

Mr. Simon Knight: I think $15 is the minimum.

Mr. Grant Thomson: My response would be that I think $15 is going to incent the right behaviours within industry. I've already talked about the fact that there is a lot of uncertainty, as we sit here today, as to what some of these capture projects are going to cost in total. So it's hard to know what types of incentives we need to look at beyond, for other parts of the projects. But in terms of the $15, I do believe that's going to incent the right behaviours.

Mr. Maurice Vellacott: Mark.

Mr. Mark Lesky: I think the $15. I'd just put one concern forward, and that is the competitive nature of it. What we really do need to have is a strong, healthy industry. We've seen before that with a strong industry, high capital turnover, we're then able to achieve substantial environmental performance. So it's the focus on capital turnover that drives environmental performance, and we've seen it over the last 15 or 20 years.

Mr. Dave Hassan: I think EnCana has generally been planning around the $15-a-tonne cost. That's the scenario we're using.

● (1255)

Dr. David Keith: I think it's unlikely, highly unlikely, that $15 a tonne will achieve the level of emissions reductions we need to achieve in order to avoid a dangerous disturbance to the climate system. I'm not aware of any serious study that says that.

That said, the comments that have been made about competitiveness really do matter. The answer has to be contingent on what our big competitor to the south does. If I were the czar of climate policy, I would continuously push just a little bit ahead of where the U.S. pushes.

In the end, we're going to need costs more like $50-a-tonne CO_2, but I wouldn't just impose them instantly, because then there would be hideous implications for competitiveness. You do have to tie it to what other major competitors are doing.

Mr. Maurice Vellacott: Malcolm, do you have any comments?

Prof. Malcolm Wilson: Take a situation like SaskPower, which is building. If we have a cost of $15, that would reduce the net cost they have to achieve in order to achieve price neutrality if they're selling their CO_2 for enhanced oil recovery. As people say, it will incent in the right direction, but as David says, ultimately it's certainly nowhere near enough to go to less geological storage.

Mr. Maurice Vellacott: Okay.

I have a couple of minutes yet, and I'd appreciate responses on this one from as many as possible.

This is with regard to the whole issue of whose jurisdiction carbon sequestration falls under. Is it federal or provincial? Is there a municipal component here as well? Where does it primarily break out in terms of the jurisdiction of carbon sequestration?

Mr. Mark Lesky: If I could, I'd appreciate taking first crack at that question.

From my perspective, the permitting structure within the provinces is a very clear location for managing these issues. The federal government has the responsibility to set the policy direction, but the structure is currently available within the provinces.

I would prefer to operate under the single window type of approach. I'd be looking to the provinces with their current structure to take the lead on the permitting and regulatory side on this.

Mr. Maurice Vellacott: Simon or Grant, do you want to respond?

Mr. Grant Thomson: I would agree with Mark's comments.

Mr. Simon Knight: I think maybe you're asking two things here. First, who has the regulatory responsibility? That's the provinces. Two, who has the moral responsibility for reducing greenhouse gas emissions in the country? I don't think you can say that belongs with one single jurisdiction. That's why I'm suggesting that work on moving this technology forward is going to be required from all levels of government.

Dr. David Keith: Part of the problem here is that you regulate two things. Local safety regulation is, and I think should be, handled by the provinces and even municipalities, on levels of siting. But national regulations are needed, in concert with the provinces, to manage emissions to the atmosphere.

Prof. Malcolm Wilson: I would agree with David on that one.

The Chair: Mr. Vellacott, you have 10 seconds.

Mr. Maurice Vellacott: Mark, Simon, Dave, same question. I just want to know your sense of this.

And "jurisdiction" is the term I'm using; I'm avoiding...and kind of bridging here.

Mr. Dave Hassan: I would agree with Mark. The provincial regulations in place in Alberta and Saskatchewan, and with which I'm familiar, are very competent, very sound in terms of regulating the oil and gas industry, which includes injection of CO_2. I think those regulations are sound. They could regulate the actual storage operation.

The Chair: We have a couple of minutes.

Monsieur Lussier, please.

[*Translation*]

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

Mr. Hassan, how many people are served by the 180 square kilometre Weyburn oil field?

[*English*]

Mr. Dave Hassan: Weyburn is a town of around 10,000 people. That area is primarily agricultural, such as ranching and grain. We employ about 120 people working on the project directly.

[*Translation*]

Mr. Marcel Lussier: Does the public participate in the decision-making or the impact studies regarding these projects?

[*English*]

Mr. Dave Hassan: Yes. Before the project was launched, as part of the provincial regulatory process, there was an extensive public review and public consultation process.

[*Translation*]

Mr. Marcel Lussier: Who is responsible for informing the public of any dangers involving the wells? Is this the responsibility of departments, of pressure groups, of the industry?

● (1300)

[*English*]

Mr. Dave Hassan: The communication about the project is a joint responsibility between the operator, EnCana, and the provincial regulatory authority, Saskatchewan Industry and Resources.

[*Translation*]

Mr. Marcel Lussier: Mr. Knight, would you agree?

[*English*]

Mr. Simon Knight: Yes, it's in Saskatchewan, so it's in a separate jurisdiction from Alberta, but I understand that's the reporting structure.

[*Translation*]

Mr. Marcel Lussier: Are the Environment or the Natural Resources Departments responsible for informing the public?

[*English*]

Mr. Bill Reynen: Yes, we do. We see that it's important to have an open and transparent process in assessing this technology. And we do support studies in terms of public surveys and try to develop information and make it available to the public.

[*Translation*]

Mr. Marcel Lussier: Have you intervened with regard to the Weyburn project? Have you sent out teams to inform the public?

[*English*]

Mr. Bill Reynen: Not the Weyburn project, no. It's not project specific, but just technology in general.

The Chair: Thank you, Mr. Lussier.

I certainly would like to thank our guests. This reminded me of about 30 years ago, sitting at the oil sands hearings before there were oil sands and hearing that the costs would be $30 barrel, that it would be uneconomical, that it couldn't happen, and so on. I think we're maybe hearing about how, with the development of technology, things can improve.

So I want to thank all of you. Thank you to our two witnesses who were on the phones, and thank you, members.

The meeting is adjourned.

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