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Chair: Mr. John Williamson





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• (1300)

[*English*]

**The Chair (Mr. John Williamson (New Brunswick South-west, CPC)):** Good afternoon.

Thank you for being here.

[*Translation*]

I call this meeting to order.

Welcome all to the 42nd meeting of the Standing Committee on Public Accounts of the House of Commons.

Pursuant to Standing Order 108(3)(g), the committee is meeting today to undertake a study of Report 3, Hydrogen's Potential to Reduce Greenhouse Gas Emissions, of the 2022 Reports 1 to 5 of the Commissioner of the Environment and Sustainable Development.

The witness has done a sound test as well as an Internet connection test.

[*English*]

I'd now like to welcome our guests.

From the Office of the Auditor General, we have Martin Dompierre, assistant auditor general, in replacement of the commissioner of the environment and sustainable development, Jerry DeMarco. We also have Philippe Le Goff, principal. It's good to see you both.

From the Department of Natural Resources, we have John Hanaford, deputy minister; and Sébastien Labelle, director general, clean fuels branch.

From the Department of the Environment, we have Christine Hogan, deputy minister; Douglas Nevison, assistant deputy minister, climate change branch; and, by video conference, Derek Hermanutz, director general, economic analysis directorate, strategic policy branch.

I believe it is Mr. Dompierre who will be giving the opening remarks for five minutes.

You have the floor. Go ahead, please.

**Mr. Martin Dompierre (Assistant Auditor General, Office of the Auditor General):** Thank you, Mr. Chair.

Mr. Chair, thank you for this opportunity to discuss our report on hydrogen's potential to reduce greenhouse gas emissions, which was tabled in Parliament on April 26, 2022.

I would like to acknowledge that this hearing is taking place on the traditional, unceded territory of the Algonquin Anishinabe people.

With me today is Philippe Le Goff, the principal responsible for this audit.

The potential role hydrogen could play in net-zero energy systems and decarbonization is gaining significant global interest. Hydrogen can be used to drive down emissions where electrification is not technically or economically feasible, such as in energy-intensive industries. However, hydrogen's potential for decarbonization depends on how the hydrogen is produced and used.

For this audit, we wanted to know whether Environment and Climate Change Canada and Natural Resources Canada comprehensively assessed the role that hydrogen should play as a pathway to reaching Canada's climate commitments.

Overall, we found that the two departments had different approaches to assessing the role hydrogen should play in reducing greenhouse gas emissions. Environment and Climate Change Canada expected to achieve 15 megatonnes of carbon dioxide equivalent emission reduction in 2030, whereas Natural Resources Canada projected up to 45 megatonnes by 2030.

To assess the demand for hydrogen, Environment and Climate Change Canada assumed a blending mandate for hydrogen and natural gas that was not based on any existing policy at the provincial or federal level. In addition, this approach was uneconomical, based on the current trend of carbon pricing.

• (1305)

[*Translation*]

For its part, Natural Resources Canada favoured a transformative scenario that assumed the adoption of aggressive and sometimes non-existent policies, along with an ambitious uptake of new technology.

It is important that Environment and Climate Change Canada and other federal departments adopt a standard framework to estimate the greenhouse gas emission impacts of proposed policies, clean technologies, and fuels.

Generally, Environment and Climate Change Canada did not distinguish existing policies and measures from those not yet announced or implemented. We found that Environment and Climate Change Canada's climate plan that was in effect at the time of the audit was based on measures that sometimes had not been implemented and that relied on some policies that did not have the necessary legislative and financial support.

Environment and Climate Change Canada would benefit from a stronger framework for peer review, public scrutiny, and quality assurance on control in its modelling exercises. This is important because it would improve the quality and transparency of the department's climate change modelling in future emission reduction plans, and would inspire more trust.

Mr. Chair, this concludes my opening remarks. We are pleased to answer any questions the committee may have.

Thank you.

[English]

**The Chair:** Thank you very much.

I will turn now to Ms. Hogan.

You have the floor for five minutes, please. Thank you.

[Translation]

**Ms. Christine Hogan (Deputy Minister, Department of the Environment):** Thank you, Mr. Chair, for inviting Environment and Climate Change Canada to your committee.

I am pleased to have this opportunity to discuss Environment and Climate Change Canada's response to Report 3 of the Spring 2022 Reports of the Commissioner of Environment and Sustainable Development.

Before I begin, I, too would like to acknowledge that this meeting is taking place on the traditional territory of the Algonquin Anishinabe peoples.

The department welcomes the commissioner's report on hydrogen's potential to reduce greenhouse gas emissions.

[English]

We agree with the recommendations addressed to the department. As our action plan shows, Environment and Climate Change Canada is acting upon them.

Let me highlight two primary points. First, I can provide some context regarding how Environment and Climate Change Canada approached its modelling work. Second, I would like to emphasize that despite differences that may exist between Environment and Climate Change Canada and NRCan's approaches, Environment and Climate Change Canada has the same overall assessment of the potential for hydrogen to play a role as a clean fuel and industrial feedstock that both helps the Canadian economy decarbonize and represents an important economic diversification opportunity for the Canadian economy.

On the modelling question, Environment and Climate Change Canada and Natural Resources Canada conducted complementary but quite different modelling exercises. The objectives, analytical

approaches and scope differed. I will defer to Natural Resources Canada to speak to the analysis developed for their hydrogen strategy.

For our part, Environment and Climate Change Canada's modelling was about the overall impact of the full suite of measures in the December 2020 strengthened climate plan. It was not intended to provide a disaggregated impact of any specific set of measures or targeted activities, including measures related specifically to hydrogen. In addition, although our modelling included a proxy for the hydrogen strategy that was still under development at the time, that proxy on its own was not intended to estimate the full role hydrogen could play in reducing emissions.

Of course, since late 2020, the government has announced a number of initiatives to encourage the increased production and use of clean hydrogen. The 2030 emissions reduction plan, for example, which was released at the end of March of this year, references a number of hydrogen-related initiatives.

The clean fuel regulations, which were finalized in July 2022, will reduce emissions by requiring gasoline and diesel to become less polluting over time. They will also drive innovation in clean technology and will increase demand for low-carbon energy, including biofuels and hydrogen.

Natural Resources Canada's clean fuels fund will help producers by investing to de-risk the capital investment required to build new or expand existing clean fuel production facilities. This will help grow domestic production capacity for clean fuels, including clean hydrogen.

The Government of Canada is also supporting the production and use of clean hydrogen through the support of projects funded under the net-zero accelerator initiative.

Finally, I would highlight that in budget 2022, the government did commit to establishing an investment tax credit to support investments in such things as clean hydrogen production.

Working across the government with departments, particularly our partners at Natural Resources Canada, ISED and Finance Canada, Environment and Climate Change Canada will continue to build on and improve such initiatives as we move forward with the government's climate change agenda.

In closing, the department will consider the commissioner's observations as we move forward on the 2030 emissions reduction plan and all subsequent climate policies in the coming months and years.

Thank you very much.

● (1310)

**The Chair:** Thank you, Ms. Hogan. We appreciate your time.

Mr. Hannaford, you have the floor now for five minutes.

**Mr. John Hannaford (Deputy Minister, Department of Natural Resources):** Thank you very much, Mr. Chair.

I am also honoured to be joining the committee from the unceded territory of the Algonquin Anishinabe people.

Mr. Chair, the commissioner's report highlighted hydrogen's essential role in our future, and my department fully agrees. Much has happened since the report's release. Global urgency on energy security, the energy transition, and the climate imperative have cemented hydrogen's critical role in meeting domestic and global energy needs. This urgency plus Canada's climate commitments make Canada a partner of choice to supply clean hydrogen.

Globally, hydrogen investments are expanding. Both the United States' Inflation Reduction Act and the EU's green deal include significant investments in hydrogen. Canada is also growing its hydrogen sector through budget 2021, budget 2022 and the fall economic statement.

For example, the \$1.5-billion clean fuels fund supports new production capacity for clean fuels. In fact, in early November, \$800 million from this fund went to support 60 projects, including several hydrogen facilities. The strategic innovation fund's net-zero accelerator recently announced \$300 million towards a \$1.6-billion project that produces and liquefies hydrogen in Alberta and will create 230 jobs. A clean hydrogen investment tax credit provides a refundable credit of up to 40%. The \$15-billion Canada growth fund focuses on four areas, including hydrogen, and provides different sorts of fiscal support. As a last example, the Canada Infrastructure Bank's mandate has expanded to include clean hydrogen production, transportation and distribution.

Mr. Chair, these initiatives will solidify Canada's investments in the private sector and attract foreign investors. As you may have seen, more than 10 multi-billion dollar hydrogen projects were highlighted at the Atlantic hydrogen expo in August. At the same time, the government committed to the Canada-Germany Hydrogen Alliance.

As our action plan shows, NRCan is acting on the recommendations outlined in report 3 from the commissioner. We're already updating our hydrogen modelling to incorporate new economic and technical data. When we developed the hydrogen strategy, we spoke to over 1,500 public and private representatives. We're now planning more workshops with them, as well as with provinces and territories, to discuss modelling results. We're also working on our first biannual report, showcasing key data related to hydrogen production, uses, investments, jobs and exports. It will track progress on the strategy's recommendations, document results, and identify new priority areas for the near term.

Hydrogen is also one of the many economic opportunities being discussed at the regional energy and resource tables. Launched in June, the tables provide an opportunity to work with provinces, territories, indigenous groups, industry workers and experts to ensure that each region is well positioned to use its unique local resources in order to thrive economically in the low-carbon future.

Now, I want to turn to the audit's suggestion that NRCan overestimated hydrogen's potential in the hydrogen strategy. The strategy was meant as a call to action. To that end, it needed to show the full potential of hydrogen in multiple sectors and the full slate of actions that could be taken by governments and the private sector to unlock that potential. The strategy was meant to show what could happen, first, if only incremental actions were taken and, second, if significant actions were taken across the economy. In those scenar-

ios, 2030 emissions reductions ranged from 22 to 45 megatonnes, in line with those estimated by ECCC's model, which only looked at one use of hydrogen.

Mr. Chair, the future is promising for Canadian hydrogen. We are already known as a clean-energy leader. We have decades of experience, a skilled workforce, and existing infrastructure that includes a vast pipeline network. We also have the feedstocks, including hydroelectricity, wind and natural gas, to produce clean hydrogen in several provinces. The government is committed to unlocking hydrogen's potential to ensure Canada's economic and climate success.

Thank you, Mr. Chair.

• (1315)

**The Chair:** Thank you all very much.

We'll now turn to our first round.

Mr. McCauley, you're joining us virtually. You have the floor for six minutes.

**Mr. Kelly McCauley (Edmonton West, CPC):** Mr. Chair, thanks very much.

Witnesses, thanks for joining us. I appreciate it.

To the AG's office, do we know how much the government has spent, so far, on the hydrogen strategy, based on what seem to be rather faulty projections?

**Mr. Martin Dompierre:** I don't believe we have that information in the report, but I'll ask Mr. Le Goff to provide a response.

**Mr. Philippe Le Goff (Principal, Office of the Auditor General):** Mr. Chair, that is correct. We don't have that information.

**Mr. Kelly McCauley:** Would it be available to you? Could you get back to us?

**Mr. Philippe Le Goff:** I think the departments would be better positioned to provide that information.

**Mr. Kelly McCauley:** Okay, could the departments provide that to us, then?

In your opening statement, you noted that the departments used different approaches to assess hydrogen and its use in reducing GHGs. They are wildly different projections. Did the departments explain to you how they came up with such wildly different methodologies and numbers?

**Mr. Philippe Le Goff:** Mr. Chair, yes, they explained it to us. We saw the modelling, and we looked at the different hypotheses that were used to achieve these numbers.

**Mr. Kelly McCauley:** Is there a reason there would not be just one projection or one calculation to use? It seems very odd that the same government is using numbers that are 300% apart on GHG projections.

**Mr. Martin Dompierre:** We would have expected that both departments would have a coordinated approach in terms of determining the emission reduction. As we mentioned in the report, one department indicated that the reduction would be 15 megatonnes of emission versus 45 megatonnes of emission, so definitely a coordinated approach would have been necessary.

**Mr. Kelly McCauley:** Yes, one would have thought.

Do you accept Natural Resources' opening statement that they seem to be making an excuse of it being just a call to action? They seem to be excusing a lot of the rather damning comments in your report about their numbers and how they came up with the numbers.

**Mr. Martin Dompierre:** Basically, we looked at a number of assumptions. As we say in the report, some of these assumptions were overestimated, and they were based on non-existent policies. The report provides numerous examples.

As an example, there was an assumption for very low-cost electricity by provinces, where the assumption was \$40-per-megawatt power across all provinces, whereas the observed price in 2020 ranged between \$52 and \$124 per megawatt. Some of these assumptions were definitely quite off as to the market value of some of those electricity costs.

**Mr. Kelly McCauley:** Is it acceptable in any accounting practice or any general practice to base projections on what I am perhaps going to call dishonest projections or calculations by basing them on a policy that hasn't been developed or technology that hasn't been developed?

**Mr. Martin Dompierre:** I would say that we looked at the modelling and the assumptions. I am not in a position to determine if it was dishonest by both departments, but we definitely looked at those assumptions in trying to understand how they came up with these emission reductions.

**Mr. Kelly McCauley:** Thanks.

Based on the cost projections in exhibit 3.1, does Canada reasonably have the ability to replace current energy use with hydrogen? I stress the word "reasonably".

**The Chair:** Mr. McCauley, whom is that question directed to?

**Mr. Kelly McCauley:** That is still to the AG.

**Mr. Philippe Le Goff:** Mr. Chair, we are concerned that Canada will need an incredible amount of energy to provide the amount of hydrogen that is mentioned in the report.

• (1320)

**Mr. Kelly McCauley:** Yes, and it's either at an incredible cost or with an incredible increase in GHG.

Are you aware of an analysis that has been done by any department as to the cost to the economy, the GDP and jobs if we replace current energy with hydrogen at the higher cost mentioned in your report?

**Mr. Martin Dompierre:** May I ask Mr. Le Goff to respond to that question?

**Mr. Kelly McCauley:** Yes, please.

**Mr. Philippe Le Goff:** In the strategy—and the Department of Natural Resources can talk about it—there is an estimate of the economic impact that hydrogen will have in terms of jobs and GDP.

**Mr. Kelly McCauley:** Jerry DeMarco commented.... I'm taking this out of a news briefing, which says that, due to the high cost of hydrogen, he is expressing "doubts about whether hydrogen can play any sort of meaningful role" because of the lack of infrastructure, pipelines and the costs.

Do you agree with that? Do you believe that the two departments with us today accept that comment from Mr. DeMarco?

**Mr. Martin Dompierre:** I agree with Mr. DeMarco's conclusion that he stated. I would ask the department if they agree with what Mr. DeMarco said.

**Mr. Kelly McCauley:** Right.

I think that's my time, and we'll get back to them in time.

**The Chair:** It is your time.

One thing, Mr. McCauley, that you or one of your colleagues should come back to is that Mr. Le Goff said, on the question of departmental spending, that the departments would be better placed to answer that. They haven't answered that, and I think somebody needs to put that question to them. I don't think it's appropriate to just say "provide the information" until we know if it can be provided, just to be fair to the departments that we're not expecting something from them if they're either not sure exactly what's being requested or they're not able to provide it.

I leave that for you to come back to in another round.

Turning now to Mr. Dong, I am very pleased to see you. For a second I thought you were not going to make it here today.

**Mr. Han Dong (Don Valley North, Lib.):** No, I'm here.

**The Chair:** It's over to you for six minutes.

**Mr. Han Dong:** Thank you very much, Chair.

I want to thank all of the department officials and the officials from the AG's office for coming today.

My question is for NRCan. Very quickly, can you give us an overview of the state of the technology in terms of its application? You mentioned in your opening remarks that there were significant investments already in place from both the public sector and the private sector.

Please, tell us a bit about that.

**Mr. John Hannaford:** Mr. Chair, the production of hydrogen is something that's been part of our industrial mix for a long time. We have been producing hydrogen in a variety of different ways through different technologies. What has changed recently is the degree of demand as some of the new technologies have come on board to create hydrogen both through electrolysis, which is through the conversion of water into hydrogen, and through the reform of natural gas, which essentially uses very high heat to separate out the hydrogen from the carbon in methane. Those two processes, combined with carbon capture and storage, can lead to quite substantial supplies of very low-carbon fuel, which can be applied in a number of different ways.

Canada has been a leader with respect to the development of such technologies as hydrogen cells, which can convert that hydrogen into electricity and can be used as a source of power in automobiles, in heavy- and medium-weight vehicles and in other applications, such as steel production.

The application of that hydrogen technology is being advanced through a variety of different means around the world. There is an increasing demand for hydrogen as a clean fuel that we are seeing in a number of different ways. I mentioned in my opening statement the arrangement that we have reached with Germany. We have also been in conversations with other key partners, such as Korea, Japan and the United States, about the application of hydrogen as a clean fuel.

I would say, as I also mentioned in my opening statement, that this is something relevant across the country. As we think about the regional tables, and as we are trying to study and identify with each province and territory areas where we have a strategic advantage that we can use to move toward a cleaner carbon future, hydrogen—

• (1325)

**Mr. Han Dong:** I have very limited time. I want to get a couple of questions in.

You used the word “demand” twice. Can we say that the technology is mature enough, or is very close to the stage of vast commercialization, to replace fossil fuels? Is it mature enough to even have the potential to be an environmentally friendly way to produce electricity? Can we say that?

**Mr. John Hannaford:** It is increasing. The technology is advancing and demand is increasing. Such things as the crisis in Europe are advancing this even more quickly.

**Mr. Han Dong:** As the technology grows, does it pose any risk to the sufficiency of energy supply in Canada along the way?

**Mr. John Hannaford:** Again, there are a couple of pathways to hydrogen. Actually, there are several. The two principal ones present different sorts of challenges. If you're using electricity through electrolysis—separating water—then you need a sufficient

energy supply in order for that to happen. Similarly, in the conversion of natural gas, you need to think about how energy is supplied in order to create the heat that would generate the separation of the molecules.

Those are things that then become relevant as we think about some of the challenges of electrification and some of the technologies that are available there.

**Mr. Han Dong:** Did NRCan overestimate the emissions reduction potential of hydrogen? I want to give you a chance to answer this question.

**Mr. John Hannaford:** Mr. Chair, we were engaged in a very specific exercise, which was to identify the full potential of hydrogen at a point in time. That exercise arrived at the figures that we've been discussing. That was intended as a call to action. It was not intended as an analysis, other than of the full potential of the technology.

We continue to refine this. We have a series of committees that we have stood up that aim to draw from the wisdom of the private sector and other forms of experts—and with the provinces and territories—to make sure that we better understand this technology as it evolves and its potential. That will result in an update report next year, which will give our most recent picture of what the potential of the technology is.

**Mr. Han Dong:** In your opening remarks, you named a few international players investing heavily in hydrogen technology.

What's the risk of not doing anything with this technology, or not enhancing and incentivizing private investment in that technology in Canada?

**Mr. John Hannaford:** The risk is being left behind. As you mentioned, there is substantial investment that is happening internationally. We have strategic potential here. Any sorts of decisions with respect to this take time in order to come to fruition.

**Mr. Han Dong:** What do you mean by “left behind”? Is it like a job loss or—

**The Chair:** That is time, I'm afraid. You'll have to come back to that.

[Translation]

Mr. Trudel, you now have the floor for six minutes.

**Mr. Denis Trudel (Longueuil—Saint-Hubert, BQ):** Thank you, Mr. Chair.

I would like to thank the witnesses for being here with us. The issue at hand is very important. A few days ago, we talked about the housing crisis and today, we are talking about the climate crisis, and how hydrogen fits into this. The stakes are high.

Things aren't going well in Canada in terms of the fight against climate change. Indeed, Canada is the only G7 country whose emissions have increased since 2015, that is to say since the Liberals came to power. Emissions have gone up since the Paris Agreement was put into place. We can't ignore this.

We hear the grand speeches of the Liberal ministers in the House of Commons, who talk about being "green" and supporting a green transition. However, this has not translated into any concrete results at the end of the day.

Canada has never met the targets of the agreements and major international covenants that it has signed. Not a single target. In the last budget, reduction targets were set at 40 or 45%, but we don't know if they will be met. Canada is second amongst G20 countries in terms of fossil fuel subsidies. That is telling. Canada is the worst G20 country when it comes to the average emissions per citizen. We can't pretend things are going well.

Mr. Hannaford, what is going wrong? We are here to talk about green hydrogen. Green hydrogen is all well and good, but it is not a miracle solution.

Why is Canada trailing behind and why can't it reduce its greenhouse gas emissions, despite the big promises and passionate speeches and despite its commitment to international covenants and Conferences of the Parties?

• (1330)

[English]

**Mr. John Hannaford:** We are taking very substantial steps to address the emissions, which are just an aspect of our economy and society. The emissions reduction plan that was released in the spring is among the most ambitious and most detailed internationally to both understand the challenges that we face and provide pathways as to how we will be pursuing those challenges.

Hydrogen can play a role in this, because hydrogen is a clean fuel. As we think about the investments we're making through the mechanisms I mentioned earlier, we have an opportunity to make inroads for Canada not only to meet its own objectives but also to provide a clean fuel internationally and continue our role as an energy supplier.

[Translation]

**Mr. Denis Trudel:** Setting aside the measures linked to hydrogen, what key measures would give us hope for a reduction in greenhouse gas emissions over the next few years?

[English]

**Mr. John Hannaford:** There are a number of measures that have been announced, both in conjunction with the emissions reduction plan and through successive budgets, which are intended to foster innovation in this area. We've mentioned the investment tax credit that's been put in place with respect to the carbon capture and storage technologies. We've talked about investment tax credits that are also available for clean energy and hydrogen.

These are all incentives towards substantial reductions in our emissions over time. We are also taking other measures, which my colleagues at Environment will be better placed to discuss, on the

regulatory side to change very significantly the way we do business and to meet the overall objectives that we have been setting.

[Translation]

**Mr. Denis Trudel:** According to Canada and the UN Secretary General, drilling for oil is a crime against humanity. We have to stop subsidizing fossil fuels. Canada has promised to eliminate these subsidies as of 2023. Over the past few years, Canada has continued to subsidize fossil fuels to the tune of \$8.5 billion US dollars. I should also remind you that 2023 will be upon us in 28 days.

Ms. Hogan, is it realistic to think that Canada will no longer make any investments whatsoever in fossil fuels in 2023?

**Ms. Christine Hogan:** Thank you for the question.

[English]

On this issue, I think the commitment that Canada has made around eliminating inefficient fossil fuel subsidies has been well communicated, with the phase-out next year, in 2023, as you mentioned, and we are working towards that end.

[Translation]

**Mr. Denis Trudel:** Is it really realistic to think that we will be able to achieve this?

Do you believe that we will meet this target, and that as of January 1st, 2023, which is in 28 days, Canada will no longer invest any money whatsoever in fossil fuels?

[English]

**Ms. Christine Hogan:** Mr. Chair, I think the response is "in 2023". I don't think it was as of January 1, 2023.

That is the objective. The government has made that clear on numerous occasions. It is articulated in our emissions reduction strategy and has been reiterated domestically and internationally.

[Translation]

**Mr. Denis Trudel:** Thank you very much.

Mr. Hannaford, I would like to talk about the businesses in British Columbia that specialize in carbon capture. Two technologies are used. One is a kind of vacuum that sucks up air and, thanks to a certain process, allows carbon to be buried in the ground. The other technology is a kind of filter. It is marketed at big industrial emitters that can incorporate this technology into their systems.

Lots of people are saying that this is dangerous. The greenhouse gases aren't being eliminated, even if carbon is buried in the ground. If ever there were an earthquake or some kind of similar catastrophe, for example, it could be extremely dangerous.

**The Chair:** I'm sorry to interrupt, Mr. Trudel, but your time is up.



[English]

Mr. Desjarlais, you have floor for six minutes, please.

• (1335)

**Mr. Blake Desjarlais (Edmonton Griesbach, NDP):** Thank you very much, Mr. Chair.

I want to thank the witnesses for being with us today on this important work.

I want to thank the office of the commissioner of the environment and sustainable development for being with us as well.

In previous appearances at this committee, the commissioner of the environment and sustainable development actually delivered a scathing audit on Canada's failure to achieve its climate targets. I'm certain that the Auditor General's office and the commissioner of the environment remember this.

I and many Canadians have a serious lack of trust in the emissions plans when we see results like the ones we're seeing from the emissions reduction audit we're reviewing today. You can imagine how incredibly important it is that at a time like now we actually try to reinforce principles that unite Canadians so they have confidence in structures and, in particular, our ministries when they're doing the work of trying to deliver the results that so many Canadians are relying on as we face a really catastrophic situation: the effects of climate change.

I'm concerned that Environment and Climate Change Canada is relying on some very unrealistic assumptions, as pointed out in the audit, about how these policies actually play out on the ground. As evidence of this, you can turn to exhibit 3.5 and paragraph 3.60. It makes this quite explicit in that statement, which I'll read for you now:

Environment and Climate Change Canada provided us with a comprehensive list of assumptions for both cases. We found that the department relied on some inflated and overly confident assumptions when modelling measures to reach the 30% emission reduction target for 2030.

This is something that I want the members who are with us today to take quite seriously in terms of the fact that it will have a detrimental effect on building confidence for the outcomes that Canadians truly need.

There's a list of assumptions and facts that I could go through under the same exhibit 3.5, under "unrealistic assumptions". Some of these include the following. Under "Assumption", it states:

An increase, starting in 2022, in shell (elements of the building structure, such as the walls, windows, etc.) energy efficiency of all buildings by a target of 2% each year for residential and 2.5% for commercial.

Under "Facts", it says:

These levels of increase would require major retrofits in the industry. Between 1990 and 2017, overall energy efficiency (lighting, heating, shell, appliances) for the residential sector improved on average by 1.6% per year and for the commercial and institutional sectors by 0.7% per year.

You can see that there's a huge gap there. That's the situation that I think Canadians want an explanation for. We need to find ways to actually build confidence in the solutions you're going to be offering today.

Now, here is my question: How can Canadians have confidence in Environment Canada's modelling when the gaps between assumptions and facts are so massive?

That's for Environment Canada, please.

**Ms. Christine Hogan:** I want to thank you for that question.

I would like to start by reassuring people that Environment and Climate Change Canada's modelling processes are robust and reliable, and they're in line with international guidelines and standards.

In the emission modelling of Canada's climate plans, and when assessing progress towards the country's emission reduction targets, ECCC follows international guidelines that are established for reporting on progress to targets. What we do in these instances, as we did with the strengthened climate plan and again in the emissions reduction plan that was released in March, is that Environment Canada models a package of measures together to estimate the GHG reductions associated with all of the measures contained in the plans. This is consistent with the existing UNFCCC reporting guidelines, the UN Framework Convention on Climate Change—

**Mr. Blake Desjarlais:** Let me interrupt you there, just because there's a limitation of time.

Directly speaking, your modelling includes assumptions that are.... For example, under that same exhibit 3.5, it states, "Increased sales shares in line with the California policy on zero-emission heavy-duty vehicles", while here in Canada no such policy exists.

How can you be confident in the results of the modelling when the assumption is that there are going to be policies that just don't exist right now?

**Ms. Christine Hogan:** I'm going to invite my colleague, the director general of our economic analysis directorate, to comment and respond to that specific question.

**Mr. Derek Hermanutz (Director General, Economic Analysis Directorate, Strategic Policy Branch, Department of the Environment):** Sure.

The UNFCCC accounting framework and guidelines allow for two different scenarios, and this is how Canada approaches the modelling. One is the reference case scenario, and that includes policies that are legislated, implemented or funded. That's the base-line analysis that we do—

• (1340)

**Mr. Blake Desjarlais:** That's the realistic one.

**Mr. Derek Hermanutz:** —as defined by the UNFCCC. That's, yes, funded, legislated and implemented.

Then the UNFCCC also allows for an additional measures case. That is where countries can estimate the impacts of policies that have been announced but are not yet fully funded or implemented.

**Mr. Blake Desjarlais:** Why would the department rely on this form of modelling to communicate its objective with Canadians when the real model exists? I think that's what the Auditor General is pointing out: the fact that the government is relying on policies that are, in this instance, utilizing unrealistic and largely huge assumptions that we're communicating to Canadians. When we do that, we don't see those outcomes.

**Mr. Derek Hermanutz:** We publish both the reference case and the additional measures case. The additional measures case is the one we use to show progress to the target.

**Mr. Blake Desjarlais:** Or, in this case, the lack thereof—

**The Chair:** That is the time, I'm afraid, Mr. Desjarlais. Thank you very much.

We'll turn to our next round.

Mr. Kram, you have the floor for five minutes.

**Mr. Michael Kram (Regina—Wascana, CPC):** Thank you very much, Mr. Chair.

Thank you to all the witnesses for being here this afternoon.

The audit makes many references to a document titled “A Healthy Environment and a Healthy Economy”. This document was released in December 2020. I remember it was important enough to warrant a press conference by the Prime Minister himself.

Who wrote this document?

**Ms. Christine Hogan:** This is a Government of Canada document released by Environment and Climate Change Canada but obviously reflecting the whole-of-government approach and strategy for climate change. In short, it is referred to as the “strengthened climate plan”.

**Mr. Michael Kram:** Yes, I realize it says “Environment and Climate Change Canada” on the cover, but how did we get to this point? Does the document come from the PMO and then the cover gets slapped on top? How does the whole contents of the document come together?

**Ms. Christine Hogan:** Mr. Chair, I would simply say that this is consistent with most or all government plans that you see released publicly in this way. They are a function of considerable policy work and decision-making and, ultimately, the decision of the Government of Canada and the Minister of Environment.

**Mr. Michael Kram:** Okay.

Now if we come back to the audit document and go to page 23, paragraph 3.62, I would like to read a quote from about halfway through the paragraph. Referring to Environment and Climate Change officials, it says:

Moreover, departmental officials told us it is not in the purview of Environment and Climate Change Canada's modelling group to develop cost-effective decarbonization pathways. According to the department, this responsibility is disseminated across several federal organizations.

I am wondering if someone could shed some light on how that works. There seem to be a lot of different inputs into coming up with the document, but no one seems to be responsible for coming up with the pathways that are actually feasible. Can anyone speak about that?

**Ms. Christine Hogan:** I can make an attempt, Mr. Chair.

The strengthened climate plan and the emissions reduction plan that followed suit in March are extremely comprehensive. They cover a multitude of sectors of the economy and, therefore, are products of a lot of detailed work done internally within departments and then worked up collectively in a whole-of-government way across.

Obviously, we at Environment and Climate Change Canada work very closely with our partner departments, whether that be Transport Canada in the transportation sector, Natural Resources Canada on energy and natural resources issues, or the like. There are a lot of detailed efforts that go into, then, compiling those plans and telling a whole-of-government story.

That may be sufficient for the moment, but Derek Hermanutz may also be able to elaborate on more of the mechanics.

**Mr. Derek Hermanutz:** I think that's right, Deputy.

The projections are done to represent the government's existing policies. That's done in coordination with other federal departments, as the deputy said, including Agriculture, Natural Resources Canada and Transport. The end result is that Environment and Climate Change Canada models the whole package and estimates what the global impacts will be on emissions reductions for Canada.

• (1345)

**Mr. Michael Kram:** Which of these several federal organizations are responsible for developing the “cost-effective decarbonization pathways”?

**Mr. Derek Hermanutz:** I'm not sure exactly what the commissioner is referring to there, but the whole of government is responsible for developing the policy analysis and projections that go into the climate plans. ECCC is the coordinator of that process.

**Mr. Michael Kram:** If it's a whole-of-government approach, would it be safe to say that you have to go all the way up to the Prime Minister then for accountability as to who is responsible for developing the cost-effective decarbonization pathways?

**Mr. Derek Hermanutz:** Yes, the document has to go through approval processes.

I'll ask the deputy to respond directly to that.

**Ms. Christine Hogan:** I would comment that ultimately, yes, these are approved as Government of Canada documents and plans. I think the specific work that happens on the modelling and the individual data that's collected is typically handled at the officials level.

**The Chair:** Thank you, Mr. Kram. That is all your time.

Mrs. Shanahan, you have the floor for five minutes.

It's over to you.

**Mrs. Brenda Shanahan (Châteauguay—Lacolle, Lib.):** Thank you very much, Chair.

I, too, would like to thank the witnesses for being here on this very important topic. Certainly it's an educational topic for me.

I'd like to take up where my colleague left off on the risk of being left behind. I, too, am trying to understand the business case for hydrogen. I'm trying to understand the equation between the amount of investment and the actual cost-benefit of using hydrogen.

Mr. Hannaford, can I hear you on that?

**Mr. John Hannaford:** Mr. Chair, the potential here is manifold. We certainly have domestic applications of hydrogen that we are already seeing develop. I mentioned the transportation opportunities, but there are heavy industry opportunities as well.

As the technology continues to develop.... I noted that there were a couple of feedstocks for hydrogen. The technology to create clean hydrogen—which is very low-carbon—from natural gas has advanced dramatically over the course of the last period of time.

We have domestic applications that are evolving and are increasingly real, and we have international opportunities, which are likewise evolving and are increasingly real. The degree to which we are being approached by critical partners is one of the indications of that.

**Mrs. Brenda Shanahan:** I do hear the concerns, Mr. Hannaford, of my other colleagues around just how much money is being invested, by both the public sector and the private sector.

Is there a sweet spot that we can anticipate in the near future? Has there been progress, in other words, in your measurement of the potential of this technology?

**Mr. John Hannaford:** Mr. Chair, as I mentioned, a series of conversations have been happening over the course of the last period of time, which increased our knowledge collectively with respect to hydrogen and its potential. I would say that we are seeing quite substantial progress.

As I also mentioned, this is partially driven by our climate objectives. Obviously, the climate crisis is a critical aspect of this, but geopolitics is another. As we talk about energy security and the experience that our European friends are going through as a result of the crisis in Ukraine, issues around diversification of energy supply and the different sorts of fuels and energy generation that are being considered are accelerating, in part because of the realities that our friends are confronting.

• (1350)

**Mrs. Brenda Shanahan:** Well, that is interesting, Mr. Hannaford. I'm a resident here in Quebec, and we benefit, of course, from a terrifically efficient and cost-effective electricity system.

Can you talk to us about hydrogen's comparative advantage to electricity in powering our transportation?

**Mr. John Hannaford:** I think various parts of the country are going to have various advantages with respect to hydrogen. I mentioned earlier the work that we are doing with the provinces and ter-

ritories through the regional tables, and that's partially to make sure that we are being as focused as we can be on specific advantages that each of the regions has.

In Quebec, where there is the possible generation of hydrogen through clean electricity and the separation of water molecules, one of the benefits of hydrogen is as a means of transporting electricity effectively. You can convert electricity into hydrogen, and then that can be transported and then used at another location to generate electricity. It is the possibility, in effect, of the export of electricity.

**Mrs. Brenda Shanahan:** Thank you.

Is there anything else you'd like to add?

How does government view hydrogen's role? Is this the silver bullet, in other words, for our challenges ahead?

**Mr. John Hannaford:** I would describe it as an area of real potential where we are dedicating very serious attention and serious resources, as we've mentioned, through various investments.

In order for us to deal with the issues of both the climate crisis and energy security, we're going to have to think of a number of different pathways and pursue a number of different pathways in order to achieve what we need to achieve, but hydrogen certainly has the potential of being a very significant part of that mix.

**Mrs. Brenda Shanahan:** Thank you.

**The Chair:** That is time. Thank you very much, Mrs. Shanahan.

[*Translation*]

Mr. Trudel, you have the floor for two and a half minutes.

**Mr. Denis Trudel:** Mr. Hannaford, I would like to go back to our earlier conversation on carbon capture. This new technology sucks carbon out of the air and buries it in the soil. The Government of Canada is a big promoter of this technology, but others remain highly skeptical.

I visited some businesses in British Columbia. Millions of tons of sequestered carbon could be released into the atmosphere due to the melting permafrost and earthquakes. How can we make sure that this does not happen? Can you provide any reassurance? What do you think?

How much time can carbon stay buried in the ground without coming up to the surface?

[*English*]

**Mr. John Hannaford:** Mr. Chair, carbon capture and storage technology has been evolving over a number of years. It is not new, and we have applications of the technology that are functioning. In Alberta, the Quest project is an example. There are a couple of references there. There's the storage of the carbon, and there's also the means by which it's captured. Those are a couple of different issues, in a sense.

I believe what you're referring to is direct air capture, which is the drawing out of hydrogen from the atmosphere. It is a technology that's evolving, where Canada is seeing some innovators who are making substantial contributions to the evolution of that technology.

We also, though, have people who are investing in and are real experts with respect to capture through industrial applications, through a variety of other applications of carbon that's generated. Storage of that carbon depends a bit on geologic formations. Canada has real advantages with respect to that as well. In Alberta, there are very substantial geologic formations that can form a real opportunity to store substantial amounts of carbon, and those are subject then to monitoring and to a series of other means by which the carbon is captured effectively for an indefinite period of time.

[Translation]

**Mr. Denis Trudel:** What would you say to people who claim that carbon capture is a form of greenwashing that allows big oil companies to clean up their act or prove that they are taking measures to reduce greenhouse gas emissions, at least on paper?

[English]

**Mr. John Hannaford:** I would say that, in order for us to achieve what we need to achieve in terms of decarbonization, we are going to need to pursue a whole series of different kinds of technologies, including carbon capture and storage, and that's been recognized internationally by leading authorities on energy and on climate.

This is a technology that has real potential. We have a leadership role with respect to it, and there are opportunities, again, not just domestically but also in terms of global markets.

• (1355)

[Translation]

**The Chair:** Thank you very much.

[English]

Mr. Desjarlais, you have the floor for two and a half minutes, please.

**Mr. Blake Desjarlais:** Thank you very much, Mr. Chair.

I want to return now to the assumptions versus what's really happening here in Canada. The assumptions that are pointed out in the commissioner's report are used for a particular set of modelling, as we just heard. There's also, of course, the existing modelling on policies and investments that are happening now.

With that in mind, this is for the deputy minister of Environment Canada.

When approaching the issues that are present within the targets—and you can see within the commissioner's report that reliance on the assumptions-based modelling versus the modelling of the current investments—when asked about whether or not Canada can achieve its targets, it's appropriate to be using the information and modelling that's present within the data that models existing investment. Wouldn't you agree?

**Ms. Christine Hogan:** Mr. Chair, I would respond again by talking about the fact that—

**Mr. Blake Desjarlais:** For example, there is a critically important electrical grid that is a cornerstone of the plan that your ministry is taking up, but that hasn't been in the government's current investments, and the assumptions are that this policy will be in place to actually hit those targets. That is not currently in place.

Are there investments to enable the building of an electrical grid today?

**Ms. Christine Hogan:** I'm trying to make sure I understand the question.

I think that the modelling effort incorporates all of those elements to the extent that we have that information. It pulls on a number of inputs. It has to deal with policies that we know of, whether they are at the federal level or the provincial level, and that are happening across the economy.

I would also highlight to the committee and to you that this is an evolutionary piece of work. We model efforts for each of our climate plans, but as people will know, when it comes to the progress report that we will have to make against our emissions reduction plan in 2023, there will be, of course, an updated set of projections there, as my colleague Mr. Hermanutz mentioned.

**Mr. Blake Desjarlais:** We won't know. It's evolving.

**The Chair:** I am afraid that is the time.

If you would like to respond to that very quickly, I'll allow that.

**Ms. Christine Hogan:** Derek, do you have anything you want to add? I think it's a pretty specific and important question.

**Mr. Derek Hermanutz:** I would just add that there are the two categories, which are the reference case and the additional measures. As we introduce the additional measures into the modelling, often we need to make some fairly high-level assumptions at the beginning, but as those policies evolve and further details are made available, we can update those measures. Eventually, those would be moved into the reference case if they're funded, implemented and legislated.

**The Chair:** Thank you very much.

Mr. McCauley, the floor is yours for five minutes.

**Mr. Kelly McCauley:** Mr. Chair, thanks very much.

Mr. Hannaford, is there any reasonable business case for hydrogen if it's not using natural gas?

**Mr. John Hannaford:** The costs vary between the feedstocks, but one thing you're seeing through some of the international investments is the technology continuing to evolve, so —

**Mr. Kelly McCauley:** We'll have to wait for a kind of Hail Mary for technology, I guess.

This is for Natural Resources.

The environment commissioner mentioned a lack of viability because of the lack of infrastructure. Has Natural Resources provided a projection on what it would cost for investments for the infrastructure required for hydrogen plants as projected by Environment or Natural Resources?

**Mr. John Hannaford:** I'm sorry. Was that a question for me?

**Mr. Kelly McCauley:** Yes, it is for Natural Resources.

**Mr. John Hannaford:** We have been working on transportation routes as part of the—

• (1400)

**Mr. Kelly McCauley:** I'm asking if we have done a dollar projection of the costs to build the infrastructure required.

**Mr. John Hannaford:** I'm not aware of any specific studies of costing of infrastructure, but I'll look to my colleague.

No, we have not.

**Mr. Kelly McCauley:** Environment, have you performed such an analysis?

**Ms. Christine Hogan:** No, to my knowledge, we have not.

**Mr. Kelly McCauley:** Should we not be doing that? Are we not putting the cart before the horse? This could be tens of billions of dollars. We have all these wonderful projections from the government about hydrogen doing this or that, but we don't actually know how we're going to deliver it.

Was that not part of any report or study?

**Mr. John Hannaford:** Perhaps I could answer—

**Mr. Kelly McCauley:** I'll take that as a no.

Mr. Chair, I'm going to turn the rest of my time over to Mr. McLean.

**The Chair:** I'm sorry, Mr. McCauley. Mr. Hannaford was just about to answer, so why don't we let him do so?

**Mr. Kelly McCauley:** Oh, thanks. Perfect.

Then, I'll turn my time over to Mr. McLean.

**Mr. John Hannaford:** I think there are a couple of issues here.

There is currently the potential to move hydrogen, to some degree. You can blend hydrogen with other gases and it can be moved through existing infrastructure at relatively low ratios. That is a possibility right now. Other possibilities are looking at other forms of transportation, as well as the possibility of retrofits to some existing infrastructure. Those, right now, are part of the ongoing conversation as we think about the next steps with respect to hydrogen applications.

**Mr. Kelly McCauley:** Thanks.

I'll turn it over to Mr. McLean.

**The Chair:** Mr. McLean, good day. Thank you for joining us today. I understand you're still over at the environment committee, so you're wearing multiple hats today.

You have about two minutes and 11 seconds left in this round, and then we'll be moving on. However, we will come back to you.

Mr. McLean, it's over to you, please.

**Mr. Greg McLean (Calgary Centre, CPC):** Thank you. It's much appreciated.

It's nice to see you, Mr. Hannaford.

Let me pick up where my colleague left off. You just talked about the transportation of hydrogen, in light quantities, across Canada. Is that certified, at this point in time, or is that a work in progress? Let's go with that, first of all.

**Mr. John Hannaford:** I would describe it as a work in progress.

**Mr. Greg McLean:** I would, too. Thank you very much.

What do you think that's going to require—5% hydrogen in the natural gas stream in Canada?

**Mr. John Hannaford:** I will defer to my colleague on certain details, but the blending levels.... I think this is one area where we continue to study what the effect of higher concentrations of hydrogen would be on existing infrastructure. That's where you get into questions around retrofits, as well.

I'll turn to my colleague.

**Mr. Greg McLean:** No, I think you answered the question fairly well. I appreciate it. I'll get to your colleague later in the day.

We're talking about a test, right now, to get to approximately 5% hydrogen in a 95% remainder gas stream, but turning that 5% of hydrogen from natural gas into hydrogen to get there, so really testing the infrastructure we have over.... What would you say? Is it a three-year process?

**Mr. John Hannaford:** That's my [*Technical difficulty—Editor*].

**Mr. Greg McLean:** Will we then get to 10% in the next three to five years?

**Mr. Sébastien Labelle (Director General, Clean Fuels Branch, Department of Natural Resources):** Natural Resources Canada is currently looking at the natural gas system to assess the impacts of blending hydrogen into the system. As you can imagine, it's a big network. It will take about three years to understand exactly how much blending can happen, what kinds of retrofits might be required to do that blending, and at what kinds of percentages.

We know that, for example, some pipelines out east accept a higher blend without much retrofit, while some are older pipelines that require a full overhaul to accept hydrogen. It will depend.

**Mr. Greg McLean:** Will those pipelines and retrofits you're talking about have a higher carbon content?

**Mr. Sébastien Labelle:** I'm sorry, a higher...?

**Mr. Greg McLean:** Will they have a higher carbon content in the pipe?

**Mr. Sébastien Labelle:** I could get back to you on the specifics of the requirements.

Typically, we know that, out east, they use some plastic-based materials. Those tend to be more resilient to hydrogen, but I would like to get back to you on that one, in particular.

**The Chair:** Thank you very much.

Just for clarification from the chair, when you say “out east”, is that Atlantic Canada?

**Mr. Sébastien Labelle:** It's Atlantic Canada, yes.

**The Chair:** Sometimes western Canadians confuse central and eastern Canada. Being from New Brunswick, I just want to be clear for the record.

We're turning now to Mr. Fragiskatos.

You have the floor for five minutes.

**Mr. Peter Fragiskatos (London North Centre, Lib.):** Thank you very much for the time today.

Mr. Hannaford, you were talking about where things are evolving, as far as green hydrogen is concerned. Mr. McCauley, as he's prone to do—I say this almost as a compliment, because he's turned it into an art—completed your sentence for you in talking about a Hail Mary pass, which you did not say.

I wonder whether you remember that moment in the interaction. Do you want to complete what you were trying to say?

• (1405)

**Mr. John Hannaford:** The focus is on achieving the lowest carbon concentration possible with respect to the generation of hydrogen. We've framed our approach not so much on colours as on basically carbon intensity. That is a technological question, as to how you reduce the carbon intensity of the fuel. The technology is already advanced pretty materially. Over the course of the last period of time, we've gone to a higher heat application of separation of the molecules to create the hydrogen. If you combine that with capturing the methane at source, it gets you a very low-carbon-intensity product.

The investments that are being made by some of our partners, particularly the investments through the recent United States legislation, create a real dynamic here that we are mindful of. We have been making substantial investments ourselves, both in terms of our own tax measures and in terms of direct investments through the clean fuels fund and other mechanisms. It is with a view to that kind of technological evolution. We're seeing the results of that to a degree.

**Mr. Peter Fragiskatos:** Thank you very much.

This goes both to you and to Deputy Minister Hogan.

One of the key findings from the report, as you know, is the following: “We found the 2 departments used unrealistic assumptions for modelling the potential of hydrogen to reduce greenhouse gas emissions.” I think you've addressed it, but I would like it on the record as clear as possible. Where does each department stand in response to that particular finding?

**Mr. John Hannaford:** We have taken the recommendations of the commissioner, but, as I said at the outset, the exercises that we were engaged in were different exercises. Natural Resources

Canada had been engaged in what we have termed a “call to action”, because it was really intended to show the potential of hydrogen as a fuel. The results you see are reflective of that approach.

**Ms. Christine Hogan:** In my opening comments and subsequent questions, I hope I did underscore again that the Environment and Climate Change Canada modelling that is referenced in the commissioner's report is, of course, a set of policies and measures that are contained in the strengthened climate plan. The reference that has been made to the hydrogen numbers.... We were simply able to use a proxy for hydrogen, because the strategy was still under development at that time. Further refinements continue to be made to our model, as we've seen.

If I have the opportunity, I would like to highlight that in the emissions reduction plan, which came out in March, there is an extremely comprehensive annex in that document to the approach to modelling. It can be a very complex and complicated space. We are doing our best to unpack how the modelling works against our climate plans.

Similarly, to Mr. Hannaford's comments, we acknowledge the recommendations of the commissioner. In fact, one of the other initiatives that are highlighted in the emissions reduction plan is a commitment—and it's referenced in our management action plan as well—to an expert-led process that will allow us to take stock and continue to enhance our modelling efforts going forward.

**Mr. Peter Fragiskatos:** I'll end it there, and thank all of the public servants for their work.

Thank you to the Office of the Auditor General.

**The Chair:** Thank you very much.

For our next round, we're going back to Mr. McLean.

You have the floor for five minutes.

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

Let me go on a different tack here. Thanks for the input earlier on infrastructure that has not been addressed in terms of what Canada will have to undergo in order to switch to a hydrogen economy, even as little as we can by 2030.

The production of hydrogen is among the most inefficient power production in the world. Would you agree, Mr. Hannaford?

• (1410)

**Mr. John Hannaford:** I would agree that it is expensive in the current circumstances, but that's one of the reasons we are making the investments we are making, in order to advance the technology and to create the scale that will see some economic returns.

**Mr. Greg McLean:** Advance the technologies and make the investments. Does this mean bet on technologies that don't exist?

**Mr. John Hannaford:** It means building on technologies that are evolving now, and there may well be new applications. We were talking earlier about carbon capture and storage. You're seeing technologies where one of the ways in which natural gas is reformed is to use microwave to essentially create solid carbon and hydrogen. It's a very different kind of storage situation with that kind of application.

The point is that this is an evolving space.

**Mr. Greg McLean:** Thank you.

You're correct. Let's look at the impetus for green hydrogen in this country, because we've had some announcements on it. Is green hydrogen the most expensive, least efficient power produced on the planet?

**Mr. John Hannaford:** When it comes from electrolysis, it is expensive, and it is relatively expensive to the feedstock of natural gas. Again, this is subject to evolution, and that's partially a question of investment.

**Mr. Greg McLean:** Okay. That's interesting.

I was at the International Energy Agency, and Andrew Forrest of FFI, who is one of the participants in the Canadian green energy experiment, said it will be 20 to 30 years before it's anywhere near economic as far as green hydrogen is concerned. Are we investing billions of dollars in a technology that might emerge 20 or 30 years down the road?

**Mr. John Hannaford:** Mr. Chair, there are current applications of hydrogen—

**Mr. Greg McLean:** No, we're talking about green hydrogen, not hydrogen.

**Mr. John Hannaford:** But in a certain sense, hydrogen is hydrogen. There are current applications once one has created the hydrogen that exists right now, and that includes transportation. You're seeing applications in trains, for instance.

**Mr. Greg McLean:** No, Mr. Hannaford, the question is on the inefficiency of the process in green hydrogen. We actually consume more power, if you'll acknowledge that, producing green hydrogen currently than what comes out the other end, so effectively we're energy-negative. Would you agree?

**Mr. John Hannaford:** I think the question becomes the manner in which you are generating the energy. One possibility that is being considered very actively right now is using wind on the east coast, where you use wind to generate the electricity that then converts the water into hydrogen. That—

**Mr. Greg McLean:** All of that results in more power consumed than energy produced, at the end of the day. Then there's the shipping of it over...of course, into ammonia or methanol, for a buyer who is not locked up, at this point in time, to pay the exorbitant amount it's going to cost for that energy or hydrogen chemical alternative.

Is this something that you were just hoping would emerge, the different pieces of it, or is there any plan to actually look at what the expectations are, where the market is and what people will pay for this, at the end of the day?

**Mr. John Hannaford:** We have active arrangements right now. We have an arrangement with the Germans, which is a structured conversation precisely to determine what that market will look like, and—

**Mr. Greg McLean:** I had a discussion with the Germans last year about taking Canadian LNG. It was too expensive for them. Are you now going to tell me that they've committed to taking the

most expensive power on the planet at whatever it costs us to produce it?

**Mr. John Hannaford:** Your conversation continues on LNG as well. A number of drivers would lead the Germans to be interested in the conversations we are having right now. One of them is the fact that there is an energy challenge in Europe right now as a result of what's going on in Ukraine. Multiple sources of energy are attractive as a result of that geopolitical reality, but—

**Mr. Greg McLean:** My understanding is that they're going to use the hydrogen they're looking to take from us for chemical processes, not for energy processes.

**Mr. John Hannaford:** The other piece of it is that they are looking at alternative energies of a number of different varieties in order to meet their climate objectives. Hydrogen is at least one potential source there, as—

**Mr. Greg McLean:** So the climate objectives—

• (1415)

**The Chair:** That is the time, Mr. McLean. We will come back to you, I believe.

Ms. Bradford, you have the floor for five minutes, please.

**Ms. Valerie Bradford (Kitchener South—Hespeler, Lib.):** Thank you, Mr. Chair.

Thank you to all our witnesses today for coming in and discussing this important topic about hydrogen's potential role to reduce greenhouse gas emissions.

Mr. Hannaford, you seem to be the popular witness of the day. Continuing on the line of questioning here, recommendation 3.34 states the following:

Natural Resources Canada should perform a comprehensive bottom-up modelling for the use of hydrogen. This modelling should account for the following:

- emission reduction efficiencies by sector (cost of emission reductions per megatonne of carbon dioxide equivalent)
- substitutional fuels (for example, biofuel, electrification, credit systems)
- feasible deployment of technologies and supporting infrastructure

How feasible would it be to integrate these elements into the department's current modelling systems and practices?

**Mr. John Hannaford:** I'm going to diversify witnesses.

**Some hon. members:** Oh, oh!

**Mr. Sébastien Labelle:** Thank you, Mr. Chair.

That's a great question, and it's one that we're working on right now. We are currently updating the modelling that we did for the strategy, and we've worked very closely with colleagues at Environment and Climate Change Canada, the Canada Energy Regulator and other departments that are interested in this. We've scoped work, and we've retained an external consultant to do exactly that.

Our plan is to have workshops within our hydrogen strategy working groups. We have 16 working groups with various parts of the private sector that are involved from the provinces and territories in various parts. Then we will validate those early results with them to understand and make sure that the assumptions are correct and realistic.

We expect that to come out in early 2023 as we continue to work on it, and then we'll publish it as we do the annual update for the strategy.

**Ms. Valerie Bradford:** Recommendation 3.35 states, “Based on the updated modelling, Natural Resources Canada, in partnership with interested stakeholders, should publish a hydrogen market development roadmap to track progress and outcomes of the deployment of the hydrogen in Canada.”

Is this approach similar to how other federal organizations address other clean technologies?

**Mr. Sébastien Labelle:** Yes, absolutely. As we think about the full potential of hydrogen in this case, we want to develop that in collaboration with people in the sector who are making investments, who are buying hydrogen and who are generating hydrogen. It's absolutely consistent with how we would, I imagine, work with other sectors of the economy and other energy sectors, yes.

**Ms. Valerie Bradford:** Should such a road map also consider including consumer and industry buy-in metrics, like willingness to adopt, implement, support its use, etc.?

**Mr. Sébastien Labelle:** Yes, absolutely. In the context of our clean fuels fund, for example, we have an awareness component to that. We provide a little bit of funding to promote that public awareness and confidence in fuels like hydrogen and other clean fuels.

**Ms. Valerie Bradford:** What is the status of the regional blueprints that you've been developing in partnership with provinces, territories and key stakeholders?

**Mr. John Hannaford:** I can take that one.

The whole process was launched last June, and the initial phase was with respect to British Columbia, Newfoundland and Manitoba. Since then, we've launched across the country. There are still a few provinces outstanding, but conversations are well under way.

At this stage, we are working on identification of shared priorities in order to then go to the next stage, which is a very focused conversation, not only with the province or territory but also with indigenous communities, labour movements, local business communities and other experts to basically dig down as to where we can make a real difference here and think about how best to mobilize the resources we have available to us to do so.

**Ms. Valerie Bradford:** What is the status of the reporting framework for the biannual progress report that will track the progress on the recommendations outlined in the hydrogen strategy for Canada?

**Mr. John Hannaford:** We're on track for the next progress report next year.

• (1420)

**Ms. Valerie Bradford:** When is it due?

**Mr. John Hannaford:** I believe it's March. Is that right?

**Mr. Sébastien Labelle:** I believe so, yes.

**Ms. Valerie Bradford:** How much time do I have left, Chair?

**The Chair:** It's time. I just wanted to confirm that it was March. The microphone is flicking on and off.

Thank you very much.

Ms. Bradford, I'm afraid that is the time, just a few seconds over.

[*Translation*]

Mr. Trudel, you have the floor for two and a half minutes.

**Mr. Denis Trudel:** Thank you, Mr. Chair.

Mr. Hannaford, I will leave you for now. I may come back to you later.

Ms. Hogan, what is Canada's carbon tax set at currently?

**Ms. Christine Hogan:** It is \$50 a ton.

**Mr. Denis Trudel:** The tax will go up in January. What will it be then?

[*English*]

**Ms. Christine Hogan:** It will be increasing by \$15 each year in April, not in January.

[*Translation*]

**Mr. Denis Trudel:** So it will be going up to \$65 a ton. That means that when our conservative friends say that the carbon tax will be tripled, they are talking through their hats. That is not going to happen.

However, according to the Organization for Economic Development and Cooperation, the OECD, the tax would have to be set at \$175 per ton in 2030 to be efficient. Many experts in the world are saying that if we want to reduce greenhouse gas emissions, one of the most useful tools would be a tax.

Isn't Canada's carbon tax far from being what it should be?

[*English*]

**Ms. Christine Hogan:** I have to confess that I'm not specifically familiar with the OECD report you're referring to, but as you know, putting a price on pollution is one of the foundational building blocks of Canada's climate plan, and we have laid out a trajectory through to 2030. That will take us to \$170 a tonne.

[*Translation*]

**Mr. Denis Trudel:** Earlier, I mentioned UN experts, including the Secretary General, who stated that we have to leave oil in the ground if we hope to hit our targets.

In the meantime, Canada has given the green light to the Bay du Nord oil project off the Newfoundland and Labrador coast, which should churn out 500 million to 1 billion barrels over the next 30 years.

Isn't that rather incompatible with the 40 to 45% greenhouse gas reduction targets announced by the government last April in its budget?

[*English*]

**Ms. Christine Hogan:** I would ask if you could just repeat the question. I'm not sure I fully—



[*Translation*]

**Mr. Denis Trudel:** My question is about the Government of Canada's Bay du Nord project. This oil project off the coast of Newfoundland and Labrador will be producing between 500 million and 1 billion barrels over a period of 30 years. The UN, however, is stating that we should leave the oil in the ground if we want to reach our goal of keeping the increase to 1.5 degrees. What's more, Canada has set a greenhouse gas reduction target of 40 to 45% for 2050.

Doesn't that commitment clash with this type of project?

[*English*]

**Ms. Christine Hogan:** Mr. Chair, the Bay du Nord project is one that I'm familiar with. It's somewhat outside the scope of our discussion here today. We'd be happy to come back and talk about those issues.

**The Chair:** Thank you very much.

Members, I did allow more time there because the witness did not understand the question, so I allowed Mr. Trudel to repeat it. I know he went well over his time, but sometimes, given the challenges of translation.... I wanted to allow that. If you're watching the clock, I know that he was over, but I think we ended up at the right place.

Mr. Desjarlais, you have the floor for two and a half minutes.

**Mr. Blake Desjarlais:** Thank you very much, Mr. Chair.

If we can, I want to return to the deputy minister of environment.

In my previous round of questioning, we heard that in relation to the two models—and I'll be as clear as possible—one of those models projects existing policies and investments, and the other one projects what the Office of the Auditor General and the commissioner are calling “assumptions”. We just heard from the director general of your department that it's the policy intention to adopt some of these policies over time and to build them into the plan.

They sound more like goals than a solid plan where we could project with credibility a guaranteed reduction in emissions. If we're lending this much credibility to what is defined in the commissioner's report as assumptions, have you actually spoken to the minister directly about adopting these principles that are within your reporting to hit the targets that he has committed to?

• (1425)

**Ms. Christine Hogan:** Thank you very much.

One thing I would like to say in response, Mr. Chair, is that of course if you go from the strengthened climate plan to the emissions reduction plan that came out some 14 or 15 months later, the modelling that went into the strengthened climate plan evolved to reflect the actions, decisions, policies and measures that the government had taken and then updated again. This continues to be how the modelling work progresses and I—

**Mr. Blake Desjarlais:** Would you define it as incremental? It seems to me that it's more like action by increment than firm action by policy decisions.

If there's a magic list of policies you have that the government needs to adopt to actually get to the targets that are set out as per the plan, has the government actually invested in those solutions? One of those solutions from the plan that I would like to remind you of is in relation to the greening of our energy grid. How much money has the minister committed to that?

**Ms. Christine Hogan:** I think the response is that, if you look at the emissions reduction plan on its own, it contained \$9.1 billion of investments across the economy in various sectors, and there were subsequent investments made in budget 2022—

**Mr. Blake Desjarlais:** On this specific one, the report says—

**The Chair:** I'm afraid that is the time, Mr. Desjarlais. Pardon me.

I'm turning back to Mr. McLean.

You have the floor for five minutes, please.

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

I'm not going to try to pick on any of the witnesses here, so this is for whoever wants to answer this question.

We've talked about this incremental approach we're going to have to take in our infrastructure system, particularly in our gas infrastructure system. We'll put 5% hydrogen into the gas mix, first of all, and then move it up from there—three to five years each time—and see what happens from an effects perspective.

Was it prudent, then, for NRCan to move forward with a transformative approach, as opposed to an incremental approach, in looking at what the outcome would be as far as emissions go?

That question is for anyone.

**Mr. John Hannaford:** I think that's probably for me.

As I mentioned at the outset, the intention of the strategy was to set out full potential. Since the strategy was released, we've taken a series of measures at NRCan, including through the clean fuels fund, to look at specific applications of clean fuels. That includes hydrogen as a significant area of focus.

Recent announcements were of \$800 million, and there will be subsequent announcements before too long. Those are specific investments in specific projects that will continue to move along the technology and the applications of the technology.

In addition to that, I mentioned earlier the tax credit that has been included as a fiscal measure recently, and that's—

**Mr. Greg McLean:** Tax credits don't reduce emissions.

Let me read the paragraph we're talking about. It's paragraph 3.27. I'm sure you know it:

The transformative scenario developed by Natural Resources Canada projected that hydrogen could represent up to 15% of the emission reductions needed to meet the 2030 target. In contrast to this, we found that one of Natural Resources Canada's incremental demand reports projected that in 2030, hydrogen will contribute only 0.5% of the 2030 target and 5.5% of the 2040 target. The department did not find this estimation compelling and chose to use more aspirational numbers in the Hydrogen Strategy for Canada modelling.

This is a choice you made. It isn't something that was based on any reality. It was, "We need a result. We need to put some numbers here that actually show we're going to do something." That defies the reality that exists in your department.

I'll take comment on that, but it seems to be a huge stretch how you arrived at these numbers, Mr. Hannaford.

• (1430)

**Mr. John Hannaford:** Mr. Chair, as I said, the intention here was to introduce a call to action. That included ambitious potential actions that could be taken to advance the use and production of hydrogen.

I would take one step back too. When we talk about the transportation of hydrogen, infrastructure is part of that, but the applications become part of it too. We think about the use of heavy vehicles as applications of fuel cells. That is a localized use, which is obviously intended for movement, but that's not the use of a—

**Mr. Greg McLean:** Mr. Hannaford, thank you. I have fleeting time.

How much time do I have, Mr. Chair?

**The Chair:** You have a minute and a half.

**Mr. Greg McLean:** Mr. Hannaford, or one of your officials, are you familiar with Enerdata, an international energy data collecting firm? Enerdata shows that Canada's energy as a percentage of our GDP has gone down over the last 30 years from 26%—that's 26% input for each unit of GDP—to 17%. We're still the fifth highest in the world. We know that. We live in a northern climate, but we've made significant progress in terms of the amount of energy we consume.

If we produce green hydrogen, that ratio is going to reverse. The number one way we can address global warming is to keep that efficiency ratio going down.

Would you agree with that?

**Mr. John Hannaford:** I'm sorry, Mr. Chair. I'm not familiar with the report.

What I would say is that in order for us to achieve our overall climate objectives, we're going to have to think through a number of different technologies, and hydrogen is one of them.

**Mr. Greg McLean:** Even though at this point in time it is power- or energy-negative...?

**Mr. John Hannaford:** As I said, Mr. Chair, the—

**Mr. Greg McLean:** What I'm saying is that you're saying, "Okay, it doesn't matter how much greenhouse gas we produce between now and 2030. It matters what might happen in 2060." So, it's short-term pain, environmentally, for potential gain way down the road.

**Mr. John Hannaford:** Well, I'm not saying that we would be increasing our carbon footprint as a result—

**Mr. Greg McLean:** Well, I am. The production of all this equipment—

**The Chair:** That is the time.

Ms. Yip, you have the floor for five minutes.

**Ms. Jean Yip (Scarborough—Agincourt, Lib.):** It's great to see so many witnesses here in person. Thank you.

My question is for Ms. Hogan.

Environmental groups say that the carbon capture, utilization and storage tax credit is yet another subsidy. Why are you putting that in place?

**Ms. Christine Hogan:** I would say that, similar to some of the earlier comments that have been made, it's going to take a whole suite of measures to achieve what are some very ambitious climate goals in Canada.

I think my colleague from Natural Resources Canada spoke very well about the potential role of things like carbon capture, utilization and storage and other technologies. It is one important piece, and the government's decision to put in a tax credit is in recognition of that.

**Ms. Jean Yip:** Mr. Hannaford, with respect to CCUS, do you feel that it's on target to reach net zero by 2050?

**Mr. John Hannaford:** I'm sorry. Do you mean with respect to carbon capture and storage?

**Ms. Jean Yip:** Yes.

**Mr. John Hannaford:** I think carbon capture and storage has the potential of making a real contribution.

As I mentioned earlier, we are already seeing the application of the technology, and it continues to evolve. As parts of industry look to reduce their carbon footprint—the Pathways group out of the oil sands has enunciated a vision of being net-zero—that will be a significant application of carbon capture and storage to meet our overall objectives over time.

**Ms. Jean Yip:** Thank you.

Ms. Hogan, what is the status of the commitment to convene an expert-led process to provide advice on the modelling regime? I know you touched on experts, but I'd like to know a little bit more as to what these experts will be doing.

**Ms. Christine Hogan:** As I mentioned, that is something that is referenced in our action plan. It is something that we spoke to in the emissions reduction plan.

The work is under way. I can tell you that the independent expert has completed an initial scoping exercise with Environment and Climate Change Canada staff and internal and external modelling experts. This exercise will inform how we move forward and—

• (1435)

**Ms. Jean Yip:** I'm sorry. What do you mean by "scoping"?

**Ms. Christine Hogan:** They're looking at what the specific terms of reference might be for the next steps, how broad the expert process should be and how we might want to proceed with the engagement of experts, internal and external, by government.

I think the important thing for members to be aware of is that we do intend to incorporate the advice that comes out of this expert process in time for the 2023 ERP, the emissions reduction plan progress report that is required under the Net-Zero Emissions Accountability Act.

**Ms. Jean Yip:** Thank you.

Mr. Hannaford, what is the role of hydrogen in addressing Europe's energy crisis? I know that you mentioned just a little bit, but I'd like to hear more.

This is what happens when you're at the end; you want to hear more of just little points.

**Mr. John Hannaford:** Mr. Chair, as I mentioned, the geopolitics have certainly changed in Europe, obviously, as a result of the aggression of Russia in Ukraine, and that has really brought to the fore the geopolitics of energy.

Our partners are looking to Canada to continue to be a significant energy supplier and are looking at various means by which that could take place. We've talked very briefly about the arrangements that we have in place with such key partners as Germany. Just to expand on that a bit, we had the degree of interest of having the chancellor visit Canada in order to reinforce the relationship in a number of ways, and hydrogen was a very significant part of that conversation. We've seen that one of the outcomes of that was an MOU that was signed with the German government.

We also have ongoing conversations with the European Union generally and with other members of the European Union around energy. Hydrogen for the Europeans is an avenue that they are actively pursuing. That's in terms of the application of the technologies but also looking at sources, and Canada has real potential with respect to that as a possible reliable exporter in a world where the geopolitics are complicated.

**The Chair:** Thank you very much. That is the time.

We're turning to Mr. McLean again.

You have the floor for five minutes, sir.

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

That's a good follow-on there. Thank you, Mr. Hannaford, for talking about Germany and their role in the world right now.

Germany came here asking for LNG, and our Prime Minister said that there is no business case for LNG, which was loudly contradicted by every business interest in Canada. As much as they would have come here and said, "Can you get us some LNG?", we said no, apparently.

However, there is an MOU here for hydrogen for their chemical processes. This is not for their power processes. This is what it's going to be meant for going forward. This isn't the production of hydrogen for energy purposes. It's the production of hydrogen for

chemical processes. I'll reiterate that, as it's my understanding from meeting one of the proponents.

If we're going to meet the world's needs, we're talking about \$50 per MCF equivalent that was paid for natural gas in Europe this summer. Your modelling shows a natural gas price of \$379 here. That's a 2020 number, I appreciate, in Canada. If we multiply that by the amount they're paying for gas over in Europe right now, it's an astronomical number, but on an inflationary number, think about what we're talking about, because your numbers show that if we use green hydrogen in Canada, the amount is 20 times higher for energy production than it is with natural gas. That's \$379 versus \$62.60 per equivalent unit of energy.

Can you tell us what effect you think this is going to have on inflation for Canadians who need to power their homes?

**Mr. John Hannaford:** Mr. Chair, there are several elements to that question.

First of all, the ongoing modelling is something that continues to evolve. We mentioned earlier that we continue to have conversations with colleagues at ECCC, with the CER and with outside sources to make sure that we have refined models of what the future of hydrogen is.

With respect to LNG, there are a couple of points. One of them, as we look at the next steps with respect to—

• (1440)

**Mr. Greg McLean:** I'm sorry, Mr. Hannaford. I'm not asking for input and an analogy. I was stating what happened in the news with our elected officials.

What I'm asking you is about the cost to Canadian consumers in switching to a green hydrogen industry development that replaces a natural gas energy source. If your numbers are right, it's 20 times more expensive. Is that correct?

**Mr. John Hannaford:** As I said, Mr. Chair, the ongoing review of our modelling is to be as accurate as possible. We'll see the outcomes of that with our next—

**Mr. Greg McLean:** Your model here shows that it's 20 times more expensive.

Is that correct? If it's incorrect, let me know.

**Mr. John Hannaford:** The numbers that are reflected in the report are from 2020.

**Mr. Greg McLean:** Yes. Do you think the number of \$60.60 per MCF equivalent for the production of green hydrogen has changed now? Do you think that number will go up?

**Mr. John Hannaford:** I think one of the reasons we're continuing to have the conversations with experts is to make sure that we have the most accurate number possible.

**Mr. Greg McLean:** I deal with the experts here. A group called The Transition Accelerator is moving incrementally toward getting hydrogen into our economy as a solution, but your transformative approach was a Hail Mary, just to throw something at the wall, which should never have been considered by a serious government department.

I am challenging you on that. Why did you ever go with that scenario?

**Mr. John Hannaford:** Mr. Chair, the intention of the report was to show the full potential. We have taken a series of tangible steps over the course of the last several years, including significant investments in the production of hydrogen through natural gas sources. That's concurrent with steps that have been taken by provincial governments and will be reflected in further work that we do with the provincial and territorial governments through the regional table approach.

This is all with the view to being as tangible as possible in how we take steps with respect to the evolution of our energy markets.

**The Chair:** You have 30 seconds, Mr. McLean.

**Mr. Greg McLean:** We've talked about costs. We've talked about infrastructure. We've talked about the actual delivery and the net-negative energy proposed in green hydrogen.

Do I have another round, Mr. Chair?

**The Chair:** No, you don't.

**Mr. Greg McLean:** Okay.

The effect on Canadians is going to be severe. Would you acknowledge, Mr. Hannaford, that there's a lot we don't see here as far the results are concerned, and that the cost effect on Canadians is going to be huge if we move in this direction?

Is inflation at all a part of your concern?

**Mr. John Hannaford:** We're absolutely mindful of cost as a general matter with respect to energy policy. The recent announcements with respect to things like heat pumps were with a view to the energy cost for individuals.

We view hydrogen as a matter of potential, not only for the application domestically but also because there is a global market that is forming here. That has the potential of having significant economic benefits for Canada.

**The Chair:** Thank you.

Just as a clarification, Mr. McLean, there will be another round for the Conservatives. I'm told you might be taking that, so we might see you again.

Mr. Dong, you have the floor for five minutes.

**Mr. Han Dong:** Thank you very much, Chair.

I want to follow my Conservative colleague's question, looking at this technology from the consumer's side. We know the government has set very aggressive goals for all new cars on the market not to have combustion engines using fossil fuels.

How soon will we see vehicles on the road using hydrogen technology? It's a bit unfair to ask this, but do you have any estimate at all?

**Mr. John Hannaford:** We're seeing them now. There are hydrogen vehicles driving on Canadian roads.

**Mr. Han Dong:** Say, 10 years from now, will we see a good portion of them being used by Canadians and Canadian families?

**Mr. John Hannaford:** There are going to be a variety of different ways of dealing with transportation. It's possible that light vehicles may steer more towards battery technologies rather than hydrogen technologies. It may be that the way the market will work is to steer more towards medium and heavy vehicles applying hydrogen technologies.

The use of a fuel cell is possible in a consumer car. There are examples right now. We are also making investments with respect to the infrastructure, because that's obviously a critical enabler here. We are looking at stations that will allow for refuelling.

• (1445)

**Mr. Han Dong:** Yes, that's very important, and to make it convenient so people can use it.

I've had conversations with the auto-manufacturing industry. It seems to me there's a bottleneck for what type of energy can replace fossil fuels. As you said, light vehicles are powered by electricity. It's doable. We see many of them. When it comes to larger vehicles, transports, even trains, electrical power doesn't seem to.... It seems to me there's a bottleneck.

Maybe hydrogen is a solution to replace clean diesel or whatnot. Would you agree with that?

**Mr. John Hannaford:** It certainly has potential, yes.

**Mr. Han Dong:** Just quickly, do you have any idea how much that will cost consumers? Would it be cheaper for consumers than what they're currently seeing at the gas pump? Do you have any idea on that?

**Mr. John Hannaford:** Over time, the price point will drop. This is one of the reasons why we're looking at the sorts of incentives and frameworks we are discussing right now. Right now, the relative price is higher with respect to hydrogen. That's partially a question of scale. It's partially a question, then, of investments in technology.

**Mr. Han Dong:** I want to come back to the energy cost to produce hydrogen. I didn't quite understand. I understand the line of questioning. It sounds like you need more electricity to produce hydrogen, which could then be used as a form of energy to produce electricity. Does that, in your analysis, make sense? Does that make sense in terms of energy production? Why would you use more electricity to produce less electricity using hydrogen technology?

**Mr. John Hannaford:** One of the applications here would be to take, say, wind. If you look at onshore or offshore wind on the east coast, you have the possibility of generating electricity that would create hydrogen, which could then be transported or consumed in another way. It's a way of capturing electricity, and it then becomes a vector for electricity, as well.

**Mr. Han Dong:** Safety is a major concern for this technology. Can you update the committee on the safety concerns of this technology at this point?

**Mr. John Hannaford:** I'll turn to my colleague on this.

**Mr. Sébastien Labelle:** Thanks.

That's certainly a consideration. We have dedicated working groups, and through the hydrogen strategy we are specifically looking at standards, codes and precautions. As you said, safety is certainly number one for us.

[*Translation*]

**The Chair:** Thank you.

[*English*]

That's the time, Mr. Dong, I'm afraid. That's five minutes.

[*Translation*]

Mr. Trudel, you have the floor for two and a half minutes. There is not much time left.

**Mr. Denis Trudel:** All right. Thank you.

Ms. Hogan, back to you. I was rather surprised when you didn't answer my question earlier. You are the deputy minister of Environment and Climate Change Canada. I have before me a press release from your department dated July 12, 2021, which reads as follows: "committing Canada to cut its greenhouse gas emissions by 40-45 percent below 2005 levels by 2030." That was a press release from your department.

We have the Bay du Nord project, an oil drilling project off the shore of Newfoundland and Labrador. This will produce 73 million barrels per year over the next 30 years. It will also give off greenhouse gas emissions. We have been hearing quite a bit this afternoon that hydrogen, in the short term, will not be a key measure in terms of reducing greenhouse gas emissions. Maybe that will be the case in 10 or 15 years. For the time being, however, this technology is still in its infancy. We are investing a lot of money without knowing what the results will be.

You say that the carbon tax, which will go up in April, will have a minor impact. What are the key measures, in concrete terms, that your government will use to reach the 40 to 45% reduction by 2030?

• (1450)

**Ms. Christine Hogan:** Thank you for the question.

[*English*]

I would just draw you back to the emissions reduction plan the government brought forward in March. It contained \$9.1 billion in new investments and reflects economy-wide measures, some of which you have mentioned—carbon pricing and clean fuels—while also targeting specific action sector by sector, from the building

sector to vehicles, industry, agriculture and energy, which we've heard a lot about today.

That plan was developed with input from tens of thousands of Canadians, experts and a very elaborate consultation process. It is, as I think we've tried to emphasize today, an evergreen plan, which will evolve over time, but it does present a comprehensive road map that reflects levels of ambition aligned to the Canadian target of 40% to 45% reductions by 2030.

This will be the subject of scrutiny, and it is. Through the new Net-Zero Emissions Accountability Act, the government is obliged to bring forward progress reports against that emissions reduction plan starting next year, in 2023.

There are a lot of elements to the emissions reduction plan, with very detailed implementation plans against each sector and, as I mentioned, also a fairly detailed annex that outlines exactly how we got to the measures, the modelling plan—

**The Chair:** Thank you very much.

Mr. Desjarlais, you have the floor for two and a half minutes. The time is pretty tight now.

**Mr. Blake Desjarlais:** Thank you very much, Mr. Chair. I'll be quick.

In terms of the comments just made by the deputy minister on being ambitious in the plans that they've set out to do, it's important, I believe, especially given the report by the commissioner of the environment, that we actually make sure we transition ambitions into action. That is the concern of parliamentarians, and that is the concern of Canadians.

That is what we heard in the remarks of the commissioner. It was the issue of trust in ensuring that we can actually build the public capacity and the public trust that are necessary to achieve those goals. We heard that from the commissioner this morning in terms of the concept of trust.

For the deputy minister, how do we intend to actually ensure that we build trust for Canadians and ensure that we hit the targets that are set out by the government, when we know that the data that's collected in terms of the modelling to this point is insufficient in the way that it presents information and in some ways can be seen as misleading? I think that is the important part of the report that was published by the commissioner, as it distinguishes between facts and assumptions.

In relation to the assumptions—those things that are necessary to hit the targets here in Canada and that may not actually be invested in—how do we actually close that gap? What do you do, directly as the deputy minister, to actually achieve the construction of the good policy that you call part of the evergreen strategy? How do you actually build the things that are needed in Canada—like a green energy grid—into the actual work of your department? How do we actually get to a point where we see those results in a transparent way?

**Ms. Christine Hogan:** What you're highlighting is the attention to implementation. I think that is fully my preoccupation and the preoccupation of many across government who have initiatives that are detailed in the emissions reduction plan. It's one of the reasons the plan includes an implementation plan sector by sector, so that you can see how the various initiatives and measures are being advanced.

There will be—

**Mr. Blake Desjarlais:** But are they being invested in?

**Ms. Christine Hogan:** Yes, they are. I mentioned the \$9.1 billion that came and subsequent investments in budgets.

**Mr. Blake Desjarlais:** How much has been invested in the green grid?

**Ms. Christine Hogan:** I don't exactly have that number, but I can get you that. I'm happy to do so.

**The Chair:** I'm sure Mr. Desjarlais would like that information.

Your time is up.

We will now turn back to Mr. McLean, please, for five minutes.

• (1455)

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

Thank you, Mr. Desjarlais. Those are really important questions.

I am going to go to paragraph 3.31 and one of the criticisms in the report here:

We found that when assessing opportunities to generate hydrogen using electrolysis, Natural Resources Canada assumed a very low price of electricity across all provinces. For example, it assumed an electricity price of \$40 per megawatt hour across all provinces. This was well below the recent prices observed in Canadian provinces in 2020, which ranged from \$52 to \$124 per megawatt hour....

It was \$264 in the Muskrat Falls scenario.

This meant that the department overestimated the opportunity of electrolysis to produce hydrogen at a low cost.

Following Mr. Desjarlais, all the assumptions you're making in this report you've put forward seem like they're back end-engineered. Can you comment on that, please?

**Mr. John Hannaford:** I'll turn to my colleague on this one.

**Mr. Sébastien Labelle:** The process to come up with those cost assumptions was not NRCan's alone. We hired external consultants. We had lots of engagement with lots of experts across many of the provinces, if not all. That's how we came to this number.

**Mr. Greg McLean:** So you're saying that there is plenty of blame to go around.

**Mr. Sébastien Labelle:** I'm sorry. Is there a question?

I think we are updating those assumptions based on the new costs as they become clear, and we'll have that in March or early next year.

**Mr. Greg McLean:** Well, I'll comment that Canadians do expect you to give them a realistic scenario about what we're facing here, and I think the report is quite clear that this is a very unrealistic scenario.

Let's talk about the full-cycle cost of carbon involved in green hydrogen or any type of hydrogen, if you will, because it does matter. It matters with the production of steel, concrete, copper and everything that's going to come from overseas to produce new turbines. They have a two-year run rate before they're energy-positive with the inputs that go into their production. In their 10-year life, obviously they're going to produce something at the end of the day, but they're also going to produce a lot of emissions. Those emissions go up as the resources in the world become more scarce.

Have you modelled that into your scenario at all? That would be an environment question, I think, more than anything.

**Ms. Christine Hogan:** Derek Hermanutz, would you like to respond to that in terms of the scenarios?

**Mr. Derek Hermanutz:** Yes, I would just say that our scenarios work in consultation with other departments and other parts of the department to try to build in the most realistic assumptions that we can, using the best information we have at the time.

**Mr. Greg McLean:** Okay. Well, thank you very much.

I think we've proven pretty clearly in this report that the assumptions built in here don't seem realistic at all, but there is a cost here. There is a short-term and a long-term CO2 cost, and there is an indication why we aren't getting lower-carbon production in Canada: We aren't counting the full cycle of this.

Offshoring carbon production doesn't work either. If we get wind towers built in Germany and don't count that as part of our carbon footprint if we're going to use them in Canada for producing hydrogen, then we are missing half the equation.

I'm going to go back to the modelling here from both your departments. Was this modelling driven from on high in order to come up with a result to meet a government narrative, as opposed to a realistic scenario?

**Mr. Derek Hermanutz:** I would say it's our most realistic scenario at the time of the strengthened climate plan. It's a bottom-up modelling initiative, so it looks at each individual policy in conjunction with each other—

**Mr. Greg McLean:** Wait, so is this the difference in the ECCC plan? You're telling me about the bottom-up analysis, which would be the incremental analysis, not the transformative one that NRCan put together. I'm getting a bit of a contradiction here.

**Mr. Derek Hermanutz:** I'm speaking of our Environment Canada modelling.

**Mr. Greg McLean:** Okay. It differs strongly from the NRCan model, the transformative NRCan model. Is that correct?

**Mr. Derek Hermanutz:** It's a different exercise, as we said from the start.

**The Chair:** You have 30 seconds, Mr. McLean.

**Mr. Greg McLean:** The exercise is to come up with a realistic scenario about what this is going to cost Canadians, what this is going to cost the environment and how we actually attain the goal.

I'll ask other departments if they can put something reasonable on the table here about how we come to a result that ends up with actual decarbonization in the world.

• (1500)

**Mr. John Hannaford:** Mr. Chair, I would say that we are continuing to have our conversations with experts, with other departments and with the CER, all with a view to being as accurate as we can be as to this area.

**The Chair:** Thank you very much, Mr. McLean. That is your time.

Mrs. Shanahan, did you have any more questions? The floor is yours.

**Mrs. Brenda Shanahan:** I would just like to allow each department to summarize why they used different models, because I think that's the key here. Assumptions go with models, and models are attached to the strategy or the approach.

I'll go to the environment folks first. Can you explain the difference in modelling assumptions between your department and Natural Resources Canada?

**Ms. Christine Hogan:** Thank you. I always appreciate the opportunity to further clarify.

As I mentioned in my opening comments, Environment and Climate Change Canada's modelling, the modelling that's referenced in the commissioner's report, focused on a set of policies and measures contained in the strengthened climate plan, including a single proxy for a hydrogen strategy that was still under development at that time.

It's important to distinguish the modelling that NRCan did to develop its hydrogen strategy from the work that Environment Canada did to produce a model for a broad, comprehensive climate plan.

Hopefully, that helps clarify matters somewhat.

Also, I'll underline that the modelling Environment Canada undertakes for things like the strengthened climate plan or the emissions reduction plan is done following international guidelines that are established for reporting on progress related to Canadian targets.

Thank you, Mr. Chair.

**Mrs. Brenda Shanahan:** That's excellent.

If I can, then, I'll ask Mr. Hannaford if he can summarize why NRCan took the approach that it did in modelling.

**Mr. John Hannaford:** Thanks, Mr. Chair.

Our intention through the hydrogen strategy was to create a call to action, which was to show the potential of this area of energy generation. This was something that was a product of analysis that was done, as my colleague mentioned, through a series of consultations with experts.

We continue to do that consultation. That's one of the reasons why we are committed to a progress report, which will further refine the picture that we have been painting with respect to the future of hydrogen, and we'll continue to work with our colleagues at Environment and Climate Change Canada and with the Canada Energy Regulator.

**Mrs. Brenda Shanahan:** That's excellent. Thank you.

I'd like to go back to Environment Canada.

What are some of the regulatory incentives for clean hydrogen? Can you describe those?

**Ms. Christine Hogan:** Yes. Thank you for that.

We have a range of them. Some of them I referenced in my opening statement, including the clean fuel regulations that were published in July 2022. Also, Natural Resources leads the work on the complementary clean fuels fund that has been put in place to help incentivize clean fuels and technologies, including hydrogen.

I would also highlight the role that carbon pollution pricing can play in this space, because it does create incentives for cleaner fuels and cleaner technologies.

Those would be two things I would highlight.

Also, members mentioned earlier the work that is under way related to clean electricity and potentially the role that hydrogen will play around cleaning Canada's electricity grids over the coming decade. Those would be a couple of things I would highlight.

Thank you again for that question.

**Mrs. Brenda Shanahan:** Thank you.

I have a general question now. We're always curious what other countries are doing with hydrogen.

Ms. Hogan, go ahead if you have an answer, or we can turn to Mr. Hannaford.

**Ms. Christine Hogan:** I will happily defer this one to John Hannaford. This is a very dynamic space, which I know Mr. Hannaford has referenced a bit already in his remarks today.

**Mr. John Hannaford:** Yes. It is a dynamic space.

I mentioned the situation in Europe, where they are looking at a whole series of applications of hydrogen and hydrogen generation. Asia is another area where there is very significant interest and potential. We have been in conversations with our friends in Korea and Japan about the possibilities for hydrogen.

There continues to be interest in that regard, and there is a series of investments being made in those jurisdictions with respect to the consumption of hydrogen and the sorts of applications that could be made in energy generation, transportation and industry.

• (1505)

**Mrs. Brenda Shanahan:** Thank you very much.

That's all for me, Chair.

**The Chair:** Thank you very much.

I want to thank everyone for coming in today. I appreciate the witnesses coming in as well, and in person. It's always great for committee members here on a Friday to see people back.

With that, I will adjourn the meeting.

Thank you again for your time. Have a good weekend.

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