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Chair

Mr. James Maloney

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● (1535)

[*English*]

The Chair (Mr. James Maloney (Etobicoke—Lakeshore, Lib.)): Good afternoon, everybody. We're going to get under way. We're running a little late and we have a lot to do today, so we're going to adhere very strictly to the timelines.

Just before we get going, I want to let everybody know that, while at the last meeting we had a discussion about some potential travel plans, I am not going to be taking that to the Liaison Committee because we do not have unanimous consent on that.

As for our presentations today, unless anybody strenuously objects, I'm going to suggest presentations be kept to nine minutes each, which will allow some opportunity for more questions.

To our witnesses, thank you all very much for being here. We have three presentations in the first hour. Young Women in Energy, I would like to thank you particularly because I know we cancelled on you last week, so thank you for making the effort and joining us again today.

I will open the floor up to each group for up to nine minutes. You don't have to use all nine minutes, but you're free to if you'd like to. I encourage you to speak in both official languages because you may be asked questions in French or English.

Ms. Reschke, since you were kind enough to return, why don't we start with you, if that's all right?

Ms. Chelsey Reschke (Member, Young Women in Energy): Thank you very much for having me. It was an unfortunate occurrence last week with the line strike. I am in the pipeline sector, so I guess it was somewhat of a fateful event.

I'm thankful to be here on behalf of Young Women in Energy and my employer, Keymay Industries. I'm humbled and excited at the opportunity to present my views, which I've gathered over the last eight years of being in energy, along with being a voice for about a dozen or so industry leaders I consulted in preparation for this speech.

I want to spend my time speaking to two interests, “clean tech” definition clarity and platforms that support the commercialization of technology. First, I'll explain how Keymay Industries, my company, which was historically in manufacturing, is now involved in the clean tech market.

Within the natural resources ecosystem, transportation via pipelines is a pretty critical component. Oil and gas pipeline construction is particularly challenged right now by the current political and economic climate, with sustained low commodity prices and an increase in complexity. Fostering innovation has understandably been taking a back seat, as businesses tend to pursue their operational survival.

I think a lot has already been said by other witnesses about the importance of policy stability and reliability from term to term helping out a lot in that sector. We do notice that the large-scale adoption of technology is much more reliant on having that for the long planning cycles they tend to have.

I agree with that sentiment, but I'm giving you the small and medium enterprise perspective here: there are other driving factors for innovation. During the 2015-16 downturn, Keymay Industries spent 1.5% to 2% of our revenue each year on the development and commercialization of an automated coding technology for pipeline construction.

The equipment, which is called the AutoBond, replaces a manual painting process and provides a major savings to our customer in the form of efficient improvement and very large-scale reduction in one-time use materials. It's a significant environmental impact. Like I said, the landfill reduction is a key component here. We estimate that in the course of the next couple of years, there's going to be about 2,500 kilometres of new pipeline construction, and we're talking about a landfill savings of 240,000 pounds of waste.

This brings me to my first point. Is this clean tech? Many who I talked to in preparation for this said, “Absolutely,” and nodded, while others said that the government is looking for biofuels, batteries, and grid solutions. There's a lot of work to be done here in ensuring that small, medium, and large enterprises are included in the development of clean tech.

The definition provided in this study is “any product, process or service designed with the primary purpose of contributing to remediating...any type of environmental damage”. The latter two words are really the key part, “environmental damage”.

At first glance, the example I gave you about the AutoBond may seem like a very small drop in the bucket. It's important to acknowledge that small companies all the way through to large companies have an important role to play as we transition to a more sustainable energy ecosystem.

The major emphasis within the clean tech definition that you have provided us seems to be the remediation or prevention of environmental damage. As there is no generally accepted clean tech definition nationally or internationally, I see this as a leadership opportunity for Canada to champion the measurement and classification of clean technologies using a much more holistic view of the impact, rather than isolating purely the end benefit or product. This is what some would call the wheel to well philosophy, this holistic kind of balance of considering all components that go into the end product, and not just what it's doing at the end of its life cycle.

Life-cycle impact is a much more valuable part of the definition. The reality is that without measuring cradle to grave, how do we truly know if there is a prevention or remediation piece occurring?

● (1540)

One example is the recent tax that Singapore levied on Teslas, and this is a very eye-catching kind of headline. The Singapore land transport authority did a study, and they discovered that the energy that goes into generating the electricity for Teslas uses over 400 watt-hours per kilometre. They taxed the Teslas, because this wasn't as efficient as some of the other energies that could go into driving a car.

Similarly, if we look at the biofuels debate, the United Nations Intergovernmental Panel on Climate Change warned that increasing bioenergy crop cultivation poses risks to the ecosystem and biodiversity. Their examples are that biofuels—some of them, I should specify—produce greater total greenhouse gas emissions than those of petroleum products.

The clean tech study is an incredible opportunity for the government to engage industry experts and economists, first to design the proper instruments and tools that you'll need to measure these life-cycle impacts that I'm referring to, and then to provide that feedback to the public so that all stakeholders, including industry, academia, and associations, have a clear understanding of where that area of priority will be and where we will be making a real difference.

The motivation to create clean technology isn't solely for the environmental benefit or the intrinsic benefit. It is also for profit. Where there are inefficiencies or wastefulness, there will be entrepreneurs. In my opinion, clean tech products or technologies will spring to life not because of government policy or incentive but as supported by government policy and incentive. Really, when we look at the $2 billion already spent in the last three years on clean tech R and D, a very healthy amount of that, almost 70%, comes from industry as compared with about 18% provincially and 14% federally. I really don't believe there is a lack of motivation or incentives impairing the creation or adoption of clean tech. I think we need to start looking at some of the disconnects between the R and D and commercialization stages. There is definitely a disconnect there.

There has been a lot written already, such as in the 2015 publication “Canadian Energy Strategy”, about technology and innovation as a high-priority area of focus, but it is very heavily leaning toward the development and research side of things. Really, this is where I'm starting to echo a lot of the experts who have 20, 30, or 40 years more than I do in the industry. It's very unclear in those studies what portion of that $2-billion expenditure is in what stage of that product being developed or realized. Is it more in the R and D stage or is it on the commercialization side? As I said, it's surfaced in almost every single conversation I've had with my peers and mentors that a focus on commercialization is essential, and it's often missing.

The programs they mentioned most frequently, since you guys are looking for examples, included Technology Partnerships Canada, which was retired in December 2006, and the Canadian innovation commercialization pilot program. They mentioned these repeatedly because they had something in common. They both supported pre-commercial products and services, not R and D. There were a lot of examples within Technology Partnerships Canada, where the government was able to get a return on this investment, up to 1.5 times, for the technologies that were successful. But I'm sure you guys have much more access than I do to all of the information behind those programs.

To reiterate, I really appreciate the opportunity to speak to you. I believe that the highest value the government can provide in fostering clean tech is to assume this leadership role in defining clean tech in a manner that emphasizes life-cycle impacts, and to ensure that the expenditure that will be spent in the next little bit on clean tech development and adoption is inclusive of both carbon-based and carbon-free or renewable-type industries at all levels—small, medium, and large enterprises. If we are going to prioritize anything, it will need to be the investment in the commercialization phases of the technology, not pure R and D.

Thank you very much for having me.

● (1545)

The Chair: Thank you very much.

Mr. Wright, why don't we turn the floor over to you.

Mr. Tony Wright (General Manager, Fundy Ocean Research Center for Energy): Thank you to the committee, both members and to the staff, for your kind invitation for us to be here today. On behalf of everybody at the Fundy Ocean Research Centre for Energy, or FORCE, as it's commonly known, it's an honour.

I'm pleased to be joined by Melissa Oldreive, our environmental programs manager at the facility, and Jeremy Poste, representing one of our berth holders at FORCE, who is with a company called OpenHydro Technology Canada.

We're happy to be part of a conversation about how clean technology can be part of our economy and our environment. We're here today to discuss specifically the marine renewable energy sector, which includes river current, tidal, and wave technologies. Our specific focus at FORCE is with respect to tidal devices, which have application for both tides and rivers. Tidal turbines operate much like a windmill, but albeit under water. They convert the natural flow of water and current into electricity.

FORCE, where Melissa and I work, is a demonstration facility that connects these turbines to the Nova Scotia transmission grid. FORCE was supported by a $20-million grant from the Government of Canada. That grant has been a huge success for us, spurring nearly $100 million in development activity in this sector and the involvement of over 250 Canadian companies. That activity is projected to reach $240 million as each of these devices is installed at our facility.

The FORCE site is in the Bay of Fundy's Minas Passage, which contains approximately 7,000 megawatts of power potential. That's enough to power almost 2.5 million homes, or all of Atlantic Canada at peak demand. It's quite a staggering resource. That resource flows across the country. It's not limited to the Bay of Fundy, where it's estimated 40,000 megawatts of tidal power from our coast regions lie in wait. This potential climbs significantly if we apply that estimation to Canada's rivers, where it's estimated 340 gigawatts of power lie in wait for all Canadians.

If you look at a map of Canada, you can predict places where tidal and river energy can be extracted. Just as the water speeds up when you hold your thumb over a garden hose, you'll find an energy resource any place where two shorelines pinch together. Unlike other forms of renewable energy, tidal energy is predictable. We can predict the output today, tomorrow, or a hundred years from now, and that makes it easier to plan and integrate into the grid.

Last year, my colleague here, Mr. Poste, did just that. He deployed the first large-scale, grid-connected tidal device in the Bay of Fundy. This is certainly not the first deployment in the world. In-stream tidal energy projects are expanding in the United Kingdom, the United States, Australia, France, China, and South Korea. Others, like Chile, India, and Japan are also taking early steps. At the moment the U.K. leads this sector, with over 1,800 megawatts in development. The region has deployed dozens of devices, including the first industrial-scale, four-turbine array, the final step before moving to pure commercial farms.

The technology also has applications in northern and remote communities, where people often rely on diesel-based generation for their power sources. Even at this early stage, tidal technology can compete with those costs. North America has seen small-scale deployments in British Columbia, Manitoba, New York, Maine, and elsewhere. In fact, an in-stream project in a small Alaskan village has already shown potential to lower and stabilize electricity rates for remote communities. Importantly, although the project is located in a sensitive spawning ground for salmon, monitoring to date has shown no significant impacts from the installation of this device.

Whether we place a turbine in Alaska, the North Sea, or the Bay of Fundy, continued environmental monitoring will be crucial. Power developers need to provide clear and convincing evidence that their technology is safe and that impacts are acceptable. That means getting in the water and getting equipment wet, and that's something Canada is very good at. Hundreds of Canadian companies have the skill to directly translate to supporting this industry, and they'll have already been put to work monitoring and measuring the resource, transporting and installing substitute power cables, and building turbine components and pioneering new research.

Canadian scientists and contractors have also been hard at work around environmental effects monitoring. Working with them, FORCE has built three underwater science platforms to gather data from the sea floor. These platforms are creating a critical new piece of Canadian expertise: the ability to see and sense extreme turbulent flows located, for example, in the Minas Passage. Wind projects rely on meteorological data to get the ball rolling, both for consenting and for project planning in terms of profitability. We're building the comparable tools for tidal. The data the platforms produce makes everything possible: the technology, design, resource assessment, financing, public acceptance, and more. These sensor platforms and the expertise surrounding them are pioneering. They are also a huge export opportunity for Canada.

● (1550)

Getting the industry moving has also taken the considerable political will of both provincial and federal governments. For that, we would like to thank you. We still need it though, and this includes infrastructure, specifically related to port facilities and a greater capacity that can accommodate increased adoption of renewables; federal policy leadership on renewable targets in tandem with your leadership on carbon; and financial mechanisms to support cost reduction.

As I mentioned, we're not alone in this race. Capturing even 10% of the global market could translate into $5 billion in exports by the year 2050. We're off to a great start.

Again, 250 Canadian companies have been involved in the activity in the Bay of Fundy alone. Across the country, Canadian companies like Rockland Scientific and Instream Energy Systems in B.C., New Energy Corporation in Alberta, and MilAero in Nova Scotia are already providing solutions to the international market. Small Atlantic Canadian companies like EMO Marine have been bought by international firms like the MacArtney Underwater Technology Group.

As the industry matures, so will the opportunity. We believe our oceans and rivers have the potential to create those opportunities right here in Canada.

Thank you very much. I'd now like to turn it over to Jeremy Poste.

The Chair: Thanks. I'm going to have to ask you to keep your comments to about two and a half minutes though.

Mr. Jeremy Poste (Country Manager, OpenHydro Technology Canada): Members of the committee, I am sincerely delighted to be with you here today.

As mentioned by Tony just earlier, when it comes to marine renewable energy, Canada is not only a huge potential of untapped resource across the country, but more importantly, Canada has no shortage of talent to harness this resource and foster economic development across the country.

My last three years with OpenHydro in Canada have been dedicated to demonstrating that tidal energy can be safety extracted from the Bay of Fundy to power Canadian homes without compromising the environment in which in-stream tidal turbines are placed.

On top of generating electricity from a clean and predictable energy source, this project has demonstrated that a few megawatts of ocean energy can generate significant investment within the local supply chain. Indeed, more than $33 million were invested during the construction phase and installation phase that employed more than 300 people, 100 of them new job creations.

Marine renewable energy is such an urgent and early-stage sector that it needs political leadership, and appropriate policy instruments to de-risk its development over the next years and achieve adoption within the renewable energy mix.

There are four key areas that are essential to the successful commercialization of tidal energy and marine renewable energy by extent, and that will need appropriate attention and leadership in order to keep the development of marine renewable energy on track with our renewable energy objectives. They are detailed resource characterization and environmental monitoring, grid availability, infrastructure, and long-term visibility through government support and leadership.

We need to develop a suitable understanding of our marine environment through applied research and development in order to optimize the safe and sustainable conversion of marine energy into affordable electricity for Canadians. Whereas tidal energy is highly predictable, a fine understanding of site characteristics is key. Tidal and river current sites are extremely challenging and turbulent environments that require innovative measurements and measuring techniques in order to de-risk financial models based on energy production.

My second point is about grid availability, which involves the development of a coastal grid infrastructure to export the power extracted from offshore marine energies. I am hopeful that the Canada infrastructure bank will look positively at projects that promote smart grid integration, as well as the expansion of a grid infrastructure for the transmission and distribution of clean renewable energy to customers.

My third point relates to infrastructure, and how to develop a suitable marine infrastructure to support the commercial development and create long-term local jobs.

France, for instance, has decided to invest 50 million euros, about $75 million Canadian, in the expansion of existing port infrastructures, wharfs, and quaysides in the port of Cherbourg in Normandy. This project has immediately attracted companies all over Europe to co-finance the establishment of industrial facilities for offshore wind blade manufacturing, offshore wind farm preassembly works, and the assembly of the upcoming OpenHydro turbines.

● (1555)

The Chair: I apologize Mr. Poste, but I'm going to have to stop you there. We do have your speaking notes, which will be available to committee members, so we will have the benefit of your presentation.

Mr. Switzer, I will turn the floor over to you, sir.

Mr. Jason Switzer (Executive Director, Alberta Clean Technology Industry Alliance): Thank you very much. Good afternoon.

I'm very pleased to be here representing Alberta's clean technology sector as executive director of the Alberta Clean Technology Industry Alliance. I also worked in the oil patch for much of my professional career and then more recently at the Pembina Institute, Canada's leading energy and environment think tank.

Alberta's clean tech sector, we've discovered through undertaking our first major survey of this sector, is largely focused on the needs of the natural resource sector, unsurprisingly, with over three-quarters of the companies in our province marketing to oil and gas or mining.

The health of this sector and its absorptive capacity—the ability to take on novel technology and commercialize it—is actually vital to the long-term success of the clean tech ecosystem in Alberta. I'd encourage you to have a look at our report at www.actia.ca for more details. We think our province is going to become a world-class destination for clean tech venture investment and scale-up and are working regionally with partners B.C., Ontario, and Quebec through the national alliance Canada Cleantech.

Like the previous speaker, I would say our perspective on clean tech is wide. It involves both something new, some element of novel intellectual property or business model, as well as the inclusion of environmental performance better than the competing alternative as part of its core value proposition. In short, you could include clean tech in the natural resource sector in oil and gas as well as in new sectors such as increasing natural sink capacity through CCS or soil carbon enhancement.

[*Translation*]

Ladies and gentlemen, thank you for giving us an opportunity to discuss this topic, which is vitally important for the future of our country and of Alberta.

Here, I would like to emphasize how the space of innovation can be stepped up in the extractive sector.

[*English*]

As you know, our oil patch has an incentive and certainly a history of adapting to change, but the need to demonstrate step-change environmental and economic performance comes at a time when leaseholders and their service providers are at a historical disadvantage, losing money on a large portion of the barrels being produced and facing the prospect of a capped or even a declining market in their future. But it's worth remembering that the oil sands industry was borne out of adversity, bankruptcies, operational failures, and even the famous Abasand fire, which took the first commercial plant out of operation permanently in the 1940s. That didn't lead to the abandonment of the sector then.

I would say don't count the oil and gas sector out of the future, but the future will look significantly different than the present or the past.

First off, it's important to know that the high prices for oil and gas in the last decade planted the seeds for the current crisis. As prices escalated, investment focused on developing novel sources of hydrocarbon, including in the Arctic and the oil sands, in Brazil, off the Gulf of Guinea, and so on. It also laid the groundwork for the success of lower cost, high productivity development right here in North America. In fact, companies like Encana were at the front edge of applying a kind of manufacturing approach to resource development. As a result, we've moved to a situation where the problem is supply and not demand.

In fact, McKinsey and others forecast that the global demand for oil and gas will peak within the next 10 to 20 years. Some forecast that it has already peaked and that, with the advent of electric vehicles and demand reduction technologies, we're likely to see a significant decrease over time. Certainly, no serious attempt to address climate change includes growth of oil and gas combustion.

Innovation, in my view, is key to going where the puck is and not where it was. Some changes to technology, process, or business models are merely incremental. I think we realize that incremental will not get this sector where it needs to be. Research on this sector has shown that technology adoption is relatively slow with an average of 16 years from concept to widespread commercial adoption. As a slow clock-speed industry, the oil and gas sector is disadvantaged by high capital cost and by the need for the public sector to intervene to accelerate deployment.

Among the key barriers to technology change in oil and gas is our historic tendency to under-invest in R and D, with only 1% of net revenue in R and D compared with 4% to 12% in computing or electronics. The high capital cost and high risk for any change to the technology template while piloting disruptive change in technology can be both costly and career limiting for proponents.

● (1600)

It also induces regulatory risk. If you change the template, you're asking the regulator to put new constraints on your project approval.

In terms of intellectual property conflicts, one of the tendencies in the industry is to sort of paper around a particular innovation to prevent other people from doing it, and of course, that slows innovation. Most fundamentally, there's a kind of cultural challenge: business architecture lock-in. For example, one study of the adoption of the Internet of things in the oil and gas sector concluded that managers are deploying things, but are confronted by the fact that they can't change their fundamental business architecture, so you're maintaining existing organizational silos rather than changing them.

There are two fundamental ways to disrupt this. First is to rethink what business we are in and then, second, to rethink the role of the public sector in supporting innovation.

Let me talk about the business piece first.

Upstream, a future-oriented view would look toward investment in extraction technologies that leave the carbon in the ground while recovering the electrons, the hydrogen, and the rare earth elements. Several researchers in Alberta and elsewhere are working on this, but like the oil sands before they were commercialized, these are technologies that are outside of the profitability horizon of publicly traded oil companies. Public investment is urgently needed here, and maybe a technology prize, something that catalyzes imagination. Of course, if that's the case, then count ACTia in as part of that.

In downstream refining, I'm aware of a group of experienced engineers and technologists from several leading companies who, working out of Sarnia's Bowman Centre, are investigating the potential for transforming long-chain asphaltenes, the heart of the oil sands, into graphene and carbon fibre. In that view, if you can imagine it, if Ontario were the world's lowest-cost producer of carbon fibre, what would that mean for the long-term prospects for our auto sector or our building sector? There's a moat in there that even Warren Buffett would applaud.

If we were to seriously focus on rethinking what the downstream market is for a product, we might have a long-term story that would be unique globally.

There are several public sector interventions that are necessary to accelerate clock speed in oil and gas. They will include rethinking IP and incentives for technology deployment as well as for rethinking the industry model. As an example for your consideration, Alberta, in reviewing its oil sands royalty regime, struck new ground in offering royalty incentives for non-combustion uses of bitumen. I think that's a model that would be really important in other sectors as well.

There are a few other elements, such as regulatory incentives and flexibility mechanisms for innovative technology deployment. As I mentioned, when you change the template, you create risk for the regulator. In the U.S., the EPA offers negotiated performance waivers under the Clean Air Act and the Clean Water Act. This empowers authorities to trade certainty of environmental performance for the opportunity of better performance at a lower cost.

One could also offer a fast track in regulatory consideration for projects that are better than the average or better than the last project that came through the queue. On that basis, companies would compete for a spot in the NEB queue on the basis of how well they were doing from an environmental perspective, rather than how well the project did in terms of getting itself into the queue on a first-come, first-served basis.

We also need a lot more focus on pre-commercial technology sandboxes. A good example of that is the partnership between Natural Resources Canada and the Government of Alberta to launch the Alberta Carbon Conversion Technology Centre in support of the carbon Xprize here in Alberta. Technology sandboxes are the magnets around which ecosystems can form. Much like you go to CERN in Geneva if you study particle physics in order to smash atoms together and understand the fundamental stuff of the universe, we need to create these kinds of magnets in other domains, here in Canada. Like the carbon conversion centre—

● (1605)

The Chair: I'm going to have to interrupt you, Mr. Switzer, and stop you there. We're just over our time limit. Thank you.

Mr. Jason Switzer: Thank you.

The Chair: Mr. Tan, you're up first. I understand that you may be sharing your time with Mr. Arseneault.

Mr. Geng Tan (Don Valley North, Lib.): Yes. I'm going to share my time with my colleague.

Mr. Switzer, the oil and gas industry has always been a very important industry for Alberta, so I have no doubt that you really want to make use of your clean technology to help the industry reduce its carbon footprint and increase its efficiency.

How willing is the oil and gas industry to adopt and to apply your so-called clean technology? How long will it take for the industry to get the proof that your technologies are worthwhile? What's the time frame?

Mr. Jason Switzer: I think the absorptive capacity of the industry has traditionally been limited. That's why I think a focus both on incentives for technology deployment, which may be financial mechanisms, as well as these technology sandboxes is critical. Getting over the commercialization valley of death where the cost of deploying new technology can number in the tens or hundreds of millions of dollars requires the ability to essentially plug and play. You want the infrastructure in place so the companies are able to see examples in practice that allow them to move more quickly.

Mr. Geng Tan: Thanks.

Mr. Poste or Mr. Wright, when the turbine technology is used in the near shore, and solar technology as well, the tidal turbines are subject to corrosion. There might even be a deposit on the blade or even on the pathway that reduces its capacity and reduces the lifetime of the tidal turbine. How do you compare your tidal technology with others, wind and solar?

Mr. Jeremy Poste: At this stage, there has been no convergence of technologies in the tidal energy sector. You would see different technologies like three blades, wind turbine type, and some other concepts like ours with no axis in the middle. It differs among technologies.

There are a lot of technological challenges to overcome in this industry. You rightly pointed to the fact that we are in the ocean where there is not only corrosion, but high flow, biofouling, and all of those technological challenges that we are trying to demonstrate through our first project at the FORCE test centre. That means we have a suite of sensors that monitor most of those challenges on the technologies themselves. That's where the demonstration projects are necessary because we get to see that over the lifetime of those tidal ranges, over 15 years, and check the predictions of all those changes every six months, five years, 10 years.

● (1610)

Mr. Geng Tan: Thank you.

[*Translation*]

Mr. René Arseneault (Madawaska—Restigouche, Lib.): Thank you, Mr. Tan.

My question is for Mr. Wright or Mr. Poste and concerns the energy generated from tide currents.

I am from New Brunswick. For those who don't know this, the Bay of Fundy has the highest tides in the world. So it's an ideal location, on planet Earth, to conduct testing and research.

In that regard, is the research conducted and the technologies used in bays with much smaller tides as useful as in the Bay of Fundy?

Mr. Jeremy Poste: Topologically and geographically speaking, I think that the Bay of Fundy is very unique. It gives rise to the highest tides in the world. When it comes to tidal power, the beauty of the Bay of Fundy is that it also has very strong currents. So the bay provides both a difference in elevation between low and high tides, and very strong currents.

Today, it is estimated that the Bay of Fundy's harnessable power is between 2 gigawatts and 3 gigawatts. The entire tidal power market, around the world, is between 100 gigawatts and 120 gigawatts. So the international market is much broader in scope than the Bay of Fundy's market. Of course, the Bay of Fundy has an exceptional resource. But the resources in Europe, in Asia or in other locations where OpenHydro operates have current speeds that may be comparable to those in the Bay of Fundy.

Mr. René Arseneault: Once conclusive results are obtained, it is possible to install those kinds of turbines, which look like spaceships, by the way. They are quite something, at least from what we can see. They can be installed in much less imposing bays.

Mr. Jeremy Poste: Exactly. A few years ago, the Government of Nova Scotia, along with the providers and promoters who had come to the Bay of Fundy, decided to prove that the technology would be technologically and financially sustainable in one of the most extreme parts of the world in terms of tides.

Mr. René Arseneault: Thank you.

[*English*]

The Chair: You're right on time.

Mr. Strahl.

Mr. Mark Strahl (Chilliwack—Hope, CPC): Thank you, Mr. Chair.

My question is for Ms. Reschke.

You said that clean tech products or technologies will spring to life not because of government policy or incentive, but supported by government policy or incentive. Some might say in spite of government policy or incentive.

Can you elaborate on what the difference is between supported by but not because of, and what that means as government designs programs? What should they be focusing on?

Ms. Chelsey Reschke: The whole concept that I'm trying to drive at here is a broadening of the policy and not trying to have the government play the role of picking the winners and losers.

The problem is that the market decides in most cases. Like I said in that investment summary, the significant investment comes from industry as it is, and that's far in advance of this clean tech study, or any of the involvement that the government plans to have in the future.

What I'm trying to say is that we look at broadening the horizons to include more scale—so small, medium, and large enterprises. I know there's a lot that needs to be done to support the large enterprises because of the complexity and the long time frame, and government is probably going to be a major player in the large enterprises because you can be more patient.

I think you asked the gentleman, Mr. Switzer, about the time frame. Most of the time he said it is an average of 16 years for implementation. If the government is going to do anything, I think it's to be patient, and to make sure you are broadening and not narrowing that definition. If you are going to narrow it, you're going to pre-emptively eliminate some opportunities for things to naturally come on board out of the minds of inventive entrepreneurs and people who naturally have a knack for anticipating where the market is going and what the industries are going to need to transition.

We understand that this is a transition. I'm in Alberta. I grew up in oil and gas. My mom was in filtration. I'm in corrosion, protective coatings for pipelines. We all see what's happening, but it's not an overnight thing so let's broaden the definition and make it more inclusive while that transition occurs.

● (1615)

Mr. Mark Strahl: Right.

Part of my next question to you was going to be on the ill-defined nature of clean tech. We've had oil and gas folks in here talking about improvements to drilling technology, for instance, running rigs on natural gas, which is at the source, where they are. We had members on this very committee who didn't think that qualified as clean technology.

You touched on it briefly, and we had Pierre Desrochers here who said of green technologies, “Often they create, I would argue, more problems than those that existed before. It's not because they're based on renewable energy sources that they are necessarily more sustainable.”

You mentioned the renewable fuels initiative, which I remember watching unfold. There were demands that the government of the day get a percentage of renewable fuels into the system, and it was considered to be unacceptable that it wouldn't happen immediately. Within five years, the policy was rejected as having caused a spike in food prices, a shortage of worldwide food supply, and a realization, as you said, that the greenhouse gas emissions or the inputs to create that fuel were just as high as traditional oil and gas.

Can you maybe explain how, in your view, we need to have the longer view, that if we don't properly consider life-cycle impacts, we're going to not only endanger the economy but our environment?

Ms. Chelsey Reschke: This prompted me to really consider a future doing a master's in economics, because I think those are the kind of people that you're going to need. You're going to need some measurement specialists. I'm not that person.

First of all, this is an example from the biofuels.

I talked to a gentleman named Jeff Golinowski from Tier 1 Energy and he went on an hour-long rant about the biofuels thing because the land is permanently damaged. Had they done the feasibility study in advance and notified everybody about how much would be consumed in the development of this biofuel and what the long-term impacts to the land would be, then they probably wouldn't have gone forward.

To your point, the economists that you probably have access to would look at things like the extractive cost that goes into developing batteries, for example, and how much carbon is liberated in the heavy mining industry to get *x* number of tonnes out of the ground, let's say. We would put a value on that, and then carry it through a kind of ecosystem. It's almost like the concept of the tiny plastic beads in cosmetics and how they bioaccumulate in the ocean.

This is a very tangible concept that I'm trying to give to something very complex, but you have a very large budget. If you're going to develop something, I would encourage this definition to be the prime focus of the study.

I would encourage you to engage really valuable industry experts and economists who can measure how much.... Maybe you make it on a scale of carbon liberation, because the real problem is how much carbon we are liberating in each process. Tag a value to it, track it really clearly, and have some sort of additive calculation before we proceed to develop things like biofuels or some of the more new-age technology.

I'm sorry I can't be more specific on that.

● (1620)

Mr. Mark Strahl: You've said before that you believe the government should prioritize investment in the commercialization of new technologies over pure R and D. Could you maybe just expand on that thought? We don't have much time.

Ms. Chelsey Reschke: I guess what I've heard about R and D is that we should look at it like a pyramid. At the top of the pyramid, the R and D phase probably eats up the least amount of money because it's more in the science, not so much in the application.

The application process, or applying science by taking that patent off the shelf and making it commercially feasible, is at the bottom of the pyramid. It takes longer and it costs more money.

I'm not a finance expert either, but to get something to that phase, there's more emphasis on R and D all the time, with a lot of programs at the provincial level. There are grants. They are usually around $50,000. That's not enough to commercialize something. Maybe the government could spend a smaller portion, like 15% of the study money, on R and D, and more like 40% on the late-stage commercialization pieces.

I think that the problem is—no offence intended to anybody—how you are going to measure which ones to invest in. You need to talk to people at GE and 3M, people who have developed technology and are experts at this gated approach. They kill it if it's not going to go forward, and they have the best scorecards in the world.

The Chair: I'm going to have to stop you there.

Mr. Cannings.

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

I'm going to start with Mr. Switzer. You mentioned that the future of the industry—I assume the oil and gas industry—will look very different. You said we have to go where the puck is going to be, not where it is.

Then you mentioned a few things kind of quickly, at least for me, about perhaps some of those possibilities. I wonder if you could expand on how that future will look in your mind's eye, where we have to be headed, and what we can do today to get there.

Mr. Jason Switzer: I think this discussion about what else you could do with the competencies and the resource is going to be incredibly important going forward, so I set out a storyline around what else you could liberate besides transportation fuels if you're looking at the oil sands or the vast resource in the western Canadian sedimentary basin. Certainly there are opportunities around mobilizing the electrons themselves, so creating electricity through technologies such as in citric acidification. There's liberating the hydrogen. There are bio-pathways, or actually bacteria, that consume the hydrocarbon and produce hydrogen as a by-product. Also, there are actually experiments under way right now looking at how to recover the heavy metals from the oil sands, rather than produce transportation fuels.

The first piece is thinking through what market the world needs. Are we going to need more lithium if the world is electrifying its transportation fleets? Absolutely. Could Canada be a leading producer of that lithium? Definitely. We have a huge industry built around extracting resources from our oil and gas sector, so we need to think about that.

We should also think about what to do with asphaltenes, which are a unique element of oil sands. The pipelines that connect Alberta, the resource source, to one of the world's leading manufacturing hubs in Ontario are already there. The question is, what could you do if you had the world's cheapest source of carbon fibres, and how many industries could you disrupt if Ontario were the cheapest place to produce that? That's a significant storyline that I think deserves to be investigated.

I think the point was made, though, around whether the industries that are in place right now are capable of making that kind of innovation. I think the answer is that they're under an existential threat right now, and as Canadian companies they have nowhere else to go. They've in many ways doubled down, buying out the oil sands' assets from their international peers, so the incentive to experiment and try new things is there.

I think the experience of AOSTRA, the Alberta Oil Sands Technology and Research Authority, is illustrative, with $1 billion invested by the public sector over 10 years, at times with the opposition of the international oil and gas sector. Companies didn't want to do that. Their time horizon for return on R and D investment is much shorter than what the public sector was forcing around trying to crack the opportunity that was the oil sands.

You need that decadal view, a long-term horizon, that no company can do on its own, but the impact of that is pretty significant. A single $1-billion investment by the public sector translated into over a $100-billion investment by private investors in a single year into the oil sands. We need to think at that scale and that does require picking winners. That's what government needs to do. It needs to focus. It needs to pick winners.

● (1625)

Mr. Richard Cannings: Thank you.

I'd just like to move to Mr. Poste and Mr. Wright and talk about tidal energy. Especially Mr. Poste, I see from your company's website that you have experience in the U.K., France, and other jurisdictions. I just wonder if you could quickly give us an idea of how those jurisdictions differ from Canada in your operations and how your experience there might inform the Canadian industry.

Mr. Jeremy Poste: As you said, my company is operating in Canada, France, Japan, and the U.K., and nobody is taking the same approach. In terms of policy and regulatory framework, a different instrument has been used in those jurisdictions, and sometimes more emphasis is put on commercialization as well. I spoke about the French model where significant investment has been made in port infrastructures that not only enable the tidal industry to get tidal projects going, but the offshore wind industry to invest in those locations as well. That's one of the models we can see in France.

In the U.K. some funding mechanisms supports have been quite comparable to what is done in Nova Scotia for tidal. Nova Scotia has a feed-in tariff for the development of tidal at this early stage. Maybe the slight difference we have between Canada and the U.K. is that they've bet on the issuance of long-term leases for development of pre-commercial or commercial rates. One developer can get up to 100 to 200 megawatts of consent to get his development going throughout the year. That's a type of visibility that is given to the developers or the technology providers or the site leasers.

When it comes to Japan it's a bit different. It's solely a government initiative to do a demonstration project, which is quite isolated at this stage and funded by the government. That's a different model and at a very early stage right now.

I hope that responds to your question.

Mr. Richard Cannings: Thanks.

The Chair: You have 15 seconds, so I don't think you have any time. Thanks.

We have about a minute and a half left.

Ms. Ng, I think you have a question.

Ms. Mary Ng (Markham—Thornhill, Lib.): Mr. Poste and Mr. Wright, I'm very encouraged to hear that the work both of the organizations are doing has stimulated the creation of 250 companies, start-ups right around the Bay of Fundy. Can you talk to me about how the level of investment that has been made through NRCan and elsewhere has helped and how, from our perspective, that helps encourage other investment from the private sector and create not only the outcomes but local jobs?

Mr. Tony Wright: It's not just investment that has helped spur academic activity related to the tidal sector. First of all, it takes the resources, something Canada has plenty of, both on the tidal side and the river current side. Canada is blessed with an opportunity to invest in renewable energy, that's for sure.

Before getting into the answer to your direct question, in Nova Scotia specifically the regulatory environment has given both the public and developers a sense of where marine renewables are going. That's unique. That doesn't exist in any other jurisdiction in Canada. That's certainly been an incentive to attract the investment because developers like Jeremy know there is a path through the demonstration phase and into larger-scale commercial development if all works out okay. They need that kind of certainty to make the significant investments that are required in this nascent industry today.

● (1630)

The Chair: Thank you.

Unless you have something very short to finish, I'm going to have to cut you off.

Mr. Tony Wright: The investment by the clean energy fund at NRCan back in 2009 was paramount to creating the infrastructure to connect the turbines to the transmission grid. Without that, companies like Jeremy's would have had to spend that $20 million just to get into the water on top of that. The clean energy fund has provided that enabling infrastructure.

The Chair: Thank you very much.

My apologies, my job is to cut people off.

I want to thank all the witnesses for joining us today, particularly those who made the effort to come back a second time. Your evidence has been of great value, but we do have to move on to our second hour.

We will suspend for one minute. I would prefer people don't even get out of their seats, except for our witnesses.

● (1630)

(Pause)

● (1635)

The Chair: We'll get going again.

Two witnesses will be joining us by video conference. They aren't quite ready, so we will start with the two groups who are in the room. We have Ontario Cleantech Materials Group, and then we have Mr. Wissing and Mr. Won.

Mr. Bowes or Mr. St. Louis, why don't we start with you. We give each group up to nine minutes for their presentations. You don't have to use all nine minutes. Then we'll open the floor to questions.

Please go ahead.

Mr. Brian St. Louis (Coordinator, Ontario Cleantech Materials Group): Thank you.

Good afternoon, Chair, honourable members, committee staff, and fellow witnesses. We would like to thank the committee for the opportunity to appear before you today and to contribute to your study on clean technology in Canada's natural resources sector.

My name is Brian St. Louis, manager of government affairs for Avalon Advanced Materials. I'm here with my colleague Gregory Bowes, CEO of Northern Graphite. Together we are representing the Ontario Cleantech Materials Group, or OCMG.

My remarks today will focus on the immediate opportunity for Canada to leverage its natural resource wealth to participate in rapidly growing clean tech supply chains. This can be achieved by producing the critical materials and by manufacturing the value-added advanced manufacturing products required via sustainable methods. The government can establish policy instruments that support pilot and demonstration projects as well as process development work to capitalize on these opportunities that are central to the shift to a low-carbon economy and ultimately create jobs and economic opportunities, including in northern and indigenous communities.

As a brief introduction, the establishment of the OCMG was sparked by the Ontario Ministry of Northern Development and Mines, who hosted a battery supply chain round table in October of last year. This was followed two weeks later, at the mining innovation summit in Sudbury, with the panel, “Hot Commodities: New Materials and New Opportunities for a Low Carbon Economy”.

The OCMG's overriding goal is to stimulate the production of value-added clean tech materials and to leverage this Canadian strategic advantage into anchoring the domestic manufacturing of downstream clean tech components and end products. This is being pursued by increasing awareness, engagement, partnerships, and collaboration to establish hubs for advanced material production and innovation. This is all with the realization that numerous materials, such as refined forms of graphite, lithium, rare earth elements, cobalt, vanadium, and others, are absolutely fundamental to the mass uptake of clean energy technologies, including electric vehicles, wind and solar power, fuel cells, and other clean energy sources.

The OCMG is a collaborative network of industry and academia. It does not have any membership dues. It has no paid or permanent staff. We are not looking for support for the group itself. We do, however, recognize that all clean tech material companies have needs and challenges that, while shared at the macro level, are complex and unique. Working within smaller and less formal collaborative networks, as enabled and demonstrated by the OCMG, allows for flexibility and specificity. While companies should not have to go it alone, the group fully understands and appreciates that it is SMEs themselves, not groups or associations, who need the investment to commercialize and produce real results.

Today the OCMG has 17 members, as listed in the presentation shared with the committee. They span the supply chain, from production and manufacturing to research and development, and include commercial laboratories, battery manufacturing, and battery recycling companies. This full supply chain is supported by members from leading universities, associations, and service providers. The OCMG is an open and collaborative network and effort, focused on advocating for the industry and not individual companies or projects. It is open to all those participating in these supply chains. Within this group you have the players needed to create clean tech material supply chains right here in Canada.

What does this collaboration entail? Examples include material companies working with commercial labs or universities to do the following: first, optimize their individual innovative processes to improve product economics and product quality; second, maximize resource efficiency and reduce the environmental footprint by reducing the need for, or recycling of, energy, water, heat, and reagents in extraction and processing technologies; third, extract materials that can be manufactured into specialty products that may not have been previously produced without process innovation; and last, extract and recycle clean tech materials from discarded products.

Academic institutions also play a central role by supporting two other areas. The first area is the identification, training, and development of the highly qualified personnel who are and will be needed by the industry. The second area is by assisting clean tech material companies prepare themselves not just for the current needs of clean and high tech products but also for the next generation of technologies and their accompanying special material needs.

Overall, clean tech materials are and will continue to be critical inputs to the products that reduce and prevent adverse environmental outcomes and that ultimately enable a low-carbon economy. Furthermore, for both environmental and economic reasons, creating or recycling these products in the most efficient and environmentally friendly way possible is a necessity, and frankly, it's something that's demanded by consumers and customers.

● (1640)

One question posed by the committee was about what types of risk the federal government could address to help de-risk the adoption of clean technology in the natural resources sectors.

As mentioned, it is the innovative processes developed by Canadian companies and their partners that allow the production of these specially engineered clean tech materials. As with any innovative process, much work and ultimately funding must go into research and development, and then it's scaling up these technologies and processes. The development is high risk and high cost and does not have the immediate upside that would be sought by traditional investors.

As assistant deputy minister Frank Des Rosiers noted in his testimony before the committee, this leads to many Canadian SMEs falling into the “valley of death”, or perhaps less ominously labelled, the “commercialization gap”. The committee has heard wide-ranging testimony on this topic, thus I would simply strongly echo that this is an immense challenge for the clean tech materials sector, and it must be overcome if Canada is to have a success in this area and compete globally.

The processing challenges of the base and precious metal industries are well known and the marketing straightforward. The same is not true of lithium, cobalt, graphite, the rare earths, and many other specialty metals and minerals. Therefore, what are the best practice policy instruments for de-risking clean technology in the clean tech materials sector?

First, the government must support innovative Canadian clean tech SMEs in piloting and/or demonstrating their innovative processes, as financing a scale-up of technology is the most dominant barrier to these companies. This is not to say that the government must go this alone. To the contrary, there should and must be a willingness of private companies, partners, and investors to be directly involved.

Second, the committee heard in a previous study how effective the flow-through share program has been in enabling junior companies to raise exploration in some forms of project development financing. However, the new realities in material production for the clean tech sector are not the same as in the traditional mineral development sector. Commercialization involves extensive research, process development, and pilot plant testing to demonstrate that these processes can be scaled up and commercial products produced while at the same time mitigating environmental impacts.

Some of this process development work is not currently incorporated within the flow-through framework. There's a recommendation of the OCMG that the flow-through program be amended to cover these critical parts of commercializing the production of clean tech materials and the value-added products derived therefrom. It should be kept in mind that this is driven by private investors, private equity firms, and other sources of investment funds essentially in partnership with the government, which can inject some of the much-needed capital into the industry.

The OCMG is mindful that there are many good and valid competing interests and is willing and able to work with government to determine what aspects of development and demonstration processes qualify and to help establish guidelines by project and by company that are impactful, yet are not—nor do they become—an onerous burden on the government. The outcome of this would be to allow clean tech material companies and downstream process innovators to raise the risk capital necessary for small-scale early-stage innovation and process development that leads to the scaling up of technologies and commercializing these results.

One organization that supports pilot and demonstration projects is Sustainable Development Technology Canada, which has been successful in assisting growing and innovative Canadian SMEs via investment. However, SDTC does operate under a somewhat rigid framework that can constrain its abilities to incorporate some of the strategic and policy objectives that are central to government priorities.

Another example is the Quebec provincial government, which is already successfully investing in the clean tech materials sector while offering complementary support to private funders and partners via Ressources Québec, a subsidiary of Investissement Québec, as well as directly via other government departments.

In conclusion, what recommendations to the Government of Canada should the committee consider for its final report? The OCMG recommends that the government, first, support commercialization projects in the clean tech materials sector via development policy instruments that are focused on clean tech supply chain development, innovation, and resource efficiency; and second, amend the existing flow-through share program to better support clean tech material process innovation, development, and ultimately commercialization.

Thank you to the committee for inviting the Ontario Cleantech Materials Group to appear before you today. We look forward to your questions.

● (1645)

The Chair: Thank you very much.

Welcome to our two witnesses who are joining us by video, Mr. Rand and Mr. MacGregor.

Maybe I will get Mr. Wissing and Mr. Won to present next for up to nine minutes, and then I can turn the floor over to each of you gentlemen.

Mr. Ray Won (President, ISTAVA Inc., As an Individual): Thank you, Mr. Chair.

My name is Ray Won, and I'm here with Wayne Wissing. We're privileged to have this opportunity to meet with your committee to discuss a most important topic, that being opportunities in CO2 reductions while creating a sought-after product for the European Union and Far East markets. Before starting our presentation, I'd like to provide a quick preamble on why the two of us are here as witnesses.

Over the past six years, Wayne and I have had numerous conversations on renewable energy solutions for Canada. Many of these conversations were a result of Wayne's observations and experiences gained through annual visits to Europe. Through these visits, he saw first-hand how Europe was adopting, and in many cases leading, the alternative energy movement. Wayne's professional engineering background lent itself well to analyzing many technical aspects of the observed solutions, and gave him the ability to envisage how they could be adopted by Canada.

Canada has adopted a number of renewable energy solutions across our nation. The first was the burning of felled trees, using the wood for heating and cooking. Today we also use some methane gas and wood waste products. The burning of biomass materials may be for direct heat, such as in wood-burning stoves and furnaces, or for boiling water, which generates the steam required to drive the turbines that produce electricity. As of 2014, Canada produced 2,043 megawatts of electricity through biomass technologies.

For decades, Canada has been blessed with hundreds of lakes and streams that supply hydro power. British Columbia, Manitoba, Ontario, Quebec, and Newfoundland are the primary producers of hydroelectricity. Canada is therefore the world's second-largest producer of renewable power using hydro's kinetic energy. This equates to 378.8 terawatts.

Though the uptake of wind energy and solar was slower in Canada than in other developed nations, we have seen significant growth in these sectors. As of 2014, Canada produced 9,694 megawatts of wind energy, followed by 1,843 megawatts of solar energy. Rounding out the list, we have geothermal generation and will soon have ocean wave and tide generation.

It is now accepted that renewable energy is not the real question. It's how we transport and store the generated electricity when the winds don't blow and the sun doesn't shine. This moves us into the discussion of the battery and the many forms it can take.

Today's presentation will focus on a number of important points. We trust that our discussions will answer the questions that the committee sent beforehand.

At this time I'd like to turn the floor over to Wayne. Sometimes my job is to take some of these many thoughts he has and distill them into something that is more understandable. If you see me nudge him, you'll know that I'm on that track of trying to get him to get to the point.

Thanks very much.

Mr. Wayne Wissing (Electrical Engineer, As an Individual): Thank you.

The Chair: That was quite an introduction.

Mr. Wayne Wissing: Yes. I've basically been a scientist most of my life and so my thoughts are very wide.

Anyway, an observation on Canada is that we are focusing on electric cars and going eventually to ground-source heat pumps if you want to go to zero emissions. That means that in all these cases, we're going to use electricity.

I realized very quickly that there is no way that we can have this world all be electric. It's impossible. We already have a hard time with the air conditioning in the summertime. It's overloading the circuits everywhere. If you now look at that in relation to heat pumps, when you actually start to heat houses, you need approximately two to three times more heat pump capacity than when you use it for cooling.

That means that you use two to three times more electricity for heating the house. In the case of air conditioning, not everybody has air conditioning. However, if we are going to go to heating houses with heat pumps, everybody will have a heat pump. We're going to run out of power, and we haven't even talked about the electric car that's going to be plugged in the laneway.

I looked at the Tesla website and the smallest charger is a 40-amp charger. If you drive long distances every day, like a salesman or something, you need to double-charge it. That means 80 amps of power that you draw at the same time that everybody has the thermostat automatically starting the heat pumps at five o'clock and start cooking. We're going to end up with not enough electricity.

If we have to change that, we have to start changing not only the middle of the house, like the panel, we have to charge the wiring in the streets. We have to put in more transformers, and whatever feeds these transformers has to be heavier and so on, all the way to the power stations. That would be a replacement of millions of kilometres of wiring throughout the whole country, and we don't have that type of money.

I started to look at this and I said, wait a minute, when we look at powering a household, we're actually using different energies. We use electricity for the computer at home, the lights, to run the TV, and maybe electric cooking, but we have a second power source coming in, which is natural gas, and the third power we're using is fuel for the car, which could be gasoline or diesel fuel. We actually use three energies today, and with cleaning up this world, we are saying we want to put everything in electricity. You can't do it. You just don't have it.

What I'm trying to suggest is a different way of looking at how we can do it. This is an established technology that I'm taking about, and it's called P2G, power to gas. It was developed about 10 years ago in Germany, and it works on a very simple principle. I understand you have handouts.

I have this picture here for you, and when you look at it, the first one is basically the components of making water. You see an oxygen molecule and two hydrogen molecules there, and the next one is carbon dioxide. What they do on the first model, the water, through the means of electricity, they toss out the oxygen and they keep the hydrogen. Then the second molecule, which is carbon dioxide, they again toss out the oxygen and keep the carbon. Then they merge it together in this model, which is methane gas or natural gas.

The advantage of this natural gas is that it is 100% pure natural gas. There are no trace elements in it of oil or gas. There's no mercury in it. This is natural gas that is pure. That means when you burn this, of course there's no oxygen here, but to get combustion, you use oxygen, and you basically then take that oxygen again and merge it with hydrogen and it becomes water. That's your waste product. The carbon is merged with oxygen in the combustion process, and you get carbon dioxide again.

What you have done is basically taken the cycle all the way around, from starting with CO2, and then combining it, and then releasing it back into the atmosphere. They call it carbon-neutral natural gas. In the handout I showed the process that can be used in carbon neutral natural gas when you use this.

● (1650)

The next document I have is this one that is related to what happened in Germany, where they actually have an overproduction of electricity due to renewable energy. At the bottom you see that, even when they reduced the standard energy production—they reduce it every day, more and more—they're still overproducing because what we see under the zero line is the overproduction. The discussion of carbon-neutral natural gas is getting very strong there because they see it as wasted energy, what they are doing right now. When we produce more of this carbon-neutral natural gas, then we can actually divert our energy to a carbon-neutral source instead of having everything electricity.

To do that, to collect all the surplus power in Canada.... What happens with nuclear power plants, wind turbines, etc., is that they need to be collected. Therefore, you want an east-west power grid. An east-west power grid is already defended by Engineers Canada and by the Chamber of Commerce. The Liberal Party has talked about it. The NDP has talked about it. The Green Party has talked about it, and the Chamber of Commerce. I speak now for the Progressive Conservatives. I think they also have made the same discussion because they often look at the policies of the Chamber of Commerce.

● (1655)

The Chair: Thank you. That might be a good place to stop.

I appreciate that.

Mr. Rand, I'm going to turn it over to you, and first, I just want to say thank you for coming back a second time because I know you were scheduled to be here last Tuesday, and it was cancelled.

Mr. Tom Rand (Senior Adviser, Cleantech, MaRS Discovery District): Thank you for the opportunity to speak.

I'm Tom Rand. I'm a senior adviser here at MaRS in their clean tech group, and I'm also the managing partner of ArcTern Ventures, which is a privately backed venture fund that invests directly in clean energy technology companies.

I'm going to focus a lot on the adoption side. I notice in the focus here it's not so much on the development of technologies but rather the adoption. I'm also going to bracket a lot of comments.

As I'm sure the committee knows, there was an enormous amount of work done over the past 12 to 18 months through the provincial Canadian working group on clean tech. That work was very robust. The outcomes, I think, are sound. Therefore, I'm going to focus my comments mainly on recommendations on following through on how to define the mandate that came out of some of the federal budget recently. There is about $1.8 billion that's heading towards EDC and BDC. I think it has it exactly right in addressing some of the central risks around adoption in the natural resources sector, as well as others, of clean tech.

Clean tech is capital intensive. We have a great farm team here in Canada. One of the questions you ask is, “What are we doing right?” You can tweak SDTC, but broadly speaking, it's done right. Double down on SDTC, that was done.

The question is how you get large first commercial plants adopted. I think that's where the market is stopped. There's a logjam there. There are probably a dozen companies in Canada capable of building large commercial facilities of next generation clean tech with a greater than incremental drop in energy use and greater than incremental gain in energy efficiency. Next-generation cellulosic ethanol, for example, is the poster child I've been using to talk about this market gap. It was addressed in the last budget, so I don't want to advocate for it being addressed. It has been addressed.

I will talk a bit about the risk that all of that political will may go to naught if EDC and BDC are not given a narrow enough mandate to allow them to move the market and change the risk for the private sector so that they can play and come into this space.

The risk is that EDC and BDC will act as market followers not market makers. They are banks. Their primary job is to return dividends to their shareholders. The funds that are being allocated to EDC and BDC can be very effective if they are firewalled, and those groups are given the capacity and the licence to use that capital in a different way and have success metrics associated with using that capital in a different way.

I have a one-pager. I can distribute a soft copy to you to follow up, but I'll go through it very quickly.

The point I'm making is that a very narrow mandate to follow up on that budget is required to get BDC and EDC to move the market. I'm going to focus my comments mainly on EDC, which has $450 million to fund first-of-a-kind commercial projects. I think NRCan has existing programs that can dovetail nicely with what EDC is doing, particularly if NRCan focuses on some of the enabling funds that get a company through the gate to EDC. FEL-3 drawings are site-specific drawings for getting these first commercial plants built. If NRCan endorses some of these points on a mandate to EDC, that's the best thing we can do. A lot of work was put into that policy and I don't think we can do any better.

First of all, the size of those projects should be very large. If the capex of those projects is not at least $50 million to $100 million, then you're incrementally different from SDTC and you're not moving the market. They should be big.

Secondly, the technical risk should be for first-of-a-kind large commercial. If it's the second and third, the private sector should be there, to a large extent, as opposed to the first of a kind.

Regarding commercial readiness, those projects should have offtake contracts with global partners, tier-one engineering firms, who have committed to build that plant and can provide a robust cost analysis and lots of upside potential. This is so that when we build that first-of-a-kind plant in Manitoba and they are producing cellulosic ethanol, there is a robust pipeline of opportunity behind that plant, which speaks to further GHG reductions but, of course, also an economic upside for the country. It should cover a large amount of that first project. If they come in and take a 10% or 15% piece as they normally would, it's not going to do anything. They need to take up to half of those first projects.

● (1700)

It should be milestone-based, so supporting a company right through the engineering engagement and FEL-3 drawings, which are sort of advanced engineering drawings to define the plan. Then milestone it right up through shovel-ready, permitting, and commissioning. I think we have projects in the pipeline today. I don't think it takes more than 12 to 18 months to get that out that door.

Projects built in Canada that have partners with a broad pipeline of activity overseas are also very helpful. The point I'm making there is that we have an enormous ability to move the needle here in Canada on greenhouse gas emissions, but the most we'll move that needle is if we look to these Canadian clean technology companies as exporting solutions to the rest of the world.

The poster child is Woodland Biofuels. It can build a cellulosic ethanol plant in Canada with a Chinese partner. There are Chinese partners who will pay for half that plant. It has 30 to 40 plants it can build in China, the same partners. That's the equivalent of taking every single Canadian car off the road. That's where the link comes to very substantial GHG reductions when we look to global markets. There's more detail, but I don't want to get into too much detail now.

The main point I'm making is that there is a lot of substantial work that's been done. I endorse the outcome of that working group. Now the challenge is that if we do not provide that narrow mandate—and NRCan is one of the groups that can do that—then this money might disappear down the rabbit hole under business as usual. That's the risk. There are receptive audiences in EDC and BDC. There are good people there who understand this. The banking divisions, though, just don't speak this language, so refining that mandate would help.

Lastly, NRCan does great work. There are buckets of money that have been very helpful as companies look to operate demonstration plants at scale. If that could be formed as a continuum feeding into EDC, there's work being done to form a clean tech hub in Ottawa where's there a single door. That would be very helpful, and NRCan has programs that will dovetail nicely as it coordinates those activities.

I'll finish with that. I will certainly offer the one-pager. It's not long, but I'm happy to distribute it to the committee if the committee sees fit.

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

Mr. MacGregor.

Mr. Ian MacGregor (President, Chief Executive Officer and Chairman, North West Refining): Obviously I'm old and probably not as well versed in the clean tech area as everybody else.

I'd like to compliment you on your ability to listen to all this stuff. Thanks for doing it.

I'm currently building the largest industrial project in North America. It's a $25-billion refinery we're building 45 kilometres northeast of Edmonton. We are building phase one right now. We've spent about $8 billion. We're going to spend $8.5 billion or $9 billion by the time we're done. We have about 5,000 people working on it. We'll start up in the late fall or late this year.

Connected to that project is what is the world's largest system for managing CO2. We're building a pipeline system to take the CO2 from the refining operation to central Alberta where it will be used for enhanced oil recovery. The system has a design capacity of about 40,000 tonnes a day, and that's roughly equivalent to all the cars in Alberta. We think we're making significant environmental improvements in the embedded CO2 content of the diesel we make in the refinery. We are the only oil sands-derived diesel that will be able to exceed all low-carbon fuel standards, and we think that is a significant competitive advantage.

This is the first new refinery that's been built in Canada since 1984 and the first new one in the U.S. since 1977. We've had a lot of opportunities to reduce our environmental costs.

I'll tell you a little about myself and I'll tell you why I'm here. I started off as the first person in my family to go to university. I'm a mechanical engineer, and that's because my mom could fix cars and she thought that's what mechanical engineers did, so she made me take mechanical engineering. When I got out of university, I could make $900 a month as a welder, and I could make $600 as an engineer, so I rented a shop, bought a welding machine, and started welding. I've never worked for anybody else ever. I do my own thing and try to figure out how to create decent-sized businesses around being an engineer. I've been in every element of the energy industry from power generation to natural gas liquids to offshore drilling to refining now and CO2 management.

My life has been lived as an entrepreneur. It's been lived starting businesses, and what I think is that we have way too much focus in Canada on the idea and way too little focus on how we make somebody with a good idea into a successful business owner. We lack the infrastructure that helps somebody who is just starting off, so all the kids I see coming around.... In Calgary a lot of young people have been laid off because they were working in the energy industry. They are subject matter experts. They've been let go now. Really what they want to do is start their own businesses, and they know what they're doing. They're smart technically and they have a bunch of clean tech ideas, but they don't really know how to start a business.

What we need to do is spend our money on the infrastructure that helps people start effectively and helps them survive until they get it commercial. We spend all our time talking about great ideas and great technologies, and if you look back through all the money that's gone into that, you'll find it's very inefficient. We haven't gotten any big, skilled businesses in Canada, that I know about anyway, with all this money we spent, so I'm into creating things at scale.

I'm into building infrastructure that will allow young people to move forward. I'm on the investment committee at SDTC. They do great work, but there needs to be help for young people with good ideas. We need to have a place where they can congregate. We need to have mentors there. We need to support them and help buy down their overhead so they can get going. We need to make it easy, and we need to do that wherever there is enough population to be able to justify it.

I think we should locate them close to where the market is. In Calgary we have a $40-billion-a-year oil and gas capital market. This is a good place to do things related to energy because clean tech ideas can be easily introduced here, and there's an immediate market for them. I don't think we should be trying to do things where there is no market because I don't think they'll eventually be successful. We need the market pull to get new ideas out and functioning at scale.

I think that's about all I have to say.

Thank you.

● (1705)

The Chair: Thank you.

Thank you for your brevity and your youthful exuberance.

Mr. Serré, you are first up.

[*Translation*]

Mr. Marc Serré (Nickel Belt, Lib.): Thank you, Mr. Chair.

I will share my time with my colleague Mr. Fragiskatos.

I would first like to thank the witnesses for the knowledge they have shared with us and for the presentation they prepared for today.

Mr. Rand talked earlier about our government's investments in clean energy and sustainable development. Our investments in the energy sector have been fairly significant.

I will now move on to my first question.

[*English*]

I'll go over to Mr. St. Louis and Mr. Bowes.

We talk about investments that we made with our budget, but you also indicated your second priority, flow-through shares. We have that in the mining industry, with the 15% tax credit for mineral exploration. If we were to expand that, can you give us more examples of what was not covered in the mining exploration credit? You mentioned the flow-through shares. How can we expand that to help the industry—to help you—grow, with good-paying jobs?

Mr. Gregory Bowes (Founding Member, Ontario Cleantech Materials Group): The qualification for the flow-through tax credit is fairly narrow. It is essentially grassroots exploration, so it doesn't extend to predevelopment, development, or construction activities. The point Brian was making was that these specialty minerals are quite different from the run-of-the-mill base and precious metals. Often the metallurgy and the processing are complex. It's a research and development exercise to find the best way to extract these minerals and to develop commercial processes. Things like taking a large bulk sample, doing a pilot plant test of the technology, and then doing additional testing to scale it up and demonstrate that it is commercial—none of that is currently covered by the flow-through share program.

What we are basically suggesting is for the clean tech minerals. We can define what the minerals are and what specific activities relating to their upgrading and commercialization are included. We're not talking about hundreds of millions or billions of dollars here. In our case, it would probably be a couple of million in terms of bulk sampling and so on. We have a very promising purification technology, which relates to the manufacture of anode material for lithium-ion batteries, and also bipolar plates for fuel cells. We need to do a pilot plant test of that process. We are entirely dependent on the capital markets for that. It's not flow-through eligible. Right now, the capital markets are not great, so we're kind of stalled, which is unfortunate, obviously.

● (1710)

Mr. Marc Serré: Thank you.

My second question is for Mr. Rand.

You talked about the investments and the single-door approach that we are developing, and you mentioned EDC and BDC. Obviously, when you look at lenders and capital.... I want to know if you have some specific recommendations for the federal government to encourage, foster, and support EDC and BDC to invest more in the clean tech sector?

Mr. Tom Rand: They do have a mandate to put that capital into clean tech, and I think there is a fairly robust definition of "clean tech" coming down the pipe along with that capital. The challenge is, again, that they don't follow the market. They have to make the market, which means they have to be willing and able to lose some of that money. It doesn't mean they will, but if they put it into their risk spreadsheets and count on using it in a similar way to their existing capital base, they are not going to move the market because they're going to be acting just as a private bank would.

An example would be BDC. BDC wants to go late-stage, which is good—this is growth capital, scale capital—but they are questioning whether they are going to be able to lead deals, i.e., be the lead investor to define the terms. If they go late-stage and only follow, they are not doing anything. If I lead a deal that's late-stage, I have no problem finding other investors to come in with me. That's an example.

There are two things. First, you have to be willing to lose money, and second, you have to lead deals if you're going late. I have other, more specific recommendations, but those are the two big ones.

Mr. Marc Serré: I'm looking forward to your one-pager.

The Chair: Mr. Fragiskatos, go ahead.

Mr. Peter Fragiskatos (London North Centre, Lib.): Thanks very much.

It's always great to join this committee. I'm not on it, but anytime I get the opportunity, I jump in because it's so interesting.

Mr. Rand, I know you focused on definitional issues, but I wonder if you could comment on the state of venture capital when it comes to clean tech in Canada. I know that much is made of the venture capital firms that are focusing on clean tech in the United States and Europe, but what is the situation in Canada? Just set the scene for us.

Mr. Tom Rand: Very quickly, here's some background. Back in 2006 you could count the venture capital firms in North America that invested in clean tech. There were probably 300. I can count them in North America now, and there are probably about six that focus on clean tech. In Canada, there are two or three and many define clean tech in a way that avoids the big stuff. They do energy, IT, or sensors. It's another version of ICT applied to the energy space, and they call it clean tech or IOT, industrial Internet of things, so you're making machines smarter.

I agree that's clean tech in the sense that it's efficiency, but it's not the big box stuff where you're making and moving energy around. Probably only two or three funds look at that. We are raising a second fund of $150 million. We hope to have that closed soon, but there are not a lot of us out there. ArcTern Ventures has primarily looked to strategics, we call them, to be our investment partners because there are very few investors in clean tech: 3M, GE, Siemens, the Kuwaiti Investment Authority, Enbridge, Iberdrola. These are big corporates.

You can't push on a string. If the venture community doesn't want to go to clean tech, they won't, but you can build an ecosystem where the risks and the reasons why venture investors fell on their faces in the early 2000s, which they did in Silicon Valley.... There are lessons we've learned and we're smarter, but you can also build an ecosystem that takes out some of those risks like SDTC in Canada and large commercial support for large commercial projects as well.

The state of venture capital for clean tech is not healthy. I don't think that's a secret, but for us it's a buyer's market. It's not a bad thing for us, but for the industry it's not good.

● (1715)

The Chair: Thank you very much.

We're going to have to stop there, Mr. Rand.

Mr. Barlow.

Mr. John Barlow (Foothills, CPC): Thank you very much, Mr. Chair.

Thank you to our witnesses. I know it's been a long day, and I appreciate your patience.

I have a really quick comment for my colleague Mr. Serré. I appreciate your advocating for flow-through shares. That's a very important program, but before the Liberal government expands it in mining, I would encourage them to reintroduce it into the oil and gas sector. You eliminated that flow-through share program for exploratory wells, and in Alberta that's been pretty significant.

Ian, good to see you again and thank you very much for making some time to be here with us today. You talked about what we're doing in carbon capture technology with the North West upgrader. We often hear about Alberta's dirty oil and that we're not doing anything in Alberta to try to change that perception of what's going on in Alberta. I think what you're doing is a prime example of the innovation and the technological advancements that have been going on in Alberta.

What have been some of the biggest hurdles you face in getting that carbon capture technology up and running? I know this has been a long process for you.

Mr. Ian MacGregor: We're trying to build basic infrastructure. We're trying to build a big distribution system for CO2, and some days I feel like a truck driver trying to build a number one highway. We're trying to build something that's going to last for 100 years. It's going to be the CO2 equivalent of a highway. It's going to take the CO2 from, not just our plant but all plants from the Edmonton area, capture that CO2, and take it to central Alberta.

We've been producing oil in Alberta since 1914 in quantity, and most of the places where oil came out is a place where you can put CO2 back in. When you put CO2 in most of those places, you get more oil out, so it pays for the costs of managing the CO2.

I'm sure you're all familiar with the Weyburn project. My partner and I used to own 11% of that. It's one of the largest projects in the world that uses man-made CO2 as a feedstock for a downstream industry. The quantities are truly amazing. In central Alberta we think that there are enough places to put CO2. You could put in about two billion tonnes, which is about 25 years of the total annual emissions of the oil sands industry in Alberta. We think we can take the equivalent of those CO2 emissions and use them as a profitable feedstock with the system that we're building. We think there are other places in Alberta where you could do it, but we're trying to start where we think it's relatively easy.

The challenges in doing this are that you have to own the reservoirs, you have to have the infrastructure, and you have to have the CO2 sources. We made the decision early on that we were just going to do it ourselves, and we're going to connect all of those things together. That's what we've done.

When we're finished, the diesel that comes out of our plant will be the lowest carbon diesel made in the world today. We think that's a real achievement, because when we start with oil sands diesel, we start about 20% worse than the light average oil sands. The oil sands materials, the embedded CO2 costs in the diesel you make, are about 20% worse than the average U.S. crude slate. When we finish up, we're about 7% better. We think those things can make Canada competitive, but there can also be clean tech projects where you're trying to do something that really does make a difference.

My own view is that you have to do these things on an enormous scale or it's not very interesting. We're thinking we're going to have a business that gets 100,000 barrels a day of light oil out of the ground using CO2. We think we're going to have something that's the equivalent of taking every car in Alberta off the road.

I'd like to put it in terms of windmill equivalence. We've been putting up windmills in Alberta for 30 years. Over that time we have put up about 900 windmills. What we're doing with the CO2 pipeline is about the equivalent of 3,200 windmills. Our little piece of pipe is about three times what we've done in Alberta in the wind energy business in the last 30 years. For me, for Canada to get on the map, we have to be doing things at that scale. We can't be dicking around doing little things. Sorry.

● (1720)

Mr. John Barlow: That's okay. I appreciate your lack of political correctness sometimes. That's fine.

Thanks, Mr. MacGregor.

Really quickly—I don't have a lot of time—what do we need to do? Is this technology something that can be copied and done elsewhere? I know you've been sort of the test here, but Saskatchewan's been doing it as well. How do we promote this technology to show that this is what we're doing in Canada, and that we're not just sitting on our hands here?

Mr. Ian MacGregor: To work at scale, you can only make small, incremental improvements. You can only really do something that's a little ways, a step out there. That's what we're doing. This has all been done before.

The main innovation we're bringing to it is using man-made CO2. In the U.S. there's a big industry down there, but they use CO2 that comes out of the ground. We're making a small step to collect the man-made CO2, purify it, make it into a liquid, and then put it in a pipeline. That's a little technical step, but our project costs about a billion dollars. The capital markets won't finance you for a billion-dollar project unless it's just a small step.

I'm sorry, I don't know the other participant's name, but what he was saying around the same made sense to me. Somebody has to be first, so push it and get something that's industrial scale, the first one. That would help any of us, I think.

The thing that I think is really missing is that we don't have enough deep infrastructure to help a young guy starting off. Most of the ideas that are going to transform the world are going to be coming from a young guy. He wants to rent a desk, and he doesn't know how to start a business. If you take some of our resources.... We spend all of our resources picking ideas, and 99 out of 100 of those ideas are failures. We need to build an infrastructure that improves that success ratio from 1 out of 100 to 10 out of 100. We need to do that by supporting young people with new ideas in a way that is well-thought-out. I have thoughts on that, but this is not the right forum for them.

Mr. John Barlow: Thank you.

Mr. Rand, I have a quick question for you, and you might have to answer it some other time. You talked about the lack of venture capitalists—and I appreciate my colleague bringing that up—but what is your link? Witnesses are asking taxpayers, the government, to go where venture capitalists, the private sector, won't go. For me, it's tough to tell my constituents, "We want you to pay for something the private sector won't do." What's the link that we're missing there?

Mr. Tom Rand: The link is project finance. Large bits of infrastructure get built on debt. They don't get built on equity. Venture capital just does not have the scale. It's not the right asset class to build a $250-million biofuels plant. You need project finance for that. It's just not appropriate for a venture fund to be investing in developing the technology, and then building the first factory. They're different asset classes.

The Chair: Thank you.

Mr. Cannings.

Mr. Richard Cannings: Thank you.

Thank you, all, for being here today.

I'm just going to start with Mr. St. Louis and Mr. Bowes. When talking about some of the rare clean tech minerals, you mentioned graphite, lithium, and cobalt. I'm not sure if they're rare, but it's not like lead or gold or silver. What is Canada's ability to produce these? I know there are some rare earth elements that China has cornered the market on. I know the Teck smelter in my riding produces indium, germanium, and cadmium, those sorts of things. If we did provide this impetus for Canada to increase this, what is our ability to produce these for the world?

Mr. Brian St. Louis: I think it's a pretty simple answer. We have a strong ability. Naturally, Canada is very endowed with resources. We have good projects across the country in various metals that we've mentioned, and some other ones you mentioned there, as well, actually—indium and germanium. I think without getting into too much detail, there's everything in Canada that could be needed, almost, by the high-tech and clean tech applications that are growing.

Mr. Gregory Bowes: I would just add that we have graphite projects, we have lithium projects, and we have cobalt projects. We are in competition with a lot of other projects all over the world to get built and supply these critical minerals. It really takes everybody to be on board, from the government to first nations to the financial markets, to get these things built. As I said, it's a competition. Then the second phase is the R and D that goes into the value-added processing of those minerals and the creation of new products.

● (1725)

Mr. Richard Cannings: Thanks.

Moving on to Mr. Wissing and Mr. Won, I'm just curious if you could provide a little more detail on the carbon-neutral natural gas, what the energy inputs are like, how that whole thing works, and where you're sourcing the carbon dioxide. Are you just taking it out of the air and putting it back in the air? Is that the cycle?

Mr. Wayne Wissing: You could. There are several ways of taking CO2 out of the air or separating it. The ideal way of doing it is basically doing it on the same site where you merge the two components together to make natural gas, but there are simpler ways when you have limited resources. To give an example, in the Netherlands, for instance, in a high-rise with solar panels on the roof, all year round, whenever the sun makes hydrogen, when the heating season starts you just bring in a bottle of CO2 and mix it together at the time they use it to heat up the apartment building. It is a very simple process, if you want to keep it very simple, but ideally you have sources where you take the CO2 out of the air.

There's a company in Calgary right now. There are investors involved in it, like Bill Gates and Google. It's called Carbon Engineering, and they are looking at the cheapest way to extract CO2 out of the air. It's right now at a stage where they can extract it, but it is a liquid. To get it out of the liquid more cheaply is the next step. If they do that, they are the champion in separating the CO2 out of the air. You can set these things up wherever you want in the world with solar or wind power to power it, and it's the equivalent of thousands of trees, basically.

Mr. Richard Cannings: Okay. Thank you.

I'll go to Mr. Rand to finish. You talked about biofuels several times as an example, and we heard earlier today about some of the risks around some types of biofuels and the life-cycle impacts of them, whether they were produced from agriculture, etc.

I'm just wondering if you could comment on biofuels and how we can trust that they are a solution and not part of the problem.

Mr. Tom Rand: That's a good question. I focus on what we call next-generation biofuels, which use cellulosic material, so that's agricultural waste, forestry waste, construction waste—non-food based sources—converted into ethanol. I've never looked at food-based biofuels for that reason.

Mr. Richard Cannings: When it comes to carbon dioxide greenhouse gas, if you had the wood waste sitting there, is it better to burn it as a biofuel?

Mr. Tom Rand: You can use it to make electricity if you like, but it's more valuable as a liquid fuel. From a technological point of view, liquid fuels are harder to replace and there is more economic value in a liquid fuel than there is in the same amount of energy in the form of electricity.

Mr. Richard Cannings: Okay, I'm just trying to get at the carbon dioxide production.

Mr. Tom Rand: The carbon dioxide production, woodland being the example, is a 92% reduction in carbon dioxide compared to the gasoline it replaces, and that takes into account the full life cycle.

Mr. Richard Cannings: Okay. Thank you.

How am I doing?

The Chair: You have another minute, if you want to use it.

Mr. Richard Cannings: Really, I was rushing through this. Where do I go now?

The Chair: People are allowed to use their time as they see fit.

Some hon. members: Oh, oh!

Mr. Richard Cannings: I'll go back to you, Mr. Wissing, and the east-west power grid. Could you just spend a minute talking about that?

Mr. Wayne Wissing: I'm glad you are giving me that opportunity. You have a map somewhere. This is basically the map we are looking at where I proposed how the grid runs. You notice that it's quite high up in the north, and the reason you want to put it there is that if you look at the wind map you'll find that the reddish part on the wind map is where the most wind is.

Currently we have most of our wind turbines in Ontario at the same height as Rome, at the 45 degrees parallel. If we put it there, then you'd wonder why, as Rome is not known for wind turbines or windmills at this time. But if you put it at the height of Moosonee, in the northern part of Ontario, which is at the height of the Netherlands, then you know there will be definitely more wind there. If you look at the earth, the more north you go, the more wind you get, and from the equator, the more south you go, the more wind you get. As a matter of fact, Antarctic is the windiest continent in the world.

There are several issues with how you compete against, say, Europe. The European Union has a land mass that is half the size of Canada and there are 500 million people, so if you want to put a wind farm up there it is very expensive because ground is expensive and you have to fight a lot of battles. In our case with relatively cheap land, you could convert that wind to carbon-neutral natural gas and actually make it an export item because Europe doesn't have enough room to make renewable energy and we could export carbon-neutral natural gas to Europe for them to use because we are uniquely positioned, as a country, with a massive amount of land mass and with a relative low population, which Europe doesn't have.

There is another product that is called torrefaction, which is converting wood to bio-coal. It's the same thing. You can take coal-fired power plants in Europe and give them this bio-coal and they will be carbon neutral at the same plant with no change of technology. This is the whole thing. If we want to save money in the world and give it to the rest of the world as far as that goes, this is the opportunity because the infrastructure for change is so expensive that you'd better use sources of energy that are carbon neutral.

● (1730)

The Chair: Thank you very much. That was a long minute.

Thank you very much to all our witnesses. Mr. MacGregor had to leave a bit early but we're very grateful for your taking the time to be here.

Mr. Rand, thank you again for joining us twice.

We will adjourn for the day.