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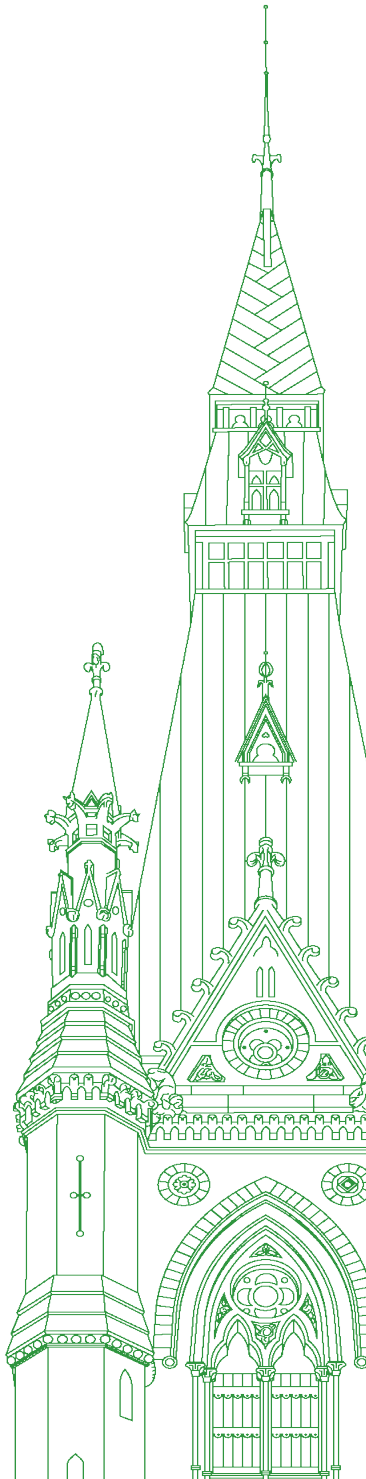

Chair: The Honourable Kirsty Duncan

Standing Committee on Science and Research

Monday, September 26, 2022

● (1830)

[*English*]

The Chair (Hon. Kirsty Duncan (Etobicoke North, Lib.)): Dear colleagues, I'm going to call this meeting to order. Welcome to meeting number 18 of the House of Commons Standing Committee on Science and Research.

I'm happy to welcome Ms. Idlout today, Ms. Taylor Roy, Mr. May, Mr. Ruff and Ms. Gallant.

We welcome you to the committee.

[*Translation*]

Welcome to meeting No. 18 of the House of Commons Standing Committee on Science and Research.

[*English*]

Today's meeting is taking place in a hybrid format, pursuant to the House order of June 23, 2022. Members are attending in person in the room and remotely using the Zoom application.

We're really pleased to have this last meeting on small nuclear reactors. Pursuant to Standing Order 108(3)(i) and the motion adopted by the committee on Tuesday, February 1, 2022, we are meeting on the study of small modular nuclear reactors.

Here are a few comments for the benefit of our witnesses and members. For those participating by video conference, click on the microphone icon to activate your mike, and please mute yourself when you are not speaking. Regarding interpretation for those on Zoom, as you know, you have the choice at the bottom of your screen of floor, English or French.

Now I would like to welcome all our witnesses. We're delighted to have you. You have a really interested committee here.

From Atomic Energy of Canada Limited, we have Amy Gottschling, vice-president, science, technology and commercial oversight. From the Canadian Nuclear Safety Commission, we have Caroline Ducros, director general, advanced reactor technologies, and Brian Torrie, director general, safety management. From the Department of Natural Resources, we have André Bernier, director general, electricity resources branch; and Daniel Brady, deputy director, nuclear science and technology. Each organization will have five minutes to present. At the four and a half minute mark, I will hold up this yellow card. It will let you know you have about 30 seconds left.

With that, colleagues, we welcome our witnesses.

We will begin tonight with the Atomic Energy of Canada Limited.

The floor is yours.

Ms. Amy Gottschling (Vice-President, Science, Technology and Commercial Oversight, Atomic Energy of Canada Limited): Madam Chair and members of the committee, let me begin by telling you that today I attended the first day of the Women in Nuclear Canada conference. This year is the largest attendance the conference has ever had, selling out at 500 attendees.

I can tell you that the energy and excitement in the room was invigorating. These women, who make up 23% of the nuclear industry, are mothers, daughters, sisters, students and young leaders who know they have a career in an industry that is making a difference in our world. They know they are supporting a technology that plays an instrumental role in promoting human health and addressing the world's challenges in clean energy and environmental sustainability. These women are our nuclear workforce of today and of the future, a future which includes nuclear as part of its energy mix.

I would also like to acknowledge that this conference has the privilege of indigenous participation and has embraced their beautiful culture, teachings and traditions. I will share what I learned this week with my children. The conference is being held in Niagara Falls, which is situated within the traditional territory of the Haudenosaunee and Anishinabe peoples.

Let me turn now to the matter of SMRs, which is why we are gathered here this evening. As you may know, the Government of Canada, through AECL, designed and built nuclear demonstration reactors, research reactors and the generating CANDU reactors in Canada. Today we no longer build reactors but we support reactor developers through the Chalk River Laboratories, the largest scientific facility in Canada.

As you have seen, in the world of SMRs there are a great variety of designs. Our role, as laboratory owner, is to support reactor vendors in validating those designs. Our broader role is to meet the Government of Canada's requirements for nuclear expertise, certainly for the Canadian Nuclear Safety Commission, and for another 13 government departments and agencies.

We deliver those roles through our oversight of Canadian Nuclear Laboratories, or CNL. In addition to activities to revitalize our campus, they're performing hundreds of experiments, qualification tests and nuclear technology demonstrations every day.

The foundational sciences of SMR technologies are not new. Universities and research laboratories around the world have been researching, developing and demonstrating these technologies for decades. That the market has rebranded them as SMRs and brought them forward at a time when we need every available technology to solve this climate crisis is a crucial turning point.

AECL is here to support this pivotal moment in time. As we turn our minds to getting Canada to net zero by 2050, AECL has been working to ensure that the Government of Canada maintains and retains strong capabilities in the most promising SMR technologies that the market will bring to mitigate this climate crisis.

AECL has the ability to create a nexus where academia, government and private industry can align to ensure safe and expeditious deployment of nuclear technologies. As an example, last month CNL broke ground on the advanced nuclear materials research centre. This centre will have 23 labs and 12 hot cells, and is a continuation of services that will support Canada's reactors, both large and small, to produce electricity and medical isotopes to 2060 and beyond.

We do not promote nuclear to the exclusion of other renewables—that is not necessary. In fact, they can be complementary. Nuclear reactors like SMRs are quickly becoming catalysts for the hydrogen market due to their reliable source of electricity and heat, both of which are needed to serve the different hydrogen production technologies. Furthermore, SMRs can be switched into and out of hydrogen production as electricity demand fluctuates.

At our Chalk River site, CNL is already exploring how to leverage various clean and renewable energy sources and how they work together in a hybrid energy system. I urge you to consider these exciting developments.

I will conclude by extending an invitation, through you, Madam Chair, to the committee, to come to visit Canadian Nuclear Laboratories and see what AECL is accomplishing for the benefit of all Canadians.

● (1835)

Thank you. *Meegwetch*.

The Chair: Thank you so much, Ms. Gottschling, and for your kind invitation to the committee. We are glad to have you here tonight.

We will now go to the Canadian Nuclear Safety Commission for five minutes.

The floor is yours.

Ms. Caroline Ducros (Director General, Advanced Reactor Technologies, Canadian Nuclear Safety Commission): Chair and members of the committee, my name is Caroline Ducros and I am pleased to join you virtually here in Ottawa, the unceded traditional territory of the Algonquin Anishinabe peoples. I am the director general of advanced reactor technologies at the Canadian Nuclear Safety Commission, CNSC, Canada's independent nuclear regulator. I am joined today by Brian Torrie, CNSC's director general of safety management.

For the CNSC, safety always comes first. Regardless of the project proposed, we will never issue a licence unless fully satisfied of its safety.

In these brief remarks, I will provide the CNSC's perspective on first, deploying SMRs in Canada to help meet climate change commitments; second, advancing SMR-related science and research in Canada; and third, ensuring the safe deployment of SMRs globally.

SMRs are novel nuclear technologies, seen by multiple Canadian provinces as a means to help combat climate change. Ontario Power Generation's Darlington new nuclear project puts Canada at the forefront of assessing a grid-scale SMR among G7 countries.

The CNSC is committed to safety and efficiency in licensing and regulating SMRs and enabling their safe deployment. For SMRs to be able to help provinces meet climate change objectives, the CNSC must be both efficient and effective. The funding that we received in budget 2022 is accelerating our readiness efforts. Those efforts include ensuring that our regulatory framework is appropriate for SMRs, that we have the right people and that the necessary research is being conducted.

SMRs are being proposed or considered for deployment in areas of Canada with no history of nuclear power generation. That requires early and ongoing engagement by all involved, including the CNSC, to build relationships and trust, especially with indigenous nations and communities and potential host communities.

SMR technologies are different from Canada's homegrown CANDU technology, which the CNSC is accustomed to. There's much to do in short order.

Through our existing research program, the CNSC has extensive ties with Canadian academia on the science and research needed to support safety cases for CANDU reactors and other nuclear facilities. That approach is being leveraged for SMRs. Our budget 2022 funding will enable us to support independent third-party research on key SMR-related priority areas. This research will support our view of proposed SMR designs and projects, and expand workforce availability in the nuclear sector.

Based on a recent visit by CNSC president Rumina Velshi to the U.S. Idaho National Laboratory—their leading centre for nuclear energy research and development—the CNSC would support a recommendation that the government make substantial investment in Canada, so that we can develop similar capacities.

Canada is only one of several countries considering SMRs. The CNSC is taking a leadership role and working closely with international regulators, notably the U.S., the U.K. and international organizations.

Our goal is to harmonize requirements and standards, share reviews and streamline licensing processes as much as possible, while maintaining our regulatory sovereignty. We're helping to advance this work directly through participation in the International Atomic Energy Agency's—IAEA's—nuclear harmonization and standardization initiative, and through president Velshi's role as chair of the IAEA's commission on safety standards, which establishes standards for the global nuclear community. This work will be key for the safe and timely deployment of an SMR global fleet, both in Canada and, especially, in nuclear newcomer countries.

Other regulators, proponents and countries are looking to Canada to demonstrate that SMR projects can be done safely, quickly and efficiently. For SMRs to play the role envisioned by many, dedicated efforts on the part of all involved are needed. CNSC is getting ready to efficiently regulate SMRs, and we will only allow safe projects to proceed.

Thank you.

● (1840)

The Chair: Thank you so much, Ms. Ducros.

Thank you both for your time and expertise, and for paying attention to the time. We appreciate that.

We're now going to Natural Resources for five minutes.

Mr. André Bernier (Director General, Electricity Resources Branch, Department of Natural Resources): Thank you, Madam Chair, for the opportunity to speak about small modular reactors in Canada.

Like Caroline, I'd like to recognize that I am joining you today from my home in Ottawa, which is in the traditional unceded territory of the Algonquin Anishinabe people.

Protecting the health and safety of Canadians and the environment always has been, and always will be, the Government of Canada's top priority regarding nuclear energy.

The Government of Canada has made a commitment to achieving net-zero emissions by 2050, and by 2035 in the electric sector.

[*Translation*]

Today, nuclear energy is an important part of Canada’s energy mix, currently accounting for 15% of our electricity generation, and contributing to Canada’s 82% non-emitting electricity supply.

In the transition to a low-carbon economy, we need access to a variety of technologies. In this context, nuclear power is among those options being considered by many around the world.

[*English*]

As a baseload, dispatchable and non-emitting source of energy, SMRs could also play a role in enabling deeper integration of variable renewables such as wind and solar into Canada's energy mix, especially in regions without significant hydro resources. SMRs are the next wave of nuclear innovation with the potential to play a role in the future of Canada's nuclear industry by providing non-emitting energy for a wide range of applications, from grid-scale electricity generation to use in heavy industry and remote communities.

Canada has the potential to become a leader in the development and deployment of SMR technology and potentially claim a significant share of a projected global market estimated to be $150 billion a year by 2040. To capitalize on this opportunity, Natural Resources Canada helped lead the development of the SMR action plan for the development, demonstration and deployment of SMRs. The action plan now has 119 partners who have committed to over 500 concrete actions.

That said, while the federal government has important responsibilities relating to nuclear energy and the environment, jurisdiction over electricity systems ultimately resides with the provinces and territories. In this regard, I would note that Alberta, Saskatchewan, Ontario and New Brunswick have shown their interest in using nuclear energy to help decarbonize their energy systems, with a premier-level memorandum of understanding to collaborate on SMR development and deployment.

SMRs have the potential to contribute to advancing economic reconciliation through meaningful partnerships with indigenous communities. To that end, we created an indigenous advisory council to the SMR action plan.

To protect the health and safety of all Canadians, our government is committed to continuous improvement with respect to ensuring that safe solutions are in place for managing radioactive waste and decommissioning, now and in the future. This commitment is supported by Canada's independent internationally peer-reviewed nuclear regulator, the CNSC.

As part of its commitment to continuous improvement, the government is evaluating Canada's current radioactive waste policy, and we are developing a comprehensive new policy that further provides Canadians with confidence in the long-term management of all of Canada's radioactive waste, including any waste from future technologies such as SMRs. Results from that engagement are being analyzed, and we plan to release the policy before the end of the year.

Thank you. We would welcome any questions you have.

● (1845)

The Chair: Thank you to all three organizations. We're grateful to have you tonight.

We will begin with our first round of questions. They will be for six minutes.

Tonight we start with Mr. Tochor.

Mr. Corey Tochor (Saskatoon—University, CPC): Thank you, Madam Chair.

My question is for André from the Department of Natural Resources.

You talked about net zero. With the current trend lines of emissions going up in Canada and not going down, if it's not nuclear, how do we get to net zero by 2050?

Mr. André Bernier: In the Canadian context, the journey towards net zero breaks down very quickly into a province by province or regional story. The options available, for example, to the hydro-rich provinces are very different from those that are more reliant on fossil fuels.

Certainly it's challenging when you look at things from a system perspective, to look at how you replace the baseload that is provided by coal and natural gas without looking at alternatives that might include nuclear or could include more enlarged hydro. It could also include natural gas with carbon capture and storage, but certainly the fact that you have four provinces that have identified nuclear as one of their priorities and those collectively account for the vast majority of interests in Canada tells us that it's very likely to play a significant role in the journey towards a net-zero economy.

Mr. Corey Tochor: We always hear about net zero with the current demands, but if EVs take off—the projections do look like that—the demand for electricity is only going to increase. Regardless of what province you're in, and yes, some provinces have more hydro and not to tell the provinces how to generate electricity per se, there's not that much hydro left that is “easy” in many of the provinces. If it's not nuclear, how do we do it? This is the question everyone is asking.

If there have been studies on replacing all of that natural gas with, say, solar, how many acres or how much of Canada would be covered by something like that? It would be enormous. The promise of nuclear is hopefully to use fewer non-renewable resources. I'm just curious here. From the department side of things, what is the plan B then?

Mr. André Bernier: Thank you for the question.

Looking towards the growth that would come from, say, electric vehicles or industrial electrification heat pumps, for example, there's a wide range of projections for how much electricity use could increase in the coming years up to 2050, but certainly we expect it to be very significant. The challenge is not just decarbonization and reaching net zero by 2035, but also a really significant build out of supply.

In my remarks I showed sensitivity to the leading roles that provinces and territories play in this space. I think I need to continue in that vein in the sense of not wanting to provide a prescriptive view on what any one province must do or not do. I would certainly agree that a lot of Canada's best large hydro sites have already been developed. That's not something that would be easy to expand on a really large scale.

We certainly hope that variable renewables will play a much larger role going forward. Certainly if you couple that with energy storage, a greater connection between provinces and territories, and other things that modernize the grid, the amount of variable renewables can be increased quite significantly, but in the end you still need to have some baseload that is provided by sources such as nuclear. I'm avoiding providing a prescriptive response. I don't think it would be my place to do so, but certainly I am acknowledging that a non-emitting baseload is a critical component of a future grid and that nuclear is one of the prime options for providing that.

● (1850)

Mr. Corey Tochor: I want to switch gears to the regulatory side and the CNSC. It is my understanding that the SMRs will be classified as a class 1A nuclear facility, which is similar to the existing traditional plants out there. Could you expand more on this technology-neutral approach?

How does that break down? What are the benefits and disadvantages of having the same classification for SMRs versus the would-be CANDUs in Canada?

Ms. Caroline Ducros: The classification for class 1As in the regulations under the Nuclear Safety and Control Act is just what it is. The key is that our regulatory framework is both performance-based and prescriptive. The performance-based aspect of it allows it the flexibility to be able to receive applications for novel technologies, including SMRs. The key here is that we would treat any application in accordance with the regulatory requirements for the safety of human health and the environment, and in keeping with our international obligations.

SMRs would not be different in that respect in terms of a licensing review than another class 1A, like the CANDU reactors would be. However, the regulatory framework itself would not have to change in that respect. We could look at the SMRs depending on the design safety that is being proposed with a graded and risk-informed approach. This is something that our regulatory framework is robust enough to allow.

Mr. Corey Tochor: Just briefly, how safe is nuclear? Are you proud of the record that our country has with nuclear facilities?

Ms. Caroline Ducros: Yes, I'm very proud of the record that our country has with nuclear facilities. We have been regulating these facilities for decades—and nuclear power plants—and have done so very safely.

Mr. Corey Tochor: Thank you.

The Chair: Witnesses, I hope you realize the committee is very interested in what you have to say.

Thank you, Mr. Tochor.

We're now going to Mr. Lauzon for six minutes, please.

[*Translation*]

Mr. Stéphane Lauzon (Argenteuil—La Petite-Nation, Lib.): Thank you very much, Madam Chair.

I am pleased to take the floor today.

First and foremost, I would like to thank the witnesses. I invite them to listen to the English interpretation so that they fully understand what I am saying.

My first question is for Mr. Bernier.

On June 7, you were called to testify before the House of Commons Standing Committee on Environment and Sustainable Development. At that meeting, you responded as follows to a question from my fellow MP, Monique Pauzé, regarding the percentage of renewable energy in Canada:

> Putting aside hydroelectricity—which is, of course, the backbone of our system and a renewable source of energy—and focusing on wind and solar, it is, I think, in the neighbourhood of 6%, 7% or 8%. However, as Drew indicated, we expect these to grow very rapidly over the coming years, wind in particular.
>
> I hesitate to make a projection as to what role it might play, but there's a lot of unexploited potential.

You're expecting a lot of growth in wind. We already have a good system, and there's a lot of untapped potential in that area. So why should the government invest in the science and research around small modular reactors instead of focusing on the technologies we already have?

● (1855)

[*English*]

Mr. André Bernier: Thank you very much for the question and thank you for making the link.

Yes, the figure of 7% or 8% is accurate for the amount of the contribution of wind and variable renewables, but it's predominately wind. For the electricity generation in Canada today, the overwhelming majority of that is very much hydro.

Every expectation is that wind energy will increase substantially over the coming years. It's an increasingly mature and competitive technology and one that, especially as you deploy wind over a larger and larger area, you can take advantage of that widespread area so that, when the wind is blowing in one place but not in another, it smooths things out at the system level a little bit better.

Notwithstanding that the expectation is that it will make a much larger contribution going forward, there are limits to how much wind or solar you can deploy and still maintain system reliability. There is a baseload role to electricity generation that wind can't fill at this point with the technology that we have. At some point, if we have better ways of storing energy over the long term—and our hydro dams play a very important role in that regard—this is something where you would be able to store energy and smooth out fluctuations over the course of the day, over the course of the week, over the course of the months or even seasons. Once that happens, I think we can expect wind and solar use to go up even more.

At present, though, we don't have the technology available for wind or solar to play that role of baseload energy to the degree that we would need to maintain system reliability and, for that reason, non-emitting sources such as nuclear, large hydro, natural gas and carbon capture and storage will be part of the mix. For that reason, it's natural to focus on each of those in different ways, and I would refer to my earlier remark that you have four provinces that have indicated that this is a priority for them. That is their jurisdiction, and we're pleased to be able to support that priority of theirs.

[*Translation*]

Mr. Stéphane Lauzon: Thank you.

Ms. Gottschling, in your remarks, you said that AECL is no longer making small reactors, without giving further details. However, you explained that AECL is now using partners instead of developing the technology itself.

Can you tell us more about it? Why did AECL, which was involved in nuclear development, decide to end its participation? What is the explanation behind that?

[*English*]

Ms. Amy Gottschling: Decisions were made in the past to separate the technology from AECL and provide exclusive rights to that technology to us and SNC-Lavalin. That decision was made many years ago, and we are proceeding on the path forward.

The AECL of old was set out with the intention to define the nuclear industry, to direct it and to provide a technology push. The AECL of today is here to enable technologies, to provide some services and to be an enabler, a convenor of minds and a trusted adviser. We have the power of a thriving national nuclear lab that can help tackle the challenges and demonstrate technologies.

The AECL of today is here to ensure that we have the capabilities and expertise to responsibly and efficiently deploy any new nuclear technologies in Canada.

[*Translation*]

Mr. Stéphane Lauzon: Thank you.

One of the four themes and research activities of the Federal Nuclear Science and Technology Work Plan is enhancing national and global security, nuclear preparedness and emergency response.

Anomalous environmental events caused by global warming such as the storm...

● (1900)

[*English*]

The Chair: Mr. Lauzon, I'm sorry to interrupt. Would you like to ask the witness to table a response since your time is up?

[*Translation*]

Mr. Stéphane Lauzon: Yes, please.

[*English*]

The Chair: Thank you. I'm sorry to interrupt. My apologies.

[*Translation*]

Mr. Blanchette-Joncas, you have the floor for six minutes.

Mr. Maxime Blanchette-Joncas (Rimouski-Neigette—Témiscouata—Les Basques, BQ): Thank you, Madam Chair.

I would like to welcome the witnesses with us this evening, as well as my colleagues.

My first question is for Mr. Bernier, from the Department of Natural Resources.

Mr. Bernier, in your remarks, you mentioned that Canada should position itself as a world leader in the production of small modular nuclear reactors. You spoke of demand and a global potential of $150 billion.

I'm trying to understand the situation to clarify some things. Several countries have already produced small modular nuclear reactors, including China, South Korea, Russia and the United States. The Americans asked the Department of Energy to commission a report on various small modular nuclear reactor designs. The report concluded that small modular nuclear reactors would not be operational by the end of the decade. Even in 2022, there is not a single small modular nuclear reactor in the United States ready for commercial use.

All of the countries I've named have tried to market small modular nuclear reactors on a global scale. We know that there may be potential demand. However, these countries have not successfully marketed this type of reactor.

I would like to know how Canada will differ from countries who, for several years, have already tried to sell small modular nuclear reactors.

[*English*]

Mr. André Bernier: When I think about the potential role that Canada could play as an SMR provider.... You will see as an example right now Ontario Power Generation's decision to select the GE Hitachi, BWRX-300 reactor, which is built off an existing reactor design involving two major industrial partners, General Electric and Hitachi. It may not be the case that there will be a Canadian reactor that would be exported and used worldwide, but the first deployment of this reactor that I mentioned will occur at the Darlington site in Canada. Already there's significant interest not just within Canada—Saskatchewan, for example—but outside of Canada as well, in Poland and Estonia, for use of that reactor.

The economic opportunity is linked not just to whoever makes the reactor, but also to the supply chains that support that. In this case, because this will be the first grid-scale deployment of an SMR in the west, it positions Canada, we hope, very favourably to benefit from that if others choose to adopt this particular reactor technology.

There's no disagreement. This is not something that will make a material difference before the end of the decade. It's not something where we expect SMRs to contribute on a large scale to the achievement of the 2030 goal. Even by 2035, it's likely that we'll see a very small number of SMRs deployed in Canada, but beyond that point, as we look toward what we expect to be a very significant expansion of the electricity system in Canada but also globally to meet the needs of a decarbonized economy, that's where there could be a very significant role for SMRs, and Canada as a leader in terms of demonstrating this technology. I mentioned the Darlington site, and there's the Global First Power project at Chalk River.

We hope that we're favourably positioned to benefit over time.

[*Translation*]

Mr. Maxime Blanchette-Joncas: Thank you very much.

My next question is for representatives of the Canadian Nuclear Safety Commission.

The commission's role is to regulate the nuclear energy industry and ensure nuclear safety, but also to develop nuclear energy in Canada.

How do you ensure that there are no conflicts of interest within the current structure of nuclear governance?

[*English*]

Ms. Caroline Ducros: The CNSC's mandate is clearly about the regulation of nuclear energy during the full life cycle of nuclear: from mining and milling, through processing, power plants and medical isotopes, to waste management and decommissioning. We don't have a mandate as a proponent for any type of technology. We review the technologies that come to us to ensure that, whatever we recommend to the commission, we have used a scientific basis and had a robust review of full and complete information. Then, if we're not ready to recommend it to the commission because we don't think it's safe, we will not, but we don't have a development mandate.

● (1905)

[*Translation*]

Mr. Maxime Blanchette-Joncas: The Department of Natural Resources would not have mandated you to develop nuclear energy in Canada. Is that correct?

[*English*]

Ms. Caroline Ducros: That's correct. Our role as a world-class nuclear regulator is to be efficient and effective in our regulatory process, in our reviews of licensing applications and in our compliance verification. Our role is not to develop.

We also have another role in terms of disseminating scientific information to the public, and sometimes this would mean debunking, but we don't have a role in developing power.

[*Translation*]

Mr. Maxime Blanchette-Joncas: Can you explain the mechanisms you use to ensure citizens' safety when implementing and developing nuclear interests in Canada?

[*English*]

Ms. Caroline Ducros: Madam Chair, I wonder if I could have a reframing of the question.

The Chair: Monsieur Blanchette-Joncas, you can have a short question. Perhaps you can ask the witness to table the answer, please.

[*Translation*]

Mr. Maxime Blanchette-Joncas: Indeed, I ask that the answer be tabled, because I suspect it's going to take more than a few seconds to explain it all. I will repeat the question.

What mechanism does the Canadian Nuclear Safety Commission have in place to ensure citizens' safety when developing and using nuclear power in Canada?

The Chair: Thank you, Mr. Blanchette-Joncas.

[*English*]

With that, now we will go to Ms. Idlout.

We're glad you've joined us. You have six minutes.

Ms. Lori Idlout (Nunavut, NDP): *Qujannamiik, iksivautaq*.

I'm so used to having an Inuktitut interpreter that I almost started speaking in Inuktitut. I will rejig my brain.

I wanted to direct my question to Amy Gottschling first. In regard to the size of a reactor, what would be the average size of a reactor that would be necessary to power rural or remote communities? For example, in Inuvik, which has a population of about 3,243, there are two power plants. One is diesel-powered, with a total capacity of 6.2 megawatts, and one is gas-powered, housing three gas-fuelled generators rated at 2.8 megawatts.

Nakurmiik.

Ms. Amy Gottschling: Thank you for the question.

The size of the reactors that are geared for remote deployment would be around the five-megawatt range. The beauty of the SMRs is that you can plug and play if you need more than one to cover the energy needs you have. It sounds like you would need two of those.

Ms. Lori Idlout: Could you provide an example of what kind of waste management would need to happen?

Ms. Amy Gottschling: The solution we have in place right now for the current reactors in Ontario is quite sound, and the disposal solutions we have in place and the policies we have in place would also be applied to SMRs.

Ms. Lori Idlout: Thank you.

My next question will be for Caroline Ducros, with the commission.

Have there been any discussions about the training of indigenous people to support the development of such SMRs? Also, what kinds of opportunities would there be to ensure that indigenous people would be able to operate them?

Ms. Caroline Ducros: Thank you for the question.

A lot of the opportunities in terms of operating SMRs would have to be led by industry. They will be the ones who come forward with applications and are operators of facilities. In terms of training, my expectation would be for the proponent to do that also.

From a regulatory perspective, we have a duty to consult, and we have a very large duty, a commitment, to enter into relationships in collaboration with indigenous people when it comes to licensing reviews and compliance verification.

We're not the operators, so I would put the onus on the proponents to undertake that type of activity.

Perhaps I'll pass this to Mr. Bernier in terms of the policies on equity and hiring.

● (1910)

Mr. André Bernier: Thank you very much, Madam Chair.

I will briefly mention that, as part of our work under the SMR action plan, we established an indigenous advisory council. In fact, next week, the SMR leadership table will be meeting—deputy ministers and utility heads. It will be co-chaired, for the first time, by a member of the indigenous advisory council. One of the reasons for this is exactly as you described: to make sure that, as part of the conversation, we're able to look at potential opportunities for indigenous communities or development organizations, including on the skills training side and in terms of potential ownership stakes in any projects.

I think there's a whole other conversation to be had about community acceptance. I would like to acknowledge that, but I wanted to briefly mention the work of the council.

Ms. Lori Idlout: Thank you.

I have a question for all three witnesses. It doesn't matter to me in which order they answer.

I note that all three witnesses mentioned they've had indigenous engagement, but they didn't let us know what indigenous nations, government organizations, or whatever they've had engagement with. I wonder if they could list those for us.

Qujannamiik.

Mr. André Bernier: Madam Chair, I'm on screen, so perhaps I could kick us off.

As part of the SMR action plan, Natural Resources Canada carried out fairly extensive engagement at the community level, though it was primarily targeted at communities that were either close to existing nuclear sites or might be implicated—

Ms. Lori Idlout: I'm sorry. I'm interrupting because I just asked for a list of the indigenous organizations or nations you've engaged with.

Mr. André Bernier: Perhaps we could follow up and provide a list, if that's acceptable.

The Chair: Yes, table it with the committee.

Thank you so much.

Ms. Lori Idlout: Thank you.

Am I out of time?

The Chair: You have 20 seconds.

Ms. Lori Idlout: Okay, perhaps that could be a written response on the importance of impact assessments and how they would be used in this kind of process, if that's clear.

Qujannamiik.

The Chair: Thank you, Ms. Idlout.

Thank you also to the witnesses for supplying that information. We appreciate that.

We'll now start the five-minute round. This time, we will start with Mr. Williams.

Mr. Ryan Williams (Bay of Quinte, CPC): Thank you, Madam Chair. It's always a pleasure.

Thank you to the witnesses for joining us today.

I'm going to start with Mr. Bernier, if I may.

Mr. Bernier, what progress has been made in making nuclear technology eligible for the government-funded green bond program?

Mr. André Bernier: I should acknowledge that the federal government's green bond program is led by the Department of Finance. Although they do draw on the expertise of other federal departments, such as Natural Resources Canada, I would be stepping outside my role to speak on that.

Mr. Ryan Williams: Perhaps I will ask a broad question: Has Natural Resources Canada had input on that program?

Mr. André Bernier: Yes, our input was sought as part of the Department of Finance's development of the green bond program.

Mr. Ryan Williams: Please provide a general yes-or-no answer: Does Natural Resources Canada support that?

Mr. André Bernier: What I can comment on is.... We understand that, as the Department of Finance developed their position on green bonds, they looked extensively at international practices, and nuclear was generally not included. That includes, for example, the United Kingdom's green bond program—the United Kingdom being a very significant nuclear power. Their green bond program did not include nuclear.

Certainly, we inputted on the pros and cons, but ultimately it was their decision to make, with reference to international practices in this area.

● (1915)

Mr. Ryan Williams: I have a follow-up question: Do you know whether the United States is using a similar program, at this point?

Mr. André Bernier: I apologize, but I am not as familiar with the U.S.'s use of that as an instrument. We could provide that in a follow-up.

Mr. Ryan Williams: That would be fantastic. Thank you.

Ms. Ducros, a scientist named Dr. Christopher Keefer told the committee in June that all the nuclear waste one person would create in their lifetime, if all the power was produced by nuclear energy, would fit—I'm sorry, Madam Chair, but I have a prop—into a pop can just like this one.

Do you agree with that assessment?

Ms. Caroline Ducros: Unfortunately, I'm not an expert on nuclear waste. I would have to get back to you on whether it would fit into a pop can.

Whether or not it fits in a pop can is less significant to me than whether every licence application clearly delineates what's going to happen to that waste—that the waste goes to an authorized waste management facility, that they are going to do what they can to reduce the amount of waste, and that it's safe.

Mr. Ryan Williams: Okay, I have a different question for you, then.

Canada is one of the leaders in nuclear power and research in the world. Do we have any issues regarding nuclear proliferation from our current electrical and research uses?

Ms. Caroline Ducros: Canada is a signatory to the treaty on non-proliferation. This requires us to forbid developing or acquiring nuclear weapons, and it also obligates Canada to accept safeguards verification from the International Atomic Energy Agency. It also requires us to implement export controls to ensure that any nuclear transfers don't contribute to other nations' nuclear programs.

From an SMR perspective, the proponents will need to demonstrate that they meet CNSC's requirements in this respect. It's part of our mandate to make sure that we meet the international obligations to which we are signatories.

Mr. Ryan Williams: Do you have any recommendations for this committee on what changes we should seek, or any advice, to ensure that our industries succeed?

Ms. Caroline Ducros: The recommendation I would have is that we always ensure that we meet our obligations and that we carry on with our compliance verification, as we do, and our work with international partners.

Mr. Ryan Williams: Thank you.

My last question is for Ms. Gottschling.

We had some questions earlier about whether we can hit the 2050 goal of net zero without nuclear. I'm going to ask you to answer the same question, please.

Ms. Amy Gottschling: I have heard the same analogies made, that there is no path to net zero without nuclear. We've also engaged in studies and see the gap as very large. The challenge we have in nuclear, and how much nuclear power we would need to hit that gap, is the same across all energy industries. I believe it will take a mix of diversified energy portfolios to hit that target.

The Chair: Thank you. You were bang on.

Thank you, Mr. Williams. Thank you to all the witnesses.

With that, we will go to Mr. McKinnon, for five minutes, please.

Mr. Ron McKinnon (Coquitlam—Port Coquitlam, Lib.): Thank you, Chair.

I'm interested in exploring the potential evolution of SMRs and potentially micro modular reactors. Specifically, I'm interested in ocean-going shipping. I know that as a sector, the freighters that go all around the world have an enormous CO2 footprint, and they tend to burn messy, dirty fuel as well.

If we could project the state of the art of SMRs or micro reactors, do you see the ability to economically deploy that sort of technology on the typical ocean-going freighter? Further, what might the challenges be to that, and what can we do as a government to encourage research in those directions?

That is a question I believe for Atomic Energy.

Ms. Amy Gottschling: Thank you for the question.

I apologize; I probably can't speak to the economic feasibility as such, but what I can point you to is that the marine transport industry is engaging with the nuclear industry to discuss these opportunities. We are doing so at CNL as well.

The parallel would be the historical use of SMR technologies for the navy and its fleet. There is a precedent set for using small reactors for water transport with the navy, and I would draw more on that.

● (1920)

Mr. Ron McKinnon: Thank you.

I'm going to carry on with understanding the scale of the problem in terms of nuclear waste and how it can potentially be handled with SMRs in general. When you talk to people about the proliferation of SMRs, generally the first thing they're concerned about is all the nuclear waste.

I'll address this to the Canadian Nuclear Safety Commission. Perhaps you can address these concerns.

Ms. Caroline Ducros: The nuclear waste is one of the things we regulate, and it's part of the licensing application review. With any application that comes to us, the licensing has to have a path for where the waste will end up, and that waste has to end up in a licensed facility.

Canada has managed its nuclear waste for quite some time. When it comes to policy decisions on the reprocessing of waste and those types of things, it's the Government of Canada that has to make that decision. From a regulatory perspective, we will review each application to ensure that they minimize the amount of waste they produce and that they have safe storage and management of that waste.

Mr. Ron McKinnon: I understand that the waste from one reactor might turn out to be the fuel for another. It might need to be refined. It might need to be repurposed in some manner.

Is that a viable expectation, that as we go forward generating nuclear waste from these various reactors, we will be able to redeploy the spent fuel, if you will, and the waste in terms of other technologies?

Ms. Caroline Ducros: I'll begin, and then I'll pass it to NRCan.

The policy on whether or not Canada is going to accept the reprocessing of nuclear waste fuel to use in another facility has not been determined yet. However, if Canada were to go in that direction and allow that type of technology, the CNSC would regulate it in the same way we would regulate any other fuel or reprocessing facility. Our regulations are able to handle that type of novel technology.

Mr. Ron McKinnon: Natural Resources, please do carry on, if you can.

Mr. André Bernier: I don't have too much to add on that point. One of the main sensitivities when we get into reprocessing, especially if it involves the movement of nuclear waste across borders, is the risk of proliferation. We know that SMRs in general are using a different kind of fuel and producing a different kind of waste than CANDU reactors, so by no means is it an insurmountable obstacle, but it is a very different set of considerations than our current equilibrium, where we have natural uranium being used in country and not reprocessed.

Moltex, which is one of the SMR developers with roots in New Brunswick, is looking actively at this. There are many tough questions in the future, but it is certainly considered as one of the potential SMR models.

Mr. Ron McKinnon: I guess I don't have any more time.

The Chair: I'm sorry, Mr. McKinnon. We thank you for the questions.

Thank you to all our witnesses.

We will now go to Monsieur Blanchette-Joncas for two and a half minutes, please.

[*Translation*]

Mr. Maxime Blanchette-Joncas: Thank you very much, Madam Chair.

I will direct my questions to the Canadian Nuclear Safety Commission.

The Impact Assessment Act, in force since 2019, excludes from the impact assessment process nuclear fission or fusion reactor projects with a thermal capacity of more than 200 megawatt thermal located outside an existing nuclear facility.

I would like to know if future nuclear reactor projects will be subject to an impact assessment.

How will Canadians, particularly Quebeckers, know that it’s done safely, based on environmental issues that will be taken into account?

● (1925)

[*English*]

Ms. Caroline Ducros: The Impact Assessment Act has a project list that designates which projects are subject to the impact assessment. In terms of the question, any SMR located within the licensed boundary of an existing class IA nuclear facility, if the proposed project had a combined thermal capacity of 900 megawatts, would be subject to an impact assessment under the Impact Assessment Act. If it was located outside a class I nuclear facility and licensed boundary and had a capacity greater than 200 megawatts thermal, it would also be subject to an Impact Assessment Act IA.

Having said that, any project that goes through the CNSC, any licence application that goes through the CNSC, is subject to an environmental projection review under the Nuclear Safety and Control Act.

To the second part of the question, these reviews ensure that impacts on the environment from proposed projects are limited and manageable, and that the environment and the health of persons continue to be protected. Also, the environmental protection reviews ensure that the public and the indigenous—

[*Translation*]

Mr. Maxime Blanchette-Joncas: Excuse me for interrupting. I'd like to ask a second question, as time is running out.

Wouldn't it be safer to conduct systematic impact assessments for all projects, especially because we know that they can present environmental risks?

Why exclude nuclear development projects from the Impact Assessment Act?

[*English*]

Ms. Caroline Ducros: The project list for the Impact Assessment Act was based on the risk profiles of facilities. The Nuclear Safety and Control Act is a very powerful act, and has an environmental—

The Chair: I'm sorry to interrupt.

Monsieur Blanchette-Joncas, your time is up. Would you like the answer to be tabled?

[*Translation*]

Mr. Maxime Blanchette-Joncas: Of course, Madam Chair. I would like an answer to be tabled.

Thank you.

[*English*]

The Chair: Thank you.

Mr. Cannings, we haven't even given you time to catch your breath. You have two and a half minutes, please.

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

My apologies to the panel for missing your testimony. I was at an emergency debate.

I will ask a question of Natural Resources Canada about training.

I'd just like to hear your thoughts on the training that is necessary, especially to operate small modular reactors. How long does that training take, and what kind of qualifications are necessary, etc.?

Thank you.

Mr. André Bernier: I will respond only briefly, which reflects a bit of a lack of in-depth expertise on that on my part.

Certainly the work to become an engineer or someone working in a nuclear facility requires extensive training—years and years, in many cases—on top of someone's undergraduate and graduate work and special licence. That's a very top-of-mind thing for us as we think about the next generation of nuclear operators working on SMRs. In fact, Mr. Brady and I were meeting with McMaster University just a bit earlier today. We know that Canada's universities, among others, are very interested in getting themselves ready well in advance to make sure that the workforce of the future is there.

I could tag my colleague, Dan Brady, here.

Dan, if you would like to join us for a moment, you could elaborate a bit more on the training requirements. What changes, if any, might there be as we think about work with small modular reactors?

Mr. Daniel Brady (Deputy Director, Nuclear Science and Technology, Department of Natural Resources): Thank you for the question.

For part of the requirements, I was going to actually defer to the CNSC, as any operator there has to meet their requirements as part of the overall training. Maybe they'll provide a bit more on that aspect.

The training of the younger generation into these roles, as well as making sure that the ones who are operating these facilities are well trained, is a very important aspect going forward.

Maybe Ms. Ducros can provide a bit more insight.

Ms. Caroline Ducros: Yes, that is correct. Having adequate training of staff by the nuclear operators is a requirement of the licence. We do compliance verification against that requirement at all operating facilities.

The Chair: Thank you, Mr. Cannings.

To all our witnesses, we'd like to thank you very much. You are the last witnesses of this study. We appreciate your time, experience and expertise. We'd really like to thank you.

With that, to our committee, we will briefly suspend because we will be going into committee business.

[*Proceedings continue in camera*]