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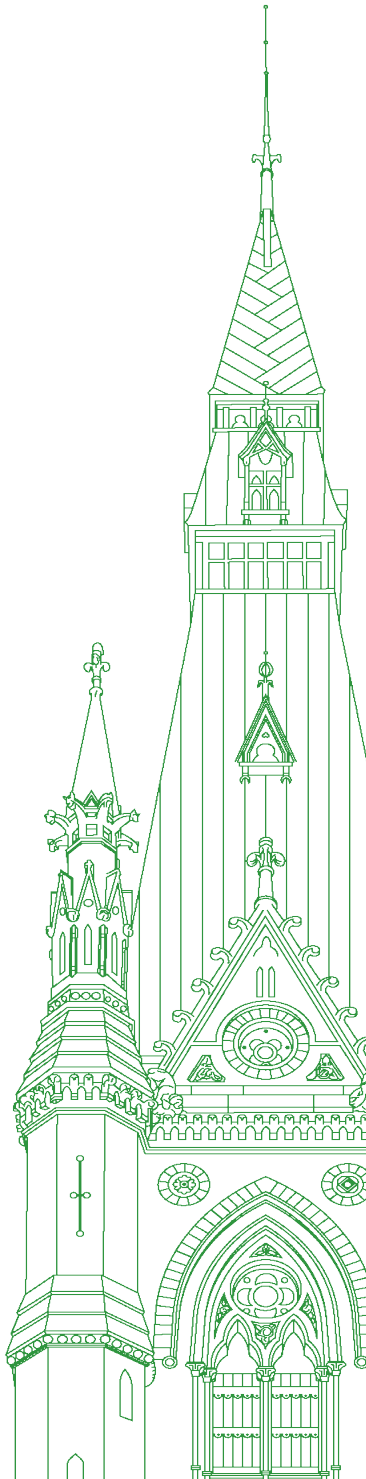

Chair: Mr. James Maloney

Standing Committee on Natural Resources

Friday, June 18, 2021

● (1300)

[*English*]

The Chair (Mr. James Maloney (Etobicoke—Lakeshore, Lib.)): I call the meeting to order. Welcome to meeting number 34 of the Standing Committee on Natural Resources.

Thank you to everybody for not just being on time, but early. We can get under way.

We have four witnesses joining us today: Clean Energy Canada, represented by Dr. Mark Zacharias; Navius Research Inc., represented by Michael Wolinetz; S&T Squared Consultants Inc., represented by Don O'Connor; and the Pembina Institute, represented by Bora Plumptre.

Of course, we have Mr. Longfield appearing today, replacing Mr. Serré.

Mr. Longfield, thank you for joining us today.

A special thanks to all of our witnesses. Some of you might have done this before, but in case you haven't, the process is that each witness group will be given up to five minutes, with an emphasis on “up to”, to make opening remarks. After all of the witnesses have finished their opening remarks, I'll turn the floor over to committee members who will then be asking questions.

You have all tested your headsets and your sound devices. You have translation services available to you. You're encouraged and welcome to speak in either official language. You will be asked questions in both languages.

On that note, thank you again for coming.

I'll start with Clean Energy Canada. Dr. Zacharias.

Dr. Mark Zacharias (Special Advisor, Clean Energy Canada): Good afternoon, Mr. Chair, and members of the committee.

My name is Mark Zacharias, and I am a special adviser to Clean Energy Canada, a climate and clean energy think tank at Simon Fraser University. I am based in Victoria, British Columbia.

I will be speaking today on how Canada can position itself to become a clean hydrogen leader through growing domestic supply and demand, which will in turn set Canada up as a clean hydrogen exporter.

Canada is already a top-10 global hydrogen producer. However, nearly all of Canada's hydrogen is produced from natural gas, whereby carbon dioxide is allowed to escape into the atmosphere, where it contributes to global warming. This form of hydrogen production is termed “grey hydrogen”. Current emissions from global industrial hydrogen production, used mostly in refineries and the fertilizer industry, amount to 830 million tonnes of carbon dioxide per year. For comparison, Canada's entire economy emits just over 700 million tonnes annually.

In contrast, clean hydrogen is produced without, or with very few, greenhouse gas emissions, and is made in two different ways. Green hydrogen is produced from zero-emission electricity, using electrolysis. Blue hydrogen is made from natural gas, in conjunction with carbon capture and storage. Both green and blue hydrogen are valid climate solutions, and Canada is well-positioned to produce both types at scale.

Clean hydrogen has a number of unique advantages as a climate solution, particularly in sectors that are the most difficult to decarbonize and where alternatives are limited. These are often referred to as the “toughest third of emissions”. These include trucking, shipping, and the production of steel, cement and fertilizer.

Canada is among a small group of countries with the highest potential for exporting clean hydrogen, thanks to an electricity grid that is currently 83% non-emitting; sufficient access to fresh water, which is required for electrolysis; as well as abundant natural gas resources.

The International Energy Agency cites “a growing international consensus that clean hydrogen will play a key role in the world’s transition to a sustainable energy future”. BloombergNEF, meanwhile, estimates that clean hydrogen could meet up to nearly a quarter of the world's energy demand by 2050.

Canada is in the game, and last week's announcement by Air Products Canada of a $1.3 billion investment in a blue hydrogen energy complex in Alberta is an excellent start. However, Canada's long-term hydrogen advantage is most likely not production from natural gas but from zero-emission electricity. The cost of producing green hydrogen is projected to be on par with blue as early as 2030, and cheaper thereafter. Green hydrogen is expected to be cheaper than natural gas by 2050. Canada's ability to generate abundant and low-cost renewable energy is a significant competitive advantage.

What must Canada do to seize the hydrogen advantage?

First, it must replace fossil fuels with new hydrogen-based applications, particularly in sectors that are the most difficult to decarbonize and where alternatives are limited. Steel and cement manufacturing are excellent examples where hydrogen can replace fossil fuels.

Second, use clean hydrogen to decarbonize natural gas utilities, which are increasingly setting targets or facing regulations requiring that they blend increasing amounts of renewable gases, which could include biomethane and hydrogen. Currently, up to 15% to 20% of the blend can be hydrogen, with little modification to existing pipeline systems and domestic appliances.

Third, reduce the emissions intensity of current grey hydrogen production by making it blue through carbon capture and storage, or by replacing it with green hydrogen.

Fourth, use hydrogen to store energy. As we decarbonize our energy systems using variable sources of electricity, there is a growing need to store this clean energy for use during all hours of the day, and this is something hydrogen can be used for.

To summarize, Canada has tremendous opportunities to build and participate in the hydrogen economy.

Thank you for the invitation to speak today. I look forward to your questions.

● (1305)

The Chair: There are two things. First, thank you very much. Second, my apologies for mispronouncing your name.

I'll move on to our next witness, from Navius Research.

Again, I'm hesitant to try to pronounce your name because I'll probably get it wrong as well.

Mr. Michael Wolinetz (Partner and Senior Analyst, Navius Research Inc.): There we go. I thought you'd have another go at a tricky last name.

My name is Michael Wolinetz. I am a partner, senior analyst and consultant with Navius Research. We are a Vancouver-based energy and economic consultancy. Our work primarily involves producing forward-looking analyses where we simulate how government policy, technology and energy markets and costs will affect greenhouse gas emissions and the economy in general. Our work spans all sectors of the economy, all energy consumption, all emissions sources and all potential greenhouse gas abatement actions.

I'll be speaking somewhat more briefly, focusing more on the renewable and biofuels side of things. I think there is significant opportunity for renewable low-carbon biofuels in Canada. To get there, it's critical to have policies that create long-term and durable signals for the consumption of these low-carbon and renewable fuels. In order to get to some meaningful level of production, there needs to be very large investments. These will only happen if they can be significantly de-risked by ensuring that there will be some market for the product being produced.

In terms of the cost and benefits of these fuels, our work consistently shows us that these fuels will cost more than conventional fossil fuels, but the benefit is that there are new sectors and commodities that create new economic development jobs in Canada, and there are significant opportunities to reduce greenhouse gas emissions.

Regarding economic activity and job creation, if we're focusing on the biofuels side of things, there is significant potential for job creation, especially in rural parts of Canada, as it may involve additional collection of forestry harvest residues or agricultural residues, as well as processing within the rural areas. That being said, from this specific green economy sector, we see a lot of jobs but not such a quantity that it would completely offset the jobs related to the current conventional fossil fuel industries.

Regarding the potential for net reduction in Canada's greenhouse gas emissions, there's substantial abatement potential from low-carbon renewable fuels, especially when we're talking about advanced biofuels produced from woody or grassy feedstocks. That being said, it's not a silver bullet. We're talking about a silver buckshot approach here, so it will have to have to occur in conjunction with numerous other abatement opportunities. That would include electrification and energy efficiency as well as other low-carbon fuels like hydrogen.

We see a pretty healthy niche that could be occupied by biofuels. We do a lot of work now forecasting how Canada's economy and energy system evolves when meeting legislated and announced targets, as well as it how it evolves as we trend towards a net-zero-emissions future. We see a persistent and ongoing demand for energy-dense fuels that could be used, notably for transportation like trucking, marine and aviation, as well as in industry.

Biofuels, notably those produced from residues that could be sustainable and also give a real greenhouse gas reduction, could occupy a healthy niche of our energy system, something on the order of 15% to 25%, depending on the extent of energy consumption and the extent of feedstock production. That being said, it requires careful management to ensure that the bioenergy system is actually giving a real and substantial net reduction in greenhouse gas emissions. You need careful management to ensure that you're not depleting stocks of soil carbon—for example, not degrading soils and not resulting in additional deforestation.

As I mentioned earlier, biofuels may be complemented by hydrogen in terms of other low-carbon fuels, and certainly will act in concert with energy efficiency and electrification using renewable energy consumption. That being said, I am somewhat less optimistic and more uncertain about the future of hydrogen. I certainly see a role for it in interacting with intermittent renewable solar and wind electricity generation, and potentially blue hydrogen, although I don't necessarily see it as an outright shift to a full hydrogen economy in the future where hydrogen is cheaper than current energy sources.

Thanks for having me participate. That's all I'll say right now.

● (1310)

The Chair: Great. Thank you very much. I appreciate that.

We'll move on to Mr. O'Connor from S&T Squared Consultants.

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Mr. Don O'Connor (President, S&T Squared Consultants Inc.): Thank you, Mr. Chair.

My name is Don O'Connor. I'm the president of S&T Squared Consultants.

Our client base is international, and so far this year we've had clients from Canada, the United States, Europe and Southeast Asia. Clients include investment banks, multinational refining companies, alternative fuel producers, agri-food processors, associations representing agri-food processors and biofuel producers, technology developers and some large fuel users.

I'm a mechanical engineer by training. I'm a registered professional engineer in British Columbia and Ontario, and I'm also a member of the Society of Automobile Engineers. I've co-authored seven peer-reviewed papers mostly related to greenhouse gas emissions from alternative fuels, and I'm a co-inventor of seven patents, most of them related to processes for cellulosic ethanol.

I have 40 years of experience with alternative transportation fuels, first as a marketer, then as a producer, and for the past 20 years as a consultant. I've worked with many of the provinces when they introduced their renewable fuel programs between 2002 and 2012, and my experience covers ethanol, biodiesel, renewable diesel, natural gas, methanol, propane and hydrogen.

For the past 20 years I've been the developer of the GHGenius life-cycle assessment model. This model focuses on the GHG emissions of transportation fuels. It has over 200 pathways for producing and using conventional and alternative fuels. It is specified currently in regulations in B.C., Alberta, and Ontario; and Quebec has proposed using this model for its proposed renewable fuel requirements. The model is used around the world, and through our development and use of the model we've acquired more real-world data on the performance of alternative production fuels and processes than anyone else in Canada.

Based on my experience, I'd like to make three observations for your consideration.

First, reductions in GHG emissions now are worth more than will be the reductions 10 years from now. We should stop thinking about per cent GHG emissions reductions in 2030 or 2040, and instead focus on looking at the cumulative GHG emissions between now and 2030 or 2040. In other words, the time for action is now, not 10 years from now.

My second point is that it's a lot more complex and takes a lot longer to replace fuels and vehicles than it does just to lower the carbon intensity of fuels using existing vehicles. I saw that over and over again in the 1980s and 1990s, when the company I was working for was introducing some of these alternative fuels.

The third point is that many of the claims that companies and organizations are making about achieving net-zero emissions are being made with the focus only on making the fuels and not using the fuels. Net-zero crude oil production only addresses 10% to 15% of the life-cycle emissions of gasoline and diesel fuel. On the other hand, technology-produced net-zero renewable fuels on a full-life cycle basis are available today, and could conceivably be implemented.

I'm here to answer any questions you have in the production and use of alternative fuels and the GHG emission performance of the various alternatives.

I look forward to your questions.

Thank you.

The Chair: Thank you, Mr. O'Connor.

Last up we have Mr. Plumptre.

Mr. Bora Plumptre (Senior Analyst, Federal Policy, The Pembina Institute): Thank you, Mr. Chair.

Good afternoon, members of the committee. Thank you for the invitation to speak today.

My name is Bora Plumptre. I'm a senior analyst at The Pembina Institute in the federal policy program, and I'm really excited to take this opportunity to speak about the need and the opportunity to facilitate greater supplies and consumption of low-carbon and renewable fuels in Canada.

I'd also like to acknowledge that I'm speaking to you from the traditional unceded territory of the Algonquin Anishinaabeg Nation, whose presence here in what is also known as Ottawa reaches far back in time.

I will focus my comments on two areas: first on the urgent necessity of accelerating a shift toward low-carbon and renewable fuels, particularly for transportation; and second on the regulatory powers of the federal government and the contribution that the judicious exercise of those powers could make toward the objective that, I would submit, unites the whole committee in conducting the present study, which is to say a vision of a net-zero society in which affordable clean fuels proliferate throughout our country's energy systems and beyond to our partners in international trade.

To me, this is a praiseworthy vision that would see us shift our energy economy into areas where investors are already going, positioning us to compete in the rapidly growing global market for clean energy and enabling us to finally meet our responsibility to eventually eliminate our ongoing contribution to the worsening effects of climate change.

Canada can and must do much more to decarbonize its transportation sector, which remains heavily reliant on petroleum-based fuels. Our emissions of greenhouse gases from mobile combustion sources remain stubbornly high, having grown 54% since 1990 and 16% since 2005, which is our base year for climate target setting.

Today, transportation is our second-highest-emitting economic sector, responsible for one quarter of our national GHG emissions. In most provinces and in all territories, it is the highest emitting sector. These figures are drawn from the federal Department of the Environment, and what they tell us is that right now, despite recent policy innovations, on a biophysical level, we're not headed in the right direction.

Whether in pursuit of our nearer-term emissions reduction target for 2030 or in pursuit of our longer-term aspiration to build a net-zero society, the decarbonization of fuels must be a key element of our strategy for transportation. Vehicle-focused policies are necessary too, but they are not sufficient to decarbonize the whole system. Government must pay attention to the core energetic component of mobility, namely fuels.

How do we do this? Electrification appears increasingly likely to solve the problem of emissions from passenger road transport, but given the deep uncertainty about which fuelling solutions will propel medium and heavy duty freight vehicles in the long term, we still need to approach this challenge in a way that provides a clear investment signal while remaining technology neutral.

Thankfully, we have a policy coming into place in the form of the clean fuel regulations, sometimes still called the “clean fuel standard”, which will fundamentally reorient the regulatory paradigm for the fuel market across Canada around the criterion of life-cycle carbon intensity. This reorientation is long overdue, and I was really pleased to see this type of policy approach, a low-carbon fuel standard, also recently endorsed by the Leader of the Official Opposition.

This is an important contribution because it helps provide certainty about the path forward for both the obligated and voluntary participants in the market this policy will create. Certainty and risk minimization for investors are essential to making progress on both technology and deployment, and the best way to minimize risk is by means of a regulatory program such as the clean fuel regulations, which act effectively as a non-subsidy transfer from high-carbon to low-carbon fuel producers. In other words, without resorting to public spending, the policy will shift capital flows on an ongoing basis to companies that can accelerate our transition to net zero. Subsidies, by contrast, of course have a habit of going away.

Another essential virtue of the clean fuel regulations is that they enable a portfolio-based approach to decarbonizing the national fuel supply. Many models have attempted to project what the energy system might look like by mid-century, and many scenarios of our energy future remain possible, but where the models converge is on the basic finding that we will need a portfolio of cleaner fuel options in order to achieve our climate goals. Increasingly stringent clean fuel regulations will enable the cost effective build out of this diverse portfolio without government having to pick winners.

Whether your interests—or, perhaps more properly, those of your constituents—are to promote one type of low-carbon fuel or another, the most important aspect from both a business and a climate perspective is to ensure a stable investment environment for projects to get done. There is a virtuous circle to enable between financial dependability and emissions reductions. A properly administered clean fuel regulation will provide the financial architecture for accelerating direct investments in the market-ready solutions and promote innovation in the more expensive, earlier-stage technologies that need to be scaled up.

● (1315)

Thank you. I'll stop there, and I look forward to your questions.

The Chair: Thank you very much, Mr. Plumptre.

I think this is an all-time first. We started the meeting early and every witness came in under time. It bodes well for the rest of the meeting.

Let's move into the first round of questions of six minutes, starting with Mr. Patzer, who I believe is in the committee room.

● (1320)

Mr. Jeremy Patzer (Cypress Hills—Grasslands, CPC): You bet. Thank you, Mr. Chair, and thank you to all of the witnesses for being here today.

I'm going to start with the Pembina Institute.

Any kind of natural resource project is intimately connected with the environment. We all know that managing our environmental impacts can be complex if we're trying to make sure that our actions result in a net benefit—again, no matter what kind of project we're pursuing, whether it's an alternative or conventional form of energy.

I'm just wondering if you share the concern we've heard from others about land use when it comes to an increased demand for biofuels.

Mr. Bora Plumptre: Thank you for the question, Mr. Patzer.

I certainly do believe we need to take sustainability considerations into account when it comes to biofuel production. Mr. O'Connor would be able to speak to that in depth, I'm sure.

I would agree with what Mr. Wolinetz said in his comments that there is a true opportunity for Canada to take advantage of the fact that we have a natural resource base and a plethora of potential feedstocks for different biofuel production processes that we are not yet fully taking advantage of. This can be something that Canada can pursue in a sustainable way.

I do believe the Department of the Environment is taking steps to ensure that this type of approach is being hard-wired into the regulation.

Mr. Jeremy Patzer: I'm going to go to Mr. O'Connor, then. Do you want to answer that as well?

Mr. Don O'Connor: Sure.

I think there's no question that agriculture in Canada is quite sustainable. Canada has been tracking a number of sustainability metrics related to agriculture since the 1980s, and every five years Agriculture and Agri-Food Canada puts out a comprehensive report on the environmental performance. You can't find a report of that quality anywhere else in the world.

One of the things that has happened is that we've seen increasing yields of crops, particularly those that are used for biofuels. At the same time, we see stagnant or declining demand for some of these crops from some other traditional uses, so the feed going into livestock is lower today than it was 10 or 15 years ago.

Mr. Jeremy Patzer: I'm going to elaborate on that a little bit, because other stakeholders I've been meeting with and hearing from as well are talking about sensitive grasslands being broken up. We're also seeing ranchland being lost and converted for people to chase this $20 to $22 canola.

We know that price may or may not hold. The markets are always up and down. There's the volatility associated with it. However, either way, people are busting up grasslands in order to try to grow some of these biofuel stocks.

I'm just curious to know whether you have any reports or have done any looking at research into the effects this may or may not have in the long term.

Mr. Don O'Connor: The information that Canada has and reports in its national inventory report shows no change in grasslands. However, they do admit that Canada does not have a perfect system for monitoring changes in grasslands.

However, overall, the cropland in Canada has been declining for the last 15 or 20 years, similar to the declines in agricultural land that we see in the rest of the developed world.

Mr. Jeremy Patzer: I've seen a lot of people where I come from who get out of ranching and go into farming instead. We're looking at the sequestering power of ranch land and the long-term benefits it has. I would say it's a bit of a shame that this is happening. We've seen documentaries, such as *Guardians Of The Grasslands*, outline very clearly the benefits of our grasslands.

I'm going to move on to another point.

I have a question for Clean Energy Canada. As I was saying to you, Mr. O'Connor, I've seen some concerning numbers about how, if we aren't careful and strategic with an energy transition and how we grow new industries, we will see other types of damage done.

As of 2019, the International Renewable Energy Agency calculated that solar goals for 2050 consistent with the Paris Agreement will result in old-panel disposal more than doubling the tonnage of global plastic waste. The IRENA—the same agency—also forecast massive jumps in mining for minerals that are in higher demand. Silver would jump by 250% and indium by 1,200%.

I also read another report that states, “Building one wind turbine requires 900 tons of steel, 2,500 tons of concrete and 45 tons of nonrecyclable plastic.”

When we look at the disposal and what they're doing with that, quite frankly, it's just ending up buried in the ground. There are lots of examples above and beyond that, as well.

I'm curious to know about the following, because we were talking a lot about how we're going to electrify as a way of getting zero-emission fuel sources or energy to be able to create fuel sources. Have we looked, though, at the unintended consequences of burying wind turbine blades in the ground, with the amount of steel and concrete that go into these products? We were also looking at GHG life cycles. Are we looking at that? What are we doing with this?

● (1325)

Dr. Mark Zacharias: It's a good question. I'll go first.

Yes, the transition to a net-zero world is going to require massive increases in the metals, minerals and materials to build all of the infrastructure required. What happens when that infrastructure gets to the end of its life and its end-of-life cycle? Again, because it's a fairly new industry and it's scaled up so quickly, these questions are just being tackled.

For example, there is now a company in Texas that recycles wind turbine blades and reuses them back into materials. Both California and B.C. are looking at extended producer responsibilities for solar panels. A number of countries in Europe are looking at end-of-life considerations around all of the assets and infrastructure required for solar, wind and other types of generations.

Absolutely, Canada is a leader in sustainable mining through IRMA and some of the other processes, in trying to export them globally as sustainable sources of mining.

There is some catch-up necessary, but I would think Canada and particularly a lot of the provinces are already on this.

The Chair: Thank you.

We will move on now to Mr. Weiler.

Mr. Patrick Weiler (West Vancouver—Sunshine Coast—Sea to Sky Country, Lib.): Thank you, Mr. Chair.

I want to thank all of the witnesses for joining us today and for the breadth of knowledge they bring to the discussion and the study we're doing.

My first question will be for Clean Energy Canada. In your remarks, and also in your report on “How Hydrogen can Deliver Climate Solutions and Clean Energy Competitiveness for Canada”, you noted that studies indicate that the cost of green hydrogen is going to drop by 64% by 2040 while blue hydrogen is going to rise by almost that same amount, mostly due to changing natural gas prices. You mentioned that as a result, green hydrogen could be cost-competitive within a decade.

In this study so far, we've heard almost unanimous feedback that Canada should be focusing on blue and green hydrogen production at the same time in order to build out some of the common infrastructure that's going to be needed sooner, particularly with where the prices are right now, relatively, with those two.

If these market projections hold true going forward, how should Canada be approaching its strategy on hydrogen today?

Dr. Mark Zacharias: It should be looking at both. Blue hydrogen, obviously, is more cost-competitive and will likely be cost-competitive for at least another decade.

Having said that, when you look at the recent announcement by the Biden administration in the U.S., they're looking at green hydrogen at about $1.50 U.S. a kilogram within the next decade. That would out-compete blue hydrogen as it's currently costed in Canada.

I think there's a two-path track here. One is that where we do have natural gas processing assets and we have uses for natural gas that are near natural gas sources, we should be scaling up blue hydrogen, but also be looking at the long term. Western Australia, to give you an example, has a hydrogen minister, and they're looking at 100 gigawatts of production of clean hydrogen—that's green hydrogen—which already has contracts for sale in Japan right now. That's within the next 10 years. One hundred gigawatts is basically 100 site Cs. That's the scale of hydrogen that's coming on stream.

Germany has allocated $13 billion Canadian to its hydrogen strategy, Portugal $10 billion and France $7 billion. There is going to be an enormous competition for clean hydrogen.

Again, Canada does have an advantage in the short term because of our ability to produce blue hydrogen. Also, we have a lot of industries that actually use hydrogen, and it could be cleaned up. We have a very large fertilizer industry, a very large chemical industry, and we do also develop steel and cement.

Mr. Patrick Weiler: Thanks for that. We've talked about a few of the key overarching mechanisms we have—the price on pollution, the clean-fuel standard—as ways of having that certainty for business and not necessarily picking winners. It does seem that many of these other countries that you're mentioning are trying to pick hydrogen as a winner in the low-carbon fuel space of the future.

We do have a $1.5 billion fund for these types of fuels, but what more would you say is necessary on top of the structures that we already have in place and the strategy in that fund to really allow Canada to be able to fully take advantage of some of the economic opportunities in hydrogen going forward?

● (1330)

Dr. Mark Zacharias: I think Canada is on the right track. It has done the right thing in identifying hubs because what will be appropriate for Alberta and Saskatchewan to feed their industries will be different for Quebec. Quebec, with its large hydro capacity, will have cheap electricity and the ability to produce green hydrogen, which could in turn be exported to Europe. Western Canada might be a little bit different, so I think that's been good.

There is a Canadian hydrogen strategy. However, it is basically 141 pages, and it's full of recommendations rather than concrete actions. Those concrete actions actually have to be attached to funding. The $1.5 billion is for a whole suite of low-carbon fuels. That needs to be ramped up if we are going to be competitive with other jurisdictions, including Europe, Asia and the States. That's what's missing on the Canadian national stage.

Mr. Patrick Weiler: Thank you.

In regard to the same report I mentioned earlier, you also noted the potential of synthetic fuels in which hydrogen could be blended or combined with carbon-based fuels to create new fuels. One of the examples that you mentioned in the report is Carbon Engineering, which happens to be a company based in my riding that unfortunately I don't think we're going to have time to welcome to this committee before we rise for the summer.

What role do you see synthetic fuels playing in Canada's low-carbon future, as well as fuels directly produced through direct air capture?

Dr. Mark Zacharias: I think that's going to be a little ways out, and it's going to be a much more risky venture than other low-carbon fuels that we've talked about on this call today. It may come to fruition at some point in the next year, but it really will depend on the price of electricity and the availability of electricity for direct air capture.

Mr. Patrick Weiler: Thank you.

Next, I want to go to Mr. O'Connor for a question. In your third observation, you mentioned that many of the claims for net zero are only looking at the production side, not the scope 3 side, which of course is very important. You mentioned that net-zero life-cycle fuels are available now. Which of those net-zero life-cycle fuels right now do you see that we should focus most on in terms of short-term measures?

Mr. Don O'Connor: I think there are two. The first is ethanol, where you can capture the CO2 that comes off the fermentation and inject it underground, so it's carbon capture and storage. That's worth 30 g/MJ. We have ethanol plants today in the low 40 g/MJ on a full life-cycle basis. The other major factor is the fuel that's used—natural gas. Renewable natural gas or biomass combustion can get those plants down to zero.

The other fuel that has a lot of interest in Canada and in the United States is something called “renewable diesel”. It's made from vegetable oils or animal fats. It has low GHG emissions, probably in the order of 20 to 25 g/MJ. Again, more than half of that is due to the hydrogen that's used in the process.

I know that the companies that are looking at doing this are looking at two things. The first is carbon capture and storage, again, for the hydrogen. Second, those plants also produce some co-products that are biogenic in nature and can be used to produce the hydrogen. Using the biogenic components can get the hydrogen part of it down to zero, and again, you can still do the carbon capture on that biogenics to get the full life cycle down to zero without looking at some of the other things that are going to happen in the future with the use of renewable fuels, better farming practices and all of that.

The Chair: Thank you.

Thanks, Mr. Weiler.

We will move on to Mr. Simard.

[*Translation*]

Mr. Mario Simard (Jonquière, BQ): Thank you, Mr. Chair.

I would have a question for Dr. Zacharias from Clean Energy Canada.

Dr. Zacharias, before I ask you this question, I just want to tell you where I stand. It seems to me that the government's proposed strategy on hydrogen is more about trying to find opportunities for the oil and gas industry. I won't hide the fact that this bothers me a little.

I'll ask you my first question, which I'd like you to answer briefly.

Do you think hydrogen made from gas or oil can be called clean?

● (1335)

[*English*]

Dr. Mark Zacharias: I think the answer to that question is, currently, yes. If you look at last week's announcement from Air Products Canada, they are planning to use carbon capture and storage and offsetting to get to 95% carbon removal from the project, so that is sufficient. Even two years ago when we were looking at blue hydrogen, if we saw 80% to 90% carbon removal, we thought that was good. Therefore, the technology has improved.

[*Translation*]

Mr. Mario Simard: Thank you.

I asked you this question, Dr. Zacharias, because I read an article earlier this week by Bruno Detuncq, who is a professor emeritus of the École Polytechnique de Montréal. He indicated that strategies to bury carbon are currently at the experimental stage and that these are very dangerous processes.

What stage is this at, to your knowledge? I saw a fairly alarming statistic that said that, to produce 10 million tonnes of hydrogen, it would basically mean burying 100 million tonnes of CO_2. So I'm guessing that's not hidden under a rug.

To your knowledge, are these hydrogen storage strategies sufficiently developed to be both safe and profitable?

[*English*]

Dr. Mark Zacharias: Sure. I'll speak to both of those questions.

On the first one, yes, Canada has been sequestering carbon dioxide underground for many years. Shell's Quest project in Alberta has been up and running since 2018, and I believe it has already sequestered several megatonnes of CO2 underground. Canada has favourable geology in terms of offshore basalt formations on both coasts, as well as depleted oil and gas reservoirs in Alberta, Saskatchewan and B.C.—and possibly off Newfoundland and Labrador as well—to store carbon dioxide. Canada does have the potential to store a lot of CO2 underground.

Second, on the economics, currently blue hydrogen is expensive. It's several times more expensive right now than grey hydrogen, which is hydrogen without carbon capture and storage. However, as technologies improve and costs scale down, I think it will be cost competitive, but again, green hydrogen might be more cost competitive in the next decade.

[*Translation*]

Mr. Mario Simard: Thank you.

Quickly, you mentioned earlier that the government should have a hydrogen strategy, and you brought up a rather interesting statistic. You say that by 2030, green hydrogen would be cheaper than natural gas. I heard an answer you gave earlier when you said that the United States wanted to move towards green hydrogen within 10 years. You also mentioned Australia and France.

In its strategy, shouldn't the federal government focus on supporting green hydrogen before supporting blue or grey hydrogen in order to have access, perhaps, to markets that will develop internationally?

[*English*]

Dr. Mark Zacharias: It's a good question. My answer is that Canada's competitive advantage right now is in both green and blue hydrogen. By using blue hydrogen right now, it does two things: One, it gets Canada ready for a green hydrogen revolution and to scale up its production; and two, it's a way to transition a workforce from natural gas and the oil and gas industry through into blue hydrogen, and possibly into green or clean hydrogen at some future date.

[*Translation*]

Mr. Mario Simard: In this hydrogen strategy, what do you think the government should put in place in the short term?

[*English*]

Dr. Mark Zacharias: Over the short-term right now, the government is doing a good job on the hydrogen hubs and getting those established. More funding would be required for Canada to really understand the export opportunities to scale up production.

We actually need a jurisdictional review that looks at all of our potential competitors and what our competitive advantages are. Canada produces a lot of electricity, some of which at times we don't need, and that electricity could be used to produce green hydrogen.

More work is required. The federal hydrogen strategy is a very good first step, but the recommendations in that strategy need to be turned into actions that can be moved forward quickly.

● (1340)

The Chair: Thanks, Mr. Simard. We'll have to stop there.

We'll go on to Mr. Cannings.

Mr. Richard Cannings (South Okanagan—West Kootenay, NDP): Thank you.

I'd like to thank all of the witnesses, but I will continue with Mr. Zacharias, along those same lines.

My first question is about blue hydrogen. It seems that most of the carbon capture and storage in North America basically involves enhanced oil recovery, that is, pumping carbon dioxide underground into those depleted oil and gas formations, specifically to produce more oil.

I just wonder if you would comment on that. I've heard some negative comments about using that strategy to produce blue hydrogen.

Dr. Mark Zacharias: Yes, enhanced oil recovery is when carbon that's pulled out of blue hydrogen production is then in turn transported to an oil reservoir and used to increase and recover oil out of the reservoir. That is happening right now, and much of the carbon coming down the Alberta Carbon Trunk Line is used for that purpose. That's the short term.

I think there are a number of studies that have been published—I don't have them offhand right now—that show the overall carbon balance of that activity. I can't remember what it was. I would like to say, though, that it's only one small portion of carbon capture and storage.

If you look at B.C.'s offshore, you'll see that we have very favourable salt formations, and Ocean Networks Canada, based out of the University of Victoria, is looking at going out, potentially next summer, and doing some pilot carbon capture and storage, where basically the carbon is mineralized into the salt formations.

The east coast of Canada has very similar geology as well, so there are some opportunities for carbon capture and storage that haven't yet been built out to scale and don't involve EOR or enhanced oil recovery.

Mr. Richard Cannings: That's what I've been hearing as well.

Maybe you can also comment on the project off Norway that seems to be one of the big carbon capture projects gearing up to take a lot of carbon produced in the European industries and storing it underground off the shores of Norway in these geological formations, without enhanced oil recovery. They feel that enhanced oil recovery is just sort of oil business 101. We need to do it without that to really get the impact on the climate action.

Dr. Mark Zacharias: Yes, so Norway is doing some pilot projects right now. What they're planning to do is to take carbon dioxide produced from concrete plants, move that by pipeline off to disused oil platforms, and then use the oil platforms to inject the carbon dioxide into the depleted oil formations. It's not at scale right now. They're still looking for capital, but it may be an opportunity to store carbon offshore.

I'd also note that Norway isn't the only European country looking at this. A number of the countries in and around Denmark, down to northern France, are looking at the same opportunity.

Mr. Richard Cannings: Thank you.

I want you to go on to expand your comments on using hydrogen in various industries. We've heard about it being used in heavy transportation, but I think you mentioned fertilizer, cement and chemical industries. Perhaps expand on how hydrogen could be used in that manner.

Dr. Mark Zacharias: Sure. Canada has a number of potential uses for hydrogen. In the industrial sector, it can be used either as a feedstock in terms of chemical production, ethanol and so on. It can be used in fertilizers. It can also be used as a heat source for steel, cement and other reactions that currently use coal or natural gas. That's the industrial space.

We've talked briefly at the committee about it's use as a fuel for transportation, either through the use of a fuel cell, by blending it with diesel, or by direct injection into a diesel engine. There's a company in B.C. now that has just been set up, called Hydra Energy, and that does exactly that. It can be injected into the natural gas grid that currently exists, currently at percentages of up around 20%, to help decarbonize the existing natural gas grid.

It can be used for pretty much anything you can think of that requires energy. It can also be used as a grid-scale storage solution for renewable energy when the wind blows and the sun shines. California is doing this with the Los Angeles Department of Water and Power. They're taking over production from renewable power during the day, storing it as hydrogen and then running it through a fuel cell at night to produce electricity. So there are many uses.

● (1345)

Mr. Richard Cannings: Thank you.

Mr. Chair, how much time do I have?

The Chair: You have about 50 seconds.

Mr. Richard Cannings: I think I'll just move to Mr. O'Connor for an explanation. I think Mr. Weiler kind of touched on the life-cycle analysis of the net-zero impacts of different fuels, and you made a comment about the crude oil analysis at 10% or something. I just missed the details of that. I'm wondering if you could repeat that with some more details.

Mr. Don O'Connor: Certainly.

When you look at the life cycle of gasoline or diesel fuel, you go back right to the beginning of the extraction and production of crude oil, through the refining and then through the use. The use contributes about 75% of the total life-cycle emissions, and the other 25% is split between the crude oil and the refining. It depends on the kind of crude oil, but 10 to 15% of the emissions result from crude oil production—again, 10 to 15% from refining and then 75% from the use.

Making net-zero crude oil doesn't get you very far in terms of net-zero gasoline or diesel fuel.

The Chair: Thank you, Mr. Cannings.

We're on to round two of five minutes for each, starting with Mr. Lloyd.

Mr. Dane Lloyd (Sturgeon River—Parkland, CPC): Thank you, Mr. Chair, and thank you to our witnesses.

Mr. Simard's line of questioning greatly interested me, Mr. Zacharias. When we're talking about the production of green hydrogen, it's being sourced, I believe, primarily from hydroelectricity and renewable sources like solar and wind power.

If we don't bring on new sources of hydroelectricity, wind power and solar power, as we see hydrogen begin to grow, what do you think the impact would be on electricity rates for Canadians?

Dr. Mark Zacharias: That's a good question.

Canada's healthy economy, healthy environment climate plan released on December 10 talked about a two to three fold increase in clean electricity requirement and generation for Canada. In speaking with NRCan officials, they tend to agree that it's at least double the amount of power Canada's going to need by 2050 to power a net-zero revolution.

As you scale up green hydrogen or clean hydrogen, yes, you're going to scale up. The amount of power's going to be increased across Canada.

Having said that, though, globally, looking at renewable power costs, they are plummeting. Alberta has 4 cents/kWh kinds of bids for wind power. If you look at Saudi Arabia right now, they've just recently had a bid at 1.04 cents/kWh. That is unbelievably low, and those costs and those renewable power at scale prices will probably not be the same price for Canada, but we can scale up considerably at a very low cost.

Again, it could be scaled up within the next 10 years if we need to.

Mr. Dane Lloyd: We've seen how difficult it is to get the Site C dam. We've seen the project in Newfoundland, at Muskrat Falls. Hydroelectricity is one of the backbones of Canada's electrical grid. Do you think that the growth in wind power and solar power, given how much government subsidies are also going into it, will be able to replace our inability to build new hydroelectric capacity?

Dr. Mark Zacharias: I don't know the answer to that. I do know that there are a number of institutes working on that very question right now that are going to be reporting out over the next year or two. It's a good question.

Mr. Dane Lloyd: Okay.

From your observations, where is most of the private sector investment going in the hydrogen space? Is it going to blue hydrogen or green hydrogen? Where are you seeing the private money going in this country?

Dr. Mark Zacharias: Globally, I would look at green hydrogen as where the investment money is going for those countries that don't have natural gas assets. Right now in Canada, I think I see blue hydrogen as being kind of a source, and attractive for capital right now, mainly because we have natural gas at very low cost. We have a trained work force. We have companies that are set up and ready, and we have uses for natural gas right now as well. Blue hydrogen can be used in steel, cement, chemicals, fertilizers, as well as in the refining processes.

● (1350)

Mr. Dane Lloyd: Something that Mr. Cannings was talking about is that some people have been trying to push against this enhanced oil recovery. It's an issue that's quite close to my heart because the Alberta Carbon Trunk Line, which you referenced, begins in my riding at the Sturgeon Refinery. We know we're sequestering over a megatonne of carbon dioxide every year going into these somewhat nearly depleted conventional oil wells near Red Deer.

Would you agree that if we are going to be using oil as a resource for decades to come, enhanced oil recovery is probably the most carbon efficient way to produce that oil?

Dr. Mark Zacharias: I would agree that if we are going to produce oil and continue to produce it in decades to come, EOR is one of the most efficient ways to do it. It's certainly much more efficient than oil sands mining and the refining that comes along with that.

Again, we can get into a further conversation around, kind of, oil forecast futures, but right now, EOR does seem to be a low-cost and fairly sustainable way to produce oil.

Mr. Dane Lloyd: Do you think it's also a good transitional way...because it seems that it's very profitable for people who are investing in carbon capture to take that carbon? Quest, I believe, is injecting it into some of these formations, but it's not being used for EOR.

Do you think it could be a good transitional way for some of our energy companies to invest more in carbon capture over the years to come—that EOR could help that transition?

Dr. Mark Zacharias: Absolutely. We're at the beginning of a journey around hydrogen. The infrastructure and the assets that you build today, whether it's road, rail, pipelines or processing, even though it may be specific to blue hydrogen now, it may transition to green hydrogen later, and it may provide us with a competitive advantage to transition to green hydrogen at some later date.

I think those assets and that experience—

Mr. Dane Lloyd: I'm short of time, so could I get one more—?

The Chair: Thanks, Mr. Lloyd. You're actually out of time.

Mr. Dane Lloyd: Oh, thanks.

Thank you, Dr. Zacharias.

The Chair: You will get lots more opportunity, though, so don't worry.

Mr. Lefebvre, you're up next.

Mr. Paul Lefebvre (Sudbury, Lib.): Thank you, Mr. Chair.

Once again, this is a great panel of experts and witnesses here today. Thank you so much.

[*Translation*]

I would like to make a comment to my colleague from the Bloc Québécois, Mr. Simard, concerning carbon capture, utilization and storage, or CCUS. He seems to have some reservations about the scientific evidence, but all the witnesses speak favourably of it.

I would encourage him, perhaps in a future term, to go to Mr. Lloyd's area. There are some incredible technologies there, and I think we should all see them first-hand to understand their importance.

[*English*]

I want to touch base on a few things.

Mr. Wolinetz, in your remarks, you shared your concerns with jobs as we transition to a low-carbon economy and said that it will not be enough to offset the loss of jobs in the fossil fuel industry.

I want to know your sources on that, because it's a big statement to make. What analysis, what studies are you basing that conclusion on?

Maybe start with that.

Mr. Michael Wolinetz: Sure. At Navius Research, most of our forward-looking analyses are produced with what's called a "general equilibrium model". This is a model that shows all of the interactions between the different sectors within the economy, so it tracks allocation of capital, commodities that are used and produced by different sectors as well as employment. Within this model, we can simulate the impact of greenhouse gas policy, for example, that would lead us towards a net-zero greenhouse gas emissions future. We can look at how that changes activity in different sectors as well as emerging sectors—these would be green energy sectors that may not exist yet—and from that, we can infer the quantity of jobs that may be lost in some sectors and that may be gained in other sectors.

The challenge with the transition we're facing is that we have a significant export industry in conventional energy sources that are emitting greenhouse gas emissions. In that transition, we may be able to supply ourselves with low-carbon fuels, but if we don't seize opportunities to also continue to find ways of exporting energy as well, then there may be a contraction in the overall size of the energy sector.

I would want to put this in context, though. Nationally, the energy sector is an important sector, but Canada has a vast number of jobs in almost every other sector, notably service-related sectors. Regionally, of course, though, it may be more important to support green energy growth and green energy jobs in some parts of Canada, notably Alberta and Saskatchewan, to mitigate economic impacts in those regions.

● (1355)

Mr. Paul Lefebvre: When you have that analysis and as you're studying this...we're talking here about hydrogen and the future of that potential, certainly for Alberta and Saskatchewan with respect to the CCUS. That's what we're talking about here, the blue hydrogen. We're also talking about biofuels a lot, the clean fuel standards.

With regard to the potential that has certainly for the agricultural industry, are all of those jobs taken into context, as well as the potential this has, as we're going down that path?

Mr. Michael Wolinetz: We look across the full economy. The potential for new jobs from green energy sectors is very large, but, to be honest, most of our analyses show that you're at high risk of net losses of jobs from Alberta, for example.

On seizing an opportunity to export green energy in the form of hydrogen, I'm not as optimistic as Mr. Zacharias is, but that would certainly go a long way to mitigating that situation.

Mr. Paul Lefebvre: However, we're still at a point of saying that we know we need to decarbonize and at the same time trying to produce jobs or keep jobs or transition these jobs. That's kind of the focus of our government. Thank you for that, because it's a concern that we all have. We know that we need to head in that direction, but at the same time, how do we transition these workers to the same type of lifestyle that they have? If we leave people behind, it's tough to get everybody on board.

Mr. Zacharias, on the hydrogen storage—

The Chair: You have about 10 seconds.

Mr. Paul Lefebvre: could you maybe expand on that? What is the cost of that and what is the potential of that?

Dr. Mark Zacharias: Mr. Chair, do I have time to respond?

The Chair: You may very briefly.

Dr. Mark Zacharias: I can follow up later.

The Chair: That's really brief. That's perfect. Thank you.

Next we have Mr. Simard for two and a half minutes.

[*Translation*]

Mr. Mario Simard: Thank you, Mr. Chair.

Mr. Wolinetz, you seemed to be puzzled by the hydrogen issue. I think you ended your presentation by saying that you were skeptical.

Could you say more about that?

What are the reasons for your reservations about hydrogen?

[*English*]

Mr. Michael Wolinetz: There's a lot of excitement and news about green hydrogen becoming cost-competitive with blue hydrogen in the near term. I think there is some nuance and some context there that causes me to be somewhat more reserved in my excitement.

The first one is that we have to think about the context. For making green hydrogen from solar power, the costs are truly plummeting for solar power. Canada has a good solar resource, but not nearly as good as what the U.S. southwest has, for example. The cost of solar power here will never be as low as it is in the U.S. southwest.

The other cause for excitement is the fact that you can make green hydrogen from electricity at hours of the day or times of the year when that electricity has a relatively low value. The problem is, as soon as you enter into that market, you suddenly have use for that electricity, and people will enter into that market until that electricity becomes expensive again. What's more is that hydrogen is not the only use for that electricity. We're also seeing costs of battery energy storage plummeting so that energy utilities or other players in the energy market could use that electricity, store it, and deliver it at a time when it's much more valuable. This idea of an off-peak resource for hydrogen is real, but it's by no means unlimited. It's always going to exist at the margin.

● (1400)

[*Translation*]

Mr. Mario Simard: You just mentioned the cost of battery technology, which is improving.

Are the costs associated with storing carbon to produce blue hydrogen high?

Are they such a deterrent that companies that want to make blue hydrogen will be tempted to seek federal government support?

I am asking because I wonder what the advantage of hydrogen produced from carbon capture would be over hydrogen made from storage in batteries.

[*English*]

The Chair: You have time for a very quick answer.

Mr. Michael Wolinetz: From the perspective of greenhouse gas emissions, there is no particular advantage. From the perspective of helping manage the electricity system, hydrogen may be useful there. From the perspective of someone in a natural gas-producing region who wants to keep their job, blue hydrogen could be useful there.

The Chair: Thank you.

Mr. Cannings, it's back to you.

Mr. Richard Cannings: Thank you.

I'll go to Mr. Wolinetz again.

At the end of your presentation, I think you were talking about low-carbon renewable fuels and some of its advantages and pitfalls. One that you quickly ran through was a concern about the disturbance of soils and deforestation that must be avoided.

Could you expand on what you meant there?

Mr. Michael Wolinetz: Sure. There is a vast amount of carbon that is locked up in the biomass of the forests as well as the soils of Canada. If you do something to produce fuels that disturbs that carbon, you can very easily end up in a situation of releasing more greenhouse gas emissions than you would by using fossil fuel emissions.

Don O'Connor is certainly more of an expert on this than I am.

The concern I have is that in our modelling analysis, we show a market and a need for low-carbon biofuels such that they are driving up the price of feedstock to the point where we could conceivably be logging forests to produce that feedstock, so if this kind of fuel production is existing outside of good greenhouse gas accounting and life-cycle greenhouse gas accounting, we'd be missing a really big part of the picture.

There are challenges there. I'll give you an example. B.C. has a fairly healthy export industry for wood pellets, which are used for energy in other parts of the world. Previously most of those wood pellets were coming from mill waste, leftovers after you use the wood at a lumber mill or a paper mill. However, those pellet companies have long-term contracts to deliver pellets, and if there's a downturn in the forestry industry, there is suddenly less waste. There have been incidents and reports of their bringing in whole logs, which may have been dead logs or downed logs, but they are full logs to turn into pellets. The problem is those logs would have sat as logs for a century or more and would have then delivered some of their carbon both to the soil and to the atmosphere, and if we bring them in and turn them into pellets, we're releasing those carbon emissions right away, so there are challenges with bioenergy, certainly bioenergy from forestry or agricultural residue whereby you can disturb the carbon balances within nature.

The Chair: That's—

Mr. Richard Cannings: I was going to ask Mr. O'Connor to elaborate, but if there's—

The Chair: Go ahead quickly. You have 15 seconds.

Mr. Don O'Connor: What's been said is all true, but it's also true that we can build soil carbon, particularly in agriculture. Canada has an excellent track record of doing this, in that every year we have more than 10 million tonnes of CO2 being added to the soils across Alberta, Saskatchewan and Manitoba because we've adopted more sustainable agricultural practices in the last 10 or 20 years. It's forecasted that the increase in soil carbon, while it declines a little bit every year, is going to continue for quite a number of years going forward.

The Chair: Thank you.

Thanks, Mr. Cannings.

Mr. McLean, it's over to you for five minutes.

Mr. Greg McLean (Calgary Centre, CPC): Thank you, Mr. Chair.

Thank you to all of our witnesses today. Your testimony is fascinating, and I have a whole bunch of questions here for elaboration.

First of all, Mr. O'Connor, thank you very much for your presentation. The one thing that very much struck me was that you talked about the importance of reducing CO2 emissions sooner rather than waiting to reduce them up until 2030. When you consider life-cycle analysis of these transitions and the upfront CO2 emissions involved in the transition, how do those square with reducing emissions now versus by 2030?

● (1405)

Mr. Don O'Connor: Generally speaking the emissions that are associated with building plants tend to be a very small portion of what ends up being the total life cycle. They are not usually included in most life-cycle analyses because we run into questions like over how long a period of time we should amortize these construction emissions. Should we do that in 20 years, which is what we do for tax purposes, knowing that the plants will last a lot longer?

Given the fact that they're small and that no one can agree on the amortization period, they're generally not included and they don't impact the conclusion that we should be doing as much today as we possibly can.

Mr. Greg McLean: Okay. Thank you.

We looked at this years ago when I was in venture capital. We looked at the life-cycle analysis that showed biofuels costing 1.6 units of energy to produce 1 unit of energy. We've asked for some updates on those numbers and haven't received them. That's like paying $1.60 to earn $1.

Can you square that for me? How does that make sense in terms of biofuels' inclusion in an efficient horizon going forward?

Mr. Don O'Connor: If you go back 30 or 40 years, that might be true, but there have been tremendous improvements in the efficiency of really all aspects of the biofuel production process.

Mr. Greg McLean: Yes, this was just over a decade ago, so we're not talking 30 or 40 years ago.

Mr. Don O'Connor: This could still be some pretty old data.

Mr. Greg McLean: Actually, they've confirmed that data for us, and we haven't seen the updates in the last decade, so we're looking for those.

Mr. Don O'Connor: I have data from existing plants, operating today, that use about 25% of the energy that they did 20 years ago.

Mr. Greg McLean: Okay, thank you.

I'll go over to Mr. Wolinetz now.

Mr. Wolinetz, thank you for your last response to my colleague's question.

We have heard from the forestry study here on this whole nature of the mosaic of the forest and how some of the forest naturally will burn; some of the forest will have to decay and take 100 years to release the carbon, as opposed to turning it into it.

You think that there are still some residues left that we can turn into biofuels, given what the forest industry needs as far as that mosaic that they talk about, to fuel their industry and to maintain their carbon footprint.

Mr. Michael Wolinetz: Yes, absolutely. From the forestry industry, I think the big untapped opportunity is what's called “harvest residue”. When logging happens, there are a lot of smaller pieces of biomass. These would be tree branches and tree tops. They decay relatively quickly, and in some cases, they're actually piled and burned on site in order to mitigate fire risk.

Mr. Greg McLean: Slag.

Mr. Michael Wolinetz: Yes, slash piles.

That's the opportunity there. We're not talking about whole-tree harvesting or pulling up stumps or anything like that. We're talking about this relatively short-lived biomass that in some cases is already being released to the atmosphere.

Mr. Greg McLean: At the same time, the forestry industry says that's what they want to use as well. I'm just worried about duplicating what our environmental inputs are, as far as who's going to use that excess biomass for something different in the process here.

Mr. Michael Wolinetz: Yes, that's a real concern. To put it simply, everyone is counting on the same truck of wood chips.

I have talked to some experts who believe that in the future, every molecule of usable wood will be used for something. We shouldn't necessarily count on that wood going into fuels. It could also be used for a number of different products—so bioproducts.

That being said, energy is a large bulk commodity market, whereas a lot of other things are specialty items. It provides a significant opportunity.

Mr. Greg McLean: Great, thank you.

Let me ask another question here.

To build on what Mr. Patzer said earlier, I note there's a report by a group called Thunder Said Energy in the U.K. that has confirmed something that a whole bunch of studies have said, namely, that the CO2 produced from biofuels when you break new land is effectively double what you're replacing that fuel with.

Mr. Jaccard from the University of Victoria was one of our witnesses a week ago. He said he's seen 30 studies like that. He disagrees with those studies.

Can you comment on that? It seems that this is a recurrent theme, that we're actually producing more CO2 from biofuel production with new land being broken, as opposed to the already existing stock of biofuels material.

● (1410)

Mr. Michael Wolinetz: I agree with the statement that if you break new land, you could emit a significant quantity of greenhouse gas emissions. What I don't agree with is that our current bioenergy system depends on breaking new land. Based on what I've seen, cropland in Canada in general has been declining slightly. Nor do I agree with the statement that you would have to break new land to expand the bioenergy system.

Mr. Greg McLean: Thank you.

The Chair: Thanks, Mr. McLean.

Mr. May, we will go over to you for five minutes.

Mr. Bryan May (Cambridge, Lib.): Thank you, Mr. Chair.

Before I get into the questions I have, I want to acknowledge that Mr. McLean had a very good point, that we might be working with data that's not nearly current enough. I'm wondering if Mr. O'Connor would be willing to share with us that data he referred to. Obviously, he can't do that right at the moment, but I'm sure there's a lot to that data.

Mr. O'Connor, if that's something you could provide to us, I know we would greatly appreciate that.

Mr. Don O'Connor: There is some information in the public domain that I could share. Of course, a lot of the information I have from companies is confidential. I can't share individual company information, but I do know that there is some information in the public domain.

Mr. Bryan May: Thank you.

Going over to Mr. Plumptre, I'm wondering if you can comment on how we can leverage the opportunity for renewable fuels, low-carbon fuels, and carbon capture, utilization and sequestration present us, and their associated decarbonization to create a just transition for those working in the fossil fuel industry today.

Mr. Bora Plumptre: Thank you, Mr. May.

Well, it's a very big question, I think.

To pick up on something that Mr. O'Connor was emphasizing in his remarks, one of the things that I think this committee could potentially have an influence on, given the fact that the clean fuel regulations have yet to be promulgated in the Canada Gazette, part II—they're still under development—is to push for a potential reorientation in the design of these regulations and to focus on the development of renewable fuel pathways and energy pathways that are consistent with reductions in that 75% of emissions in the life cycle that Mr. O'Connor was referring to in terms of end-use combustion. Those scope 3 emissions are really what we need to reduce in order to make progress on these longer-term aspirations that we have for net zero by 2050.

Right now, I think the regulation is trying to do a lot of things in terms of supporting pathways like carbon capture and enhanced oil recovery, which may be legitimate things to support when we bring in other criteria like just transition, but in terms of the math of reducing carbon emissions, that focus on scope 3 is something that could be enhanced through the regulation that's under development right now.

Mr. Bryan May: Again, my focus is more on the just transition piece.

I'm wondering if you have any thoughts or suggestions on how we can use the incredible skills of the workforce we have. What type of training, if any, would be necessary to move today's fossil fuel workers into tomorrow's future low-carbon workers?

Mr. Bora Plumptre: Well, I think we have a bit of a model that the federal government has already started to develop in its just transition task force for powering past coal. We have made federal investments in some centres to develop new training opportunities for oil and gas workers. Clearly, there's not going to be a one-to-one transfer of every type of skill, and the labour market is something that will evolve over time, but I.... This is a tough nut to crack, and you know....

Mr. Bryan May: Fair enough.

Mr. Bora Plumptre: Yes.

Mr. Bryan May: Quickly, for Mr. Zacharias, my question for you, sir, is about the transportation of hydrogen from the production site to its final destination. How do we store large quantities of hydrogen? Is this method commercially viable if we were to increase nationwide hydrogen production for that export use, whether it be tenfold, 100-fold or 1,000-fold? Do you have any thoughts on the transportation side of this?

● (1415)

Dr. Mark Zacharias: It's a good question. We would need to build out a new hydrogen transportation infrastructure if we were to scale up two- or threefold at least. Right now, you can transport hydrogen in trucks at 250 to 500 bar up to 10,000 psi, but it's not all that cost-effective. I think that in the near term blending hydrogen with the existing natural gas stream up to ratios of 20% plus, may be possible.

Many jurisdictions are looking at dedicated hydrogen pipelines at some point. Fortis, in B.C., is looking at the potential to use a disused natural gas pipeline and re-sleeve it. Then it could accommodate up to 100% hydrogen. There are a number of storage and transportation options out there, but I think it's early days for Canada.

The Chair: Thank you.

Thanks, Mr. May.

We're moving into a third round of five minutes each, starting with Mr. Zimmer.

Mr. Bob Zimmer (Prince George—Peace River—Northern Rockies, CPC): Thank you, Mr. Chair.

To start off, my first question goes to Mr. Wolinetz.

I've asked different groups before about the affordability of renewables. I think it ultimately comes down to the person who is using them. We need to make them affordable. Certainly, our fuel prices have gone up. We need to make it so that it's sustainable for Canadians. They're the ultimate payers of the bill, so to speak. Again, we need to make it affordable.

Mr. Wolinetz, you talked about a contraction in the energy sector and said that it's possible this would occur. I'm in northern B.C. We have huge plays on natural gas. As many know, the largest project ever taken on privately in Canada is our LNG Canada project out on the west coast, all to get that clean natural gas to the world. We all know that's going to reduce emissions. It has a potential impact of halving emissions where they're using high-emitting forms of energy.

What more can we do to promote that clean energy? This is something that's available right now and that we can get out to the world. Even in the next 10 to 20 years, if there are new forms of renewables that come out that might be better, if we can go to electrification, etc., this is certainly a good idea in the mid-term. What are some opinions around that, Mr. Wolinetz?

Mr. Michael Wolinetz: My opinion is that the greenhouse gas benefit of exporting LNG is transitory. You're absolutely right that burning gas is less emissions-intensive than burning coal. However, I have not seen a very long-term study—to mid-century—in which the world is trending towards very deep greenhouse gas reductions along with a large or growing role for natural gas in any energy system. It's going to have a supporting role that's probably going to dwindle over the years.

I don't think LNG has a very strong role in supporting the transition to clean energy.

Mr. Bob Zimmer: I'm a bit puzzled by your answer, because we know that even in the United States a lot of electricity is produced using coal and other hydrocarbons. To me, using the fossil fuel that emits the least would seem to be an obvious answer.

I want to ask you about the forestry sector. You referred to renewables and using some of the waste products from lumber processing, such as bark, tree stumps and that kind of stuff.

I live in a very remote part of the province. We're 15 hours away from Vancouver. Even more remote are these logging places that are up the highway. The biggest challenge to getting these products that are often put into burn piles is the remoteness. We all would like to use them in a better way to make pellets and things like that so they are used efficiently.

How do you overcome the life cycle reality that most of this waste that could be used for renewable energy is so remote?

Mr. Michael Wolinetz: Transportation cost is a big element of any bioenergy system. The estimate I gave that maybe 15% to 20% of our current fossil fuel liquid energy consumption could be replaced with bioenergy produced from residues from forestry and farming takes into account both sustainability criteria and technical criteria, as well as, to some extent, production cost.

The estimates of how much residue is available generally come from spatial analysis that considers where this stuff is relative to our transportation networks and our major processing hubs. The higher the value of that fuel, the further afield you might go to get it. Without a doubt, there are certainly some remote logging operations for which it won't make sense to bring in that residue and there are others for which it will make sense.

● (1420)

Mr. Bob Zimmer: It brings me back to what my colleague Greg McLean was talking about with the life cycle. At the end of the day, by the time we've gone and collected some of the wood waste and brought it back and gone through all of the process involved in that, have we come out ahead? It doesn't seem as though we have.

Mr. Michael Wolinetz: In terms of greenhouse gas emissions, we have absolutely.

The analysis tools that we use cover the full economy and all energy used within the economy. They don't show that we somehow run out of energy. The question is not how much energy we have; it's whether we can use energy without causing environmental damage. There are vast quantities of energy available. It's the environmental damage we need to concern ourselves with.

The Chair: Thanks, Mr. Zimmer.

Mr. Bob Zimmer: Thanks, Mr. Chair.

The Chair: We go back to Mr. Weiler for five minutes.

Mr. Patrick Weiler: Thank you, Mr. Chair.

I want to pick up on a point that my colleague was just mentioning. You mentioned earlier in your opening, Mr. Wolinetz, the potential for substantial abatement if we're using more grassy or woody products.

I think the previous member mentioned a key point in terms of what type of support or regulation it is going to take to incentivize or move us more in the direction of using those products that are now going to waste or otherwise.

Mr. Michael Wolinetz: I think policies like the clean fuel regulation are very helpful. That said, the clean fuel regulation, to get to a point where we're using those wastes, would need to be stronger. We need to be thinking about where it's going after 2030.

Something more in line with where California and B.C. expect to be with their similar policies by 2030 should do it. B.C., for example, has already provided enough of a transitional signal for the refinery in the greater Vancouver area to start doing co-processing. They're looking at how to actually use these materials and process them at the same time as our fossil crude in order to make a blended renewable fossil product in such a way that we could eventually transition over to a fully renewable product.

I think we're on the right track with the clean fuel regulation, but we need to expect that it will need to get stronger.

Mr. Patrick Weiler: Thanks for that.

My next question is for Mr. Plumptre.

You mentioned in your opening the importance of things like the clean fuel standard and other policies to ensure that we're not picking winners and that we're going to have a portfolio-based approach and have the certainty for investment going forward in some of these lower-carbon products in the future.

My question to you is this: What risk do you see to investment today in the technologies that we're going to need for this type of a low-carbon future when you see other parties perhaps putting out policies or suggesting policies that would be less ambitious or that would eliminate some of these different mechanisms that are proposed?

Mr. Bora Plumptre: It's a great question. Thank you.

To take the example of the federal low-carbon fuel standard or clean fuel regulation, actually we have a proposal from the leader of the opposition that would see the stringency of the signal of that policy actually go beyond what is currently proposed in terms of the average life-cycle carbon intensity of fuels by 2030. The CFR right now, as proposed, is aiming for about 13% by 2030. In B.C., provincially, it's already at 20% and it's similar in California. They're already into the second phase of their program.

I would say that it's understandable that Canada is just starting to get going, but other jurisdictions are already moving ahead, and the potential risk lies in some of these fuels that do present an opportunity to make a near-term contribution to our emissions reductions, as Mr. O'Connor was emphasizing in his remarks. Some of these fuels, such as renewable diesel, are promising and could play a large role in mitigating those residual emissions that still occur in the transportation sector and passenger transport as they are increasingly electrified, but we're still going to be dependent on liquid hydrocarbon fuels in both the light- and heavy-duty sectors for a long time to come. Those residual emissions could be substantially reduced if we increased our shares of things like biodiesel and renewable diesel.

The risk right now is that other jurisdictions are moving ahead. In just the past year, I think, U.S. petroleum refiners—and there have been several including Marathon, Phillips 66, Chevron, Renewable Energy Group and HollyFrontier Corporation—have been making multi-billion dollar investments in upgrading their refining operations, and we're, so far, not seeing too much of that type of activity here in Canada, although it does seem to be the case that some investments are starting to be announced now that we're getting to the point of actually implementing the regulation, so I'm encouraged by that.

● (1425)

The Chair: Thank you.

Thanks, Mr. Weiler. I'll have to stop you there.

We will go back to Mr. Simard for two and a half minutes.

[*Translation*]

Mr. Mario Simard: Thank you, Mr. Chair.

I'd like to turn to Mr. Wolinetz, who spoke earlier about biofuels and the green jobs that can be associated with them.

We commissioned a study on the potential of the Quebec forest. Over the next 10 years, there are 16,000 potential jobs in the forestry sector. Unfortunately, the federal government's support is still missing.

For example, Elkem Metal will produce biochar, which is used in a metallurgical process that significantly reduces the carbon footprint. However, it won't receive a cent from the federal government.

If we want to develop a strategy to maximize forestry waste and forestry biomass, don't you think that we should have a federal government strategy to that effect?

[*English*]

Mr. Michael Wolinetz: I agree, actually. I think there is a significant opportunity for clean energy production and for economic development in the forestry sector. I personally feel that it would be of equal importance to hydrogen, so in that sense a federal strategy could be a helpful thing.

That said, to drive the growth of that overall sector, I still believe it's better to set the policy that would create the market conditions to make it happen in the long run, in the big picture.

[*Translation*]

Mr. Mario Simard: Thank you. I find this interesting.

In the interest of market development, do you think it would be worthwhile for a federal government procurement policy to include carbon footprint as a criterion?

[*English*]

Mr. Michael Wolinetz: Government procurement could be a very useful tool to create the early market conditions that help this industry or sector get going, but to fully scale it up, I don't think government procurement would be necessarily the correct tool. You'd want to be addressing the carbon intensity of the wider pool of fuels the way that the clean fuel regulation does.

The Chair: Thanks, Mr. Simard. You're out of time, unfortunately.

Mr. Cannings, we'll go over to you.

Mr. Richard Cannings: Thank you.

I'd like to pick up on something that Mr. Zimmer was asking about and maybe turn it over to Mr. O'Connor, in terms of the narrative that we want to use our natural gas reserves and resources in British Columbia to export those.... The climate argument there is that this would replace coal and be a good thing for the world.

I'm wondering if there's been any life-cycle analyses of that whole process and how natural gas compares to coal, and if there's anyone on the panel today who could talk about the future of Canada's natural gas exports in this changing world of different fuels.

● (1430)

Mr. Don O'Connor: There have been a number of studies done in various locations looking at natural gas versus coal, and there have been a few done looking at exported LNG displacing coal. That information is available. I think the push-back you get from people is, well, how can we be 100% sure that it's displacing coal and not adding to additional energy demand?

Mr. Richard Cannings: Thank you very much for that.

Turning to Mr. Plumptre, you mentioned that these clean fuel standards were more stringent in some places and that we needed regulations that were increasingly stringent. I'm wondering whether you could elaborate on where Canada needs to go with our clean fuel standards to achieve the best results.

Mr. Bora Plumptre: Thank you, Mr. Cannings.

I believe that the clean fuel regulation is fundamentally on the right track, but I think that we've ended up in a situation, just given the length of time it's taken to develop this admittedly fairly complex policy, in a place where the regulation is perhaps a bit unbalanced relative to what was originally envisioned.

When the government announced the clean fuel standard, as it was then called, back in 2016, they were targeting 30 megatonnes of emissions reductions by 2030. That scope of ambition and the scope of the coverage of the policy was reduced by about a third in favour of carbon pricing last winter, under the healthy economy, healthy environment plan, along with the commitment to quite drastically increase the rate of growth in the carbon price. That was a reasonable policy decision to make. However, as a result, I think the design of the clean fuel regulation has ended up in a place where there were all kinds of flexibilities introduced into the regulation to account for the fact that it was originally intended to cover liquid, gaseous and solid fuels, and now it's only focused on liquids.

The Chair: Thank you. Thanks, Mr. Cannings.

We'll go back to Mr. Patzer for five minutes.

Mr. Jeremy Patzer: Thank you very much.

Mr. Wolinetz, in your opening remarks, you touched on something that's extremely important in my riding and in a lot of areas across the country, and that's the impact on rural Canadians.

I'm concerned about the viability for rural Canada going forward, especially as the cost of living and the cost of energy go up with these, whether they be policies like the carbon tax and clean fuel standards and regulations, or just the transportation costs they're going to have for all of this change in energy. We also know that it's going to have a disproportionate impact seniors on fixed incomes and have a massive impact on people who are already living in energy poverty in our urban communities.

When we're looking at jobs for rural Canada, one of the strengths of rural Canada is that you can live with a lower wage—or at least it used to be the case that you could make minimum wage or a little higher and still be able to afford to live in rural Canada. These days, that's not so much the case, because the cost of everything is going up. This energy transition continues to drive costs higher for these people, but the wages don't increase with them.

For the people in rural Canada and for seniors on fixed incomes and people in energy poverty, how can we justify continuing down this path that we're headed on?

Mr. Michael Wolinetz: Certainly, I don't think greenhouse gas reduction and poverty reduction are mutually exclusive. You may need to implement separate and unrelated policies to ensure that you're not unduly affecting people on low incomes or seniors on fixed incomes.

In terms of rural living, there are some real opportunities within a bioenergy system to increase employment in those areas. You would be increasing wage rates and increasing well-being. Certainly, it's not necessarily the case for all people who live in rural areas, but none of this is going to affect their collection and use of heating wood, so that's on the one hand.

On the other hand, there's just the natural turnover of our stock of vehicles, our furnaces and our water heaters. The impact of minimum energy efficiency regulations means that people's energy costs also have a downward force acting on them. It's not just that fuels will get more expensive, but that generally speaking, over the years and decades, indeed, the efficiency of everybody's equipment is going up. That can mitigate a lot of this.

● (1435)

Mr. Jeremy Patzer: The efficiency side of things is definitely good and benefits everybody, but on the government regulations, it states right in them that the avenues they are pursuing are going to disproportionally impact these people. To say that they're mutually exclusive is not necessarily the case. We know that GHG reduction is the point of a clean fuel standard and the point of the carbon tax, and it states clearly, right in it, that those people are going to be disproportionally impacted.

Mr. Michael Wolinetz: Sure. What I mean is that the goals of those policies are not mutually exclusive. You can use revenue recycling in any number of ways to try to mitigate the economic impact on certain segments of the population. You can use changes to your tax policy to do the same. You can use other sorts of policies to mitigate that.

I think that you—and everyone—are always concerned for lower-income segments of our society. In implementing greenhouse gas policy, we should always be mindful of how it impacts them and should consider adjustments to the policy or, in fact, other policies outright, in order to make sure they're not unduly affected.

Mr. Jeremy Patzer: This question will be for you and could be for any of the others if they want to answer it as well.

Right now, we're seeing a shift to combined-cycle natural gas power plants in Saskatchewan. There is one that was just built, just northwest of Swift Current, and it provides I think around 353 megawatts of power. Basically, it can do 350,000 homes or more. It has tremendous baseload power. It's natural gas, so it's cheap energy.

Are these units going to continue to be viable going forward? Are biofuels going to be an option to be used as well in these power plants going forward?

Mr. Michael Wolinetz: In the work we've done, we see that by 2050 you'd need something pretty close to a zero-emissions electricity sector, which means that using natural gas, even efficiently in a combined-cycle power plant, is not compatible with that. You can decarbonize the gas stream. You could inject renewable natural gas or even hydrogen, and then there are modifications that would be required to make that turbine still operate with a high amount of hydrogen in it.

That being said, these units 30 years out may still be viable in terms of adding support to the system. They're there. They're standing by. You would use them very rarely, but they're still part of that system in terms of offering a diversified and reliable source of power should it be needed.

The Chair: Thank you. Thanks, Mr. Patzer.

We will go over to Mr. Longfield.

Mr. Lloyd Longfield (Guelph, Lib.): Thank you, Chair.

Thank you to the witnesses. It's been a terrific discussion today.

I'm subbing on the committee today. I normally sit on the environment committee.

I see that we also have a University of Guelph alumnus with us today.

Dr. Zacharias, welcome. It's always good to have Guelph in the House. I see that you have your Ph.D. in Zoology from the U of G.

I want to start my questioning with you, Dr. Zacharias.

In terms of the infrastructure needed for the transition to hydrogen as a fuel source in transportation—and here I'd note that I'm also co-chair of the automotive caucus with Mr. May, who's also in this discussion—we have looked at the larger vehicles being powered by hydrogen, versus electric vehicles. Linamar, in Guelph, is working on that transition, but we'll need a network of hydrogen supply for vehicles.

You mentioned a little about infrastructure in your comments. Could you expand on that a bit, and what we would need to do through the work of NRCan?

● (1440)

Dr. Mark Zacharias: Thanks for the question.

If hydrogen become more favourable as a technology for medium and heavy-duty vehicles than batteries, then a huge scale-up is going to be required nationwide.

Right now, batteries are winning the battle on light-duty vehicles. Batteries are winning the battle on last-mile delivery vans. They're winning the battle on basically urban transit buses, as you saw with Ottawa's announcement yesterday, and the TTC.

Hydrogen is a kind of long-term transport fuel. It's really probably for semi, class eight-type trucks—and that's probably it right now.

Looking at the U.S. and what the Biden administration is looking at doing to scale up U.S. electric charging networks, I just don't know that it's possible for Canada to do the same with hydrogen, other than for the major Trans-Canada highways at this point. A lot of work needs to be done.

Mr. Lloyd Longfield: Out your way, Ballard has been involved for many, many years.... I worked with Ballard on some of their systems in the mid-nineties, and they were looking at trains and at larger vehicles, as you said, the class eights—class fives would be EVs—but actually getting large shipments across the Trans-Canada. NRCan is funding the Ivy network in Ontario for electric vehicles.

As you said, there's a challenge there.

Dr. Mark Zacharias: Absolutely, and the additional challenge is that Canada has globally the cheapest electricity rates in the G7. Again, that's another tick against hydrogen as a transportation fuel for Canada.

It may make sense for hydrogen buses in China and other countries, but it will be more difficult in Canada to scale up the hydrogen infrastructure and compete against battery electric vehicles.

Mr. Lloyd Longfield: To continue in that argument, if we look at Japan going to zero-emission vehicles, the study we looked at in the environment committee as well, Europe going to zero-emission vehicles, we may be buying vehicles that are zero emission and the market might be ahead of us in terms of us delivering policy and programs.

Dr. Mark Zacharias: Yes, maybe.

I would look at Canada, particularly in the battery medium, heavy-duty vehicle space. We're doing quite well.

Lion Electric has an order for 2,400 trucks from Amazon. GM is going to be building vans at its plant in Ontario. We have the metals and minerals to supply battery manufacturing, and a lot of work going on in that space. It's happening through government right now.

Again, it's not hydrogen related and it's not low-carbon fuels related, but it generally has the same objective at the end of the day, which is decarbonization of transportation.

Mr. Lloyd Longfield: That's terrific. Thank you.

I'm going to switch over to the Pembina Institute in my last 50 seconds.

Looking at carbon capturing storage, Pembina Institute gave me some very good information on that last summer when I was doing some research around that, where the 45Q program in the States had some tax incentives.

I understand that Finance Canada has an open call for people wanting to contribute to tax policy around encouraging carbon capture and storage. Are you involved with that with the Pembina Institute?

Mr. Bora Plumptre: Certainly I would be happy to connect you with my colleagues who are leading our participation in that consultation process, which I believe is ongoing.

I think that the government is looking to have that concluded by the fall so that investments can start getting under way.

The Chair: We appreciate that.

We have about 16 minutes left. We're going into another round of six-minute questions, which would mean only two people would get to ask. If everybody agrees to reduce it to four minutes per person, we can get everybody in for one round. Does anybody disagree with that? No? That's great.

Continuing with the Lloyd theme, Mr. Lloyd, you are next.

Mr. Lloyd Longfield: Thank you, Chair.

Mr. Dane Lloyd: I'm passing my time on to Mr. McLean.

The Chair: Okay.

Mr. McLean, you have four minutes.

Mr. Greg McLean: Thank you, Mr. Chair.

Thank you to my colleague Dane Lloyd.

I'll remind Mr. Longfield, the last speaker, that last week in the House he voted against carbon capture, utilization and storage, so I thank Mr. Longfield for putting in a new wrapper that might look a little better from his perspective. It's much appreciated.

I'll go to Mr. O'Connor here.

Mr. O'Connor, you talked in your testimony about increasing yields from crops. Now, Mr. O'Connor, increasing yields is probably built on things like fertilizers and technologies, all of which, of course, are carbon intensive, energy intensive. Give me the circular rationale for how we actually get more energy efficiency by actually producing more, if you will, carbon in order to kind of get to the biofuels at the end of the day.

● (1445)

Mr. Don O'Connor: It's not really true that we're using more fertilizer per tonne of product. We actually see increases in nitrogen-use efficiency in most crops across Canada, but we also have things like new varieties being developed. Tractors are getting more efficient. Implementation of innovation practices in agriculture is actually a very social kind of exercise, and all of the agriculture groups are looking at how they can help even their average producers become as effective as their most efficient producers.

Mr. Greg McLean: I'm sorry but I have only a little bit of time here.

I'll move to Mr. Zacharias.

Mr. Zacharias, in the same vein, trying to circle some of the facts here, you talked about 100 gigawatts of hydrogen power coming in the near term here as equivalent a hundred Site Cs. Site C was anticipated to cost $16 billion and it is way beyond delivery. We're actually only going to get power out of Site C at best by 2025, so that will mean way more costs and way more time.

Tell us how far away these hydrogen solutions are that are one hundred times Site C that we're talking about.

Dr. Mark Zacharias: I gave the example of Western Australia looking to scale up over the next decade. It has, much like the southwest U.S., tremendous solar opportunities and wind opportunities. We may not have those in Canada.

Canada's scale-up of hydrogen is likely going to be stepped, and it will be blue hydrogen—which is happening now—with very modest increases for specific applications, followed probably by green hydrogen, which is happening already in Quebec. There's an 88-megawatt electrolyzer being built there. Basically, in those provinces that actually have energy surpluses at certain times of the year where there's existing load available to produce—

Mr. Greg McLean: Let's stop there, because we do have to talk about capacity and not just about excesses at certain points of time in the year. I think we agree on that.

I'll ask one final question, Mr. Zacharias. We've talked about how we're going to need two to three times as much energy, and yet replacing the natural gas delivery network, as far as power goes in Ontario and Quebec alone, is going to require—Enbridge was before the committee and provided us with that—seven times the 15,000 megawatt facilities...in a Grande-Baleine style of project. That is not going to happen in the short term, is it?

Dr. Mark Zacharias: No, it takes many years to scale up.

Mr. Greg McLean: Thank you very much.

I have one final question here for Mr. Plumptre.

In your presentation, you talked about a lot of things, including de-risking. I spent 20 years in the financial industry, Mr. Plumptre, and when I hear somebody saying things like “de-risking”, it means transferring risk from the actual project components to the taxpayer. We call that “rent seeking”. We say, “Who's going to benefit from this at the end of the day?” and it had better be the taxpayers of Canada, because it's the taxpayers of Canada who are actually the ones paying for it.

Can you comment on that, please?

Mr. Bora Plumptre: I would absolutely agree that these policies are implemented with taxpayers or, more preferably, citizens in mind.

I think when I was discussing the idea of risk, what I was trying to get at was that in my experience interacting—and I should be clear of course that I don't represent the clean fuel industries as I am participating here on the panel—with investors in these spaces, what I've consistently heard, is that relying on some form, some expression, of the public purse, whether through tax expenditures or through direct subsidies in one form or another, is much less preferable in getting projects under way than is having a secure, dependable regulatory program in place that they know is going to be there in five, 10 or 15 years.

Mr. Greg McLean: You're talking about all these things—

The Chair: Thank you, Mr. McLean.

Mr. Greg McLean: —when you talk about direction.

Mr. Bora Plumptre: Okay.

The Chair: Mr. Lefebvre, you're next.

Mr. Paul Lefebvre: Thank you, Mr. Chair.

I'll continue talking to Mr. Plumptre.

Certainly in the study we're looking at clean fuels, and I was wondering if maybe we could get your feedback for this committee on the importance of having a price on carbon, or a carbon tax, and whether we can reach our climate targets without a price on pollution or a carbon tax.

● (1450)

Mr. Bora Plumptre: I know the committee has heard from Professor Jaccard on this matter. Strictly speaking, from an economics perspective, these targets could be reached without a carbon tax. I think that from a practical perspective, when I look at where Canada is today, my answer is, no, we can't do it without a carbon price, but that doesn't obviate the need for complementary regulations in order to get to where we need to go.

Mr. Paul Lefebvre: Yes, and just like the clean fuel standard is very important as well, certainly.

However, what's optimistic, I guess, on a go-forward basis, is that now we have all political parties that agree on a carbon tax. For a while, the Conservatives were obviously fighting against it, but now they're on board, so I find that at least we're all on the same page in moving things forward.

Mr. Zacharias, I asked you a question a long time ago now—about an hour and a half ago—on the hydrogen storage that you talked about. I think it's very important that we understand this. Very quickly, here's what I want to know. How do we store large quantities of hydrogen? Is that currently viable? If we're going to see a tenfold or 100-fold increase in nationwide hydrogen production, what are the challenges and what are the opportunities?

Dr. Mark Zacharias: There are many different ways to store hydrogen. You can store it in tanks under pressure. You can store it underground in salt caverns, which is happening in the U.S. You can convert it into another product such as ammonia, and you can transport it long distances. You lose about 30% of the efficiency on hydrogen by doing that. Also, like natural gas, you can store it in pipelines if you have a dedicated pipeline network, and that can provide quite suitable and long-term storage.

Those questions haven't yet been sorted out. Again, I think we're a ways away before being able to answer those.

Mr. Paul Lefebvre: We had a witness last week who talked about how, certainly in the U.S., there was a hydrogen pipeline. It was very interesting for us when looking at what kind of infrastructure you need for that, right? Can we convert an existing pipeline to a hydrogen pipeline or not? Those are questions that are top of mind as we go down that path. What are your thoughts on that?

Dr. Mark Zacharias: You simply can't repurpose a natural gas or oil pipeline into hydrogen without re-sleeving it and doing a number of other retrofits. It's not easy, and it will be a while before that technology scales up to a point where it's cost-effective.

Having said that, if hydrogen is used adjacent to where it's produced, the cost of storage and transportation can be quite low. For example, for hydrogen that would be generated near a city like Vancouver and then input into the natural gas grid, either at 20% through an existing pipeline or at 100% through a dedicated hydrogen pipeline, those economics could work at some point in the future.

Mr. Paul Lefebvre: How much can you actually input? I forget.... I think you mentioned this in your opening remarks. It was around 15%. How much hydrogen can we input into natural gas pipelines?

The Chair: You have 30 seconds.

Dr. Mark Zacharias: Right now, it's 20%.

Mr. Paul Lefebvre: Twenty per cent?

Dr. Mark Zacharias: Maximum.

Mr. Paul Lefebvre: The maximum right now.... You say “right now”. Can you explain?

Dr. Mark Zacharias: Well, depending on the age of the pipeline and depending on the equipment at the end that's going to be burning the fuel, you could have domestic or commercial equipment that could use greater than 20% hydrogen in the gas supply.

Mr. Paul Lefebvre: Thank you.

The Chair: That's your time, Mr. Lefebvre.

Mr. Simard, over to you.

[*Translation*]

Mr. Mario Simard: Thank you, Mr. Chair.

I'd like to ask Mr. Wolinetz another quick question.

Mr. Wolinetz, you talked about the job creation potential of low-carbon sectors.

Do you have any data on what the development of the biomass sector might represent in terms of job creation?

[*English*]

Mr. Michael Wolinetz: We've seen nationally, if we're just talking about the collection and delivery of feedstock to production facilities, that it could be on the order of 20,000 to 30,000 jobs nationally, roughly speaking. I can look for some numbers and perhaps send you something off-line if you'd like.

[*Translation*]

Mr. Mario Simard: How long would it take to create these 20,000 to 30,000 jobs?

[*English*]

Mr. Michael Wolinetz: It would be over the next 20 to 30 years.

[*Translation*]

Mr. Mario Simard: Okay.

Earlier, you said something about biofuel production that made me raise an eyebrow, and I don't know if I understood correctly.

As far as I know, there aren't any projects that involve taking anything other than forestry waste. I've looked into this a little bit, and in Canada there's no project that involves using trees, for example, to make biofuels. Where it becomes advantageous is only if we use forestry waste.

Is that a fair representation of what you're thinking?

● (1455)

[*English*]

Mr. Michael Wolinetz: From a greenhouse gas reduction perspective and a cost perspective, it is preferable to be using forest residues. That being said, the value of biofuels could rise such that you might be looking at other feedstocks that have less of a positive greenhouse gas impact.

[*Translation*]

Mr. Mario Simard: So we could use agricultural residues, among other things.

Do you feel that the targets set by the Clean Fuel Standard are restrictive enough to develop the biofuels market?

[*English*]

Mr. Michael Wolinetz: The federal clean fuel regulation, in my opinion, is unlikely to be sufficiently strict between now and 2030 to require agricultural or forestry residues to be part of our bioenergy system. There's enough abatement from first-generation biofuels, from electrification and from carbon capture and storage to comply with that policy over the next nine years.

[*Translation*]

Mr. Mario Simard: What do you think an attractive target for developing the biofuels market would look like?

[*English*]

Mr. Michael Wolinetz: I think it would be trending toward the requirement in British Columbia or California, for example. Instead of about a 13% reduction in life-cycle carbon intensity of fuels, it would be moving toward a 20% reduction.

The Chair: Thank you, Mr. Simard. I have to stop you there.

Mr. Cannings, you have about three minutes.

Mr. Richard Cannings: Thank you.

Mr. O'Connor, I want to pick up on the forest waste used to create renewable natural gas, what the life-cycle analysis of that looks like, and how much of a future you see for that aspect within Canada. I know that FortisBC, for instance, is trying to get more renewable natural gas. I have a company in my riding that wants to build two or three of these plants in my riding. They feel they have more than enough feedstock.

Could you talk about the life-cycle analysis for the net-zero aspect of it and about the future of that sector?

Mr. Don O'Connor: In British Columbia we have this regulation that requires that the forest residues be slash-burned. That burning does not happen very efficiently. We get fairly significant methane and N2O emissions from burning that slash. If we can take those forest residues and use them in a controlled manner to make RNG, we could get a net negative RNG out of that process. Even if we were to use mill residues, the emissions would be probably in the order of one-tenth of what they would be for fossil natural gas.

Mr. Richard Cannings: So the life-cycle analysis of that whole process would be net zero or negative. Is that right?

Mr. Don O'Connor: From forest residues, it would be negative.

Mr. Richard Cannings: Right.

Do you see this as something that Canada could develop as a future feedstock for our natural gas consumption, or will natural gas consumption decline, as we heard earlier in this hearing? I'm just wondering what the future of this is for the country—and for the world, for that matter.

Mr. Don O'Connor: We use an awful lot of natural gas, so it would take us quite some time to switch from forest residues to supply all of our fossil and natural gas. There's been a request for proposals to do a study in B.C. to look at the market potential of RNG from all sources. I don't believe there are enough forest residues today to displace our current natural gas use.

● (1500)

Mr. Richard Cannings: Does Mr. Wolinetz want to jump in and add anything?

Mr. Michael Wolinetz: If you wanted to fully decarbonize your gas stream, there wouldn't be enough forestry residue. You'd have to reduce the amount of natural gas you're using, produce renewable natural gas from a variety of feedstocks, including forest residue, and likely supplement it with hydrogen.

Mr. Richard Cannings: Thanks very much.

The Chair: Thank you, Mr. Cannings.

I appreciate that, and everybody accommodating us with the time.

If everybody could stick around for two minutes, I want to thank the witnesses. That was a very interesting panel, to say the least, and incredibly informative. We're all very grateful, so thank you.

We are almost done this study, but if MPs can stick around for a moment, our guests can leave.

Mr. Bora Plumptre: Thank you for having us.

The Chair: It's our pleasure.

Mr. Greg McLean: Thanks for coming, everyone.

The Chair: Monday is our eighth and final meeting of this study. We're going to have 90 minutes with witnesses. We'll then go in camera for 30 minutes of drafting instructions. The revised agenda has just gone out within the last half hour.

That said, we are at the end of the session and things are moving and changing by the minute. I don't know what's going to happen on Monday. In the event that for some reason our meeting gets scuttled on Monday, I want to thank all members of this committee. It's been a real pleasure working with every one of you.

We said at the outset that this committee works well together. It has proven to be true throughout. Even when we disagree, we do it respectfully. I'm constantly reminded of this every time I go to another committee. For that, thank you to all of you.

I also want to thank all of the people who make these meetings happen, our translators, all of the staff, our clerk and analysts. You guys hold all of this together. We do a lot of talking, with a lot of different ideas on different things, and you put it all together, make it work and make it run smoothly. For that, we all owe you a deep debt of gratitude, so thank you.

If I have an opportunity, and we're here on Monday, I will say it again, but we do all appreciate it.

On that note, I hope to see you on Monday. Have a safe and enjoyable weekend.

Mr. Greg McLean: Mr. Chair, in addition to echoing all of your thanks, do we need half an hour for instructions on Monday, or would 15 minutes suffice?

The Chair: It probably would. We can build in a safety valve. If we end up going a bit over an hour and a half with the witnesses, there's always a bit of transition time between the public and in camera sessions. It will probably work out closer to that, Greg.

Mr. Greg McLean: Thank you.

[*Translation*]

Mr. Paul Lefebvre: Have a good weekend, everyone.

[*English*]

The Chair: The meeting is adjourned.