HOUSE OF COMMONS
CHAMBRE DES COMMUNES
CANADA

Standing Committee on Natural Resources

RNNR • NUMBER 006 • 2nd SESSION • 41st PARLIAMENT

EVIDENCE

Monday, November 25, 2013

Chair

Mr. Leon Benoit

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● (1535)

[*English*]

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

We're here today, as everyone knows, at our sixth meeting in this session of Parliament of the Standing Committee on Natural Resources to discuss, pursuant to Standing Order 108(2), a study of the rare earths industry in Canada.

We have with us today witnesses from the Department of Natural Resources. We have Christiane Villemure, director general, Industry and Economic Analysis Branch—welcome to you. And we have Magdi Habib, director general, CanmetMining—and welcome to you.

Thank you both very much for being here today.

If you could go ahead with your presentation at the start, and take the time you need for that, then we'll go directly to questions and comments from members.

Go ahead, please.

Ms. Christiane Villemure (Director General, Industry and Economic Analysis Branch, Department of Natural Resources): Very good. Thank you very much.

[*Translation*]

Mr. Chair, honourable members of the committee, I am the director general of the Natural Resources Canada branch that studies the industry and economic aspects of minerals and metals. My colleague, Dr. Habib, is the director general of the Canmet lab, which is in charge of the scientific aspects of mines.

It's a privilege to be here today and to talk to you about rare earths.

[*English*]

We will see how rare earth markets are relatively small and how they feed into critical uses essential for the high-tech and clean-tech industries, altogether worth trillions of dollars.

While mining rare earth is very similar to mining other commodities, the rare earth field is new and presents some significant S and T challenges for processing and refining rare earth elements. This is important in view of the anticipated shortages of some rare earths, where some Canadian projects show promise, so we will discuss some of the work done by CanmetMining to address these aspects.

What are rare earths? Rare earths are a group of 15 elements, plus yttrium and scandium, that exhibit similar properties and occur in many of the same mineral deposits. Ironically, rare earths are not rare. These elements are fairly abundant on the earth, but rarely occur in concentrations that are economically exploitable. They're found together, often with other elements, and are difficult to separate because many of their properties are similar.

You've probably heard about light and heavy rare earths. Very simply, those elements on the left side of the lanthanite series of the periodic table—on the slide or the diagram that we've shared with you—are considered light rare earths, and those on the right side of the periodic table are heavy rare earths.

Most deposits are rich in light rare earths. They are valued in many applications. Considerably fewer deposits are rich in heavy rare earths, so global production is lower and prices are generally higher. Four heavy rare earth elements—europium, terbium, dysprosium and yttrium, together with neodymium—have been defined as critical by the United States Department of Energy, Japan, and the European Community because of their scarcity, high demand, and criticality in many high-tech applications.

[*Translation*]

The luminous, magnetic, catalytic and other characteristics are what make rare earths so indispensable.

[*English*]

Hybrid vehicles, rechargeable batteries, mobile phones, LCD screens, laptops, wind turbines, medical imaging equipment, radar systems, catalytic converters, alloys that are more corrosion-resistant, all of these require rare earth elements. There's not an automobile produced today that does not contain dozens of motors powered by permanent magnets containing rare earths.

It's fairly well known that in most of these applications only small amounts of rare earth are required. However, the considerable growth of those industries, now totalling close to $5 trillion, and their innovative technological capacity, are driving greater demands for rare earths. Over the last 10 to 15 years, the world consumption of rare earth elements has increased at 8% to 12% per annum, a trend that experts agree will continue, and may increase.

We can appreciate that even if global production of rare earth is relatively small, about 130,000 tonnes per year, a disruption in supply chains would impact global industries in a significant way. Up until this year, China controlled over 97% of global rare earth production. The States, once domestically self-reliant, has become dependent on imports from China. Two companies have begun to mine rare earths this year, in the States and in Australia. These are predominantly light rare earth mines. They will not produce the critical heavy rare earth elements that global industries require. China will remain the dominant supplier of heavy rare earths until other producers emerge.

According to global analysts, the forecasted demand and supply of rare earths by the year 2020 presents a mixed picture. There may be a significant oversupply of many of the light rare earths impacting the economics and viability of rare earth mines under development elsewhere in the world. In the same timeframe, there may be some significant supply shortages of heavies, those considered critical.

China, the sole supplier of four of these critical rare earths, has implemented a series of gradually more stringent export restrictions and trade bans since 2005. In March 2012, the U.S., Japan, and the European community jointly filed a complaint with the World Trade Organization against China's rare earth export restrictions. Canada is a third-party complainant in this action, and we're expecting the WTO dispute settlement panel report to be released soon.

Moreover, expert analysts forecast that China's heavy rare earth resources will be depleted over the next five to eight years. China will need to replace these resources to supply its domestic industries.

Canada currently imports small tonnages of light rare earth compounds and also imports rare earth permanent magnets, components, and products that contain permanent magnets. Interestingly, Canada's geology is rich in the heavy rare earth resources. Specifically, eight of the twelve advanced rare earth exploration projects contain elevated concentrations of the critical rare earths forecasted to be in deficit.

There are more than 200 individual exploration projects identified in Canada at different stages of development. While Canada does not currently produce rare earths, experts have indicated a strong potential for at least two or more Canadian rare earth projects to come to the marketplace by the year 2018. Interestingly, these advanced projects are rich in critical heavy rare earths. Projects to watch are those that are planned to reach production in the next four to five years: Avalon, Quest, Matamec, Pele Mountain, and Orbite.

We all know that mining itself is complex and an area of incredible innovation, overcoming logistical barriers, engineering, and environmental management challenges. Rare earth elements are all of that, plus some additional challenges. There are complex science and technology challenges throughout the supply chain. Hydrometallurgy, to separate the individual rare earth oxides needed by the manufacturing industries, has been identified as a need by the nascent Canadian rare earth elements industry currently in its formative stages.

Over the past two years, NRCan's CanmetMining has conducted rare earth element research, some in collaboration with industry. Our research is focused on mineral and metallurgical processing challenges that are associated with hard rock deposits, those that we find in Canada.

Specifically, we have projects looking at the mineralogy of Canadian deposits; physical separation to produce high-grade concentrates; through hydrometallurgy, developing separation processes; and understanding any toxicity issues associated with rare earths—although we want to recuperate a maximum amount of these materials. We are also developing certified reference material as quality control tools for analytical laboratories.

In closing, we're dealing with materials with small markets feeding bigger markets, producing goods that are important for our daily life. While NRCan is involved in advancing solutions to address S and T challenges, it is encouraging to watch industry evolve and organize itself.

Mr. Chairman and members of the committee, we would be pleased to answer your questions.

● (1540)

The Chair: Thank you very much for your presentation.

This is a study meant, I think I can safely say, to give us an introduction to the industry, and certainly I've heard a lot of terminology that doesn't really help identify this rare earth element sector clearly. I'm looking forward to questions that would clarify that.

I will take about fifteen minutes at the end of the meeting to deal with two subjects. One is to pass the budget for the committee, or at least look at the budget for this study. The other is to discuss the handling of Bill C-5, which will come to committee. It collapsed in the House today, so it will come to committee next Monday. I want to discuss the time that will be needed to discuss it.

Having said that, let us get directly to questions or comments on the issue we're here to deal with today, starting with Mr. Leef, the best darn MP from the Yukon, for up to seven minutes.

Voices: Oh, oh!

The Chair: Well, he's the only MP from the Yukon.

● (1545)

Mr. Peter Julian (Burnaby—New Westminster, NDP): He's also the worst.

The Chair: Well, we ought not to look at things in a negative context.

Mr. Ryan Leef (Yukon, CPC): That's right. I get both categories at once.

An hon. member: He's also the one with the most hair.

Mr. Ryan Leef: Yes, that's scary, isn't it?

Thank you to both of our witnesses for coming today.

Under the R and D section of your slide, you noted that there was a gap analysis completed to determine areas in which knowledge can be developed. What did the gap analysis tell us?

Mr. Magdi Habib (Director General, CanmetMining, Department of Natural Resources): Mr. Chairman, the question relates to the R and D gap analysis and its outcome in 2011. We conducted a gap analysis in which we consulted with all industry associations, universities, and provinces and territories in order to identify the technological gaps that we have in this area of science.

The five areas that were identified, as shown in the presentation, are: the mineralogical characterization of rare earth elements and the minerals; secondly, the physical separation, which is the milling stage that we call "beneficiation", in which we need to concentrate the mineral that contains the rare earth elements; the third area is hydrometallurgy, the separation and leaching, which is the most difficult and most complex part during the hydrometallurgical processing of rare earth; then there is the production of reference material, which is important to ensure that the analyses being conducted in laboratories are reliable before producing analytical results; and the other area of research identified during the gap analysis was the study of the toxicity of rare earth elements,. As much as we would like to see complete recovery of rare earths, there is a possibility that we'll have some leaching of rare earths into the effluents, and we want to make sure that we're studying the toxicity of the rare earths into the effluent streams.

Mr. Ryan Leef: Thank you. I was reading a kind of summary article in *Outdoor Canada* this week. A proponent around the Kippewa open pit mine was being asked for their opinion, and the comment was that rare earth mining is a lot more harmful to the environment than other types of mining.

First, is that characterization accurate? Second, are we positioning ourselves now...or maybe just give us some background on how we are positioning ourselves to deal with the mine projects that are coming online to ensure that we're able to make up for any of the additional technical or environmental challenges that come with rare earth metal mining.

Mr. Magdi Habib: Mr. Chairman, on the question about the study that has been conducted, I'm not aware of that study.

But in the area of environmental science, the project will be looking after the environmental impact of rare earths in the environment. It's a study that began a few months ago. To date, we don't have enough data to make any further comments. We'll be happy to share at one point in time, once we have some, the data available on the environmental impact of rare earths.

Mr. Ryan Leef: With China accounting for roughly 85% of the total production in rare earth metals, if they're on a slightly downward trend, and even if they are going to be the major supplier of the heavy rare earths, are the studies and research we're doing and the technological assessments, the gap analyses...? What is your sense concerning the Government of Canada and moving these projects forward? Are we doing this in a reasonable time period, or are we trying, as some people might characterize it, to rush projects through to meet market demand?

What's your sense about the Government of Canada's approach to responding to the gaps or to this opportunity for dealing with the market change?

● (1550)

Mr. Magdi Habib: As mentioned, Mr. Chairman, the gap analysis and the literature review that we've done indicates quite clearly that, yes, China is dominating 98% of the market. They have the process in place and they are producing rare earth elements. The type of mineral deposit they have is different from the Canadian deposit; it is a hardrock deposit in Canada.

The practices in China are not very environmentally friendly. Canada is looking at developing clean and green technologies that will address any potential environmental impacts as a result of the processing of rare earth elements. In that sense, it might take time to develop the technologies, but we'll have to make sure that the technologies that are developed are not causing any harmful effect to the environment and the ecosystem.

The Chair: Ms. Villemure, you wanted to add to that. Go ahead, please.

Ms. Christiane Villemure: Thank you, Mr. Chairman.

I would like to add to my colleague's comments to say that the S and T challenges we are facing globally are faced by others as well. China, as Dr. Habib is saying, has a very discrete methodology and set of processes to process rare earths, but everybody else in the world is basically in the same game, trying to figure out the science behind the separation of rare earth elements.

CanmetMining labs are working in collaboration with universities and with industry, and it's very important to have a collaborative effort to tap into the pockets of knowledge that may exist throughout the country.

Mr. Ryan Leef: Super. So there's a collaborative effort internationally to work and resolve this.

Ms. Christiane Villemure: Absolutely, yes.

Mr. Ryan Leef: Great.

There seems to be a concentration on the map right now of these projects favouring the eastern part of the country. Is it because of the geography of Canada that this is typically where they're going to be found, or is it an exploration issue? If it is an exploration issue, are there things the Government of Canada is doing to try to encourage rare earth exploration in other parts of the country outside the east, in that northern part of Saskatchewan and in the Northwest Territories?

Ms. Christiane Villemure: Mr. Chairman, I will answer this question. I think that exploration activity is quite high throughout Canada. Exploration is an activity of chance, to some extent. Probably the level of exploration activities in certain parts of the country led to the identification of some more deposits. It doesn't mean that these are the only regions where rare earths could be found, and exploration activities are ongoing.

As I mentioned in my presentation, there are about 200 projects identified in Canada. We need to continue to look at those projects and how they evolve. They're not all shown on the map; there are some projects elsewhere as well that could show promise in the future.

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

We go now to the official opposition, to Monsieur Gravelle, for up to seven minutes, please.

Go ahead.

Mr. Claude Gravelle (Nickel Belt, NDP): Thank you, Mr. Chairman.

Our colleague Christine Moore was very interested in this study, but unfortunately she was hospitalized over the weekend, so she won't be here for the study. I'm going to do my best to ask her questions, and hopefully you'll be able to answer some of those questions.

Here is my first one. I'm not sure how rare earth is measured, by tonnes or by pounds. How many tonnes or pounds are available in Canada for processing or for mining?

Ms. Christiane Villemure: Mr. Chairman, that's a good question. I don't have the number exactly in my head at the present time. If you consider that there are about 130,000 tonnes produced globally, the Canadian potential is estimated to be about half of that, or 40% or 50% of it, when you consider the reserves—what is in the ground. This is a number that I can advance relatively fairly.

Mr. Claude Gravelle: Does the slide showing your map show all of the deposits in Canada?

● (1555)

Ms. Christiane Villemure: No. There are about 200 projects in Canada, and those that are shown on this map are the most advanced.

Mr. Claude Gravelle: Can you tell us who owns these companies, what the country of origin is? How many are Canadian-owned and how many are foreign-owned?

Ms. Christiane Villemure: Mr. Chairman, I think most of them are Canadian-owned. Some may have participation from other countries. The Matamec deposit, for example, has Japanese participation. But I believe they are all run by Canadian companies.

Mr. Claude Gravelle: Is this information that you can give to the committee?

Ms. Christiane Villemure: Absolutely. I would be pleased to do that.

Mr. Claude Gravelle: Thank you.

Where do you think the rare earths fit into Canada's natural resources?

Ms. Christiane Villemure: Mr. Chairman, the role of the department is to study commodities and needs for commodities. Rare earths is a relatively new field for the department, as for most countries in the world. We have started with some steps to advance our knowledge and understanding of the economics and science behind them. I believe that what we are doing is state-of-the-art and is at the forefront of scientific knowledge.

Mr. Claude Gravelle: I know that the deposit in Kipawa is open pit. Are most of these mines open pits, or are they shaft mining—underground mining?

Ms. Christiane Villemure: I would need to get back to you on that. I don't have the answer for each of these mines. Many are open pit. Some will be underground mines as well.

Mr. Claude Gravelle: Can you supply us that information?

Ms. Christiane Villemure: Yes.

Mr. Claude Gravelle: Thank you.

Can you talk to me a little bit more about the tailings? I think you said a while ago in your presentation that there was some problems with the tailings.

The Chair: Mr. Habib, go ahead, please, sir.

Mr. Magdi Habib: Thank you, Mr. Chairman.

Throughout the metallurgical process for the production of rare earths elements during the mining or the beneficiation step of the process, there are attempts to concentrate the rare earths minerals, and throughout this process, either by flotation or magnetic separation, you produce some tailings, which is waste material that is being disposed of.

We know that many of the minerals we have contain radioactive elements, such as thorium and uranium, so the tailings might contain those elements along with some rare earths elements. One of the studies we are planning to do in our laboratories, in collaboration with many partners in Canada, is to manage those tailings and ensure that the radioactive contents of the tailings are being managed, and that throughout the process we are recovering most of the rare earths elements from the tailings, which has an economic value.

Mr. Claude Gravelle: Thank you.

On slide 10, you list a number of mining companies that are operating presently as the most advanced in Canada. Can you tell me whether any one of these companies is planning to build a refinery in Canada or has started building a refinery?

Ms. Christiane Villemure: Mr. Chairman, I will take this question.

Avalon Rare Metals has announced that they would consider building a separation plant. The location of that plant would be in Louisiana, in the United States. Another company, Quest, has recently announced that it will build a separation plant in Bécancour, Quebec. As far as we know, these are plans. There is not a lot of detail on these plans or on the nature of the separation plants.

Mr. Claude Gravelle: In other words, some of our rare earths are going to be exported to the U.S. to be refined?

Ms. Christiane Villemure: That is a possibility. Mind you, at this stage these are plans, and the environment could change.

Mr. Claude Gravelle: Can you tell me how the aboriginal communities in Canada are affected by rare earth mining?

● (1600)

Ms. Christiane Villemure: I don't have a lot of information on this issue. At the outset, what I can provide the committee is an appreciation that most of these projects have engaged first nations and that first nations are generally interested in the mining developments.

Mr. Claude Gravelle: You mentioned that China is being taken to the World Court because of their production cutback. What happens if China wins? Is the rest of the world being held prisoner?

Ms. Christiane Villemure: That's an interesting question, Mr. Chairman.

China has made the decision to keep production internally to feed its own manufacturing industries. If China wins, it is possible that the demand for heavy rare earths especially will increase, but this will also increase the pressure and willingness to find new mines and new producers elsewhere in the world.

There are a number of projects—we have talked about the Canadian ones, but there are also projects elsewhere—to eventually produce heavy rare earths.

The Chair: Thank you, Mr. Gravelle.

We go now to Mr. Regan for up to seven minutes.

Go ahead, please.

Hon. Geoff Regan (Halifax West, Lib.): Thank you Mr. Chairman.

Thank you to the witnesses.

[*Translation*]

Thank you very much for being here today. It is most appreciated.

I understand that about 30% of rare earth deposits are in China. I'm talking just about rare earths and not specifically heavy elements that are a part of those earths. You told us that China will have almost ended its mining in five to eight years because those earths will be depleted. There will be a lack of rare earths. Considering it's 30% now, that doesn't seem like much time. At what point should we be concerned about the future of rare earths?

[*English*]

Ms. Christiane Villemure: Mr. Chairman, the projections on China are based on known reserves and the published literature. China, like other—

[*Translation*]

Hon. Geoff Regan: Might I encourage you to speak in French, if you like?

Ms. Christiane Villemure: Yes, of course. Thank you very much.

China, like all countries, is carrying out mining exploration. It's possible that new rare earth deposits will also be discovered there. I think China is as concerned as any other country about finding new sources of rare earths, both light rare earths and heavy rare earths. I think it's a concern for all countries because we expect demand to rise. Demand is growing very quickly and, in a few years, even if China continues at current levels of production, it would not be able to supply the rest of the world with rare earths.

[*English*]

Hon. Geoff Regan: Mr. Chairman, I wonder if I might ask Mr. Habib this. From the scientific point of view, how much does this concern you? Obviously, these rare earths have been found to be critical in a variety of products that are important to us, whether it be smart phones or many other products. What is the likelihood of science finding other ways to achieve the same goals without using these rare earths, if in fact they're going to be depleted? Secondly, what are the possibilities for recycling them?

Mr. Magdi Habib: Mr. Chairman, we don't really have any research in this area looking at substitution for rare earths. However, we are working on accelerating the development of this industry quite quickly by working in collaboration with many industry partners.

But I don't really have any information related to substitution of rare earths in that area of science.

● (1605)

Hon. Geoff Regan: And what about recycling?

Mr. Magdi Habib: Recycling is certainly an option. However, we have to remember that you have to have enough tonnage to be able to extract valuables in order to make the recycling process economically viable. Canada has deposits that are very rich in heavy rare earths, and we feel that the science should be more focused on the processing of the heavy earths than going to recycling, for which we don't really have enough capacity.

Hon. Geoff Regan: If we have deposits that are very rich in heavy rare earths, would I be wrong to think that with the nature of rare earths—being widely distributed and not usually in very high concentrations—mining would require removal of a lot of aggregate?

Mr. Magdi Habib: This is very true, Mr. Chairman, and it is the challenge we have in this area of science. The processing of rare earths elements throughout the whole mining life cycle requires dozens and sometimes hundreds of steps to separate the rare earths elements from each other, and during each step there is a lot of consumption and usage of chemicals. That makes the process of producing rare earth elements quite a heavy one.

So it is a challenge, and throughout the science, under our green mining initiative, through which we are focusing on improving the environmental processes of our mining process and the processing, we are aiming at developing technologies that will reduce the number of steps during processing and ensure that the process is clean to the environment and economically viable.

Hon. Geoff Regan: Are rare earths, and especially heavy rare earths, any more likely to be found at any particular depths? I'm wondering about the kind of mining that would most likely be done.

Ms. Christiane Villemure: Mr. Chairman, I don't have the answer to this question. It's a good question.

Hon. Geoff Regan: Mr. Habib, do you know the answer?

Mr. Magdi Habib: Mr. Chairman, I'm sorry, I don't really have the answer for this, but we can certainly find out.

Hon. Geoff Regan: I wonder whether you're aware of the kind of mining, for instance in China, whether it's strip mining or deeper mining that is done to extract it, generally speaking.

Mr. Magdi Habib: Mr. Chairman, the types of minerals that China is using are gravel or clay types of material, which is ionic and which represents much less challenge than the hardrock material we have in Canada. The processing of this material in China is much simpler than the processing of what we have in Canada, knowing that we have to go through all the process from extraction to separation, leaching, and hydrometallurgy. In China, the process is much simpler than what we have in Canada.

Hon. Geoff Regan: If it's in mud or clay.... I guess you can't tell me whether I'd be right to guess that it's much more likely to involve surface mining.

Mr. Magdi Habib: It's an ion-absorbed clay material, which means that it's on the surface; it's not even absorbed, but is on the surface. The leaching of ions from the surface is much quicker and simpler than for hardrock material; there it is embedded into the rock material.

The Chair: Thank you, Mr. Regan.

Before we start the five-minute round, we may as well deal with our Saskatchewan Roughriders fans and just congratulate their team on victory at the Grey Cup on the weekend.

Voices: Hear, hear!

The Chair: This committee, after all, at least in my judgment as chair, had unanimously passed a motion to support the Saskatchewan Roughriders in the Grey Cup.

Mr. Claude Gravelle: That was a motion from Ontario, I might add.

The Chair: Yes, it was a motion from Ontario; that's right.

Hon. Geoff Regan: It was supported by Nova Scotia, of course.

The Chair: It seems that everybody is a Saskatchewan fan.

Anyway, I couldn't help but do that.

We will now start the five-minute round with the parliamentary secretary to the Minister of Natural Resources, Ms. Block, followed by Mr. Trost and then Mr. Julian.

Mrs. Kelly Block (Saskatoon—Rosetown—Biggar, CPC): Thank you very much, Mr. Chair.

It is duly noted that it was Ontario that put forward that motion, so thank you very much.

I want to join my colleagues in thanking you for being here today and welcoming you. I think this is a very interesting study that we are embarking on, and I am truly sorry that Madam Moore cannot be here. I know that this is something she initiated, so I would ask that my colleagues across the way please pass on our wishes to her that she get well quickly. We hope to see her back here very soon.

I want to ask some questions in regard to some of the slides and perhaps some of the comments you have made, comments that—and I mean no pun by this—may have been mined out of some of the questions that have already been asked.

You have on slide 10 the advanced Canadian REE projects and you have the target years. I was given an article by one of my colleagues speaking to the Matamec exploration. This article states that they are slated to start construction in 2015. In your target projects, you have it at 2018 to 2019.

I guess what I want to understand is whether you could outline for me the timeline for the development of one of these projects or mines. I know it takes a long time from the exploration stage to actually producing something, but could you share with us that timeline?

● (1610)

Ms. Christiane Villemure: Mr. Chairman, the general timeframe —and it's a very general timeframe—to get to a producing mine starting from the exploration stage would be between seven to ten years. Those projects listed on the diagram were started a few years ago, and they have achieved certain steps in the mine development process. For example, they have pre-feasibility studies and some form of characterization of their deposit. This is why we can report on them about tonnage and an approximate year of production.

The years that are outlined in this diagram come from company websites, so I'm not sure.... Sometimes there are various sources of information. If you want, I can validate this information or make sure you have the right information, but as far as I know, what is in this table is the years of production as they are predicted by the exploration companies.

Exploration companies will have to go through various stages. They normally start with identifying a deposit and doing some study to validate whether the metal of interest is found in sufficient quantities in the deposit they have identified. They will go through successive rounds of characterization to increase their knowledge.

When they are confident that a deposit is of sufficient magnitude, they will embark on pre-feasibility studies, and at that stage companies are starting to assess the economic potential of a deposit. On that front, they will also normally do a few studies to further confirm the economic viability of a mine.

Companies also need to go through the environmental assessment process, which is a very stringent and thorough process, to make sure that mine development will not have deleterious effects on the environment.

Further, companies will do a formal feasibility study. Sometimes we refer to these as “bankable” feasibility studies. This is the level of information that allows a company, for example, to go to a bank and get a loan for construction. This is normally in the very last stage, in which there is a lot of information confirming the viability of a producing mine.

Mrs. Kelly Block: Thank you very much. Perhaps this is a good segue.

It was just one short week ago that we all learned about the MPMO, or were updated on the work of the MPMO. I'm wondering if you can tell us if all or any of these projects are under the supervision of the MPMO.

Ms. Christiane Villemure: Mr. Chairman, one project has completed the environmental assessment process, and that's the Avalon Rare Metals project. All the other projects on that list have not yet gone through the environmental assessment process. They are at the pre-feasibility stage.

The Chair: Thank you, Ms. Block

I'd like to ask a question for clarification.

In your slide on page 10 you have the tonnes per year of heavy rare earth elements listed. Those, you say, have come from the mine sites. But when the mining companies are doing estimates like that, it's with current technology, and often as time goes on new technology allows for more production.

Is that accurate? Is that the case here, as it is in most mining projects?

● (1615)

Ms. Christiane Villemure: Mr. Chairman, I would say that you are absolutely right, that as knowledge and technologies evolve, there is an opportunity for mining companies to take advantage of them and refine their reserve projections or improve their mining processes.

The Chair: Okay.

Mr. Trost, you have up to five minutes. Go ahead, please.

Mr. Brad Trost (Saskatoon—Humboldt, CPC): Thank you, Mr. Chair.

In follow-up to a question that Mr. Gravelle asked earlier about the refining capacity, I was looking at the rare earth elements supply chain and the list here.

Could you give us some idea, to the best of your knowledge—because different companies do different things—as to what elements of the supply chain and the mines that are proposed for Canada are looking at in developing their mine sites or other places in Canada?

I want to differentiate between refining, separation, milling, and the different stages, because some mines, I can see, do more milling, while others proceed all the way to refining in Canada.

Could you clarify and put some nuance into that answer?

The Chair: Mr. Habib, go ahead, please.

Mr. Magdi Habib: Mr. Chairman, the process for the milling and hydrometallurgy separation and leaching for all rare earth elements is the same. If the technologies that we are developing are able to resolve this separation issue between the different elements, the technology would be applicable to all the elements we have. The five most critical ones, which we talked about earlier, are the five heavy rare earth elements gadolinium, dysprosium, terbium, europium, and yttrium. These are the five heavy rare earth elements that we are focusing our research on.

This would also be applicable to the suite of other rare earth elements that we are considering, but for now we're focusing on the heavy ones.

Mr. Brad Trost: But in general, from what you know of what the companies are planning to do, are they planning to do most of this processing? You noted in one of the answers that refining will probably be done somewhere in the States; I forget where. I was reading an article in *The Financial Post* saying that for the Avalon project, they were planning to do a fair number of the steps, I believe, right on the site in the NWT.

At what stage is the ore or are the ore concentrates going to actually leave Canada? Will it be right at the end, for refining? Will it be different for different projects? How much of the value added is going to be done in Canada, based on what you know of the companies that are most advanced?

Ms. Christiane Villemure: Mr. Chairman, the further you go in the separation process, the more value is added to the product. So it's advantageous for companies to develop grinding, milling, and processing processes that go as far as possible and come as close as possible to the pure oxides, which are the materials that are needed by the manufacturing companies. Depending on the availability of technological facilities, the ease of constructing that equipment and those facilities on site, it is possible that ore could leave at different stages, depending on the company and depending on the ore type as well. It's a very difficult question to answer. It's very ore-specific.

Mr. Brad Trost: So it's very much an open question, depending on the company and the site, and it depends very much on the local geology. Did I get that right?

Ms. Christiane Villemure: Yes.

Mr. Brad Trost: Thank you.

One thing I remember from several years ago, if not at least a decade ago, was that one of the majors had a major deposit in the South Pacific, a nickel deposit whose mineralogy was rather unique. They were unable to actually get the nickel out of the sulphide ore, at least in any economical way, and possibly even in some physical way. The matrix of the nickel was very different. This was a major technological problem that they were unable to solve.

At this point, knowing that science is not perfect and looking into the future, is there any anticipation that there is going to be a major hurdle that it may not be possible to solve with the general science and engineering that is being looked at? Do we not have specific answers because this is so new, or is there some major question right now that leaves us concerned that we may not be able to get over this hump and get the concentrates and the ores we want?

I realize that's a difficult question, but let me ask for the best guesses from talking with the scientists involved.

● (1620)

Mr. Magdi Habib: Mr. Chairman, as you know, in R and D there is a lot of uncertainty in doing the science. There is no guarantee that the science will go as we expect. We try, through science and innovation, to develop technologies while reducing the risks of technological barriers, and with the advancement in technologies in different areas of mineralogical characterization, wherein we look at field emissions spectroscopy, scanning electromicroscopy, and new state-of-the-art equipment that we have now for detection and analysis, I think we can reduce the high risk associated with one of the steps going wrong.

But again, despite all that, there is always the risk that something would not go according to plan. As we are developing the technologies and looking at the uncertainties, we'll be able to determine the success of the initiative. But certainly there is high risk associated with any type of science that we do in our laboratories.

The Chair: Thank you, and thank you, Mr. Trost.

We have Mr. Julian, followed by Ms. Crockatt and Mr. Clear for five minutes each. Those are the last three names I have on the list for now.

Go ahead, please, Mr. Julian.

Mr. Peter Julian: Thank you, Mr. Chair, and thanks to our witnesses for being here today.

I'd like to start off by asking how, within NRCan, you organize your work around rare earths. Could you give us a sense of what budget and staffing are allocated specifically to rare earths and how it is organized within the department?

Ms. Christiane Villemure: Mr. Chairman, I can start, and I will ask my colleague to complement the answer.

In the past three years, we've had about $1 million over the three years to conduct research activities. This is seed money that was provided to kickstart the science and the study of rare earths. The majority of this amount and this effort is with the scientific laboratories.

On the economic side, which is the one I manage, there is the equivalent of one resource that is allocated to the study of rare earth economics and of understanding the international global context of supply and demand associated with rare earths.

Mr. Magdi Habib: Thank you, Christiane.

The $1 million that was allocated, the seed money to do the rare earths element project, included a good portion for scientific R and D, and the project that you see in the slide deck was a result of the gaps analysis we have done in consultation with industry, provinces, and territories.

Based on that gap analysis, we were able to identify the five areas of research that you see. We have shown good success in the past year at the separation phase—which is the milling phase, the beneficiation stage—when, with the very small amount of money we have, we were able to develop a small pilot plant in our laboratories to obtain a high concentration of the mineral, improving its concentration up to 98%, with a recovery of some of the rare earths elements of up to 87%.

So within a short period of time we were able to produce a pilot plant at laboratory scale and improve the grade of the concentrate, from the seed money we got from the department.

[*Translation*]

Mr. Peter Julian: We're talking about $1 million that was spent over three years. My first question is this: when will that amount run out? And have you renewed that agreement or do you have another agreement for the coming years? My second question is: what is the total possible value of rare earths in Canada? Do you have an overall estimate of the total value of rare earth deposits in Canada?

● (1625)

Mr. Magdi Habib: I can answer the first question. Funding will end in March 2014, and we hope that companies, universities and provinces will be interested in continuing this kind of initiative so that we can meet the project's overall objectives.

As for your second question, about the total possible value, I'll ask Ms. Villemure to answer that for you.

Ms. Christiane Villemure: Mr. Chair, I would like to get back to the honourable members of the committee with that answer.

[*English*]

Mr. Peter Julian: Thank you for that.

It's interesting to note that money dries up in March 2014. So obviously, unless there's a renewal, we'll be going backwards.

I was interested in knowing whether or not NRCan, through the Geological Survey, is able potentially to help with these projects across the country. I note that, if I'm not wrong, we're basically looking at two different ends of the country: the Quest development is in Labrador, it appears from the map, and then the Avalon development is in the Northwest Territories. So we have companies now looking at both ends of the country.

To what extent is NRCan available to provide supports for exploration?

I think I'm running out of time, so I'll put my last question out to you as well.

In terms of the environmental issues, to what extent is NRCan able to do some work either within the ministry or with other ministries to determine what the environmental issues are going to be, so that we tackle those first off, even before the development of the sites occurs?

Mr. Magdi Habib: Mr. Chairman, as I mentioned earlier, we just began to work in the area of environmental toxicity and environmental impact a couple of months ago, so we cannot comment at this point in time as to the results obtained so far on the study. But we are committed to developing technologies that will have no impact upon the environment and our ecosystem.

The Chair: There was another question there, wasn't there?

Mr. Peter Julian: Yes, the second question was about geological surveys and to what extent NRCan is helping facilitate these sites and others.

Ms. Christiane Villemure: Mr. Chairman, NRCan is not generally involved in exploration activities per se. The Geological Survey provides geoscience analysis and data that is put into the public domain and can be used by prospectors and explorers to help them identify and define deposits. NRCan is involved in the scientific aspects of the processing of mining various commodities, including the rare earths.

The Chair: Thank you.

We go now to Ms. Crockatt, followed by Mr. Cleary.

Go ahead, please, Ms. Crockatt.

Ms. Joan Crockatt (Calgary Centre, CPC): Thank you both very much for being here at committee. This is very interesting. It is an area that is new to most of us, so we are at the beginning—at the pre-feasibility study phase of the committee.

I'm trying to get a bit of a handle on what the opportunity is with this resource, rare earth metals. Can you equate it with some of the other natural resources we have in Canada, such as oil, gas, uranium, potash? Where would rare earths stand in terms of potential?

Ms. Christiane Villemure: Mr. Chairman, I can answer this question.

The rare earth industry is very small. Probably a small number of mines will move into production. Rare earths are critical in specific applications, and this is what makes their study, and the advancement of projects, so important.

For example, the Critical Materials Institute in the United States has identified source diversification for rare earth in order to identify safe resources they could tap into to feed the manufacturing industries in the U.S.

The Critical Materials Institute is very interested in Canadian projects and in collaborating on the scientific aspects of rare earth to identify new sources and to potentially look at how supply chains could be strengthened by greater collaboration between the two countries, which are neighbours.

● (1630)

Ms. Joan Crockatt: Okay.

You're basically saying that this is quite a minuscule resource, but it may be very important in terms of security of supply.

Ms. Christiane Villemure: This is correct.

Ms. Joan Crockatt: Okay.

In terms of security of supply, did I hear you say that Canada has a substantial part of the world's supply of rare earth minerals? Can you go back over that for me?

Ms. Christiane Villemure: Yes.

Mr. Chairman, what I mentioned is that among those projects listed on slide 10, and looking at their anticipated production rate, the Canadian potential could go as high as 50% of the global demand.

Ms. Joan Crockatt: That's wonderful. Thank you. That's sealed in my memory now.

If we're talking about this as being a security-of-supply issue, what about the economics? It's not necessarily the Government of Canada's role to develop every resource, but we do want to make sure we are giving appropriate attention to those resources and that it makes sense for industry, or for the benefit of our country, to move forward with.

It may be too early to know, but can you tell me what the economics of rare earth metal mining and refinement in Canada are?

Ms. Christiane Villemure: Mr. Chairman, I will attempt to provide an answer to this question; it is a difficult question.

The cost of developing a rare earth mine, like any mine of that size, would probably be in the order of $1.5 billion.

Rare earth materials feed essential supply chains, and the economics of this are not very well known. In fact, there are a number of studies going on in the United States to understand what part rare earths are responsible for in the big supply chains dealing with the automotive industry, high tech, or electronics—those industries.

Even though the prices of rare earth could go up, at the end of the day, the minuscule amounts of rare earth contained in those products do not make a major difference in the price of the end product. The impact is on the capacity of that product to meet client needs, what we have come to expect of the various apparatus we use every day—our cars, our cellphones, our laptops, and our screens.

Ms. Joan Crockatt: Therefore, this may be a strategic resource to develop.

The Chair: Thank you, Ms. Crockatt. Your time is up.

Ms. Joan Crockatt: Thank you.

The Chair: You may have another opportunity, if you'd like.

Mr. Cleary, you have up to five minutes, please.

Mr. Ryan Cleary (St. John's South—Mount Pearl, NDP): Thank you, Mr. Chair.

First a question of clarification: you mentioned at the beginning of your presentation that there is an ongoing study of rare earth mining. Did I hear that correctly?

Ms. Christiane Villemure: We regularly follow the rare earth industry and the rare earth markets. Studies are mostly concerned with the science. We are aware of a number of studies being conducted in the United States that focus more on supply chains or the economics.

● (1635)

Mr. Ryan Cleary: So there's no ongoing study right now into rare earth mining?

Ms. Christiane Villemure: Mr. Chairman, I'm a bit lost in regard to answering that question. The science that we are doing is about rare earth mining. It's trying to find out and address a number of issues that are associated with processing the ore and concentrating the rare earths into products that can be put on the markets, just like we would have to do for zinc, copper, or gold, for example.

Mr. Ryan Cleary: My apologies, then, as I thought you said there was an ongoing study of rare earth mining. I'll move on from there.

My riding is in Newfoundland and Labrador. We have deposits of rare earths in Labrador. We also have deposits of uranium, for example. Until recently, there was a moratorium on uranium mining and exploration. Do you usually find deposits of rare earth near uranium deposits?

Ms. Christiane Villemure: Mr. Chairman, I can take this question, but I'm sure my colleague will want to add to this.

Rare earths are often found with radioactive material, sometimes uranium. The Pele Mountain project in Elliot Lake in Ontario is one such project. This mine used to be a producing uranium mine. Rare earths are found in the deposit, and this project is now looking at a mechanism to be able to put rare earths on the market—

Mr. Ryan Cleary: I'm sorry to interrupt, but when you mention that the Canadian potential is 50% of global demand, can you say how much of that Canadian potential is in eastern Canada/Labrador specifically?

Ms. Christiane Villemure: I wouldn't be able to answer that specifically, but it is something we can find out.

Mr. Ryan Cleary: Another question is in terms of how rare earth mining compares to other mines in terms of safety, such as, for example, the safety of handling tailings and that sort of thing. Where does rare earth mining rank? In other words, iron ore might be the safest, all the way down...where would rare earth rank?

Ms. Christiane Villemure: Mr. Chairman, it's a difficult question to answer. I can risk an answer.

The major concern we hear about rare earth mines is associated with radioactivity, mainly thorium. It's sometimes uranium, but most of the time it's thorium. Thorium is less nasty and less radioactive than uranium.

So far, the data we have indicate that most Canadian deposits do not have high concentrations of radioactivity. They are at levels that need to be managed in any case, and the environmental assessment process normally helps to identify what's in the deposit and how to manage it. It's the company that will have to develop a plan to be able to do that.

Mr. Ryan Cleary: In terms of handling those potentially radioactive tailings, where do the regulations of the Government of Canada stand in comparison to regulations for rare earth mining around the world? Obviously they're better than China's, because other countries have been so critical of China.

Ms. Christiane Villemure: Mr. Chairman, Canada as a country is a major producer of uranium. There are many regulations associated with handling radioactivity, and a rare earth mine would fall under those regulations. There is significant know-how to handle radioactivity, whether it's uranium or a rare earth mine.

Mr. Ryan Cleary: Thank you very much.

The Chair: Thank you, Mr. Cleary.

We have now Mr. Zimmer, followed by Monsieur Gravelle, and then Mr. Leef.

Go ahead, please, Mr. Zimmer, for up to five minutes.

Mr. Bob Zimmer (Prince George—Peace River, CPC): Thank you again for appearing before the committee.

I have a question about page 5 in your slides. There's one thing that's of interest to me. Again, I'm from northeastern B.C., so we deal with a lot of natural resources. Some, I guess, are concerned about how those resources are developed, but we've developed enough procedures that are very safe, and very safe for consumers and all the rest of it.

I'd like to talk about how rare earth elements are used in the green energy industry, or the green economy, as some call it. I've had this discussion with different groups, too, about how much actual coal is involved in making one wind turbine. It's between 140 and 170 tonnes, so sometimes I guess the green movement, if you want to call it that, doesn't necessarily understand that even for their own green technologies, they still need these materials.

I just wanted to ask a few questions about—and we have it on the slide—what materials go into a hybrid car that would be considered rare earth elements. It's on the slide, but it's very small, so I can't quite read it. Could you speak to that?

● (1640)

Ms. Christiane Villemure: That's an interesting question. I would have difficulty reading this too.

I do have a list of rare earth elements and how they are used in various applications and clean technologies. At the outset, I can mention that cars will use quite a number of rare earth elements. The most predominant are the heavy rare earths that are important for super magnets. For example, the electric windows in our cars are actioned by a magnet containing rare earth. As we are moving to smaller and lighter cars, we need materials that are not needed in large quantities; hence, the specific uses for rare earth elements.

Mr. Bob Zimmer: You spoke a bit about the terminology “rare earth”, and I guess that could make some concerned that eventually we're going to run out of rare earth materials.

Is that a valid concern? As you say, the quantities that are used in these particular applications are small, but does it mean that we have a small amount?

Could you clarify that for the committee?

Ms. Christiane Villemure: Mr. Chairman, the rare earth elements are very important, and, as mentioned, they are used very often in minute quantities. The concern is the growth in the numbers of apparatus, the number of cellphones, for example. The demand for hybrid cars is also spinning the demand upwards.

There's research or a number of activities or intentions to look at alternatives. So far, very few alternatives have been found. It doesn't mean this will not happen. If we continue to pursue that topic, probably alternatives will be found. Another mechanism is to try to see if we can use less of that material, and some progress has been made already in that direction.

Because of the growth in the number of applications, projections are such that the current supply, even if we consider finding alternatives and recycling, will not be sufficient. We will need to continue to have sources of these products, and we will continue to need to mine rare earths.

Mr. Bob Zimmer: I'll ask this again.

We talked about the green technologies. This is from the perspective of a northeastern British Columbian who deals with opposition to developing resources without the full understanding that if we don't develop them it will completely come to a stop. And that means any kinds of gains, such as you're talking about with being more efficient by using fewer elements to make a certain technology. There isn't necessarily an understanding; it will take some time to get there, but we need to keep going to get there.

Can you clarify for the committee—and this is getting close to an opinion—that developing technologies is still a positive step, and green technologies, or we simply couldn't develop them?

Could you speak to that a bit?

Ms. Christiane Villemure: Mr. Chairman, without giving specific applications, I think the honourable member is correct in his statement that there is a dependency on rare earth and that there are some rare earth elements that are absolutely essential, and will continue to be essential, in order to develop clean technology, energy efficient technologies, and various electronic applications.

● (1645)

Mr. Bob Zimmer: Okay. Thank you.

The Chair: Thank you.

At the top of your slide you say impacts upon industries worth $4.8 trillion.

For clarification, is that worldwide, and is it per year?

Ms. Christiane Villemure: Mr. Chairman, this is worldwide and it would be in a given year.

The Chair: Okay. Thanks.

We go now to Mr. Gravelle, followed by Mr. Leef and then Mr. Trost.

Mr. Claude Gravelle: Thank you, Mr. Chair.

I want to clarify something that I think I heard.

On page 10, did I hear you say that most of these companies are still in the feasibility study?

Ms. Christiane Villemure: Mr. Chairman, most of these companies—in fact, all of these companies except one—are at the pre-feasibility stage. A couple have done feasibility studies. Quest has just released one, and Avalon has gone through the environmental assessment process.

Mr. Claude Gravelle: Thank you.

Mr. Habib, I'd like to go back to tailings for a minute. One of the mines in the Ring of Fire, Noront, is recycling its tailings as fill for the mine, reducing their footprint.

Is there a study being made that might allow for the tailings for rare earth to be returned back into the mines as fill?

Mr. Magdi Habib: Mr. Chairman, there are no studies being conducted, actually, but before we would do this recycling into the mining operation we'd have to make sure that the tailings were being cleaned of impurities and other contaminants before bringing it back to the mine.

Mr. Claude Gravelle: How do you purify tailings?

Mr. Magdi Habib: We can use the same process that we're using for the purification and recycling or the purification throughout the process through leaching and separation. That would be the same process we could use downstream in the metallurgical process.

So we can use the same technology, but at the tailing stage, for which we are in development at the present time.

Mr. Claude Gravelle: Thank you.

Do we know how much rare earth is needed to make Canada sustainable?

Ms. Christiane Villemure: Mr. Chair, that's a very interesting question. Canada will purchase finished goods that contain rare earth, so by saying “self-sustainable”, Canada will always need to rely on products that are manufactured elsewhere, to some extent. Some products are manufactured in Canada. Some cars are manufactured in Canada. The aeronautics industry is very strong in Canada. But some products that we use in our daily lives are imported, and they contain rare earth elements.

In some industries and in some manufacturing that is conducted in Canada, companies are purchasing pieces or parts or widgets that contain rare earth elements.

Mr. Claude Gravelle: How important does the government think creating a strategic alliance to create a Canadian rare earth chain supply is, and what has to happen for Canada to build a platform for self-reliance?

Ms. Christiane Villemure: That's a very, very complex question. I'm not sure I have all the information or the data or the breadth to be able to answer it in a logical fashion. If the member wants to have some appreciation of that, perhaps it's better for us to get back to the committee.

Mr. Claude Gravelle: Thank you.

Is the demand for rare earth expected to remain high for an extended period of time?

Ms. Christiane Villemure: Yes.

Mr. Claude Gravelle: How much more time do I have, Mr. Chair?

The Chair: You have about a minute.

Mr. Claude Gravelle: Mr. Julian, do you have a question?

● (1650)

Mr. Peter Julian: I do, Mr. Chair, but talk about....

An hon. member: You'll think of one in a second.

Mr. Ryan Cleary: I have a quick question.

With my cellphone, for example, with my BlackBerry, in terms of the amount of rare minerals in this, just so I understand, how much are you talking about? When you talk about minute, how minute?

Ms. Christiane Villemure: It's a few milligrams.

Mr. Ryan Cleary: And it's mostly used to magnetize? Is that why?

Ms. Christiane Villemure: Absolutely. Some of the rare earth will be used for that, but the colours on the screen of your BlackBerry are the phosphorus characteristics of rare earth. There are different types of rare earths. A number of them will make it into a cellphone or a BlackBerry.

The Chair: Mr. Julian, Mr. Gravelle's time is up, but there is a spot open for the NDP a little later, if you'd like to take that.

Mr. Peter Julian: When my mouth's not full?

The Chair: Yes, when your mouth's not full.

Voices: Oh, oh!

The Chair: Mr. Leef, you have up to five minutes.

Mr. Ryan Leef: Thank you, Mr. Chair.

There was a study from Wilfrid Laurier University that was reviewing some aquatic toxicity. They highlighted some gaps. Canmet is doing some additional research now on the effects of rare earth elements on northern aquatic species. Where's that at to date? Has there been any future request or a thought to extend that outside of the northern aquatic species to any impacts on terrestrial species?

Mr. Magdi Habib: Mr. Chairman, indeed, we are working with Wilfrid Laurier on the toxicity of rare earth elements. Our work is very complementary. We're doing work on some northern species, with some invertebrates. The work is still in its initial phase, but we're working very closely with Wilfrid Laurier to get this work going.

Mr. Ryan Leef: How is that work funded? Is it co-funded, or provincially funded, or funded by multi-levels of government? How does that break down?

Mr. Magdi Habib: Mr. Chairman, some of the projects cited here in our deck have in-kind contributions from the industry in terms of leveraging the funds. We have all the expertise and resources to get the work done. Possibly there is funding from the university—I don't know—but we know there is good collaboration between the two organizations to advance this study.

Mr. Ryan Leef: Is it predominantly occurring in northern Alberta and Saskatchewan, or is it moving into the Northwest Territories as well? Do you know what the geographic region of the study is?

Mr. Magdi Habib: Mr. Chairman, I'm afraid I don't have the answer for this question.

Mr. Ryan Leef: That's no problem.

On that initial question about there being any thought into the future, has there been any indication at this point that there would be a need to move into toxicity research on land animals, not just the aquatic end? Or is there no indication of that yet?

Mr. Magdi Habib: Mr. Chairman, there is no indication, but certainly, upon the success of this project and the results we'll be getting from this study, it might expand into other aquatic systems or environmental ecosystems.

Mr. Ryan Leef: Comparatively speaking, we talked a little earlier in some of your testimony about how there's some international collaboration on research and development. I guess my assumption is that Canada is probably in one of the better positions to take the lead on a northern aquatic toxicity study. Of course, there are other geographic regions similar to Canada's, but where are we at in terms of the international stage taking this on?

Typically, when this is done.... Of course, you'll be working with Wilfrid Laurier and they'll have a network of communities that they can push research out to, but does the Government of Canada have a practice, not just of making this research available, but of really making an extended effort to make sure they share this with other arctic parliamentarians, let's say, or with other arctic or northern regions of the globe that would benefit from a northern aquatic study?

Mr. Magdi Habib: Mr. Chairman, we have made some contacts with some other countries outside Canada, such as Australia. In Australia, they have the same types of deposits that Canada has in terms of the heavy rare earths, but it's an industry that's very conservative, and it's very hard to find out what's being done in other countries.

We know that other countries, such as Japan and the EU countries, are doing work on rare earths, but they're more focused on recycling than the hydromet process.

The information we have to date is limited to what we have in Canada.

● (1655)

Mr. Ryan Leef: Do we know a percentage for what market supply we're capable of for Canadian needs from recycling versus the actual mining?

Ms. Christiane Villemure: Mr. Chairman, the recycling of rare earth is extremely difficult. It's a process that has not been completely worked out. There are industries, especially in Japan and European countries, that are looking at it. There are perhaps some small amounts of rare earths being recycled at the present time, but it's a process that still needs to be worked on and still requires significant research.

In Canada, there is some recycling, such as the recycling of batteries and scrap metal, for example. The recycling of rare earth is very difficult because of the minute amounts of rare earths that are found in most practices and applications and that could be recycled.

The Chair: Thank you, Mr. Leef.

In our next group of questioners we have Mr. Trost, Mr. Julian, and Mr. Regan.

Go ahead, please, Mr. Trost, for up to five minutes.

Mr. Brad Trost: Thank you, Mr. Chair.

You may not know all of this, but historically, the United States has had stockpiles of certain rare earth because of the applications and the need for it in their defence industries.

Could you comment on both the United States' stockpiles, historic and present, as much as you know, and also on other countries that may have something similar? I don't know if the European Union or Japan has stockpiles of it.

How does that play into future markets and possibly the future development of the industry in Canada?

Ms. Christiane Villemure: Mr. Chairman, we are aware that the United States, and probably Japan, are stockpiling rare earth. Specific purposes are not divulged, external to those countries, possibly to feed certain critical industries. You mentioned the defence industry, and that's highly possible. That aspect is not necessarily shared with other countries, and we have very limited information on that.

Mr. Brad Trost: Following up on that, on your slide on page 7, with the critical rare earth elements, you have demand outstripping supply. In 2015, you estimate a supply of 41,900 tonnes and a demand of 47,385 tonnes per year. At what point will the rough estimates of that supply and demand meet again? Again, I understand this is guesswork, but what's been making up for the difference between demand and supply over the last few years?

Ms. Christiane Villemure: Mr. Chairman, this graph on page 7 focuses only on the critical, not the total, rare earth. These are the materials forecast to be in supply shortage. The situation has been like that—a small shortage has led to an increase in market prices.

What Canada and other countries want to avoid is the demand continuing to increase and the supply decreasing, with the predictions of shortages, anticipated out of China, for example. Many countries are looking at ways to make sure that the supply also goes up and, hopefully, reaches the demand. This is projecting the future, which is very difficult to do. We do know that a supply shortage is anticipated around 2018, 2019, and many countries are looking at filling the gap.

● (1700)

Mr. Brad Trost: One of the other things noted when I was doing research on this—and this might be for all rare earth minerals, not just the critical ones—is that even though the Chinese government attempts to control their export, some very entrepreneurial people in China have their own way of doing exports and don't always report it, in the neighbourhood of 10,000 to 20,000 tonnes. Looking at those numbers, I anticipate some would have been the critical and some the non-critical.

Is there a potential for non-governmental Chinese exports to rise to handle some of this gap over the next few years?

Ms. Christiane Villemure: Mr. Chairman, there is very little information on that aspect. Experts and analysts suspect that some material is leaked out of China. When we look at supply, demand, and production reported by various countries, some experts suspect that some rare earth are being exported illegally in certain quantities. The exact quantity is very difficult to say, but this situation probably exists right now.

Mr. Brad Trost: But the black market is not likely to impact any of our ongoing projects. It would be too small to have anything substantive.

Ms. Christiane Villemure: Absolutely, yes.

Mr. Brad Trost: Is my time up, Mr. Chair?

The Chair: Yes, it's almost up.

You have time for one more question, if you like.

Mr. Brad Trost: I'll pass, then.

I'm through with my questions.

The Chair: Thank you, Mr. Trost.

We go now to Mr. Julian, followed by Mr. Regan.

Mr. Peter Julian: Thanks very much, Mr. Chair.

I'd like to come back to the Avalon and Quest properties.

Do we have any idea of the total investments made thus far to develop those two properties? What will the eventual investment be before the mines are brought on line?

Ms. Christiane Villemure: I have some information with me, Mr. Chairman, but I'm not sure it will specifically address the member's question.

What I have here is that construction costs for Avalon are in the order of $1.5 billion. For Quest, this information is not available; it's information that has not been published.

Mr. Peter Julian: The Avalon site is the Nechalacho site north of Yellowknife.

Would the cost of $1.5 billion—you may not be aware, but if you could provide information back to us, I think it would be helpful—include infrastructure to actually get to the site itself? I assume it does, at $1.5 billion.

Would you have any of the details around the site itself and what kind of infrastructure is being put into place?

Ms. Christiane Villemure: Mr. Chairman, I believe this number would not include infrastructure. I'm not sure that Avalon requires specific infrastructure. Its location is fairly close to Yellowknife, and they have access to winter roads.

It is information that I can validate and bring back to the committee.

Mr. Peter Julian: That would be great.

The $1.5 billion is the projected total cost. Would you have any sense of how much has been invested so far?

Ms. Christiane Villemure: Unfortunately, Mr. Chairman, I don't have that particular answer for the member, but I can find out.

Mr. Peter Julian: Okay.

Similarly, then, if we don't have the Quest site, do you have projected costs of any of the other sites? I'm not thinking of the 200 exploratory sites, but the dozen or so that are featured in your deck, where the development is obviously more advanced than it is at other sites.

Would you have any sense of the projected costs and projected revenues of any of the other sites?

Ms. Christiane Villemure: Mr. Chairman, I have projected costs, and that would be in the order of about half a billion dollars, at the current level of knowledge.

In terms of revenues—

● (1705)

Mr. Peter Julian: Sorry, is that an average, or is that...?

Ms. Christiane Villemure: Yes. That's a rough order of magnitude per project.

Mr. Peter Julian: Okay.

Sorry, I interrupted you. Were you to speak to the projected revenues or production levels?

Ms. Christiane Villemure: Yes.

On the revenues as projected, and this is really dependent on the deposit, we are looking at half a billion dollars—sometimes a bit less, sometimes a bit more—in annual revenues, not net original revenues.

[*Translation*]

I'm talking about gross revenue.

[*English*]

How do you say that? Gross revenues?

[*Translation*]

Mr. Peter Julian: You are talking about gross revenue. Even still, if we're talking about half a billion dollars in spending and half a billion in gross revenue, the construction costs are one thing, but we are talking about the life of the mine. Is that half a billion the projected amount for the life of the mine?

Ms. Christiane Villemure: It's the—

Mr. Peter Julian: During the entire production cycle.

Ms. Christiane Villemure: They are annual revenues.

Mr. Peter Julian: They are annual revenues.

Ms. Christiane Villemure: They are projected annual revenues. The construction costs are one-time costs.

Mr. Peter Julian: Yes, I understand that.

However, we're talking about huge profits. It could be very useful. Do you have any figures you could give our committee about the sites where that information is available? I'm thinking of anticipated revenues, construction costs and site development. It might be interesting to establish an economic framework for these mines and the potential in that area.

[*English*]

I don't think I have a lot of time left, but there is another question I want to get back to. If the $1 million three-year grant within NRCan is used up by March 2014, what is the recommendation moving forward? Is it to renew it for another three years for $1 million, or is it to expand the actual funding within NRCan to provide support?

Over the next two or three years, how do you see the capacity on rare earth within NRCan being developed?

Ms. Christiane Villemure: Mr. Chair, this is a question that will be discussed before ministers, and it's information that I cannot provide.

The Chair: Thank you.

We'll go now to Mr. Regan, followed by me, and then we'll get to the other business we want to deal with at committee.

Go ahead, please, Mr. Regan.

Hon. Geoff Regan: Thank you very much, Mr. Chairman.

Are you able to tell us, in relation to how much the Canadian government spends on research on rare earths, how we rank compared to the U.S., Japan, or the EU, for example?

Mr. Magdi Habib: Mr. Chair, as we mentioned, Canada's investment is very small—about $1 million for three years. In comparison, the Critical Materials Institute in the United States is investing close to $120 million over the next five years. In Australia it's close to $80 million for the next three years. Although it sounds like a small investment, we are leveraging these funds from the work we're doing with the provinces and territories and through in-kind work with universities. But certainly the amount is not large enough to advance the completion of this initiative.

Hon. Geoff Regan: What would be the full amount, including provincial dollars? Are you able to give me a figure for that?

Mr. Magdi Habib: Mr. Chairman, I don't think I have that information, but certainly we can find that out.

Hon. Geoff Regan: Please do.

As well, in terms of the research we're doing in a collaborative way with other countries, I assume we have reciprocal agreements to do that. How would those be impacted if the funding were not renewed in Canada in April?

Mr. Magdi Habib: Mr. Chairman, if the funding is not there, that will certainly compromise the speed with which we would like to advance this initiative.

Hon. Geoff Regan: I've heard that the Critical Materials Institute provides funding to companies that are trying to develop projects to develop mines for rare earth minerals, and that they do so on the basis of ten to one—in other words, $10 from the institute to $1 from investors.

How does that compare to Canada?

● (1710)

Mr. Magdi Habib: Mr. Chairman, I don't have the answer to this specific question, but I know from the R and D work that Canmet within NRCan is doing that for every dollar we invest from our public funds, we get $5 back from the industry in terms of in-kind contribution.

Hon. Geoff Regan: That would suggest we're the opposite way around: they're ten to one and we're one to five, which is a long way behind. But I'm not sure we're talking about the same thing. I'm not clear exactly what the Critical Materials Institute is funding, and I hope we'll hear from them about that.

What can you tell me about the difference between what they're doing in terms of funding companies directly, as I understand it, and what NRCan is doing or the Government of Canada generally is doing? Maybe it's through tax measures. I'm not sure.

Ms. Christiane Villemure: Unfortunately, Mr. Chair, we don't have the answer to this question. We would need to look it up.

Hon. Geoff Regan: Thank you.

The Chair: Thank you, Mr. Regan.

I have a few questions, and if someone else has just a few, let me know.

My questions come from questions that have already been asked here today. I think you indicated in some comments that the percentage of rare earth elements currently being extracted from hardrock is relatively small. China is a large producer of rare earths, and most of that comes from sand, silt, clay, and that type of material.

As well as you can answer, roughly what percentage of rare earths come from hardrock mining now? If that percentage is low, then just how proven or unproven are the mining techniques that are likely to be used in these projects in Canada?

Ms. Christiane Villemure: Mr. Chairman, currently the amount of tonnage from hardrock mining is minimal. China is producing over 90% of the world's production from its clay deposits.

This is why Canadian industry is looking at solutions to S and T challenges, to be able to extract rare earth from different kinds of deposits. The understanding is that other countries where they have hardrock deposits are in a similar situation.

The Chair: To follow up on that, has there been a study on tailings from mining operations that are in no way related to rare earths, to determine whether there may be rare earths available in the tailings that could be extracted?

Do you know if there's any potential in that regard, or anybody who has explored that?

Ms. Christiane Villemure: Mr. Chairman, I believe there are some projects along those lines.

Pele Mountain, in Ontario, was a former producer of uranium. This mine has tailings that can be reassessed to extract rare earth.

There's another project that is also on the list that we provided to the committee, and that's the Orbite Aluminae project, located in Cap-Chat, Quebec. It's basically a chemical company that is in the process of producing alumina from red mud tailings. Red mud tailings contain a number of materials, and they do contain some rare earth elements. Through the electrochemical process in place at this company, it is believed that small tonnages of rare earth could be extracted out of the tailings.

The Chair: Has there been a study of other tailings done by companies who are looking at rare earths? Or are mining operations who aren't in the business of rare earths looking at possibly refining from their tailings? I don't think I really got an answer to that part of the question.

● (1715)

Ms. Christiane Villemure: Mr. Chairman, I'm not aware of any studies, but perhaps my colleague would like to comment.

Mr. Magdi Habib: No, I don't.

The Chair: On the other side, then, are there other valuable resources that are likely to be extracted along with the rare earth elements, as a byproduct, which may help to make the mines more profitable—or make them profitable at all, I guess?

Mr. Magdi Habib: Mr. Chairman, the only elements associated with the rare earth elements could be the radioactive elements, like thorium and uranium. If that could be of any value to extract and stabilize, that could be an added value, as would tantalum too.

The Chair: Okay.

Now in terms of Canada's position again—there have been some questions asked regarding this—I didn't get a clear picture of it.

Canada imports a lot of rare earths right now. Of the projects that Canada is looking at developing, I think you indicated that most of the rare earths are heavy rare earths. But if these mining operations that have been proposed go ahead, will Canada still be required to import rare earths from elsewhere around the world?

What is the probability of being able to get enough of all the rare earths that Canada might need from production within Canada?

Ms. Christiane Villemure: Mr. Chairman, if Canada needs certain rare earths that are not produced in Canada, there will be a need to import those.

I would say that the majority of rare earth elements produced in Canada would be partially used for Canadian industries but would also be exported to countries that are manufacturing goods that are coming back to the country.

The Chair: It was the other side of it that I was looking at. My time is up, though.

I understand, Monsieur Gravelle, that you have one question, and then we'll go to the other business of the committee.

Mr. Claude Gravelle: I have one or two brief questions because of what you asked.

One brief question is, are any environmental assessments for rare earth elements different from other mines?

Ms. Christiane Villemure: Environmental assessments are basically the same process for any mine, and the onus is on the proponent to do their studies and propose environmental mitigation measures that are appropriate for the types of mines they are looking to exploit.

Mr. Claude Gravelle: The reason why I asked that question is because you spoke a lot about uranium, and uranium mining comes under federal jurisdiction. So would rare earth, because of the uranium, come under federal jurisdiction?

Ms. Christiane Villemure: There are additional regulations that would need to be met when there is radioactivity.

The Chair: I want to thank both of you very much for coming today. It's very much appreciated. It's a good start. I think it's indicated how little really is known—not just that we know but is known—about this. There's a lot to be learned. I look forward to future meetings.

We have to suspend the meeting very briefly. I would encourage all members if they're going to chat with the witnesses to do it very briefly and get back to the table in two minutes. Then we will deal with the rest of the business before committee.

[*Proceedings continue in camera*]