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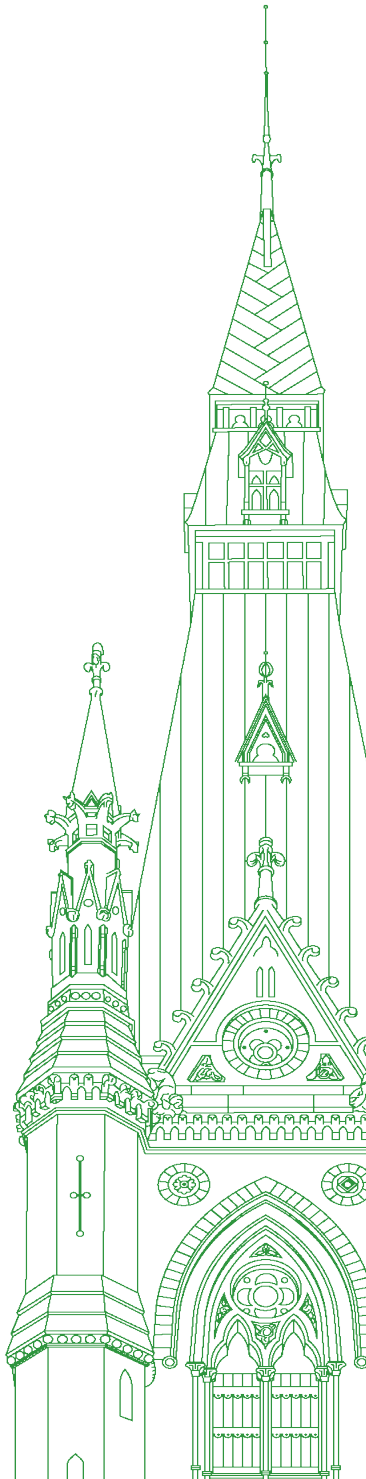

Chair: Mrs. Sherry Romanado

Standing Committee on Industry, Science and Technology

Tuesday, November 17, 2020

● (1105)

[*English*]

The Chair (Mrs. Sherry Romanado (Longueuil—Charles-LeMoyne, Lib.)): Good morning, all. I now call this meeting to order. Welcome to meeting four of the House of Commons Standing Committee on Industry, Science and Technology.

Today's meeting is taking place in a hybrid format, pursuant to the House order of September 23, 2020. The proceedings will be made available via the House of Commons website. So that you are aware, the webcast will always show the person speaking rather than the entirety of the committee. To ensure an orderly meeting, I'd like to outline a few rules to follow.

Members and witnesses may speak in the official language of their choice. Interpretation services are available for this meeting. You have the choice at the bottom of your screen of floor, English or French.

For members participating in person, proceed as you usually would when the whole committee is meeting in person in a committee room. Keep in mind the directives from the Board of Internal Economy regarding masking and health protocols.

Before speaking, please wait until I recognize you by name. If you are on video conference, please click on the microphone icon to unmute your mike. For those in the room, your microphone will be controlled as normal by the proceedings and verification officer.

This is a reminder that all comments by members and witnesses should be addressed through the chair. When you are not speaking, your mike should be on mute. With regard to a speaking list, the committee clerk and I will do our best to maintain the order of speaking for all members, whether they are participating virtually or in person.

Pursuant to Standing Order 108(2), the committee is meeting today to commence study on the accessibility and affordability of telecommunications services.

As is my normal practice, I will hold up a yellow card when you have 30 seconds left in your intervention, and I will hold up a red card when your time for questions has expired.

Now I'd like to welcome today's witnesses. From Telesat, we have Mr. Daniel Goldberg, president and chief executive officer; Mr. Stephen Hampton, manager, government affairs and public policy; and Ms. Michele Beck, vice-president of sales, North America. From Space Exploration Technologies Corporation, we have Ms. Patricia Cooper, vice-president, satellite government affairs.

Each witness will present for up to seven minutes, followed by rounds of questions.

With that, I will turn it over to Telesat. You have the floor for seven minutes.

Mr. Daniel Goldberg (President and Chief Executive Officer, Telesat): *Merci.*

Good morning, one and all.

Madam Chair, thank you for inviting Telesat to participate today.

I'm Dan Goldberg, CEO of Telesat. I'm here this morning, as you said, with my colleagues Michele Beck and Stephen Hampton.

Operating for over 50 years, with our headquarters here in Ottawa, where I'm speaking from today, Telesat is one of the world's largest, most successful satellite operators. As a proud Canadian company, we play a central role in Canada's connectivity infrastructure. Today our satellites transmit hundreds of television channels to well over a million Canadian households across all of Canada through our services to Bell TV and Shaw Direct. We provide broadband and other lifeline services to rural, remote and indigenous communities, and we deliver mission critical services to Canada's national security and public safety community. That's just some of what we do here in Canada. We offer these same types of services all around the world.

We operate in what is one of the most highly competitive global markets, including here in Canada, where the market has been wide open to foreign competitors for more than the last two decades. We're good with that. We strongly support open, competitive markets, as they spur innovation and lower costs. Telesat needs and advocates for open markets all around the world, even if we don't always get them.

We strongly share this committee's objective of delivering affordable, high-capacity broadband to the millions of Canadians who lack it today, which is now more important than ever given the pandemic. Telesat has been a leading innovator in providing broadband over satellite, designing and launching the first broadband satellite in the world over a decade and a half ago. However, the reality is that the geostationary satellites we've been launching and operating for the past 50 years, even though each new generation is much more capable than the last one, are simply too far out in space to provide the kind of superfast, affordable broadband needed today.

That's why we've undertaken the most ambitious and innovative project in our long history, a multi-billion dollar, state-of-the-art low-earth orbit, or LEO, satellite constellation. Telesat LEO consists of nearly 300 highly advanced satellites that deliver affordable, fibre-like broadband and enable LTE and 5G wireless services everywhere on earth, including throughout all of Canada. It's the biggest space program ever conceived in Canada, and it's exactly what this vast country needs to help bridge the digital divide.

Telesat LEO takes a holistic, community-focused approach to connect Canadians by partnering with local ISPs, mobile network operators, municipalities and indigenous communities. Telesat LEO will provide affordable, high-capacity backbone connectivity to a community, and then our local partner will provide the last-mile connectivity to households, schools, hospitals, small businesses and the like, as well as LTE and 5G services in the community and throughout the entire country.

Telesat LEO was designed in Canada by Canadians, and MIT researchers recently concluded that it's the most effectively designed LEO constellation being developed. We expect that the satellites and some of their key components will be built right here in Canada. From here in the national capital region, we'll operate the constellation and manage all of the global traffic that traverses it. Because of this, Telesat LEO will deliver tremendous economic and social benefits to Canada, helping to create roughly 1,000 jobs, generating valuable IP and exports and positioning Canada at the forefront of the burgeoning new space economy that, of course, will help to bridge the digital divide here as well. We plan to launch beta services in roughly two years' time, with commercial service coming online in 2023.

Some of the most innovative and well-financed companies in the world are developing their own LEO constellations, including SpaceX, and I'm very pleased to be testifying alongside them this morning.

● (1110)

SpaceX is a long-time partner. It launched our last two satellites. I'll note that Ms. Cooper, who is testifying as well, is an old and dear friend of mine and a colleague. We've worked hard to open up markets all over the world to competition.

I'm very pleased to see in that regard that SpaceX has been authorized to serve Canada with its Starlink constellation. Bridging the digital divide is a massive challenge, and no one company can solve it alone.

Other major players working on LEO include Amazon; OneWeb, which is backed by the U.K. government; and China and Russia, countries that recognize both the strategic and economic importance of LEO. All these players share a conviction that LEO is a compelling way to deliver affordable broadband to people living and working in rural and remote places, which in turn will foster a more equitable, inclusive economy and society.

Telesat is a recognized global leader in satellite communications, and our Telesat LEO constellation leverages our deep technical, operational and commercial expertise and our deeply ingrained culture of innovation. Our industry is highly dynamic and competitive, now perhaps more than at any time in our 50-year history, and we're very much in the midst of a high-stakes, highly competitive global space race. With focused execution and our world-class team of professionals, I have every confidence that we're going to be a winner in this race, keeping Telesat and Canada at the forefront of the fast-growing new space economy and bridging the digital divide here at home and throughout the rest of the world as well.

Thank you again for the opportunity to participate in this important hearing. My colleagues and I look forward to answering any questions you may have for us.

● (1115)

[*Translation*]

Thank you.

[*English*]

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

We now turn the floor over to Ms. Cooper.

You have the floor for seven minutes.

Ms. Patricia Cooper (Vice-President, Satellite Government Affairs, Space Exploration Technologies Corp.): Chairwoman Romanado, Vice-Chairmen Cumming and Lemire and members of the committee, thank you for the opportunity to appear before the Standing Committee on Industry, Science and Technology today on behalf of SpaceX and our Starlink broadband system. The committee's hearing on accessibility and affordability of telecommunications services is timely and critically important.

As this committee is well aware, COVID-19 has brought into high relief the urgent need for universal, affordable high-speed broadband access. Even before the pandemic, though, Canada's connectivity strategy noted that "rural and remote communities have identified challenges accessing affordable, high-speed Internet as the number one issue impeding their economic growth."

With Starlink recently authorized by ISED to offer services throughout Canada, SpaceX looks forward to helping to close the digital divide in Canada, particularly in remote and rural areas that most suffer from broadband gaps.

By way of background, SpaceX today is the world's largest launch services provider measured by missions under contract. We design, manufacture and launch our reusable Falcon launch vehicles and spacecraft for missions to earth orbit and ultimately beyond.

In this endeavour, SpaceX has had a long and productive partnership with Canada and Canadian industry. In June of last year, for example, SpaceX successfully lofted into orbit three RCM satellites built by MDA for the Canadian Space Agency's RADARSAT constellation. In 2018, as Dan noted, SpaceX, over the course of two separate missions, launched Telesat's Telstar 19 Vantage and 18 Vantage telecommunications satellites.

Perhaps most notably, in March 2019, Canadian astronaut David Saint-Jacques became the first person to enter the Crew Dragon spacecraft while attached to the International Space Station, an important marker on the path to Crew-1, the first operational crew mission to the ISS that SpaceX successfully launched this past Sunday for our partner NASA and last night docked.

Given this history, SpaceX is proud to be embarking on another journey with Canada with Starlink, our next-generation space-based Internet system that will deliver high-speed broadband to locations where access has been unreliable, expensive or completely unavailable. SpaceX wishes to thank Minister Bains, Minister Monsef, the professional staff at ISED's spectrum planning and engineering office, the CRTC, Global Affairs Canada, Natural Resources Canada and many others, including members of this committee, for working with us throughout the regulatory process.

We are putting our Canadian approvals to good use. Within a week of receiving our licences, SpaceX began shipping Starlink kits into Canada for our early customers, including indigenous communities, and we are starting our public beta rollout for Canadians as we speak.

Canadians are increasingly relying on the Internet. Statistics Canada shows that the share of Canadians age 15 and older using the Internet rose from 83% in 2012 to 91% in 2018. As consumer demands on speed and capacity continue to grow, however, disparities in access and competitive choice persist for many communities. Indeed, 60% of rural Canadian households lack access to broadband, defined as 50 megabits per second down and 10 megabits per second up.

As a result, the Canadian government has established a bold and historic commitment: to connect 98% of Canadians across the country to high-speed Internet within the next six years and all Canadians by 2030.

Importantly, the government focused its initiatives on several key areas, including rapid deployment to address broadband gaps during the pandemic; diversity in technology pathways, recognizing that no single solution will suffice to support all Canadians; scalability, to ensure networks can grow as demand and uses of the Internet change over time; affordability; and, network quality and resiliency, particularly in the rugged environments in the north.

SpaceX strongly supports these goals, and I therefore want to direct the remainder of my statement to discussing how Starlink aligns with them.

As an initial matter, Starlink is a technology ideally suited for Canada. The constellation of Starlink satellites flying close to the earth will reach across Canada's vast territory, whether small rural communities, rugged mountains or craggy coastlines, where the cost to deploy more traditional solutions often inhibits a return on investment and consequently defers infrastructure build-out.

Even in its current beta phase, Starlink exceeds Canada's requirements of 50/10 megabits per second per user. Our early beta testing in the United States is demonstrating speeds of over 100 megabits per second to individual households, with latencies of less than 40 milliseconds.

● (1120)

Even in remote locations Canadians will have access to broadband with the performance necessary for remote learning, teleworking, telehealth, video conferencing and even competitive gaming.

With nearly 900 Starlink satellites already in orbit, Starlink is able to provide service to large portions of Canada now, including parts of British Columbia, Alberta, Saskatchewan, Manitoba, Ontario and Atlantic Canada.

As we continue to launch satellites and with future regulatory approvals in Canada, Starlink will reach even higher latitudes in the other provinces and even in the north. Because Starlink consumer equipment involves a plug-and-play device, deployment speeds become a matter of shipping timelines. Therefore, Starlink certainly is rapidly deployable.

SpaceX is well known for continually iterating and improving our technology. For the Starlink system this means incremental innovation in both our satellites in space and the consumer equipment on the ground. This iterative approach to system design allows us to inject feedback and both improve performance and expand available capacity on an ongoing basis.

The feedback from our early beta testing in the U.S. and Canada will allow us to fine-tune the Starlink service offerings over time, and with the ongoing addition of more satellites, the system can scale as market demand grows and can adjust to the ever-evolving use of the Internet.

Since our first deployment 18 months ago, SpaceX has established a regular cadence of two Starlink launches, totalling 120 satellites per month, and set a record last month alone of deploying 180 Starlink satellites.

Finally, affordability is a key factor for SpaceX since Starlink is fundamentally optimized as a direct consumer service. SpaceX is designing the system from end to end with cost effectiveness and reliability in mind. As our services grow and we transition from low- to high-volume production, we remain focused on further lowering the cost.

Madam Chair and members of the committee, thank you again for the opportunity to participate in this hearing. We're poised to offer reliable high-speed Starlink broadband to Canadians across the country.

I look forward to answering any questions you might have.

Thank you.

The Chair: Thank you very much.

We will now start our first round of questions, beginning with MP Cumming.

You have the floor for six minutes.

Mr. James Cumming (Edmonton Centre, CPC): Thank you, Madam Chair.

Thank you to our two witnesses. It's interesting to have two partners yet two competitors here speaking to the committee. I want to start with Mr. Goldberg.

Mr. Goldberg, you have received a commitment for funding of $600 million from the federal government. How does that help your expansion program and deal with, of course, this tremendous problem we have in Canada with broadband service to rural communities?

Mr. Daniel Goldberg: Telesat has been in business and providing services around the world for about 50 years, and our model, as Ms. Cooper highlighted, is a little bit different. We're not providing a direct-to-consumer solution. We're working as we have for decades with telephone companies, ISPs, municipalities and the like.

What is helpful for Telesat about that commitment from the government is that it provides us with sort of an anchor customer here in Canada, which is useful as we're obtaining the financing to build out our system. I mentioned in my testimony that this investment we're making is a multi-, multi-billion dollar investment, the biggest investment Telesat has ever made, and we've already invested billions of dollars in our satellite fleet.

Our lenders, as you can imagine, want to make sure that we're going to be in a position to pay them back, so having a committed contract like that with the Government of Canada with a sovereign user is helpful as we get our financing in place.

I would also note that it's a great deal for the government. They have a big country to connect up. We agreed to provide 140 gigabits of very high-capacity, low-latency, very reliable services at an extraordinarily low cost, multiples lower than what exists in the market today. So it's a good deal for the government, but it was helpful for Telesat too as we get this massive investment financed.

● (1125)

Mr. James Cumming: It looks as though the launch of your LEO satellite program will be two years out or more. I have two questions for you related to that.

What could Telesat do in the interim to try to help with the issues that we have with broadband across rural Canada? What's the barrier to moving more quickly? Your competitor—or maybe not a direct competitor because of the model—is certainly moving at a much more advanced pace.

Mr. Daniel Goldberg: Listen. Right now we're providing broadband connectivity services across all of Canada, and we've been doing that for a long time.

We have more capacity and ability to expand services in almost all the communities we're serving today. We're working with government at the federal, provincial and territorial levels. We're working with other ISPs and phone companies throughout Canada to open up those pipes.

That's something we can do, again, very quickly. We have proposals out there that would allow us to do all of that. We can make significant improvements, then, in the type of broadband capacity that almost all of these communities have in the coming months.

Sometimes it will take a little longer. We have to ship equipment up to the Far North, and depending whether we're hitting the sealift schedules and whatnot, that becomes the gating factor to getting the capacity out there.

As far as ramping up our LEO constellation is concerned, I expect we'll be making some announcements in the coming weeks about who's going to be building those satellites and who's going to be launching them. We're going to put the pedal to the metal on that program. I mentioned that these satellites are, in all likelihood, going to be built in Canada. We need to get going on it. We're about nine months behind where we wanted to be. COVID didn't help for that.

Am I worried about SpaceX? I'm worried about a lot of things in life. As I mentioned, we're in a massively competitive global environment. I have a super-high regard for SpaceX. They've been a great partner for us. They're one of the most innovative companies in the world.

Look. I applaud what they're doing. They are innovating. I'll say they're getting a massive amount of support from the U.S. government to develop the technology, whether it's rockets or satellites. Good on 'em.

Yes, I'm worried about being able to compete with SpaceX. I'm worried about our ability to compete with Amazon when they come along. It's one of the biggest companies in the world. Certainly, as I mentioned in my testimony, the Russians and the Chinese have their own plans. However, as I also mentioned, we have a great plan. We just need to get going on this. I'm very confident we're going to be successful.

Mr. James Cumming: Thank you for that.

I want to shift to Ms. Cooper.

Thank you. I understand you're going to have a pilot here in Canada. Once you get that pilot started, what are the barriers you might run into to try to expand that service across particularly northern Canada?

● (1130)

The Chair: Unfortunately, Mr. Cumming, you're out of time. Hopefully Ms. Cooper can answer that in a subsequent round.

We'll now move to MP Erskine-Smith.

You have the floor for six minutes.

Mr. Nathaniel Erskine-Smith (Beaches—East York, Lib.): Thank you very much, Madam Chair.

Ms. Cooper, in your testimony you spoke to cost-effectiveness and reliability. On the question of cost-effectiveness, obviously it's early days and I suppose you are delivering beta kits right now to Canadian consumers. What do you expect the cost to be for Canadian consumers for that 50/10 speed when it's up and running?

Ms. Patricia Cooper: We actually started sending out invitations on Friday to Canadians to join what we call our Better Than Nothing Beta. It's a public beta service that consumers pay for.

At the very early end of our technology development, that beta service was offered in Canada for basically the same price as it was in the U.S two weeks earlier, just adjusted for the prevailing exchange rate.

The kit, the consumer equipment you need to connect to the satellite at the residence or the small business or office is $649. That's a one-time purchase of equipment that includes an antenna, a Wi-Fi router, a mounting tripod and a whole bunch of cables.

Then the monthly broadband service subscription is $129 Canadian. That's our offer for this public beta. Critically, there are no contracts, no early termination fees and no data caps at this point.

Mr. Nathaniel Erskine-Smith: It's fair to say right now that the goal is accessibility, but in some ways we aren't really addressing the affordability question in a serious way.

Maybe I'll put it to Telesat. You're way away from beta testing, but when you are looking to recoup that investment, are you in the same ballpark as those figures, or are you seeing the cost coming down significantly in your estimation?

Mr. Daniel Goldberg: I think the costs are going to come down significantly. As I mentioned, our model is a little different. We're going to be delivering gigabits of capacity to remote communities throughout Canada, and then our partners, ISPs, mobile network operators, indigenous bands and the like, will take our capacity and distribute it throughout their community.

At the price points to which we are going to make that capacity available to them, yes, they should be able to meet the CRTC definition of broadband connectivity at even lower rates.

Mr. Nathaniel Erskine-Smith: What would that price point be?

Mr. Daniel Goldberg: Ultimately it's going to be up to our customers to define it.

It's hard for me to say. It's going to be offered by Bell. It will be offered by different municipalities and the like. I know what we're going to be providing them that service for. Beyond that, I can't say exactly what their offering will be.

I don't know if one of my colleagues has any contribution they want to make.

Stephen.

Mr. Stephen Hampton (Manager, Government Affairs and Public Policy, Telesat): Yes. Thanks, Dan.

I'll just add quickly that the biggest obstacle and barrier to delivering affordable broadband to really remote and rural communities typically is the backhaul component or backbone. With satellite, we'll be able to deliver it at a much more affordable rate, which should contribute to delivering more affordable prices to consumers.

Mr. Nathaniel Erskine-Smith: I get that. In terms of my expectation, $129 is not so affordable, but I understand it's a beta kit and you're in very early days. I would assume that there is upfront significant investment and you would imagine, down the road, when this is up and running three or five years from now, that those costs are going to come down. I wonder, though, where you would imagine those costs coming down to.

Ms. Cooper, you're starting at $129. Do you have a sense of where those costs might go?

Ms. Patricia Cooper: You're absolutely right. This is still a beta. I think we've been offering it for three weeks, so it certainly still has early adopter prices and service.

The user equipment, this phased array flat antenna that we build ourselves has content that's more advanced than most jets, so we have been driving that cost down. I think most comparable antennas on the public market have been offered with five digits, so we've made the first leaps of being able to get it into a household budget.

We expect the consumer kit to become a lot more affordable, not just from economies of scale as we ramp up to high-rate production levels, but also from ongoing design decisions that we think will drive the prices lower over time. We don't know where that is going to go. We do have our own internal targets, though.

● (1135)

Mr. Nathaniel Erskine-Smith: Mr. Goldberg, with competition being, on yours, pretty intense, for a layperson, sending these satellites into orbit and competing with other infrastructure or other companies that are sending the same infrastructure, is there the space to have multiple competitors in one geographic territory?

Mr. Daniel Goldberg: We all need to be very cognizant about where we're orbiting our satellites. We've been doing this for 50 years in geostationary orbit. It's something that we all ought to be conscious of, not only just the physical limitations of where these satellites go, but also making use of the scarce radio spectrum to make sure there's enough of it that we can all leverage to deliver the high-capacity services that we need to deliver.

Mr. Nathaniel Erskine-Smith: As someone who does a Facebook live Q and A every Thursday at eight o'clock and has had to do it, when I visit my father-in-law in Camlachie, at a truck stop because Internet is not fast enough at his place, I look forward to this becoming a reality.

Mr. Daniel Goldberg: We're all working hard on it.

The Chair: Thank you very much.

[*Translation*]

Mr. Lemire, you may go ahead. You have six minutes.

Mr. Sébastien Lemire (Abitibi—Témiscamingue, BQ): Thank you, Madam Chair.

Last week, the Prime Minister announced that the government would be investing additional funding in the current program. The existing target of connecting 95% of Canadians by 2026 will increase to 98%. As the member for Abitibi—Témiscamingue, I am genuinely concerned that the remaining 2% or 5% will be people in my riding.

Clearly, it's a major challenge to deliver last-mile or end-of-the road connectivity to the last citizens, who may be hunting camp users or cottage owners. It seems that your technology could help get those people connected and provide coverage where cables can't go.

Is that true? Is Abitibi—Témiscamingue part of your planned coverage area?

When can we say that the federal government's programs are in effect and that people in areas without service are connected?

Ms. Cooper, from SpaceX, can go first.

[*English*]

Ms. Patricia Cooper: Thank you very much.

At this stage in our beta development, our available coverage of Canada is governed primarily by how many satellites we have in space and therefore how many satellites you see from a given spot on earth. It's dictated a little by the architecture of our space constellation less than business decisions or the ruggedness of the terrain.

At this point, we're offering our early beta service to customers in Canada up to about 50°N, but as we continue to launch more satellites, we will expand that territory to eventually cover all of Canada. That, I think, is the reality.

We've done early projects, for example, in Washington state in the U.S. for the Washington state emergency office to support their first responders working in a community that has been incinerated by one of the wildfires. Even in that remote unconnected community, they were able to use Starlink—

[*Translation*]

Mr. Sébastien Lemire: I want to bring up Quebec again, Ms. Cooper.

You said you intended to provide coverage to British Columbia, Alberta, Saskatchewan, Manitoba, Ontario and the Atlantic region, but you didn't mention Quebec.

Is that an intentional oversight, or does your plan not cover Quebec right now?

When will residents of Abitibi—Témiscamingue and Quebec be able to benefit from your technology?

[*English*]

Ms. Patricia Cooper: The provinces I listed are where the beta has been offered to date. The satellites will cover all of Quebec at some point. The stage at which we offer the public beta in Quebec is now determined more by whether the tests, all the supporting documentation and install kits are stable enough that we want to translate them into French.

Right now we are providing services that are in flux with getting the feedback from our customers to try to make sure that the service is as good as it can be, and we're refining information that would be available to the consumer.

Certainly we plan to offer services in Quebec. We expect the service to be able to technically cover all the territory. We have not started our public beta in Quebec at this point, which I would remind you, started on Friday.

● (1140)

[*Translation*]

Mr. Sébastien Lemire: I must tell you it's disappointing to hear that every province in Canada is being serviced, except Quebec.

That said, the committee has learned in the course of its studies that companies are expected to match government investment dollar for dollar.

Does that strike you as a cost-effective proposition?

Can the service be provided to customers at an affordable price?

Like my fellow member Mr. Erskine-Smith, I don't consider $129 a month on top of a $149 connection fee all that affordable. Not only do citizens in remote and rural areas like Abitibi—Témiscamingue not have access to the technology, but it also costs a lot more than it does in large urban centres.

Can we expect more affordable pricing?

Do you receive enough government support to provide service that is affordable and accessible?

The question is for Mr. Goldberg, from Telesat.

[*English*]

Mr. Daniel Goldberg: We're providing service throughout Quebec today. We need to do a lot more to drive the price down, which is why we're investing billions of dollars in our LEO constellation, but we're able to serve all of Quebec today. As I mentioned, we have incremental capacity and we can improve connectivity in all the communities. We're talking to the federal government and to the officials in Quebec about this, and we have some proposals in front of them to do that.

Not only will our LEO constellation be focused on and covering all of Quebec, I think we're going to build it in Quebec. So in addition to connecting all your constituents, we're going to create around 1,000 high-tech jobs in Quebec, so we can sustain your economy, not just with broadband connectivity, but by hiring people to build this state-of-the-art constellation.

[*Translation*]

Mr. Sébastien Lemire: I can't overstate what a boon your technology would be for Abitibi—Témiscamingue. I sincerely urge you to consider making the area a priority.

The Chair: Thank you.

[*English*]

Our next round of questions goes to Mr. Masse.

You have the floor for six minutes.

Mr. Brian Masse (Windsor West, NDP): Thank you, Madam Chair.

Thank you to our witnesses for being here.

Mr. Goldberg, what exactly do we get for $600 million? Could you lay it out? What are the terms and conditions of that $600 million? How much time do you have in that commitment to fulfill any obligations that were presented?

Mr. Daniel Goldberg: The way the commitment works is that we are providing a pool of this very high throughput low-earth orbit satellite capacity, 140 gigabits. It's more capacity available for Canadian remote communities than exists on all the satellites combined, serving Canada today.

The federal government doesn't pay anything until such time that we can actually deliver that pool of capacity, so the government is not at risk for paying for something that Telesat doesn't ultimately deliver.

The term of the agreement is for 10 years. Telesat needs to make this 140 gigabits of capacity available throughout that 10-year period.

We need to make it available to everybody, and by everybody I mean ISPs, municipalities, mobile network operators, on an across country, non-discriminatory, open and transparent basis at a particular price. It's a very low price. The government pays for that $600 million, essentially $60 million a year over a 10-year period.

Mr. Brian Masse: Essentially, right now though, nothing has really improved until you start making the investments and delivering the service. The government then buys up the contracts worth $60 million per year for 10 years, provided you actually get that onto the market.

Is that, in a nutshell, how it's going to work?

● (1145)

Mr. Daniel Goldberg: For that particular contract, yes. It doesn't kick in until the LEO constellation is in service.

We've said to the government that there are things we can do now; there are things we can do in the interim to improve connectivity across Canada, and then bridge those communities over to the LEO constellation, but that's exactly—

Mr. Brian Masse: I appreciate that.

There are several government programs out there right now, and there is a lot of confusion about what they mean, especially when it finishes in terms of the consumer getting access to it. You won't provide a direct service to the customers. You will actually provide a service to the provider. So there is another step. You mentioned municipalities, where the market isn't going to provide it, and then Bell or whoever else might want to buy it, and so forth.

Mr. Daniel Goldberg: Can I comment on that?

That's right. As my colleague described, what we believe to be the case is that the major bottleneck to driving down connectivity costs across Canada is that pipe that comes into these remote communities, and we're going to disrupt the economics with that.

What's nice about what we're doing is that not only are we going to be able to provide connectivity to everyone's home, but it's also going to be available wirelessly by 5G, by LTE. So yes, we're going to connect everyone at home.

Another big focus of this committee, obviously, is making sure that all Canadians have access everywhere to state-of-the-art LTE and 5G technology. The way our system is architected, we're going to be able to do that as well.

Mr. Brian Masse: I do want to get SpaceX into this as well. I'll go to Ms. Cooper first and then back to you, Mr. Goldberg.

This is probably going to be one of the more difficult questions to answer. What are the vulnerabilities you face with using satellites? What are your biggest challenges?

There is everything from international agreements to coordinating flights off the surface of the earth, and then on top of that, the rotations in space. More and more satellites are going to be up there. What happens to them for repair and a whole series of things? At any rate, can you generally outline that for people? I understand fibre optics. We can control that. That's the LAN we have and what we use.

Ms. Cooper, you go first and then Mr. Goldberg, if I have enough time.

Ms. Patricia Cooper: That's a terrific question.

These are really complicated projects to do. There's a reason why, in the last two generations that looked to use constellations and satellites, virtually every company went bankrupt. Our founder likes to say that our job here is to not go bankrupt.

There's a lot of upfront capital that needs to be put in, from a financial perspective. There are also two dimensions on the technology side. You need to be able to build satellites that are enormously capable. Also, because they're so close to the earth, you need more of them. You need to be able to build volume.

Our constellation is over 4,400 satellites in its final deployment. We got 900 up in 18 months. We have kind of cracked the code about how to build satellites quickly and with high capability. Each launch is 60 satellites, which is about a terabit of capacity. Because we are our own manufacturer and our own launch provider, we've been able to control that deployment and manage the costs. That's been a complicated exercise, but one that I think we've made really good progress on and we are happy with where we're headed.

The next problem—

The Chair: Unfortunately, Madam Cooper, that's all the time in that round.

We'll start our second round of questions. Our first round of questions goes to MP Nater.

You have the floor for five minutes.

Mr. John Nater (Perth—Wellington, CPC): Thank you, Madam Chair.

Again, thank you to both of our sets of witnesses. It's always great to hear from them on this topic.

Particularly SpaceX, I do have to thank you for the entertainment on Sunday evening. I have a four-year-old future astronaut at home who was just fascinated at bedtime watching the launch and wondering why he wasn't able to take a Falcon rocket to go visit grandma and grandpa who are fewer than eight kilometres away. I tried to explain to him that the efficiency of using a Falcon rocket may not cover eight kilometres. Thank you, nonetheless.

Ms. Cooper, I want to pick up on where you left off about the volume of satellites needed. You mentioned 900 currently, and that 4,000, give or take, are needed.

I'm curious about next steps. How many do we need to get to that last area of Canada, the northern part of Canada? Where do we need to get to to cover that area?

● (1150)

Ms. Patricia Cooper: We need to get in the mid-1000s to be able to have enough satellites in view that when you are standing on the earth you have continuous coverage. Right now there are satellites flying above, but the signals drop out because there aren't enough of them. One pass says you have great coverage, and then there's an intermittent gap if you're outside of our coverage zone.

We expect by the end of the first quarter of next year we'll be able to serve up to the mid-50°N latitude. Then for the Far North we need to deploy polar-orbiting satellites that go pole to pole. We actually have that very close in mind. We expect to launch our first polar deployment potentially before the end of the year and certainly in the beginning of next year.

That's for the space coverage. I want to come back to that technology question. The next question is getting this very sophisticated dish cost low. That partly has some consumer electronics dynamics scale of volume. It also has a lot to do with changing some technology. We're building those ourselves as well. We're trying to move along from that early adopter phase to a really affordable consumer price, but it won't be in the first stage that we offer the beta.

Mr. John Nater: That's great. I appreciate that.

I understand it's a “line of sight to the sky” type of system, for lack of a better term. In theory, I think most places, if not all, would have a line of sight to the sky. I'm just curious. Are there any areas in Canada specifically where there wouldn't be that capacity for SpaceX to deploy Starlink?

Ms. Patricia Cooper: No, there should be enough satellites in view from most almost every place in Canada once we have that polar deployment to go to all the territory.

There can be obstructions. That means you don't see as much of the sky as you need and therefore you see fewer satellites. We have a cool app on the App Store called Starlink. You can check your field of view to see where you have obstructions—like where there are trees. It will help you place the user equipment in a place so you see the most satellites and get the best performance.

Mr. John Nater: Excellent. Thank you so much.

I want to turn to Telesat briefly with a similar type of question focusing more on the satellite launch side of things.

I might have missed it, but how many more does Telesat need to launch in order to get to a similar capacity? Under the MOU and your commitments, you're looking at two years give or take for beta, and then commercial. How many more satellites need to be launched for your constellation to get to that point of offering services to Canadians?

Mr. Daniel Goldberg: Our system is actually architected quite differently than SpaceX's is.

We are not envisioning launching thousands of satellites. We've architected our system, and I should note that we have a patent pending on this hybrid orbit topography that our colleagues have developed.

We're going to have about 78 satellites in the polar-type orbits that Ms. Cooper referred to so that we can make sure that we have phenomenal coverage of the north. We're actually starting our constellation with the polar orbit so that we can make sure that we cover all of Canada and that we cover the Far North that we're very committed to serving. Then we're going to have about another 220 satellites in these other types of orbits that are more equatorial in nature.

Our satellites are in a little bit higher latitude than SpaceX's, so they can see more of the earth, and all of our satellites are connected to one another by optical lasers, so our satellites are always online.

I have to say that—and this is true for both SpaceX and Telesat—because we have so many satellites and because from a point on earth you're always able to see multiple satellites, it's actually a whole lot more reliable than fibre.

The problem with running fibre into these rural communities is that fibre gets cut. We hear about it all the time. Satellites are much more resilient than redundant.

Thank you.

The Chair: Thank you very much.

Our next round of questions goes to Helena Jaczek.

You have the floor for five minutes.

Ms. Helena Jaczek (Markham—Stouffville, Lib.): Thank you very much, Madam Chair.

Thank you to our witnesses.

An area that I'm particularly interested in is the whole provision of telehealth. Ms. Cooper, you did allude to this.

I've been to many fly-in communities in northern Ontario and have witnessed the application of telehealth. Quite honestly, at present, it is fairly primitive. There is the issue of latency; the actual visual is incredibly important in many aspects.

I was talking to the Canadian Psoriasis Network recently. There are only four specialist dermatologists in the whole of Manitoba who really know psoriasis. Of course, patients are from across Manitoba and they have a great deal of difficulty travelling to the centres where the specialists exist.

Could you explain—perhaps Ms. Cooper first—how LEO hopefully is going to revolutionize the potential for telehealth?

● (1155)

Ms. Patricia Cooper: That's a really promising area, one that, I think, makes us feel the urgency. We feel like we're a pretty quick-moving company, but we really feel the demands of the time to jump in and help as much as we can.

Traditional telemedicine has been to connect a hospital or a clinic so that doctors can talk to each other and can consult and access, as you say, specialized, experienced medical professionals.

There are two things that we're seeing now.

One of them is in sort of escalating that sophistication. I've been talking to groups that are doing online surgeries using this kind of distanced access for telehealth, which certainly puts a lot of emphasis on reliability and on latency.

Because our satellites are so close to the earth—they're about 550 kilometres above the earth's surface—the ping to go to the satellite app is less than 40 milliseconds. That's less than what most 5G systems are going to be targeting. It's a viable platform for time-sensitive things, not just a teleconference with your doctor but increasing time-sensitive applications.

The other thing that's happening is that, instead of connecting the clinic or the hospital, increasingly health care providers want to connect the home. They don't want their patient during the course of care to come in, so it's pushing the connectivity out to a residence, even if just for a short period of time during the course of treatment.

We've been looking at these with various telemedicine groups and clinics, and I think there's a lot of promise there.

Ms. Helena Jaczek: Thank you very much.

Mr. Goldberg, a number of my colleagues have talked about affordability, accessibility and reliability.

Where I live in the rural York region, these are all major issues, especially reliability. Is there the potential for LEO to compete directly in more semi-rural areas with existing fibre? I mean compete in terms of affordability. How do you see this playing out over the next five years?

Mr. Daniel Goldberg: Fibre is a fantastic technology for delivering high-input connectivity. The problem with fibre is, first, it's expensive to trench, deploy and maintain. Second, it tends to be single thread. You can run multiple fibres but now you've doubled your cost. You can close an economic case so long as you have enough population density, because you take the expense of running one or two fibres and you amortize it across all of these users. That starts to break down when you move to communities that are more sparsely populated. It breaks down when the fibre runs have to become very long, and it breaks down further when you have to get into territories that are just challenging to deploy fibre.

Yes, we've mapped out the country. We've done our own kind of total adjustable market, really drilling down and understanding where LEO is going to be the best economic solution, where fibre is going to be the best economic solution, and microwave. It's going to be this kind of horses for courses approach to bridging the digital divide; but LEO is going to take on a bunch of that. Yes, it's going to improve the economics, particularly in those communities.

Thank you.

The Chair: Thank you very much.

[*Translation*]

Next, we go to Mr. Lemire for two and a half minutes.

Mr. Martin Champoux (Drummond, BQ): Madam Chair, there was a change in the schedule. I will be speaking.

My first question is for Mr. Goldberg.

Is Telesat at a competitive disadvantage because it doesn't provide direct-to-consumer service, and if so, to what extent? Are you not worried about getting into a price war with SpaceX and possibly losing?

Now that a player like SpaceX has entered the market, is the solution you're proposing viable without government support?

● (1200)

[*English*]

Mr. Daniel Goldberg: We have a deep understanding of the economics of delivering these services. We think that by delivering this very substantial, very low-cost pipe to our partners, we are going to give them the economics they need to be able to compete extremely effectively in all these remote communities. I think having SpaceX there too is great. As I said in my testimony, I think the more competitors we have in the market forces everyone to innovate and drives down pricing. The consumer is going to benefit from that. I think that's great.

As for government support, listen. For certain markets I expect there's almost always likely going to need to be some level of government support. That's true in Canada and that's true in the U.S. You shouldn't have any mistake in your mind that a lot of what SpaceX is doing also benefits from government support. SpaceX themselves, as they should be, have applied for the same type of rural broadband funding south of the border in the United States. The FCC has set up a very large fund, the RDOF, that's north of $20 billion U.S., and SpaceX rightly has applied and is a qualified applicant in that fund. It's hopefully going to help bridge the digital divide in Canada, but it's going to get some support from this government funding that's out there.

Our services are going to be viable. We're going to change the game in terms of the economics. For some of these very small communities it might still be the case that having some level of government support is going to continue to be necessary. We're seeing that all over the world.

[*Translation*]

Mr. Martin Champoux: Thank you, Mr. Goldberg.

I don't think I have enough time for a second question.

Thank you, Madam Chair.

The Chair: Thank you, Mr. Champoux.

[*English*]

Our next round of questions goes to MP Masse.

You have the floor for two and a half minutes.

Mr. Brian Masse: Really quickly, Mr. Goldberg and Ms. Cooper, do your companies have any partnerships or involvement with Huawei?

Ms. Patricia Cooper: We do not.

Mr. Daniel Goldberg: Neither do we.

Mr. Brian Masse: The government obviously is investing in several programs with a spectrum auction. That also is going to lead to competition to your particular situation because it will open up some different markets. I'm just curious. What is your position on the government and the spectrum auction, releasing it sooner or later?

Mr. Daniel Goldberg: I'm a big believer that in order to provide Canadians with effective, modern, advanced telecommunications services, 5G has to get rolled out in Canada. Canada is a little behind some of the other major economies on this. One of the big barriers to that is scarcity of what's called mid-band spectrum.

Telesat was a very active participant south of the border at the FCC, where the FCC repurposed about three bits of the mid-band spectrum that the satellite operators use, has repurposed it for 5G. Now we all use that spectrum today for satellites. The FCC provided $18 billion to the satellite operators to clear that spectrum and build new facilities and preserve all of those existing important services.

Our two biggest competitors, already four times bigger than we are, are splitting that $18 billion.

Canada, ISED, just started a consultation on this. Telesat came forward proactively and proposed to accelerate the clearing of mid-band spectrum because the wireless carriers need it, but we're using all that spectrum today for rural broadband and broadcast services and public safety. We propose that we be allowed to repurpose some of the spectrum, make it available quickly to the wireless operators, take the proceeds, build LEO and then get the rest of the spectrum back to the government so that they can auction it and send the cheque to the treasury.

We need them to do this. We need it to finance our LEO. At a minimum we need it so that we can maintain a level playing field with our great big international competitors that have cleared the exact same spectrum south of the border and are getting $18 billion that they're investing in ways that are competitive and threatening to us.

Thank you for the question.

● (1205)

Mr. Brian Masse: Thank you. That's a good summary.

The Chair: Thank you very much.

Our next round of questions goes to MP Sloan.

You have the floor for five minutes.

Mr. Derek Sloan (Hastings—Lennox and Addington, CPC): Thank you.

I'll give Mr. Hampton, or whoever would like to answer, a chance to answer some questions.

For the Telesat program, what will start-up costs be? Will there be additional receivers or things of that nature that need to be purchased?

Ms. Michele Beck (Vice-President of Sales, North America, Telesat): I'll take that question.

In terms of the service, to be able to provide connectivity into these remote communities, antennas will need to be deployed that are compatible with the LEO constellation. These antennas or terminals will be equipped not unlike the Starlink, but with a modem with the proper mounting gear and the antennas that will be able to receive and then transmit the signal back.

That essentially is what is required, and that will interface into the local telecommunication infrastructure, the last mile, to connect the entirety of the community.

Mr. Derek Sloan: Would you expect the cost of that to be comparable to what Starlink is putting forward, so maybe $650, under $1,000, something like that?

Ms. Michele Beck: The infrastructure that we are deploying as part of our service is enterprise grade or carrier grade. It's comparable to fibre built, so it has extremely high reliability and extreme availability. There's going to be built-in redundancy in terms of the components that form the ground solution.

We're here serving the entirety of a community. That includes full government services, public safety, schools and hospitals. They can't afford any downtime, so the way that we're designing this is to be carrier grade. It's going to be more expensive, but it will serve the entirety of the community, and those costs are essentially amortized across a much larger base.

Mr. Derek Sloan: If I understand what you're saying, you only need one receiver per community.

Ms. Michele Beck: Yes. That's correct.

Mr. Derek Sloan: Then what would individual consumers pay?

The individual consumers don't need to buy anything, but there could be some fee to spread the cost of the community receiver amongst community participants. Is that sort of what you're saying?

Ms. Michele Beck: Yes. The ISP or the telecommunications provider will invest or purchase that remote terminal. It will be installed and they'll connect that to their local infrastructure. Consumers or local businesses will pay a monthly fee for their Internet service, and that monthly fee will depend on the type or the tier of service they want to subscribe to.

The nice thing about our service is that we can make available a 50 by 10, but we can also achieve much greater data rates as well to be able to serve schools and local governments and businesses that want greater than the 50 by 10 megabits per second. We can give them gigabits' worth of connectivity.

Mr. Derek Sloan: Thank you.

Could somebody from Telesat quickly comment on the impact of this service on cellphone connectivity? It seems as if there is some impact on that. Could you comment on that briefly?

Mr. Daniel Goldberg: Yes, I'll take that one.

Basically, we're going to connect every tower on the edge of the network. Right now on the edge of the network—and you know this when you're driving on some remote highway in Canada—you don't have any cellphone coverage. Now all these towers can have a little dish that's interfacing with our LEO constellation. We can deliver as much capacity as they want to any of these towers. So we'll be extending the reach of all these wireless networks to cover all of Canada, and not just cover Canada with some thin layer of connectivity, but have available everywhere in Canada a 5G equivalent level of service, which isn't just useful for all of us when we're driving around—

● (1210)

Mr. Derek Sloan: Could I cut you off there? I'm sorry, but I want to get in one question for Ms. Cooper.

Ms. Cooper, will any direct jobs be brought to Canada through Starlink, through any satellites being built here or in any type of installation with your services? Could you comment on that briefly?

Ms. Patricia Cooper: The satellites are being made by us in the United States, and they'll be launched by us out of the United States, but we do aim to provide and install and operate gateways throughout Canada, which would be network equipment where consumer signals are aggregated. They sit on good fibre. We would have leases with local landholders and also pay fibre operators for their connectivity. Right now we're not approved for those gateways, so at this point in the early stages of our beta, those installations are in the U.S.

The Chair: Thank you very much.

We'll now go to MP Jowhari.

You have the floor for five minutes.

Mr. Majid Jowhari (Richmond Hill, Lib.): Thank you, Madam Chair.

Thanks to both witnesses. It's quite an informative session.

My colleagues talked about accessibility, affordability, speed, reliability, quality, resilience and scalability. Both witnesses talked about the number of satellites they're going to launch.

A question for me, more on the technical side, is how we are going to position all these satellites in the low orbit. When you were talking about the satellites, Mr. Goldberg, you mentioned that the 220 satellites and the 78 satellites are going to be on a higher latitude than where SpaceX is putting them. I'm looking at SpaceX talking about 4,400 satellites. Nine hundred of them are already in place. We are talking about 300 satellites. We're talking about Amazon, Russia and China putting all these satellites in low orbit.

Tell me from a technical point of view how all these satellites are going to be hovering around. I know you're moving into a polar orbit satellite to cover what you call mid-50°N and up. How are all these things going to be there? How do you guys plan to put this in and inform each other and make sure there are no collisions?

Ms. Patricia Cooper: I'd be happy to take that.

First, I'll say that SpaceX takes space safety really seriously, not only because we're a technology company and we like to solve puzzles and make sure that we invent new things, but also because we have the responsibility of carrying people—astronauts—through space. That's the highest level of responsibility, so we certainly care about this issue very deeply.

There are a couple of elements to what you asked about. One of them is the physical space. How do you keep the satellites from colliding? How do you make sure they don't run into each other? That's an important element of space safety for sure. That's done first with some planning on where the satellites are. It's often said that space is big and there are a lot of different altitudes. There are, I think, 600 kilometres between where Telesat satellites will orbit and where SpaceX's are. Satellites in plane are also quite far from each other even within their own constellation, so there's a fair amount of distance between the spacecraft in space.

Mr. Majid Jowhari: Does that mean countries and companies come together and agree that this is the altitude they're going to? Is it an honour system whereby someone can say what the most efficient altitude for them is and therefore, they're going to put it there and then everyone is going to go for that altitude?

Ms. Patricia Cooper: There is an international registry where you file for your orbital planes and your altitudes and your frequencies.

I think this wave of LEO constellations is certainly just at the very beginning, and increasingly those negotiations and coordinations are happening. For example, I think that we are the first company to do an automated collision avoidance system, in which we take data from a database of where everything is and the satellites automatically manoeuvre around those. Part of it has to do with making sure your satellites are competent and can move if you find something. Another part is making sure we're improving the fidelity of what we know of what's in space, in orbit.

These are all the pieces of this really complicated study, but I can tell you right now that we all want the environment to be able to allow other—

● (1215)

Mr. Majid Jowhari: Thank you. I really appreciate that.

I have a minute and I want to go to Mr. Goldberg.

Mr. Goldberg, you talked about repurposing that mid-band spectrum. You talked about the fact that that has happened in the U.S. and that it's benefiting them greatly. I'm sure SpaceX is using that. You touched on it, but can you expand on that one? What is it specifically that needs to get done for us to be able to open up that spectrum?

Mr. Daniel Goldberg: What needs to get done is that, right now, we're using the spectrum for all these different things that I've described. We've been using it for 50 years. In order for it to be made available for 5G, we have to literally clear the spectrum. That means taking all the users that are currently using it—

Mr. Majid Jowhari: What do we do with them? Where do we move them?

Mr. Daniel Goldberg: We're going to move them to LEO. We're going to repack them on some of our other satellites. It's very expensive. It's very complicated, but we have a plan to get it done.

Mr. Majid Jowhari: Okay. Thank you.

The Chair: Thank you very much.

We'll now move to our third round of questions.

The first round goes to MP Dreeshen.

You have the floor for five minutes.

Mr. Earl Dreeshen (Red Deer—Mountain View, CPC): Thank you very much, Madam Chair.

It's certainly nice to hear from both Telesat and SpaceX. I was fortunate enough to be with this committee when we went to Washington back in 2017. The discussion there was a Senate hearing on rural and remote broadband. SpaceX was there telling us what we could expect for LEOs in the future. It's great to see that it has finally come full circle. Yes, it does take a while for all of this technology to be there for consumers. I think that's really a significant thing that we should all recognize.

There was discussion earlier about Amazon, OneWeb in the U.K., and also China and Russia and basically looking at the strategic economic plans that we see.

What type of security protocols are required in order to make sure that the satellite array that you have can function without concerns about other actors?

Ms. Patricia Cooper: Security is—

Go ahead, Dan.

Mr. Daniel Goldberg: No, you go ahead, and then I'll follow.

Ms. Patricia Cooper: Okay.

I was just going to say that I think security is especially important not just for our consumers' data, which is a high priority for any communications provider, but also for the operation of our satellites. We have encrypted our signals and we have an enormous amount of reliability and redundancy built into our system for that security and we are operating these at the highest level of best practices.

Mr. Earl Dreeshen: Mr. Goldberg.

Mr. Daniel Goldberg: We've been doing this for 50 years, carrying consumer traffic, government traffic and enterprise traffic. We've always taken that very seriously. We've hardened our systems both in terms of flying our satellites and with respect to all of the data that comes. The reality is that these LEO systems are probably even more robust and more resilient than the geostationary satellites are. There are just a lot more of them, so from an enemy's perspective, trying to block their transmissions or trying to hack into them becomes much, much more complicated.

I think that's true for both Telesat and SpaceX. We're both doing quite a bit of work with the U.S. government, which is placing great hopes on the opportunities to use these LEO constellations. As you can imagine, the U.S. government user has rigorous security protocols that we all need to comply with if we want to carry their content.

We've been doing it for years. I think we actually have even more of the upper hand with these much more distributed, proliferated LEO constellations.

Mr. Earl Dreeshen: Thank you.

When we were in Washington, one of the discussions we had was about the stranded assets that are there from existing telecom companies. There have been billions of dollars put into their networks and into the processes that are there. They want to be able to use that and sometimes it becomes a bit of a barrier to moving forward. Is there a degree of co-operation that you feel will be necessary for them to be able to use the satellite system versus some of the other functioning that they have?

Perhaps, Telesat, you might be best able to describe that because you deal with those particular operators.

● (1220)

Mr. Daniel Goldberg: Listen. We're living the dream right now where we continue to operate assets that we launched in some cases over a decade ago and are now bringing on this multi-billion dollar capability which in all likelihood will disrupt potentially some of the investments that we made before. We always tell ourselves that we're much more focused on cannibalizing what we do than allowing somebody else to come along and do it. To some extent, these different assets are complementary with one and other and they can reinforce each other. To some extent they're competitive and I suspect like in other industries there will be some winners and some losers, which is why we're running as fast as we can at Telesat to make sure that we're on the right side of that equation.

Mr. Earl Dreeshen: Does Starlink have similar concerns?

The Chair: Unfortunately, Mr. Dreeshen, that's all your time.

I will now turn to MP Lambropoulos.

You have the floor for five minutes.

[*Translation*]

Ms. Emmanuella Lambropoulos (Saint-Laurent, Lib.): Thank you, Madam Chair.

My first question is for Mr. Goldberg, from Telesat.

Last year, you signed a contract with the Government of Canada, which will spend $600 million on your infrastructure to significantly improve high-speed Internet coverage across Canada.

Are the new satellites ready yet? If not, when will they be ready? The aim is to bring high-speed Internet access to Canadians who are still without it.

My apologies if someone has already asked that. I had to step out of the meeting for about a half-hour, so I missed some of the discussion.

Mr. Daniel Goldberg: Thank you for your question.

I'm going to answer in English.

[*English*]

My French isn't good enough.

I did speak about this a little bit. It's less an investment in Telesat or our project. It's more of a commitment to take a very low-cost capacity on the constellation that we'll make available to users over the next 10 years at a very low cost.

I mentioned that we expect to start building these satellites in the coming months. My expectation is that the satellites will be built in Canada. My expectation is that they're going to be built in Quebec. We'll start our own beta testing in about two years' time and we'll be providing service, frankly, starting off in the upper latitudes in 2023.

[*Translation*]

Ms. Emmanuella Lambropoulos: As you know, the plan is to provide high-speed Internet access to all Canadians by 2030.

That's good to hear, because you will no doubt help us get there.

[*English*]

Stargaze?

Ms. Patricia Cooper: Starlink.

Ms. Emmanuella Lambropoulos: Okay, Starlink.

[*Translation*]

I think you already have the infrastructure to provide high-speed connectivity in rural areas.

How do you prioritize regions? How do you decide which areas will be served first?

[*English*]

Ms. Patricia Cooper: That's a great question.

At this point in the early development of our system, the biggest determining factor is where there are enough satellites in view. It's determined by our constellation architecture. Then as we keep launching, we'll have a point where we can serve all of Canada. Right now we're just starting in the beta program from Friday along the U.S. and Canadian border. It's just along the northern part of the U.S. and the southern part of Canada. We want to expand that as we continue to launch more rockets with more satellites in them.

It's a subscription service. You sign up online. We'll be taking customers as we continue to grow the programs from across our coverage area.

● (1225)

[*Translation*]

Ms. Emmanuella Lambropoulos: You said you launched the program on Friday.

How long do you expect it to take?

[*English*]

Ms. Patricia Cooper: That's correct. We sent out invitations to those who had signed up online at starlink.com a couple of months ago who said they were interested. We sent out some invitations on Friday to our first Canadian candidates. We already have a couple of orders.

We also sent equipment the day after we got our ISED licence to support some specific projects. For example, one of them is the Pikangikum First Nation community in Ontario which is a remote community that really struggled with broadband access for some time and had very few options. We've been working with the community and the community leaders and expect to connect the community by the end of November.

[*Translation*]

Ms. Emmanuella Lambropoulos: I know this kind of thing is hard to predict. Our goal is to provide high-speed Internet access to all Canadians by 2030.

Do you think we can get there before that?

Can we count on your company to help us get there?

[*English*]

Ms. Patricia Cooper: We certainly think Starlink is going to be a big help in reaching places that otherwise aren't attractive for terrestrial buildout, or are too rugged to reach with terrestrial buildout. We think we will be a big part of that. I don't think satellite broadband is going to be an enormous part of Canada's existing 33 million broadband users, but it will be a contributing factor to it. We absolutely are standing ready to help those Canadians that are least connected.

Ms. Emmanuella Lambropoulos: Thank you, both.

[*Translation*]

The Chair: Thank you very much.

Mr. Champoux, it is your turn. You have two and a half minutes.

Mr. Martin Champoux: Thank you, Madam Chair.

I'd like to rephrase the honourable member's question.

Ms. Cooper, if we asked you to provide coverage to as much of Canada as possible, including the more remote areas, how long would it take before the service was up and running?

Would it take a couple of years or quite a few?

[*English*]

Ms. Patricia Cooper: I believe it will have coverage for all of Canada by 2022, and then add capacity to serve additional users. Once we have enough satellites to cover geography, every satellite after that adds capacity to add more users.

[*Translation*]

Mr. Martin Champoux: Would you say the Canadian government's targets are a bit modest, that they could be more ambitious in light of the available technology?

[*English*]

Ms. Patricia Cooper: I can only speak for our development. We're moving as fast as we can. We feel the urgency that Canadians feel. We're really gratified to hear so many positives and enthusiastic comments in the public CRTC docket for one of our licences and expressions of interest afterwards. We're moving as fast as we can, and we're coming soon.

[*Translation*]

Mr. Martin Champoux: Thank you, Ms. Cooper.

My next question is for Mr. Goldberg.

As we know, 5G technology is being rolled out gradually. It's a topic that comes up regularly from various angles. The technology will lead to download speeds that are 200 times faster. Obviously, that won't be the case across all regions.

How can satellite technology keep pace with growing data transmission speeds in urban centres, where 5G technology will be available?

[*English*]

Mr. Daniel Goldberg: I would say that 5G is a major part of our business investment thesis. As you say, 5G requires much more capacity to deliver the speeds that it promises to deliver, but you need to connect the towers. The towers have to be connected back to the Internet backbone with a big pipe. That's been one of the real constraints on rolling out high-capacity wireless services in more remote and rural areas.

Our LEO constellation is going to bringing big pipes to those towers and enabling a 5G rollout on the edge of the network to rural and remote communities.

● (1230)

[*Translation*]

Mr. Martin Champoux: Thank you, Mr. Goldberg.

[*English*]

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

We'll now go to Mr. Masse.

You have the floor for two and a half minutes.

Mr. Brian Masse: One of the things that has been touched on is the question of what Canada needs to do with other like partners in the world for communications satellites and so forth.

Ms. Cooper, you mentioned that there's a registry, but that doesn't sound like a solid solution for the future.

Do you have any comments, Ms. Cooper or Mr. Goldberg, as to what we need to do in Parliament for that as legislators?

Ms. Patricia Cooper: Almost every space agency and satellite regulator around the world is looking at what this emerging LEO environment requires to make sure that the rule sets and the expectations for responsible action translate into local rules. I've talked to the Canadian Space Agency and the ISED space group to understand their thinking. In the U.S., which is our home environment, we've been pressing all the regulatory agencies and policy agencies to expect more of their operators and to set higher goals in their licensing applications.

One of the other things would be to improve the amount of transparency that all licensees have to show about how they're going to meet those requirements, what their plan is and how they are doing against those plans.

It's not only participating in an updated backdrop of rules and expectations but also expecting your operators to show transparency about how they're doing and what they're doing. That becomes a differentiator instead of something to keep from disclosure.

Mr. Brian Masse: Mr. Goldberg, what are your thoughts on this? We can't even get Canadian citizens out of Chinese jails, let alone try to coordinate some of these things here. What are your thoughts on how Parliament—

Mr. Daniel Goldberg: It's a really big issue, and both Patricia and I have spent the substantial parts of our careers grappling at the international level trying to make all actors be responsible. At the end of the day, you're dealing with countries and sovereign governments. Some of them strictly follow the rules; others thumb their noses at the rules. There are no easy answers.

ISED is very capable in this area. We participate under the auspices of the UN group called the ITU. There's a lot at stake, and there's a lot of work that has to happen there.

Ms. Patricia Cooper: If I might add—

The Chair: Unfortunately, that's the end of that round. Perhaps you'll get a chance during the next round.

Our next round of questions goes to MP Cumming.

You have the floor for five minutes.

Mr. James Cumming: Thank you.

Mr. Goldberg, it looks like we not only have a race to provide better Internet service but also a race to raise capital. How important is it to free up some of that spectrum space and your suggestion that that would assist Telesat with your future raises in capital towards your LEO expansion program?

Mr. Daniel Goldberg: It's vital. The $18 billion that I mentioned which the FCC allocated to our two largest competitors.... They're already spending that money. We have many operators in the sector that are worried about all that capital destabilizing our industry to some extent. Our two largest competitors are recipients of all that money from clearing the same spectrum that ISED is now looking to Telesat to clear.

We're happy to clear that spectrum. Canada needs it for 5G, but two things need to be kept in mind. One, we're using it today, and nobody wants the important services that we're providing to be disrupted. It's going to cost money to relocate those users and not disrupt their services. Two, we're spending multiple billions of dollars to fund LEO. It's the right thing to do for Canada, and it's the right thing to do for Telesat, but it takes capital. We are hoping, and are cautiously optimistic, that just like the satellite operators who cleared that spectrum in the U.S. received compensation, we'll be in that same position here in Canada.

If we don't get it, two bad things are going to happen. First, all of these existing services that we're providing are going to be at risk. I can't imagine the government's allowing that to happen. Second, Telesat will be at a severe competitive disadvantage to these already bigger competitors who have received $18 billion for clearing the same spectrum. That would be a travesty. I hope that doesn't happen.

If the government follows through on the recommendations that we made, its a big win-win-win. The wireless operators get more spectrum for 5G quickly; Telesat can look after and reposition all the existing users of the spectrum, and we'll receive some of the financing that we need to build our LEO constellation, make the 5G spectrum available and give us a fair shot in this very competitive space race.

We have a great plan. We have a great company. We have supercommitted people—

● (1235)

Mr. James Cumming: Madam Chair, do I have time for one more quick question?

The Chair: Yes, you have two minutes and 10 seconds.

Mr. James Cumming: Great.

I have another important question that I want to put to you, Mr. Goldberg.

We're all excited about the LEO program, both your program and SpaceX's program, as a potential solution for rural broadband. However, in many communities there is already fibre into the communities, and in many cases the government has provided funding for that fibre. I don't think you necessarily say that you're the solution to those communities, but can you offer any comments? It strikes me that there should be the opportunity to use that backbone to provide broadband access to many of these communities, maybe not necessarily direct wire, but it could be fixed wireless. There could be a variety of different programs for those communities that already have fibre into their community.

Can you offer any advice on that?

Mr. Daniel Goldberg: Yes. There is fibre to many of these remote communities.

As I said earlier, fibre is a great technology when the economics make sense. The problem with fibre, though, particularly for these remote communities, as I mentioned, is that it tends to be single thread. When that fibre gets cut, and invariably fibre does get cut, these communities can be off the grid for days and days and days. It's not just the inconvenience of not being able to book a hotel reservation or watch a Netflix show; there are public safety concerns and there are health concerns. It's serious stuff.

Yes, our LEO capability, even in those communities, should be regarded as complementary. We can double up on the capacity. We can make it redundant and we can really protect those communities from the inevitable disruption.

Mr. James Cumming: Thank you for that, but still to the main point, if it isn't single thread, if there is fibre installed, surely there should be an opportunity for us to expand that and get these communities some service outside of just the LEO system.

Mr. Daniel Goldberg: Yes, for sure. Listen. The great thing about LEO is that it covers the entire country. We can serve a community today and we can move that capacity the very next day. So yes, although I'm not sure I totally follow the question, 100% it's a horses for courses type of approach for bridging the digital divide in Canada.

The Chair: Thank you very much.

We'll now go to MP Amos.

You have the floor for five minutes.

Mr. William Amos (Pontiac, Lib.): Thank you, Madam Chair.

Thank you to our witnesses today. This has been a fascinating discussion.

I think all of rural Canada right now is exceptionally excited by the prospect of LEO technology rendering a better digital experience for that region. I represent rural western Quebec, 30,000 square kilometres of under-covered terrain. There is a great deal of frustration. People are looking for all manner of solutions. There's also a broad lack of understanding of what exactly LEO will be offering and how. Obviously, as we've heard from our witnesses today, there are different business cases for the Telesat offering vis-à-vis SpaceX. I appreciate the outlining of that.

I wonder, Mr. Goldberg, if you could enlighten Canadians further on the nature of the global competition among LEO satellite operators. What are some of the big challenges faced by Telesat? How do they compare with challenges faced by other providers? I've heard that we can expect consolidation in the industry over the coming years, but I don't understand all of those dimensions. I think the public would like to better understand where the business for LEO is going in the longer term.

● (1240)

Mr. Daniel Goldberg: Certainly, LEO is the new frontier in at least global broadband connectivity. All of us who have been providing satellite services for years have realized that we just can't do it effectively enough way up in geostationary orbit. We need to get our satellites closer to the ground so we can provide lower latency, higher capacity services.

Of the key players in this area, you have two of them on this committee today: Telesat and SpaceX. Amazon has its own plans to do this. The Chinese and the Russians have their own plans. There's a company called OneWeb that was backed by SoftBank and is now backed by the U.K. government. There's a mobile network operator called SparkVue, which is one of the largest mobile network operators in India. They are providing services in other parts of the developing world.

We all face somewhat different challenges. Our biggest challenge at Telesat right now is raising the rest of the capital we need to build our system. We have over $1 billion on our balance sheet. We're investing every nickel we have into this, but we need to raise some more funding. I hope this ISED spectrum proceeding will be one source of that.

Amazon's problem isn't capital. They have plenty of that. Their problem, frankly, is they are brand new at this. They are behind the ball. They are not moving as quickly as SpaceX. They are not moving as quickly as Telesat. They don't have good spectrum rights.

Ms. Cooper and I both talked about the need for these satellites. You have to make sure they don't bump into each other, but you also need to make sure you have rights to use the spectrum you need to deliver the service. Amazon is in bad shape from that perspective.

OneWeb got out early. They launched their service. They had two problems. One was raising enough capital. Two was they clearly didn't have the depth of technical expertise they needed to have to design and implement a really capable system. Telesat has that in spades. SpaceX is a leading space technology innovator. OneWeb had two strikes there.

I'm concerned about China and Russia. Capital is not going to be the problem. They are strong on space technology. They are going to be formidable competitors in this area. It really underscores why one needs to move quickly to carve out their niche in this market and start delivering services to the customers out there.

I hope that was helpful.

Mr. William Amos: Thank you for that.

I take it from your comment that the Government of Canada's investment of $600 million in Telesat's operations so that rural communities can be better serviced not only provides a significant boost to this leading Canadian contributor to low-earth orbit satellites, but also serves as a bulwark in a way in a broader set of geopolitical considerations around the deployment of LEO by other countries, including China and Russia.

Could you comment on that both from a domestic standpoint and—

The Chair: Unfortunately, Mr. Amos, that is your time.

Because we have a bit of time remaining, I will start a fourth round. I will give each of the parties their time slot so you will do the first four. Perhaps at the next Liberal round, Mr. Goldberg, you can answer that question.

With that, I will go to MP Dreeshen.

Mr. Earl Dreeshen: Thank you once again, Madam Chair.

Ms. Cooper, you talked about some of the costs for consumers and so on, the Starlink Internet at $129 per month, with a dish cost of $649. You also said that at this particular point it's unlimited with no data caps.

When you're looking at the new price points, do you have an idea of what one might be able to expect once you have gained some economies of scale? When you say no data caps at this point, which way do you think you're going with that? Are you going to be looking at data caps once you have more customers? What are your basic thoughts on that?

● (1245)

Ms. Patricia Cooper: The first point I want to make is in terms of the equipment for which a customer needs to pay the one-time, upfront cost. We think we have a really clear path to driving that equipment price down. It's one of the hardest problems in these LEO systems, specifically those that go directly to consumers. You want to have tens of thousands of them at a low per-unit cost. We definitely have a path for that, again, both because of economies of scale and some future design developments.

I don't want to say much about where we think the price is going to go or how the service is going to evolve, because we are really genuinely taking feedback from these beta tests. I think we're going to really need to understand that better in terms of how actual customers use this and how we need to understand the management of the system and the flow of traffic that an increasing number of users have.

I do want to mention two quick things on cost. Obviously the expense of deploying the network is one important element. We are a privately held company. We aren't publicly traded. I want to clarify from Dan's comments about the $18-billion spectrum clearance in the U.S. That doesn't affect us. We aren't a previous operator of satellites. We don't operate and don't have any services in the frequency bands that have been cleared. I wanted to make sure that was evident.

One of the other big advantages we have is that it costs a certain amount of money to deploy a satellite, and because we have not only our own launch services available, we also have the advantage of the innovation of launch reusability. We're flying our satellites on rockets that have been used two, three, four, five times, which is unheard of in the deployment of commercial satellites. Coupled with the innovations in the satellite design, this all brings a more affordable deployment of the space architecture at the same time that we're driving down very hard on the equipment price past this early adopter first beta test.

Mr. Earl Dreeshen: Thank you very much.

One of the comments earlier is you won't get really great service past the 50th parallel. Well, most of Alberta and Saskatchewan are north of the 49th parallel. When we think about that, we have to wait until you get to that stage where the coverage is something that is going to be significant.

Ms. Beck, you talked about antenna capabilities, the costs that would be associated with that, with the LEO constellation, again with the receiving and transmitting aspect of it.

Is there a differential with the type of broadband spectrum that you would be using as far as the cost goes, either for the antennas or for distribution out to the public? Does using one wavelength versus another wavelength change the cost for the consumer or for the ISP?

Ms. Michele Beck: Thank you for that question.

I would say that with the LEO constellation, the frequency bands that we are employing for our own constellation are in the Ka-band. The one advantage that we have using those frequency bands is the amount of spectrum that is available to us to deliver services. That's the first thing. You need a lot of spectrum to be able to deliver broadband services.

The other thing is we reuse that spectrum, not unlike cellular service. We reuse it over and over again to cover the earth, and that amount of spectrum gets multiplied. That's how we deliver a lot of capacity.

The Chair: Thank you. I'm sorry about that Ms. Beck. Unfortunately, that's the end of that slot.

I'll now offer the time to Mr. Amos.

You were not finished your round of questions, so you have the floor for five minutes.

Mr. William Amos: Thank you, Madam Chair.

I'll give the floor immediately to Mr. Goldberg to comment on that geopolitical aspect that I raised.

● (1250)

Mr. Daniel Goldberg: Thank you for that. It's a hugely important question.

The reality is that on the one hand, we operate these satellite constellations; they provide service to consumers and you think that's kind of the end of the picture. On the other hand, space is strategic and governments are very actively participating in the development of space and of technologies that fly in space, to space and that access space.

If you look at these LEO constellations, they're a great example of the important strategic dimensions and the role that government has to play here. It's certainly the case and it's obvious that when the Russians or the Chinese—even when the Government of India—are participating in the space sector, they're doing it with their state-owned companies. They've taken a strategic decision. Space is important. Space has implications in terms of their ability to look after their citizens and also for national security implications. They're making heavy investments.

The same is true of the U.S. I take my hat off to what SpaceX has developed. Listen to what Ms. Cooper has said. Ms. Cooper accurately said that because of their ability to launch satellites, they're vertically integrated. It gives them some advantages in terms of deploying a LEO constellation and going the next level. It didn't happen by accident. The Obama administration made a very conscious, strategic decision to move the U.S. away from launching the space shuttle all by itself and relying upon U.S. commercial industry to develop a capability. SpaceX rose to that challenge and answered the mail. In doing so they've received billions of dollars to help them develop those rockets, develop the Dragon capsule that we all witnessed last night, and now to develop low-earth orbit satellites and the like. That's an enormous advantage to them.

Yes, on a smaller scale, the $600-million capacity agreement that we did with the Government of Canada was vital to try to help Telesat compete against these behemoths—not just the companies, but the governments—and try to be competitive in this sector.

I think we're going to get there. It is a space race. It's an extremely strategic area. It's not only Russia, China and India. It's the United States. It's the Europeans. It's the U.K. backing OneWeb. If space is important to Canada, then Canada is going to need to open its eyes wide, look at what's going on in the world and participate in this area.

Canada has been doing that, but to beat the drum one more time, this proceeding that is taking place at ISED right now is crucial. It's existential to Telesat and to our plans to invest in LEO and to compete globally.

Mr. William Amos: Thank you for those comments, Mr. Goldberg.

I did have the privilege of joining Minister Bains at the earlier announcement at the aviation museum in Ottawa. I do believe these are important and strategic investments, both for domestic rural broadband deployment and for our capacity to build crucial and strategic innovation sector business opportunities.

I'd like to turn to Ms. Cooper.

I know I have limited time left. I wonder if you could speak to some of the geopolitical considerations and perhaps some of the risks that North America faces as we enter into an era of significant LEO service provision.

Ms. Patricia Cooper: Thank you for the question. I do think it's an important area.

I want to clarify something. I think the U.S. government has really shifted its focus from being an owner-operator of satellites and launch vehicles to being a customer. The great privilege that we have enjoyed as a supplier to the U.S. government is to provide services. The contract we have with NASA to deliver those astronauts is a service. We own the capsule and the rocket. That's a very different thing from having state-owned development money put in.

I do think that's one of the things we'll want to watch going forward. These projects are very difficult, but the drive is to fuel a connectivity demand that is very large. That's one of the drivers for a lot of the more commercial ventures. I think the early indicators are that other state-driven economies are starting to look at the kind of platform like these LEO constellations which only a few years ago folks thought were improbable. We're glad to be breaking those expectations and fielding some copycats.

● (1255)

Mr. William Amos: Thank you.

[*Translation*]

The Chair: It is now Mr. Lemire's turn.

You have two and a half minutes.

Mr. Sébastien Lemire: Should Canada build licensing requirements around the needs of urban and rural areas to reduce the size of licences and accommodate smaller Internet service providers in the marketplace? The goal would be to promote greater competition among Internet service providers.

Where do you stand on the size of licences in Canada?

Mr. Goldberg, from Telesat, can go first.

[*English*]

Mr. Daniel Goldberg: Thank you for the question.

I think the way that ISED licenses the geographic tiers is absolutely important.

There's a mid-band auction that ISED plans to hold mid-next year. They are using tier four licences, which allows smaller regional operators to build capacity blocks without having to make massive investments for spectrum in areas that they have less interest in serving.

Yes, I believe that's an important approach to allow there to be more regional competition in the market. I think that's an important tool.

[*Translation*]

Mr. Sébastien Lemire: What about you, Ms. Cooper?

[*English*]

Ms. Patricia Cooper: We don't operate in the mid-band spectrum, so we're not part of the coming auction or the auction in the U.S. I will say that I think there's a very important place for terrestrial operators, and that infrastructure and service delivery I think is going to continue regardless of what happens with LEO constellations. Our licences are not regional for satellite services.

[*Translation*]

Mr. Sébastien Lemire: Mr. Goldberg, what is the useful life of LEO satellites?

Is their useful life conducive to the need for speed capacity?

When will you have to replace the satellites in the constellation?

[*English*]

Mr. Daniel Goldberg: We've designed these very advanced satellites. We expect they'll be lasting at least 10 years. The longer they're there, the more opportunity we have to achieve a return on the satellites. It's important that the business cases underpinning these LEO constellations are sound.

Ms. Cooper referred to her founder making the observation that the goal here is not to go bankrupt, and we've seen LEO companies do that before. We've designed these satellites to last long enough that we can achieve the kind of returns we need, but we'll not only be replacing them at the end of the 10 years, we'll be launching more, to scale up the service and to have better service for Canadians throughout.

The Chair: Thank you very much.

Our last round of questions will go to MP Masse.

You have the floor for two and a half minutes.

Mr. Brian Masse: Thank you, Madam Chair.

Thank you, witnesses. There has been really good testimony today.

Mr. Goldberg, just to get an idea here, though, because at the end of the day, what we're trying to do is.... For years, I've been saying that service is essential. When you look at phones and at how government departments and a number of other things have moved online, we've got away from bricks and mortar, so there's a greater onus to do this. Actually, that can also push the costs onto customers and individual wallets.

With your plan right now, what happens after, say, for example, one or two years, if it's not viable to proceed with the full rollout of $600 million? I think you did a really good job of explaining how it works. The upside, hopefully, is that it might become even more successful—and we all hope that—but what happens if it doesn't prove viable in the short term in the next couple of years?

Mr. Daniel Goldberg: I'd say that we're about to become very, very pregnant on our LEO constellation. We're going to announce the contracts to build it and launch it. It's going to cover the full 300 satellites. Yes, we're in with both feet here.

Listen. In our own business plan, we expect that pricing is going to continue to come down and we've built our business plan to be sort of bulletproof, to operate in an environment with declining prices. That's been our experience over the last 50 years. Prices are coming down. We know that's what our customers want and what the regulators want, and we've built the business case to support that.

● (1300)

Mr. Brian Masse: That's good to hear, because even before COVID, obviously, we New Democrats have been calling this an essential service, just like our phone service, where we're connected in the home. We're moving to telehealth and we're moving to all of those different things. Now with COVID, education is more prominent and so forth. The pricing right now is not acceptable. We have to get it down.

That's why I want to change the way we do our spectrum auction. I don't want it to actually be a revenue generator. I want it to be more like an RFP to actually push it out to connect Canadians with lower pricing.

I'll leave it at that, Madam Chair.

Thank you. You answered that question. That was my concern. We have to get it lower. The status quo is just not going to work for us, and it's going keep us uncompetitive in the world.

Thank you very much for your time.

Mr. Daniel Goldberg: We agree. Thank you.

The Chair: That is our time for today.

Thank you, witnesses, for being here today and for your excellent testimony. I thank the members, analysts, translators, the clerk and our team in West Block for their help.

With that, the meeting is adjourned.