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Chair

Mr. Leon Benoit

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● (1540)

[*English*]

The Chair (Mr. Leon Benoit (Vegreville—Wainwright, CPC)): Good afternoon, everyone.

We're here today to continue our study on energy security in Canada. Today we're looking at the nuclear industry.

We have two panels. In the first panel we have two witnesses. First, from the Canadian Nuclear Association, we have Denise Carpenter, president and chief executive officer. Welcome.

From Bruce Power we have Duncan Hawthorne, president and chief executive officer. Welcome to you.

Thank you both very much for being here. We'll hear your presentations in the order they are listed on the agenda, so we will start with Denise Carpenter, for up to seven minutes, please.

Ms. Denise Carpenter (President and Chief Executive Officer, Canadian Nuclear Association): Thank you, Mr. Chairman and members of the committee.

First of all, on behalf of the 71,000 men and women who work in Canada's nuclear industry, from the workers at our TRIUMF research centre in British Columbia, the SLOWPOKE-2 facility at the University of Alberta, Cameco and AREVA in Saskatchewan, and all our power plant workers and researchers in Ontario, Quebec, and New Brunswick, we commend the people of Japan, who have shown both amazing resilience and fortitude since the devastating earthquake and tsunami almost two weeks ago.

Let me start by saying that while there is no such thing as absolute safety, Canada's fleet of reactors is safe. Each structure is designed and built to seismic standards, despite being located in areas with low seismic activity and virtually no risk of a tsunami. Safety has always been, and continues to be, the number one priority for our industry.

Our industry is based on worldwide learning and continuous improvements based on a worldwide body of engineering experience.

As a result of the Japanese nuclear incident, the federal regulator is reviewing the safety cases for all of Canada's nuclear facilities, as is normal when events of this nature occur. We are proud of our safety record, but we are never complacent. The tragedy in Japan will of course be examined thoroughly for lessons we can apply here at home.

My colleague Mr. Duncan Hawthorne will be speaking to you about this in more detail in a few minutes.

Let me turn to the broader subject of energy security. Nuclear energy is an important part of Canada's diversified electricity supply mix. Indeed, we are a 24-hour baseload power source. We produce 15% of Canada's electricity and over 50% of Ontario's.

A major advantage of nuclear power is that it produces massive amounts of electricity reliably, safely, and over long periods of time. With continuous advancements in engineering and learning, we expect to get up to 60 years of life from our plants. However, as with all energy and fuel sources, there are challenges and rewards. Our industry's cost structure consists of high capital costs and low fuel costs.

First let's consider the benefits of those capital investments. They are the same as the benefits that come from all large, well-thought-out industrial infrastructure projects, the most important one being jobs. These projects also generate revenues and taxes for communities and benefits for supply chains all across Canada.

With respect to jobs, in July 2010 the Canadian Manufacturers & Exporters showed that just two projects alone, the refurbishment of facilities at Bruce and Darlington, will support 25,000 high-wage jobs for a decade, injecting $5 billion annually into Ontario's economy and leaving us with better infrastructure that will serve our households and our industries for generations to come.

We must also consider the low operating costs of a nuclear power plant. Once a plant is producing energy, it requires little fuel. And uranium costs are subject to very little volatility in price, so an investment of this sort does not risk price volatility. According to studies conducted by the OECD , the overall cost to the consumer of nuclear power over the life of a power plant is similar to that of large-scale hydro, natural gas, and coal, and is even lower than wind and solar.

Our industry has very few external costs, meaning that we impose few costs on society or on the environment that we aren't accountable for ourselves. That's because we occupy small pieces of real estate. We release virtually no emissions into the broader environment. We produce spent fuel and other radioactive materials that are very small in volume and that are very strictly monitored, and we mostly keep and manage them ourselves.

In fact, we are the only industry that can really say that we know exactly where all our waste is. Our regulators make sure that we do. And to us, it's not just pure waste; it's a fuel that one day we may be able to recycle. As a net result, we account for the full costs of packaging, managing, storing, and disposing of these materials, which means that those costs are built into and covered by the price of nuclear power today.

● (1545)

On the environmental front, I mentioned that the power being produced is virtually emissions-free. If we did not have the nuclear power plants we have in Canada today, and instead relied on fossil-fuel-based electricity for that output, our country would generate more than 90 million tonnes of greenhouse gases every year. That would add about 12% to our annual greenhouse gas emissions.

Further replacing fossil-fuel-based energy with nuclear energy can have a very positive impact as we strive to lessen our country's, and indeed the world's, carbon footprint. Nuclear's low emissions, low fuel costs, and low real estate needs were already attractive to many countries before we started talking about either capping carbon emissions or putting a price on them. As energy demands increase and we move towards a carbon-constrained world, nuclear energy has a role to play in Canada and abroad. As developing countries look to sustainable and renewable fuel sources, nuclear is a clear choice. It is virtually emissions-free. It is affordable. It can help create jobs at home and in developing countries, which will stimulate economies rooted in innovation and research.

I wish I had more time to talk about innovation and nuclear research and development, and indeed about nuclear medicine, but I don't. These are great sources of pride for our nation. Through these areas, our industry is driving productivity, and ultimately improving our standard of living.

In closing, I will say that with each passing year the global community of people who care about the environment has more and more in common with the global community of people who provide nuclear power generation, those who are continually striving to improve its safety, its economics, and its environmental performance.

With that, I'd like to thank you for the opportunity to be here today.

The Chair: Thank you very much, Ms. Carpenter.

We go now to Duncan Hawthorne, from Bruce Power. Go ahead, please, for up to seven minutes.

Mr. Duncan Hawthorne (President and Chief Executive Officer, Bruce Power): Good afternoon, Mr. Chairman.

Obviously the presentation on nuclear power would be impacted by the events that have taken place in Japan, so I felt it might be helpful to give the committee an overview of what's here. I've provided a slide deck to try to allow the committee to understand exactly the sequence of events.

Now let me, without actually going through slide by slide, try to give you an overview of the situation. Of course everyone has watched the devastating effect the earthquake and tsunami had on the entire region of Japan that was affected.

With respect to the nuclear plant itself, at the time the earthquake hit there were six units on the site, units one to six. Three were in operation—units one, two, and three—and three were in various stages of shutdown mode. When the earthquake hit, the plant responded as you might have wished it would do. It withstood the earthquake and the automatic cooling systems went into operation, again in a way the design would have wanted to see that happen.

About 30 minutes after the earthquake, the tsunami created massive damage to the facility and in fact swamped much of their shutdown system. Basically, it's easy to see from here that the plant was not capable of withstanding the level of tsunami it was struck by. The height of the wave exceeded the design expectation for the site. It had a devastating effect on all of the shutdown systems.

I've tried to explain this event in many ways to people, and I was just at a meeting in Ontario this morning trying to do the same thing, so if I can explain this in layperson's terms, it might be easier for you.

If you can imagine your own kettle at home that's boiling water, that's actually very much like a boiling water reactor. The water actually boils within the reactor during normal operation, and instead of the water escaping through your spout as it would in your kettle, it actually then is fed to the turbine generator. So if you can imagine a scenario where suddenly you have nowhere to send the steam—because that's what happened when this event occurred, the connection between the reactor and the turbine was broken—you still have a tremendous amount of heat being generated inside your kettle and nowhere for the steam to go.

The obvious concern there is how do you keep it cool? How do you prevent the lid from blowing off? In the early period after this event when they lost cooling, that was exactly the situation they were faced with, the possibility of the water continuing to boil off and structural damage occurring.

Really, from the minute the tsunami hit, they had to consider how to apply cooling to these three powerful reactors that are still generating heat. Having tried a series of things, they then were forced with a situation where they knew that fuel damage was occurring, the water level in the reactor was dropping, and they had to do two things fairly quickly: one, to relieve the pressure by venting, and two, to find some alternate way of adding water to the reactor. They chose to do that by using seawater and using fire pumps, and they progressively worked their way through these three units.

One of the things I think we've all seen pretty dramatic pictures of is where the secondary containment has been affected. Really, the reason for that is that as they're venting, they're also venting hydrogen into that secondary containment. Under normal operation that hydrogen should have been burnt off as it was generated. There would be a lower volume of it, and it would have been dealt with as it came. But their hydrogen ignition equipment was also electrically powered. So without that, they vented hydrogen in a pretty large volume, and then the hydrogen ignited and it blew the secondary containment apart on unit one and then did the same on unit three. Those were the structural impacts we've all watched.

The important thing, however, is despite the obvious visual impact that had, the structure of the primary containment for all of these reactors continues to be sound.

The second stage of the problem, then, is now that they have water in these vessels, they have to deal with the fact that the fuel pools have been sitting with fuel and they'll also need to be cooled. That's compounded by the fact that the secondary containment has been blown off in two of the units. So you have fuel that's overheating in a fuel pool, with no means of cooling it either, and as it steams off it sends contaminants into the atmosphere.

● (1550)

As things stand today, and you'll have seen this in much of the video footage, they've been using extraordinary measures to cool the fuel pool: they've been using fire trucks to hose down the fuel pools and add water; they're using seawater and fire pumps to keep the reactors cool. It really is all a coping strategy.

The situation has gotten better every day, but we'd be wrong to say that they have it stabilized at the moment. They are still doing it in a very non-standard way. Over the course of the last 48 hours they've been able to get electrical power back to these reactors, and that allows them to start recovering instrumentation, controls, and normal cooling systems.

My estimate would be that it will take at least another two weeks to try to get back to normal system operation, in terms of providing cooling by normal means. But these facilities are commercially out of action forever, and it's now about putting them into a safe layup and shutdown state.

At the heart of this, of course, is a question mark over whether or not the design basis for this plant was valid. Everyone I think understands that Japan is a very seismic-reactive area. Their plants are designed to meet earthquake standards that we would never consider applicable to our area. But even there, this quake and the tsunami that was a consequence of it exceeded the design specification.

As Denise said earlier, lessons for us.... We have very sound design-basis arguments here, of course. In Japan, not only is the plant designed differently, but the location of the plant is very different, in terms of the onerous environment.

We are conducting a review of our plants to do three things: firstly, to confirm that the design basis for our plants is sound; secondly, to confirm that the equipment we rely on can be proven to be available in a range of scenarios, such as fire, flood, explosion, and those kinds of things. The third thing we've been asked to do is to liaise with emergency measures organizations so that we can confirm that all of our controls and arrangements for any off-site event are adequate to meet this low-probability outcome.

We've been asked to do that in a matter of months by our regulator. Much of this we consider to be providing reassurance. We have already a pretty advanced situation here in Canada. We have a set of documents called “severe accident management guidelines”. I say that we are, in Canada, ahead of many in the production of those documents, which would obviously provide some reassurance, were we to suffer events that go beyond our design basis.

As an industry, of course, we all believe that there will be lessons to be learnt from the Japanese event. A job we have here in Canada is to reassure people about the safety of our own plants.

I'll finish by saying one thing, which is important: when there were two events that happened in the past that affected our history—Three Mile Island in 1979, 32 years ago last week, and Chernobyl 25 years ago—both of those events originated in the plant and escalated within the plant. We are not that operator today, and we haven't been that operator for a long time. This Fukushima event actually was a natural catastrophe, which affected the plant. We should certainly be prepared to learn lessons from this, but we should not allow it to compromise our view of the 30-plus years of safe operation that we in Canada have seen from our own nuclear plants.

I'll happily answer any questions.

Thank you.

● (1555)

The Chair: Thank you very much, Mr. Hawthorne, for being flexible and for coming with that explanation. I know all members of the committee were looking for that, so thank you very much.

We'll start our questions and comments with Monsieur Coderre, for up to seven minutes.

[*Translation*]

Hon. Denis Coderre (Bourassa, Lib.): Thank you very much, Mr. Chair.

Clearly, today's meeting is rather special, particularly given what is happening in Japan. So it is understandable that our questions may be influenced by that to some degree. We will try to define where we stand on that issue. That is quite clear.

Canada must have a variety of energy sources, but the fact remains that the nuclear issue is a very sensitive one now, both in terms of transporting waste and in terms of the waste itself. A lot of people say that nuclear power plants do not emit a lot of CO_2, but if we look at what is happening in Japan, we can see that, when an explosion occurs and radiation is released, people are worried.

I would like us to dig a little deeper. I understand that you see things from the point of view of the industry. No one wants things to work badly, even if they want to make a profit. I understand that. So safety must be the priority. In any case, it is up to the regulators and to governments to ensure that checks and balances are in place in this area and to ensure that things go well.

Ms. Carpenter, you said that Canada's nuclear facilities are safe. We know that there are several plants in Ontario and that we have to face certain realities in New Brunswick and at Gentilly, in Quebec.

Do you think it will require a lot more money to ensure that we never have a Fukushima here? Or do you believe that what we currently have is sufficient and that we need not be concerned?

I am talking about construction and additional investments.

[*English*]

The Chair: Ms. Carpenter, go ahead.

Ms. Denise Carpenter: Thank you.

As we said earlier, it's a highly regulated industry. We have a safety record.... Duncan Hawthorne said 30 years, but it's actually close to 50 years of safe operation. We have never had people die due to radioactivity in Canada. So just based on that history, it's a safe industry.

As Mr. Hawthorne indicated, we have an engineering process and a regulatory process that respects that. And I turn it to Mr. Hawthorne to talk to specifics around the safety and some examples at his plants.

Mr. Duncan Hawthorne: Yes, there have been some questions in response to this event. Would we have to re-engineer much of our equipment and plant, and would that then add to the cost of it?

While it's not a final outcome in terms of all of the causal factors in Japan, our view would be that our plants are designed to meet what we would consider to be credible design-basis faults. Once we have carried out the review we've been asked to do with the regulator, it will be our job to confirm that the design basis is sound.

We are pretty confident that will be the case. I still expect there'll be a number of lessons learned, but I don't expect them necessarily to be capital-intensive lessons. I expect they will be lessons about how you manage a multiple event, because obviously this is a site with four units, all together. So if you have an event in one, then it actually can escalate to all four. And obviously in Ontario we do have units.

For my own plant, of course, many parallels have been drawn because we actually do have six operational units, much like the plant at Fukushima. When we return our other two units to service shortly, we will have the largest power plant in the world in one place, in Ontario.

So I think there will be lessons about how our emergency management system copes with all of this generation in one place, and whether our plans are adequate to address that. But I think it is already clear to me that there will not be major plant requirements.

For example, if you think about the Fukushima plant, to make it more tsunami-proof, if I can say that, it would simply have been a matter of repositioning some of the equipment at a higher level. It wouldn't have been about purchasing more equipment. So some of those things would obviously be taken into the design for a new build.

● (1600)

Hon. Denis Coderre: I'm not looking to compare, because they are two totally different things. But I think it is legitimate to ask some of those questions, because we never know specifically regarding earthquakes and all that. Of course you have your own grid of worst-case scenarios and what you have to plan and what to do. But because this is a public standing committee and there are a lot of people who are, I hope, listening to us and they have a lot of questions without any answers, I think reassuring people is also part of our job.

Do we have some technique to make sure or do we have kind of a map of what might happen for natural catastrophes? Do we have in some of the reactors and the placement of those reactors vis-à-vis...? We never know. Today we're talking about the Champlain Bridge and there are some experts who say it might fall down if something happens. We don't want the worst, but we want to expect and try to figure out what is the reality of the situation right now.

Mr. Duncan Hawthorne: Just to give you an idea of how that comes about, of course, there are two separate things that you consider. One is the design of the plant and the second is the location of the plant. In the licensing basis for the plant, you have to meet the licensing standard, which will include a lot of your design criteria and design basis stuff. Separate from that, you have to do an analysis of the suitability of the location. I said I wouldn't do this, but Pierre Tremblay is going to speak after me, and of course he will speak about the new build process at Darlington. An environmental assessment there will be assessing the suitability of this location for a nuclear plant, and all of the questions about how the site meets those criteria have to be met in order to pass the EA test.

Hon. Denis Coderre: You mentioned, Madame Carpenter, that we are not recycling the nuclear waste and that it might become energy there eventually. But there is an issue of managing nuclear waste. Now we have to transport them up to Sweden to recycle them.

Do you believe that now Canada needs to take a look at other recommendations—and it's not just for Bruce Power, it's for the overall—to have a better policy for nuclear waste and recycling?

Mr. Duncan Hawthorne: Maybe I'll deal with it, because sometimes things get mixed up in our minds. Firstly, in terms of spent nuclear fuel, there is a Canadian policy. It's called the adaptive phased management policy, and of course the Nuclear Waste Management Organization are actually tasked with developing a location here somewhere in Canada to store spent nuclear fuel, which would be high-level waste.

There is of course a proposal to build an intermediate-level waste storage facility, which again Pierre can speak about, because this is an OPG situation, but the intention is that this deep geological repository will also go through an environmental assessment. The steam generators are low-level waste. The last time I appeared before the commission I talked about that.

We have to be clear that there are really three things. There's high-level waste, where there's already a Canadian policy approved, adaptive phased management, to find a location and store; and in the meantime we store on site, either in spent fuels or in dry fuel containers. If you come to any of our sites, you would see those in operation. And then there's intermediate-level waste with a deep geological repository, and low-level waste is all about volume reduction. Our intention with the steam generators was to achieve that volume reduction.

● (1605)

The Chair: Merci, Monsieur Coderre.

Now to the Bloc Québécois, for up to seven minutes. Monsieur Pomerleau.

[*Translation*]

Mr. Roger Pomerleau (Drummond, BQ): Thank you, Mr. Chair.

Thank you, Mr. Hawthorne and Ms. Carpenter.

As my colleague was saying, given what has just happened in Japan, it is almost impossible to avoid the issue of security. We are discussing security in terms of management, operations and storage. Many questions are being raised. We speak for the people raising them. That is more or less what we would like to know.

Mr. Hawthorne, I would like some clarification from you. What does Bruce Power do in a nuclear power plant? Is the owner, the manager or the builder? What is Bruce Power's role? What is its status?

[*English*]

Mr. Duncan Hawthorne: Bruce Power actually leases these assets from Ontario Power Generation, so we're the lease operator. We have a lease for the entire operational life of the site. So the assets are still owned by the Province of Ontario.

[*Translation*]

Mr. Roger Pomerleau: You manage it.

Ms. Carpenter was saying earlier that there are almost no emissions into the environment and that they themselves largely take care of the storage and management of the tiny amount of spent fuel.

The generators we are talking about are enormous—given the other waste, I imagine. How is it currently stored on your site? Is it regulated by the government? Is it stored in a special way? Is it safe?

[*English*]

Mr. Duncan Hawthorne: Yes. With respect to spent nuclear fuel, the system is as follows: We refuel our CANDU plants continuously on load. We move our fuel. We store it on-site, underwater. We have a fuel base with a capacity sufficient to take about 25 years of normal operation.

I think many of you would be somewhat surprised to see the volume of waste that's been generated in such a long operating period. It's not as large as perhaps people might think. Over the last three or four years we have been moving fuel progressively from this underwater storage into dry fuel storage casks, which are effectively lowered into the water. So all this fuel is handled underwater. It's put inside a concrete cask. The water is then evacuated, and they are stored and sealed. They are all transported within the Bruce site into dry fuel storage concrete casks, which are capable of storing the fuel for up to 100 years.

This is an integral part of the adaptive phased management program. For example, fuel can come from the reactor. It can stay in the fuel bay for 25 to 30 years. It can then be moved into concrete casks, which again can be stored on the site for 100 years. The intention of the adaptive phased management is that after this, they will then be moved to a central location, which has yet to be determined.

All that is managed by federal regulation. Everything we do on the site is part of federally regulated activity. We are the licensee for the site, so whether we own the assets or not, as a licensee we are bound by the federal regulations for all those activities.

[*Translation*]

Mr. Roger Pomerleau: So your activities are regulated. You comply with government regulations.

Are the storage methods ones that you decide to use when you lease the facility? Do you make a commitment to store spent fuel in a particular way in advance when you become the lessee?

● (1610)

[*English*]

Mr. Duncan Hawthorne: No, this arrangement is consistent with what the industry does generally. The difference between North America and the rest of the world is that other parts of the world take their spent fuel and recycle it. We in North America choose not to recycle fuel, so we store it.

The reason we don't recycle goes back to the Cold War in the mid-1960s, when the U.S. decided they did not want to recycle spent fuel. From that point on, North America has been in a storage-only situation. Once we got into that situation, the fuel pools were not sized to keep fuel forever, so the dry fuel storage is the obvious next step, to take them from the fuel pool and store them in these concrete casks. That's an industry practice, and it's happening across North America.

[*Translation*]

Mr. Roger Pomerleau: Let's discuss operating costs. Ms. Carpenter was telling us that the storage of waste, the residue of the combustion process, is taken into account in the operating costs of the plant. Probably, at the end of the day, the customer pays. In your case, are the storage costs for all of these generators actually calculated into the operating costs?

[*English*]

Mr. Duncan Hawthorne: It's an important feature about our industry that everything in the cost of power includes the long-term storage of spent fuel but also a provision to meet the decommissioning costs for our site—for example, for every megawatt hour, we have to set aside 0.92 of a dollar to meet our spent fuel costs and our decommissioning liability.

As part of the total costs for our facility, we have to manage all of our operating costs and all of our other expenses, but we also have to set aside a provision for the decommissioning of a facility. The amount is actually assessed by our regulator. If the amount increases, then we have a regulatory obligation to meet that shortfall. We also have a requirement to fund spent fuel storage.

The Chair: Merci. We're out of time.

Mr. Cullen, for up to seven minutes.

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

And thank you to our witnesses.

This is taking place in the context of the tragedy that's going on in Japan. It's a confluence of timing that this committee is talking about energy security in Canada and how nuclear power fits into that question of security.

When we deal with energy security, two of the fundamental principles we deal with are safety of the energy supply and cost. I think those are fair definitions that we work with. We're also talking about public support for various options in power generation. Does the public want to see windmills? Do they want to see solar, gas-fired, nuclear, and what not?

We met with the nuclear regulator this morning.

When Japan built that reactor, the specifications were not up to a 9.0 magnitude earthquake. The specifications were below that. Is that your understanding?

Mr. Duncan Hawthorne: Yes, that's correct.

Mr. Nathan Cullen: The Gentilly-2 refurbishment will not be built to any standard above 7.5 or 8. Do we know what the standard is going to be for the Gentilly-2 construction?

Mr. Duncan Hawthorne: For the existing plant, you mean?

Mr. Nathan Cullen: For the refurbishment.

Mr. Duncan Hawthorne: We're not changing the regulatory requirement for earthquakes as part of the refurbishment of G-2.

Mr. Nathan Cullen: When did—

Mr. Duncan Hawthorne: It already has seismic qualification, as do all of our plants.

Mr. Nathan Cullen: To what level of an earthquake, do you know?

Mr. Duncan Hawthorne: I couldn't quote that; the regulator could tell you. I know what it is for our plants, but I couldn't tell you what it is for theirs.

Mr. Nathan Cullen: So what is it for your plant?

Mr. Duncan Hawthorne: It's six and a half.

Mr. Nathan Cullen: So what happens above six and a half?

Mr. Duncan Hawthorne: Well, there isn't a credible design basis fault that would give you a quake larger than that. That's the issue. As I said before, the issue is what a credible design basis fault is. What is the largest quake we've seen in the region? What are the driving things? This was my point earlier about the environmental assessment.

I can tell you right now that if we have a level 9 quake, everything is going to fall down. It's all about the probability of having such a thing. You have to bound everything in life with reasonable assumptions.

● (1615)

Mr. Nathan Cullen: I suppose that's what the Japanese said in terms of reasonable assumptions. When they were designing those reactors, they said it was outside of a reasonable assumption to assume a 9.0 quake.

I'm not suggesting a 9.0 earthquake is going to hit Ontario or Quebec or other places where there are nuclear reactors. I guess I wonder why you don't go up to a standard of a 9.0. Does it cost a lot more? Does it make the reactor unfeasible?

Mr. Duncan Hawthorne: The reality is that it might, but I can't answer that. Everything we do is based on risk assessment. This quake that hit Japan is a one in 10,000 years quake. That was how it was determined. We can say okay, you've had one. The reality is that the plant withstood the earthquake. It was actually the tsunami that was the problem.

Now, perhaps there's a conversation that if you have a record earthquake, doesn't that mean you're going to have a record tsunami —and you'll have no argument from me there. But the point is you're talking about a plant that's sited in the Pacific Ring of Fire, a highly seismically active event.

While we might question their design calculations, I don't think we should draw a parallel with Canada. We've got to be reasonable. The idea that we would design for a set of circumstances that no one believes is credible—

Mr. Nathan Cullen: Sure.

Here's a question to Ms. Carpenter. You talked about full-cost accounting for nuclear power. What is the current liability limit for accidents in Canada?

Ms. Denise Carpenter: Well, Mr. Cullen, you would know that it's $75 million. The industry has been advocating to increase that—

Mr. Nathan Cullen: To what?

Ms. Denise Carpenter: There are several numbers. There's $630 million—

Mr. Duncan Hawthorne: As far as we're concerned, this thing has died on the order paper at least four times. If it was up to me, it would be $650 million now—

Mr. Nathan Cullen: So $650 million is what you—

Mr. Duncan Hawthorne: —and it would have been some time ago.

Mr. Nathan Cullen: You feel that a liability limit of $650 million is a reasonable figure.

Mr. Duncan Hawthorne: The number that was advocated was $650 million. We supported it.

Mr. Nathan Cullen: Current estimates out of Japan for the accident there are going to run somewhere north of $180 billion.

Mr. Duncan Hawthorne: Yes, related to the earthquake and tsunami damage, not the nuclear facility.

Mr. Nathan Cullen: So you estimate the cost to the Japanese economy, in terms of the nuclear damage, is going to be less than $650 million?

Mr. Duncan Hawthorne: I'm not going to speculate on that. Actually the number in Japan is $309 billion. That is the damage to the economy. But none of that has been assigned to the nuclear plant.

Mr. Nathan Cullen: Japan has a $1.4 billion nuclear liability limit right now. Right?

Mr. Duncan Hawthorne: I couldn't tell you what it was. I thought it was $1.2 billion.

Mr. Nathan Cullen: The United States pools its liability to a figure of $10 billion.

Mr. Duncan Hawthorne: That's through NEIL insurance, self-insured, yes. Europe's is two billion euros.

Mr. Nathan Cullen: That's right. Australia's is unlimited.

Mr. Duncan Hawthorne: Yes, and ours would be $650 million.

Mr. Nathan Cullen: Not only did the government not call this bill back, but the government has been sitting on this bill for four months, and it's been nowhere in their order paper. And that is not for you to answer, obviously, because you're not that connected to the government. But the question I have is that a $650 million liability limit seems to me at least half of anybody else's in the world and appreciably less than our neighbours to the south. I understand the system. They have more reactors there; they can pool liability. But help me out here. Anything above a $650 million cost is borne by whom?

Mr. Duncan Hawthorne: It's borne by the Canadian people.

Mr. Nathan Cullen: So in terms of sheltering the costs above $650 million, does your industry consider that a subsidy?

Mr. Duncan Hawthorne: What my industry considers and what I personally consider is that if we wanted to have a conversation about whether $650 million is enough, it would be better to have it when $650 million was already the limit, and not $75 million. So I'd be happy to enter into the discussion. But since you've asked me, I'm incredibly frustrated that it isn't $650 million and hasn't been for the last two years. That's a political agenda.

Mr. Nathan Cullen: What is the political agenda?

Mr. Duncan Hawthorne: I've been in front of commissions here. I was in Senate committees two or three years ago, strongly advocating moving it to $650 million, and it's still not $650 million. If it had been $650 million two years ago, it would have been reasonable for us to come back here and ask if $650 million was enough, in light of what happened in Japan.

Mr. Nathan Cullen: That's an interesting point. How often does the nuclear liability regime get reviewed in Canada? Once about every 40 years.

● (1620)

Mr. Duncan Hawthorne: Again, I can't comment on that. I can tell you the Nuclear Safety and Control Act, subclause 46(3), was amended when I first came here, which was ten years ago, and we lobbied very much to have it changed, because we were the first private sector operator, and we had problems with our own insurance. So we were very keen to see the number be more credible because it was very difficult to explain.

Mr. Nathan Cullen: So we're in agreement—

The Chair: Thank you, Mr. Cullen. Your time is up.

We'll go now to Mr. Allen for up to seven minutes.

Mr. Mike Allen (Tobique—Mactaquac, CPC): Thank you, Mr. Chair.

Mr. Hawthorne and Ms. Carpenter, thank you very much for being here today.

Mr. Hawthorne, I appreciate the fact of your choosing not to speculate on what may or may not have happened. With the holdup, if we hadn't had a holdup before the last election, we would have had $650 million. Then we could have had that intelligent conversation about where it goes beyond that. So I tend to agree with you on that. Having been through the bill four times myself, and I think Mr. Tonks has been through it four times, we agree with your frustration.

I just want to follow up on a couple of points that were made. In the Japan scenario, as you laid that out, it was designed not for the size of earthquake they had, but if my understanding is correct, everything was operating properly after the earthquake. So therefore by definition the rods went in and everything was shutting down. I'm not asking you to speculate, but based on your history with nuclear plants, is it your opinion that if it had not been for the tsunami, things would probably have continued their shutdown process?

Mr. Duncan Hawthorne: Yes. As I said to you, one of the things that nuclear plants are very capable of doing is shutting down very quickly. We're talking here about seconds to actually take the reactor out of service. With the post-trip cooling, all of this backup cooling equipment is functioning very shortly thereafter, and in this plant it was doing so. So if you asked me to give you a full appraisal of that, I would tell you that one of the concerns I would have, even if everything had functioned well and a tsunami hadn't done anything, is the fact that the equipment would have had to function for at least 11 days, because it took them 11 days to get an electrical supply to the plant. So if I'm speaking to you entirely objectively, I'd say even if there was no tsunami, you were relying on this backup cooling system for much longer than I would have thought would be an issue.

Having said that, however, the fact that it took 11 days was probably because the tsunami distracted them from other things. But I think it's probably fair to say, if I give you an example as an answer to that, we ourselves suffered a blackout in the whole northeast region in 2003—the 14th of August, if you remember—and that was as close to this event as we could get. All of our plants were left without any external power, and all of our backup systems had to support themselves. So we should take a lot of comfort from that, because all of our plants performed very well and did what they were designed to do.

Now, to my point, we didn't have to do it for 11 days, but we certainly did it for 72 hours without any real challenge. So as I say, we should take some real comfort from that.

Mr. Mike Allen: I'm glad you brought up the blackout, because that's where I wanted to go next. You've answered that question.

One of the comments you made in March in the *London Free Press* was—and Mr. Coderre brought it up—that it's hard to compare. The two technologies aren't the same.

But as Canadians, when we look at our nuclear industry.... Denise brought it up well when she said we have 15% of Canadian energy coming from our nuclear plants, 50% in Ontario, and a significant 12%, I think you said, increase in GHGs in Canada if we didn't have the nuclear fleet. So I think it's important for Canadians to understand the difference, to make sure, because we can have an intelligent debate that nuclear power can have a role to play in the future.

You talked about "The way I explain it is our plants are a little bit of fuel surrounded by an awful lot of water, whereas these plants are an awful lot of fuel surrounded by a little water". Can you comment about that difference?

Mr. Duncan Hawthorne: Yes. There are very obvious differences in the plant designs. As I mentioned before, these reactors use enriched fuel, which we don't. We use natural uranium fuel. They have a scenario where the water actually boils within the vessel itself, so there it doesn't take a very long period of interruption of cooling before you actually start boiling off the water that's present.

In our case, our reactors, our fuel channels are surrounded themselves by a shield tank that is full of water. So there's a lot more water around, and from an operational point of view we have to work hard to keep our plants at power because we have to keep adding fuel all the time, because our fuel doesn't contain anything like the level of energy. If you take a boiling water reactor, for example, they will typically run for about a year, sometimes 18 months, without needing any fuel to be added, whereas in our case, we fuel continuously. So there's a tremendous power difference between the two, and obviously in a fault scenario like this, that power difference makes a very significant change to how the plant responds.

● (1625)

Mr. Mike Allen: Just asking you about that and the difference in the plants, I'm familiar with the Point Lepreau situation in New Brunswick and where it is built, which is quite a bit up off the bay, and I'm understanding it would take a tsunami of somewhere between 12 and 15 metres to even get up to it, and then my understanding is the backup power in that area is even much higher than that, in terms of the generators. There are mixed redundant systems.

When you look at if a quake were to happen in Canada, what would be the situation in terms of a tsunami off the lakes, for example? Would we be faced with a similar kind of thing? I know Point Lepreau is quite a bit up off the water, but in the other cases in Ontario, what is the situation there?

Mr. Duncan Hawthorne: As I mentioned earlier, that's one of the things that we will have to demonstrate in these next few months. I can speak for my own plant and obviously Pierre can answer his position, but we do want to do this review and reassure people.

If you take our own situation at the Bruce site, we would need to see something more than 15 feet for it to have any impact on our system, and there is no credible situation on Lake Huron for that level of situation to occur. Nonetheless, I think it is important that we do this analysis and we consider all of those things so that we can provide a more comprehensive reply. As I say, that would be a simple answer in terms of the Bruce situation, and I'm sure Pierre could give you an initial view on the OPG facilities.

But I think we do have to do enough of a comprehensive review to be able to answer all of those questions.

Mr. Mike Allen: How much time do we have?

The Chair: None. I'm really glad you asked. If you hadn't asked, Mr. Allen, I would have let you go forever, pretty much.

We are out of time for the first panel. I want to thank you both very much for your information. It's extremely helpful.

From the Canadian Nuclear Association, Denise Carpenter, president and chief executive officer, thank you.

And Duncan Hawthorne, president and chief executive officer from Bruce Power, thank you.

We will suspend for a couple of minutes as we change panels.

● (Pause)

● (1630)

The Chair: We will reconvene this committee meeting with the second panel. We have two witnesses.

Appearing via video conference from Des Moines, Iowa, as an individual is Dr. Mark Cooper, senior research fellow for economic analysis from the Institute for Energy and the Environment, Vermont Law School. Welcome. Thank you very much for appearing before our committee today.

From Ontario Power Generation Incorporated we have Pierre Tremblay, senior vice-president, nuclear programs and training. We will take the presentations in the order the witnesses appear on the agenda.

We'll start with Dr. Mark Cooper for up to seven minutes. Go ahead, please, sir.

Dr. Mark Cooper (Senior Research Fellow for Economic Analysis, Institute for Energy and the Environment, Vermont Law School, As an Individual): Thank you, Mr. Chairman and members of the committee.

I appreciate the opportunity to testify today, and I will share some research I've been working on about the cost of building nuclear reactors. Plus, I've done some analysis looking at the impact of safety, an issue the last panel suggested needs to be considered at this moment.

The high cost and large capital expenditures associated with the construction of nuclear reactors make the technology more expensive and risky than available alternatives. Because reactor projects are extremely complex and involve environmental safety concerns of very toxic and volatile fuel, they are prone to cost overruns. The cost is driven by the difficulty of dealing with the fuel.

Their huge size and long lead times make them vulnerable to changes in marketplace dynamics, or public policy for that matter, which may eliminate or alter their economics. Because of these characteristics, certain utilities in the U.S. cannot raise funds in capital markets to build them.

Reacting to this marketplace reality, nuclear utilities in the U.S. have sought to sidestep the judgment of financial markets to secure massive subsidies that shift the risk of nuclear construction away from utility stockholders onto taxpayers, in the form of loan guarantees, and onto ratepayers, in the form of advanced cost recovery. Equipment vendors are probably kicking in some subsidy too in an effort to get a bandwagon going.

In the U.S. the industry had some success getting loan guarantees and advanced cost recovery, but the reality of the economics of nuclear reactors has set in. Almost every one of the projects that was talked about or asked for licences has been delayed, suspended, abandoned, or cancelled altogether.

What we've had here in the U.S. is a classic bubble with a promotional frenzy in the early part of the 2000s followed by a speculative surge and then the failure of the industry to live up to its promises about costs, something it has always had difficulty doing. Finally, the bubble burst with low-cost natural gas, declining demand growth, stable alternatives, and subsequent cancellations.

The long lead times of these reactors and high costs make them a uniquely bad investment to make in a period of great uncertainty. The simple fact of the matter is that what you want in uncertain times are investments that are flexible, let you make changes, don't sink costs, the antithesis of building large central station facilities. I have laid this out in exhibits attached to my testimony.

As bad as nuclear economics were in the recent past, I believe the incident at Fukushima will make them more difficult.

As you heard in the last panel, after an incident all the people with responsibility for various aspects of nuclear reactors have to step back and re-examine. Policy-makers would be irresponsible not to look at how safety standards are set and how the process is used to re-evaluate the cost-benefit of various alternatives. To consider gathering more information and slowing down is a good policy.

Safety regulators would be irresponsible not to re-examine safety, perhaps looking for more safety measures, which may lead to long lead times or the retrofit of existing plants. Of course financial analysts will have to look at the risk of these projects, whether they are more difficult to complete and whether they're less attractive than alternative options, whether they are less popular with policy-makers who will give them less support. As a result, the cost of capital will increase.

Cost escalation flows from the conduct of these complex plants. I looked at the U.S. before Three Mile Island, I looked at the U.S. after Three Mile Island, I compared that to the French before and after, and what we know is that nuclear construction had a cost escalation problem before Three Mile Island, it had a cost-escalation after, and the problem got a little worse after, because safety was an increased concern.

Some utilities will argue it is unnecessary, especially when subsequent events or incidents don't occur. But one can also argue that the lack of events is a function of taking proper account of safety.

● (1635)

I looked in my testimony at the occurrence of such events, not to predict when a future event will occur but to make it clear that these are possibilities. They do happen; they need to factor into our thinking; and inevitably they will have an impact on costs.

In the U.S., there was never any reason for the government to put taxpayers or ratepayers at risk when this nuclear bubble started to inflate. Instead, they should have listened to the judgment of the capital markets and let the technology be. If in the future it comes around, I'm a consumer advocate: I would be glad to support it if its costs would support it, leading me to conclude that it was the least-cost option to pursue. But the simple fact of the matter is that the economics of new nuclear reactors, certainly in the U.S., were bad before Fukushima and will be worse after.

Thank you for the opportunity.

The Chair: Thank you very much, Doctor, for your presentation.

We go now to our second witness, Pierre Tremblay, from Ontario Power Generation Inc. Go ahead, please, with your presentation for up to seven minutes.

Mr. Pierre Tremblay (Senior Vice-President, Nuclear Programs and Training, Ontario Power Generation Inc.): Good afternoon.

Thank you, Chair, and honourable members of the House of Commons Standing Committee on Natural Resources. I appreciate the opportunity to appear before you today as part of the committee's work in studying Canada's energy security and the contribution that nuclear makes to safe, reliable, and low-emission baseload electricity generation.

First, let me begin by stating the obvious: that our thoughts and prayers are with the people of Japan during this extraordinary period in their history.

A bit about OPG: it is Ontario's largest electricity generator and owned by the people of Ontario. From our 65 hydroelectric stations, three nuclear plants, and six fossil stations, we have in-service electricity generation of around 19,000 megawatt electrical. OPG nuclear generation represents approximately 30% of our generation portfolio.

Safety is central to everything we do. OPG has had many years of operation with no significant nuclear safety events. In fact, in over 40 years of nuclear operations, there have been no injuries to any member of the public as a result of those operations.

Along with our own nuclear plants, we lease to Bruce, as was mentioned earlier, two plants, which they operate. Finally, OPG operates the nuclear waste management facility that services OPG and Bruce Power.

OPG produces 60% of Ontario's electricity. With the Ontario government's directive to stop burning coal as a fuel by the end of 2014, OPG will predominantly be generating low-emitting electricity from its hydro and nuclear plants. In fact, in 2010, 90% of our electricity was virtually free of greenhouse gas generation.

Nuclear power enables renewable power generation from wind and solar, which are so dependent on variable weather conditions. Again, based on provincial direction to end the use of coal in our fossil plants, OPG is actively investigating the possibility of biomass and natural gas in combination to be a potential replacement fuel for our fossil fleet.

We have approximately 11,000 employees, and our company generates $6 billion in gross revenues, which supports many communities directly and indirectly across Ontario. Moreover, for the people of Ontario, the real owners of the assets, the commercial success of OPG contributes to the well-being of all Ontarians through the investments we make into those assets and taxes and other payments we make to the province. Our net income stays in the province.

OPG's three nuclear multi-unit CANDU plants are located at Pickering and Darlington, Ontario. We have been operating nuclear power plants since 1971. In 2007, OPG was awarded the prestigious Institute of Nuclear Power Operations performance improvement award for our facilities.

Our reactors are licensed to operate by the Canadian Nuclear Safety Commission. We recognize that our licence to operate relies not only on our strong safety record but also on the earned trust from the communities in which we operate. We work very closely with our host communities at Pickering and Darlington, where we enjoy strong local support. This has translated to strong host community support for OPG's plan regarding a new nuclear build and for refurbishment to the Darlington facility. Our community partnerships include regular updates on nuclear operations as well as on safety and health issues.

In 2008, OPG was selected to operate two new nuclear units at the Darlington site. This has the potential to generate 3,500 jobs during construction as well as 1,400 jobs during the operation of those two plants. On September 21, 2006, we began the federal approval process when we submitted an application for approval to prepare the site for the new nuclear project to the commission.

The Darlington new nuclear project joint review panel hearing process on the environmental assessment began on March 21 and is scheduled to end on April 28 of this year. These EA hearings will be followed by hearings to license a chosen technology and hearings to construct and operate the plant.

OPG's nuclear operations are a key component of Ontario's long-term electricity plan. Nuclear provides the low-emitting baseload electricity that enables emerging renewable generators such as wind and solar to have the opportunity to develop their technologies and participate in the province's electricity plan.

Part of the equation of energy security for OPG is our nuclear safety. We take great pride in the safety of our workers and communities across the board. Generation using nuclear power plays a fundamental role in the low-emitting electricity for the province. Industry and residents depend on this safe, reliable, and cost-effective electricity generation.

Our CANDU reactors take advantage of natural resources and technologies that are readily available in Canada, which further enhances security of the electricity supply, independent of external influences. Nuclear will continue to provide a safe and secure supply of energy for Ontario well into the future.

Now, Duncan Hawthorne spoke at some length about the occurrences in Japan, and I will not revisit that. I'm certainly open to answering any questions you may have.

● (1640)

For my part, I would simply say that we recognize the unfolding events in Japan. CNSC has requested that nuclear operators undertake a further review of the actions that we have, and OPG —in conjunction, in fact, with Bruce Power and the rest of the Canadian industry and operators—is fully cooperating with the CNSC in this review.

Canadian nuclear power plants are among the most robust designs in the world and have multiple redundant safety systems designed to prevent damage in the event of an earthquake and other disasters. These systems ensure that reactors are placed in a safe condition in the event of an earthquake or a loss-of-power incident. Seismic qualified systems function to ensure that the reactors are shut down, the fuel is suitably cooled, and any radiation release is contained.

Ontario is not a region where serious earthquakes are common. Despite this, the reactors have been built to resist earthquakes stronger than those that seismic studies say are likely to occur in Ontario. They are designed for a one-in-1,000-year earthquake and are robust for a one-in-10,000 earthquake. Ontario nuclear facility equipment and structures are built to CSA nuclear seismic standards. In addition, the topography of Ontario makes a tsunami a highly unlikely event. I would add, however, that consideration of other events, such as severe weather, is part of the design considerations for the power plants.

Ontario's CANDU reactors have considerable redundancy in backup power supplies. Across the fleet there is a mix of standby generators, emergency power generators, auxiliary power generators, and so forth. Over the years, OPG has invested in upgrades in the systems as well as in fire protection and fire suppression systems, as part of our commitment to ongoing safety improvements.

This concludes my presentation. I'd like to thank you for the opportunity to appear before the committee. I'd reiterate that OPG is a key player in the Canadian electrical generation industry and nuclear generation business. OPG and the Province of Ontario are committed to safe, reliable, and secure nuclear generation now and in the future.

I guess I would also like to extend our invitation to the committee to visit our facilities, where we can show you first-hand the safety systems and the backup supplies, where you could talk to some of our front-line employees. These are people who come to work at the plant everyday, who live and raise families in our community.

I'd be pleased to answer any questions.

● (1645)

The Chair: Thank you, Mr. Tremblay, for your presentation.

We'll go now to questions and comments. We start with Mr. Tonks, for up to seven minutes.

Go ahead, please.

Mr. Alan Tonks (York South—Weston, Lib.): Thank you, Mr. Chair.

My first question is to Mr. Tremblay. With respect to the timetable that has been established by CNSC on risk assessment, what is the target date for a report on matters related to safety?

● (1650)

Mr. Pierre Tremblay: Mr. Hawthorne talked a little about what has been asked for, which is essentially a field walkdown, and a confirmation that the defences that are designed and built and available are in place and robust. Independent reviews are going on by the site officers themselves, who are walking the facilities as well.

We're expecting the response by April 1, and essentially there are a series of timetables for various reviews and so forth.

The industry isn't simply waiting. We don't need the regulator—and I'm sure they would agree with this—to tell us we need to pay attention and look at things, so we've been moving forward.

Mr. Alan Tonks: Mr. Hawthorne mentioned a substantial dislocation of power in 1973 with the blackout. And the implications in Japan with respect to that example were the lack of ability to pump coolant into the reactors and cool the rods.

Would a factor in the safety review be to look at a power dislocation that would create the same situation, not as a result of earthquake or whatever, but just as a matter of system overload? Would you say that a 72-hour risk factor was adequate, or would you be looking to substantially increase that, say to 11 or 12 days or perhaps 20 days?

Mr. Pierre Tremblay: As I recall, the specific event was on August 1, 2003, I believe. That was the blackout in the northeastern U.S.

Mr. Alan Tonks: That's right. I was around in 1973, but that wasn't the blackout, was it?

Mr. Pierre Tremblay: As we are a learning organization, that event led all of us to examine and assess our defences at that time. One of the modifications in design that occurred at Pickering, where there were some issues around re-establishing class IV power to the grid to the Pickering plant, was the construction of an auxiliary power system. All the facilities now have secondary and tertiary electrical backups that can power the large pumps that essentially circulate cooling fluid. So very much so, that's part of the discussion we're having with the regulator and part of the review.

Mr. Alan Tonks: You've heard Mr. Cooper's analysis with respect to the cost-effectiveness of nuclear. I notice that based on provincial government direction, OPG has been investigating biomass, natural gas, and other potential parts of the energy production inventory. In that strategic plan, to what extent do you factor in the kind of cost-effectiveness and return along the lines that Professor Cooper has mentioned?

Mr. Pierre Tremblay: I would agree that the economics certainly is a large factor in terms of the long-term viability of any project.

Certainly biomass is in itself fundamentally a risky project. We need a source, we need storage considerations, and there are many elements to beginning a biomass project on a commercial basis.

Based on the guidance we get from our shareholders, our objective is to develop all those means and mechanisms to produce electricity. I would say that our interest is maintaining a diversity of electrical supply for the security of that supply to the province of Ontario. So we are regulated. I would also add not the fossil fleet, but certainly the nuclear and the hydroelectric, so we have to account for our costs. And that certainly does make us focus on that.

Mr. Alan Tonks: Do I have time for one question, Mr. Chair?

The Chair: You have time for more than that, Mr. Tonks.

Mr. Alan Tonks: All right.

Professor Cooper, with respect to what has been described as a nuclear renaissance, have you evaluated the cost-effectiveness of other technologies? Granted that in this review of nuclear, with the events in Japan there has been a public awakening that may not be described as a renaissance. Do you make recommendations with respect to what technologies would be more cost-effective, would be safer, and would be a better national strategy than embarking further down the nuclear path?

Dr. Mark Cooper: In the document I gave you and the documents at the Vermont Law School website, there are really two key elements that turned the nuclear renaissance into a bubble. There never was a renaissance; we don't even have one picture on the wall. They really never did produce a renaissance.

Two critical factors undid the industry. One, they talked about a very low set of construction costs at the beginning. They could not deliver them by any stretch of the imagination. So it very quickly became clear that the actual projected cost of delivering them, before they started pouring concrete, which is when overruns occur, was at least three times as much as they originally talked about in the early 2000s. So the bubble came undone very quickly.

When people began to look at alternatives, while the projected cost of nuclear was increasing, the costs of the alternatives were not. Of course in the U.S. the cost of natural gas has plummeted and it looks to be very plentiful and very cheap, and the CEO of Exelon, the largest U.S. nuclear utility, has basically said nuclear can't compete. He's given big speeches and he's shown his numbers.

So it was the combination of those rising projected costs and stable alternatives. Then if you throw in the recession, which dramatically reduced demand and growth in the U.S., you really do have a perfect storm that burst the bubble long before the renaissance got going.

Frankly, you've heard the list of alternatives, although one that was not mentioned is efficiency. In my analysis that I presented to the committee I include a Wall Street analyst, because they always include efficiency; they're the only ones who do. So you've got four or five good alternatives: efficiency, wind, solar, biomass, and natural gas. Individual states and individual provinces should look at those, but they really, in my opinion, need to apply a very rigorous economic analysis.

The Chair: Thank you, Mr. Tonks.

We'll go now to the Bloc Québécois. Madame Brunelle, you have up to seven minutes. Go ahead.

[*Translation*]

Ms. Paule Brunelle (Trois-Rivières, BQ): Thank you, Mr. Chair.

Good afternoon, Professor Cooper. It is a pleasure to speak to you.

Much has been made—as you mention—of a nuclear renaissance. It seems to me that, since we have been talking about it, things have never gone so poorly. In Canada, we are in the process of reassessing it all. In fact, from your comments, we realize that the costs of constructing and refurbishing nuclear plants are enormous, not to mention the timelines. We have what went on at Point Lepreau as an example.

I live in Quebec. The refurbishing of the Gentilly nuclear plant has raised many questions. If you are familiar with that plant, perhaps you could tell me more about it. It has always seemed to me that nuclear energy was not really clean energy. In order to sell us on the idea of nuclear energy, we were told that it was clean energy because there were few CO_2 emissions, but they forgot to talk to us about the disposal of nuclear waste.

I have two questions. If you are familiar with Gentilly, what do you think of the refurbishment of that plant? Because of the nuclear bubble that you are telling us about, have we not fallen behind in developing truly clean energy?

● (1655)

[*English*]

Dr. Mark Cooper: Well, I'm not familiar with the refurbishment of that specific plant, although I have participated in proceedings in the U.S. in which refurbishment is an issue, and it suffers a little bit from the same problems. When you first do it, it looks inexpensive, but then when you actually get into it, it gets more and more expensive. So it really requires very careful consideration.

It's my understanding that there was a project talked about in Canada that also got very expensive. It gets into the many billions of dollars. So we need independent analysis of the costs.

Long lifetimes are going to be a serious concern with the older plants. I've looked at Vermont Yankee, which is not far away, and it has raised many concerns.

With respect to the bubble, one of the things I found in my research is that when utilities become committed to nuclear, it tends to consume their attention and resources and crowds out the alternatives, and that is a real problem.

With respect to "clean", I think we got to be lazy with that adjective, in the sense that it's a low-carbon resource, but it is not a clean resource. The fuel is very volatile and very toxic. We've had a reminder of that. We had gotten a little bit...lazy is the best word in thinking about it.

And frankly, the volatility and toxicity of the fuel is what drives the costs. All this engineering around that reaction is a function of the fact that it is very difficult to control—and we try very hard—and if the controls fail, the consequences are very great.

Of course, the waste product has the same characteristics. It's very volatile and toxic.

So we have forgotten that all of this engineering, which we're proud of, is driven by the inherent nature of the fuel. It's important to remember that, when we think about things such as wind, which does not have those problems.

[*Translation*]

Ms. Paule Brunelle: Thank you.

Good afternoon, Mr. Tremblay. You may have to defend a toxic and volatile fuel. What do you think of what Professor Cooper has just told us?

[*English*]

Mr. Pierre Tremblay: I'd have two specific things to say. Certainly there are hazards. No one would say that any technology is free of hazard, and we take great care with the fuel, which even after the reactor is shut down continues to generate heat and has fission products that we need to protect ourselves from.

There are a couple of points I would make. One is that the history, the performance of the nuclear industry, particularly over the last ten years but perhaps fifteen, has been remarkably improved in terms of safety, in terms of performance. In fact, in the U.S. the utilities have increased the effective generation and contribution of nuclear power by the equivalent of about 20 new facilities without any capital investment, simply through improvements and minor investments in the plant.

The refurbishments, the new builds—these projects clearly are long-term in nature; they take ten years from conception to construction. Certainly I would be in total agreement that there are risks associated with them that need to be managed.

The key for us, speaking about Ontario Power Generation, is preparation and planning. When we do a good job in planning and we take the right time to define the scope of the work, the projects are successful.

We have many examples. We manage an outage portfolio, which is about $1.5 billion over a five-year time period, and we bring these projects in on time and on budget. There are clearly some exceptions to that; there are challenges. These facilities, though, generate power for a long time. The new builds have the potential to generate power for in excess of 60 years. That's a lot of reliable full-power operation to essentially anchor the grid to allow for other forms of electricity.

I would never say that there are no risks associated with nuclear power. The question is what the benefit is, whether we can manage it, and essentially whether we are prepared to harness the benefit from it. It's as simple as that.

● (1700)

[*Translation*]

Ms. Paule Brunelle: Mr. Tremblay, the Ontario Government is planning or was planning to buy two new reactors for the Darlington plant. What is the status of that? Do you still intend to proceed with those purchases?

[*English*]

Mr. Pierre Tremblay: The environmental assessment has been submitted to the commission. The environmental assessment looks at a large array of potential impacts—economic, technical, environmental—and essentially the public consultation period began on March 21, and we are proceeding with that.

The commission is overseeing this, and basically it is our intention to continue going forward. It is a long process, a process that subsequent to the conclusion on the environmental assessment, and the environmental impact statement that we've made, will result in a decision to be made as to whether to proceed to the next step. That would lead to a technology selection and a licence application for construction. Then there would be more dialogue and discussion about the design, and an opportunity to talk about any new lessons or new issues that need to occur.

So yes, it is our intention to keep moving forward.

The Chair: Merci, Madame Brunelle.

We go now to Mr. Cullen for up to seven minutes. Go ahead, please.

Mr. Nathan Cullen: Thank you, Chair.

Thank you, gentlemen.

To you, Dr. Cooper, one of the things that we struggle with at committee is being able to find studies around energy production and costs that truly compare apples to apples. I'm wondering if you could recommend to us, either now or through a submission later on, where you have found the best either North American or global studies in an attempt to understand what it costs to produce power from the various sources, in a full-cost accounting, an all-in basis, as opposed to where subsidies get extracted out. And I put that across all energy sources.

Do you point to one group or one information source that seems to do a consistent and reliable job of comparing energy prices?

Dr. Mark Cooper: I included the Lazard study—and frankly, Lazard is lower than other people on nuclear, although it's still more expensive—for a number of reasons. One, they include efficiency, and almost nobody else does. Efficiency is an extremely—especially in the U.S.—important resource. It's baseload in the most baseload of all senses, because if consumers are not turning their things on or they're getting the same comfort with less energy, that's baked into their appliances and their buildings.

Secondly, he considers different scenarios. He considers cost of capital, he considers carbon, he considers fuel price scenarios. That kind of analysis is very rare. It's extremely rare to have someone do all of the choices and consider many of them. So that's one.

I will give you an example. The MIT study, which was very important in the early part of the renaissance year, did not include any renewables. So I personally will not use a study that doesn't include all of the choices.

The other place to look that's very interesting is the California Energy Commission. They have big resources. They have a cost-of-generation model. They run it every year. They include about 20 options. They also have a module that lets you do your own if you want, run your own. They include all of the apparent costs for a California citizen, so they include tax breaks and things like that. They might be different in Canada, but there are ways to build models to take that into account.

Mr. Nathan Cullen: Thank you for that.

Here's a question I have for Mr. Tremblay. The Ontario government put out a bid in 2007, or an expectation of a bid, for the two new builds. They were expecting somewhere around $7 billion. It worked out to just a little shy of $3,000 per kilowatt. Am I getting the numbers even in the ballpark of the original estimation?

Mr. Pierre Tremblay: I don't have those numbers, but certainly there were some questions about where the risk was going to be managed in the project.

Mr. Nathan Cullen: Right, because the province said something different when it was requesting those new builds, and I don't know what OPG's role is when the province does these requests, but I'm sure you're at least sharing information, you're involved in the bidding process.

● (1705)

Mr. Pierre Tremblay: What we generally do is provide technical guidance around the best design, if you will, or the adequacy of the design.

Mr. Nathan Cullen: We're getting to this. I know they're going through the environmental assessment.

In 2007 they put out a number.... The expectation from the minister and from the government at the time was somewhere around a little shy of $3,000 per kilowatt. It said in its documents that anything above $3,600 will be considered uneconomical. AECL put in a bid for $26 billion, Areva came in at $23 billion. Perhaps these numbers were wrong, but I'm getting this off the Ontario government's website, so perhaps they're.... Then in 2009 they dropped plans, but the plans have been reinvigorated for the two new builds at Darlington.

Are we speaking of the same thing?

Mr. Pierre Tremblay: We are certainly speaking about the same thing. We're talking about essentially what our analysis shows is in the long run competitive, based on the expected performance of the plant.

I don't have the numbers; I'm not directly involved with the new build proposal. I think it's important to note that we're not solely a nuclear utility.

Mr. Nathan Cullen: No, I understand.

Dr. Cooper, let me come back to you. Something that's confusing in this renaissance motif that the industry has put together is that there is some talk about 140 new builds globally. That was being referred to before us here even some months ago.

What I don't understand is that if the build estimates around the early 2000s that we're citing in the MIT report and others—and I know you don't like the MIT, but I'm trying to give us some sort of estimate.... We're talking about energy security here, and price security is important. What the industry site says, and I was looking at it earlier, and what the global industry site said is that because of the growth in the world economy, prices got more expensive for commodities and construction supplies and everything else. This is what caused the acceleration of costs.

In your research, you're saying that the alternatives during that same period of time came down, even though some of them also use heavy capital costs to get themselves up and started.

I don't understand why this confluence happened.

Dr. Mark Cooper: I frankly don't believe the original numbers. We have a cycle of promotion from vendors and what I call enthusiasts, and they underestimated the costs. The $3,000 number that you give me for 2007 is the kind of number they were using here in the U.S. as well. These days, utilities, who I think are still underestimating the costs, are up to more than $5,000 a kilowatt. Some people, analysts.... Lazard, I think, uses $6,000 to $8,000, and as I say, he's a little bit on the low side. Those numbers just grew a great deal.

If you look at the CERA index of costs, you discover that nuclear costs, both in Europe and the U.S., escalated much more rapidly than others. What looked like a certain relationship in 2007.... By 2011, nuclear has gotten much more expensive.

Mr. Nathan Cullen: Let me stop you just for a second.

One thing I don't understand. You say that nuclear suppressed the cost, in a sales pitch or something, to promote the industry. That's fine; industries do that. But one of those promoters—one of those enthusiasts you talk about—would certainly be somebody like John Rowe, who heads up Exelon, the largest nuclear provider of energy in the Unites States. He is coming out and saying that safety isn't their major concern right now, although what has happened in Japan will give them some thought. The main concern they have is costs, in terms of those new builds that are projected in the U.S.

Dr. Mark Cooper: He does not see it as economic any more, and I'm glad he has come around to my point of view, frankly. There were analysts who were saying that all along. We'll see what OPG's costs are, won't we?

It is important to recognize what your endowment of alternatives is. There are places in the U.S. where you have lots of wind, lots of solar, tremendous opportunities for efficiency. You need to look at your specific resources.

One of the things we have asked for in the U.S. is to try to get a price guarantee. If people are going to say that it will cost *x*, then let's have a risk-sharing scheme if you go above that. But the utilities will not give you that kind of guarantee. They will not take the risk of cost overruns, because the history is that you cannot deliver this technology at the projected cost.

● (1710)

The Chair: Thank you, Mr. Cullen.

We'll go now to Mr. Anderson, for up to seven minutes.

Mr. David Anderson (Cypress Hills—Grasslands, CPC): Thank you, Mr. Chair.

I hope I'm reading these graphs properly. I had some folks who know a lot about this say they couldn't really make sense of them.

Mr. Tremblay, if I were to tell you there were over 10,000 major nuclear incidents in the last 50 years, would you agree with that?

Mr. Pierre Tremblay: I don't know what you're speaking of. That sounds.... I don't know what you're talking about.

Mr. David Anderson: Would you define “major incident”? You have used that term a number of times here. You talk about level four and five, and you talk about an accident every 2,500 hours. I assume that means that of 400 plants operating, every 2,500 hours there's a major incident.

Can you define what those are? What does that term cover?

Dr. Mark Cooper: There are ten level-four incidents in the history of the industry. There are five level-five incidents now; Fukushima is now seen as a level five.

What I've calculated is the number of operating hours in each year. I can go back, and we know the number of reactors that were operating. If you look at the period between Chernobyl and Fukushima, you have almost 5,000 operating hours. The point of that graph is not to predict that incidents will happen, but to show that they do happen. When we get a review, as we have heard today from the utility, it is a reaction to a reality.

There have been ten incidents over 60 years. But the industry was building up the number of reactors. One of the interesting things about the period between Chernobyl and Fukushima is that we did not have a lot of new plants coming online. There were very few plants coming online. So the number of incidents is small, but as the number of reactors increases, you need to pay attention to the rate of accidents per operating year.

Mr. David Anderson: Excuse me. I have a limited amount of time here. I need a bit more explanation.

I want Mr. Tremblay to react to this, but you're talking about 2,500 to 5,000 hours. There are 400 plants operating. If you take 400 plants times 24 hours, you have more than that in a day.

Dr. Mark Cooper: No. Those are operating years.

Mr. David Anderson: Yes. I know what you're saying, but Mr. Tremblay—

Mr. Pierre Tremblay: Let me comment on that. I believe this is in reference to the INES scale, which is essentially drawn up by the IEA to assess and evaluate events in terms of their significance.

If you look at the Canadian industry and its performance, it's exemplary in this manner. As has been pointed out, there have been a number of significant events, but there's a very large culture of reporting in our industry, and there's been very little in the way of significant impact on publics.

Clearly, there have been events; no one would ever say that there aren't events. I would tell you one thing about the nuclear industry; it's that we learn from each other. We recognize that we're hostages of each other, and we learn from each other. What is happening around the lessons learned from Japan is no different from other cases.

By the way, that event in 2003 created a lot of learning for us in the industry. Chernobyl essentially built some of the operator industry groups that you see today.

No one says that incidents don't occur. They're rare. When they impact upon on the public, they're even rarer. The safety performance industry has been solid. Certainly the Canadian industry has been a solid performer.

Mr. David Anderson: Your point is that when an incident happens, you're learning from it and are changing the way you're doing things so that it does not reoccur.

Mr. Pierre Tremblay: Absolutely; we're all over it. And we get assessed to very high standards.

Mr. David Anderson: Okay.

I want to come to renewables in a minute, but first I'd like to ask you, Mr. Tremblay, can you tell us what Japan is doing right now with their other plants? What kinds of analyses and evaluations are they doing during this time with the other plants? Are they running normally?

Mr. Pierre Tremblay: I'm not certain. Certainly the 11 plants in northern Japan are shut down. I don't know about the rest of them. They have a variety of light-water reactors—boiling and pressurized light-water reactors. They have a major commitment to nuclear power, but I don't know the specific status of all the reactors in that country.

Mr. David Anderson: Okay.

Mr. Cooper, I'm glad to see you take a strong stand on renewables. I come from an agricultural area, and we like to see that. We've had some concern here, mainly from the left-wingers in the country, about the fuel versus food debate, which I think is a phoney debate. I'm glad to see you supporting renewables.

But I want to challenge you a bit on your commitment to wind. At the end of your presentation you say that nuclear has moved to the end of the line compared with efficiency, natural gas, and wind. We've heard a lot about the low prices of natural gas right now. But we have some wind generation in Saskatchewan and are finding that it's very inefficient. Your construction costs here put it at about two-thirds of nuclear, and it's 30% effective.

Would you maybe talk a bit about both wind and solar? You have them at $80 per megawatt, and nuclear at $120. Both of those are very intermittent sources of energy.

Maybe Mr. Tremblay wants to respond to this as well.

● (1715)

Dr. Mark Cooper: The costs that you see there are levelized, so they take into account availability. The solar number is again from Lazard, who is looking out to 2016 and sees solar coming down. He's optimistic about solar, and it turns out he's optimistic about nuclear.

These are levelized costs. These are busbar costs. They take into account the availability. Biomass is listed as slightly below wind. And these are straight from the source in Lazard.

If you look at the EIA numbers—

Mr. Pierre Tremblay: That's an exceptionally fine question—

The Chair: Thank you, Doctor.

Go ahead, Mr. Tremblay.

Mr. Pierre Tremblay: I would say this is a real matter of practicality. Ontario had in the range of 1,000 megawatts of wind that was installed, I think at the end of last year. That capacity generated around two terawatt hours of power. Quite frankly, if I had done that out of the 1,000 megawatts from the Pickering B plant, I'd have been shot at dawn.

Mr. David Anderson: I think the government is about to be, it seems, and that's one of the reasons.

Some hon. members: Oh, oh!

Mr. Pierre Tremblay: The point is that we need a diversity of supply, and the one thing about nuclear power is that it's there, it's reliable, and it's baseload.

Mr. David Anderson: Yes, and I think the provincial government has realized that as well, from the steps they took in trying to force people to subsidize those industries.

Thank you, Mr. Chair.

The Chair: Thank you.

If there are there no further questions for the witnesses, Mr. Cullen does have a point of order.

I'd like to thank you both very much. It was very helpful information, and we do appreciate it. It will be used by the committee, if we get to writing a report before an election. We'll see about that.

Again, thank you. If you like, you can leave table; we have a short discussion on a point of order.

Mr. Cullen, on a point of order.

Mr. Nathan Cullen: I have a very small point of order.

As you know, we have critical votes tomorrow afternoon, and it seems to be likely—all the campaign buses have been rented—to precipitate an election. First of all, I wish everyone the best of luck in what comes in the next 35 days.

Mr. Scott Andrews: No you don't.

Mr. Nathan Cullen: I do, except for Scott. As part of my point of order, can we change the record to say "except for Scott"?

Mr. Scott Andrews: He took all my money in poker last night.

Mr. Nathan Cullen: That's right, I took all his money in poker.

To the committee members, I hope the committee is able to reconvene this particular study. I think it's been of great interest to many of us. It's an important one, and I hope it doesn't get dropped in the next Parliament.

But mostly I want to say good luck to everybody. Knock on doors.

The Chair: Thank you, Mr. Cullen.

Of course should we decide to go to an election, it's up to the next committee to decide what we come back to.

Again, I wish you all the best in your campaigns. May it be a rewarding experience, assuming we're going to an election, of course. We'll find out tomorrow.

The meeting is adjourned.

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