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**BUREAU D'AUDIENCES PUBLIQUES
SUR L'ENVIRONNEMENT**

Les enjeux de la filière uranifère au Québec

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ÉTAIENT PRÉSENTS : M. LOUIS-GILLES FRANCOEUR, président
Mme MICHÈLE GOYER, commissaire

**ENQUÊTE ET AUDIENCE PUBLIQUE
SUR LES ENJEUX DE LA FILIÈRE URANIFÈRE AU QUÉBEC**

PRÉCONSULTATION

VOLUME 19

Séance tenue le 17 juin 2014 à 19 h
Hôtel Plaza, salle Chopin-Mozart
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SÉANCE AJOURNÉE AU 19 JUIN 2014 À 19 H

MOT DU PRÉSIDENT

LE PRÉSIDENT :

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Bonsoir! Je voudrais signaler d'entrée de jeu, et surtout au profit des internautes, que ce soir nous allons procéder d'une façon spéciale, nous avons l'intention d'avoir une sorte d'entrevue avec monsieur Paul Wilkinson qui est le directeur du Southwest Research and Information Center d'Albuquerque au Nouveau Mexique.

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Ce monsieur a demandé à témoigner parce que c'est un spécialiste de la gestion des déchets miniers et nous avons jugé important de l'entendre. Alors, on va se mettre en communication avec lui pour être capable de procéder à l'entrevue incessamment.

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Je voudrais rappeler, au profit des internautes qui n'auraient pas fait d'autres séances jusqu'à présent, que nous assumons un mandat donné par le ministre du Développement durable, de l'Environnement, de la Faune et des Parcs le 3 mars dernier, qui nous demande d'examiner les enjeux de la filière uranifère au Québec.

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On l'a fait en territoires cri et inuit avec des représentants de ces communautés, en vertu des mécanismes de la Baie-James et, par ailleurs, nous avons décidé, pour assumer notre mandat, de nous inspirer d'une formule en trois phases : d'abord, une période de préconsultation, c'est celle qui est en cours, qui permet de recueillir les préoccupations des citoyens ou de toute personne qui veut communiquer à la commission des choses qui seraient à son avis ou à leur avis, importantes.

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Dans une deuxième phase, en septembre, nous allons confronter ces préoccupations et les transposer, si on veut, dans un débat plus approfondi de questionnement et d'information avec des personnes-ressources de différents ministères et organismes publics et avec des experts invités.

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Troisièmement, plus tard à l'automne, une fois que toute cette masse d'information aura été recueillie, on procédera à la réception des mémoires que les gens pourront nous faire parvenir, qu'on pourra venir nous présenter directement ou qu'on voudra nous envoyer par courriel ou autrement.

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Je signale aussi que nous allons recevoir des points de vue de quiconque, des personnes présentes ou d'autres qui n'y seraient pas, jusqu'au 11 juillet. Alors, s'il y a des gens qui nous écoutent sur internet et qui voudraient nous faire parvenir leurs préoccupations, vous pouvez le faire via un formulaire qui est sur internet, vous pouvez le faire par courriel, par courrier ou... je crois que c'est les trois méthodes. Il n'y en a pas de quatrième. Oui, il y a un formulaire sur le site internet du BAPE qu'on peut utiliser à cette fin.

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Alors donc, si la chose est possible, on va essayer d'entrer en relation avec monsieur Paul Wilkinson par vidéoconférence.

Je m'excuse, ce n'est pas Paul Wilkinson, c'est monsieur Paul Robinson. C'est mon erreur.

Alors, nous avons monsieur Robinson à l'écran.

**PRESENTATION OF Mr. PAUL ROBINSON,
RESEARCH DIRECTOR
AT THE SOUTHWEST RESEARCH AND INFORMATION CENTER
ALBUQUERQUE, NEW MEXICO**

Mr. PAUL ROBINSON :

Good afternoon.

LE PRÉSIDENT :

Mr. Robinson, hi. How are you?

Mr. PAUL ROBINSON :

Very good, thank you. Thank you for the opportunity.

LE PRÉSIDENT :

We appreciate that you give us this opportunity. So you have heard about our mandate and you know what is the object of this meeting tonight?

Mr. PAUL ROBINSON :

Yes, I do.

LE PRÉSIDENT :

Okay. So what are the main preoccupations that you want to transmit to us?

Mr. PAUL ROBINSON :

Well, there are a number of things I would like to ensure that you and your colleagues are aware of and able to include in the full scale inquiry when it begins.

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One important area to start is with a comprehensive environmental and social baseline database at a level of work is seldom done in a thorough enough way to then serve as a measuring point for the environmental, as well as the social and economic impacts, that are likely to occur, and also serve as measuring points for the decommissioning or restoration work after completion, if and when activities occur.

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Similarly, there is a need for a strong public health based [...] is those that would be likely to be affected, so that one can assess whether subtle, as well as any potential acute effects can be assessed based on realistic data from the community.

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As I am sure you have heard, there are just a selection, a small number of good public health studies of communities affected by, or living near, uranium sites, and that would not be the case were Quebec to develop, unless it had that kind of baseline, and there is excellent models being developed after the fact, in Navajo Nation, the Navajo Baseline Cohort Study is a very useful example.

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The impacts of uranium mining are not limited to geologic and hydrologic or meteorologic consequences. They have major effects on cultural resources and the social fabric wherever they are developed, and those are – the conditions in those communities are unique and cannot be generalized; often are generalized, but it is unwise to generalize, and so understanding the cultural resources and the social fabric, how nature fits into a cultural setting, both as subsistence sources and traditional activities, those are rare aspects in a community.

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The communities likely to be affected by mining are rarer than the minerals themselves, and be able to reuse minerals, find alternative ways to meet needs, rather than causing permanent changes in a culture that may not yet have made the transition to a cash-economy or want to retain its traditional values but would be unable to if its citizens became involved in a cash-economy and had to change their cultural schedule for a workweek schedule.

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It's important to recognize just how valid the uranium market is, and the need for or potential for new production sites. The marketing efforts by uranium companies tell a part of the story, but they are seldom comprehensive. They provide a perspective.

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The uranium market has deteriorated from a price standpoint dramatically in the last several years, and the many deposits that are found are far from economic deposits; understanding

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resource estimation methods so that one can tell the difference between the lower-grade resource, the inferred mineral resource, and higher grade, the mineral reserve level. Those are very important so that one can determine whether a holding is likely to be valuable, or is an effort to mine investors rather than rock.

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The way in which income and revenue considerations are addressed if uranium proceeds are very important under, ensuring that all long-term costs are identified and addressed at the front-end, so they are not any surprises; when an operation closes, many operations close prior to the complete mining of their ore resource. And uranium operations have had many examples of facilities that have merely been constructed and never operated.

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There's a suite of facilities around the world that are waiting to come online if the market ever recovers, ensuring that local infrastructure development costs, that local training costs are addressed so that if communities want mining opportunities, the training occurs before the mining begins, rather than the other way around.

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Addressing the cumulative impact of the development of uranium and other metals is very important. Uranium seldom occurs in isolation, often occurs associated with other minerals that are valuable. There is a current proposal in Southern Ontario, Eco Ridge, which was first marketed as a rare earth project, and now is a uranium project, and so the combination of other minerals, what the environmental and health risks associated with that combination of materials is, is very important to understand before those risks are set before a community.

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Determining what the quality of post-mining conditions will be. Is there an effort to restore pre-mining conditions? Is it a somewhat lesser level of replacement or mediation or offsetting for a community that has lived in an area and believes it's responsible for handing down that area as good as it was before? That kind of cultural value, which I learned as a Boy Scout, that is a restoration level of recovery of an area that has been degraded; whether that is appropriate, or lower levels, that is a very important consideration.

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I think there is an opportunity for you as Commissioners and those who work in the study once it is implemented to gain personal experience visiting uranium operations that occur. There are many uranium operations that occur where you can learn about different kinds of things; one of the most important is what does final decommissioning look like and how is it monitored and what are the failure modes that have occurred? That kind of looking at final decommissioning sites, those are different sites than the ones that might be operating now, because they are at a different stage in the development process.

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160 Looking at advanced-stage exploration projects so one can see what the infill drilling and level of activity looks like, what the bulk sampling, other stages of mining that, before the extraction of the resource, that were proposed in Quebec, those are worth viewing.

165 Seeing the problems that have called some of the innovations in uranium mine and milling technology are very important; tailings dam failures have led to designs that require full below-grade disposal in a purpose-built pit. You don't put waste into a pit that might have had fifteen years of blasting and had fractures and fissures that allow seepage out of those.

170 The problems of tailings liquid seepage have led to dry tailings disposal methods being specified and maximum water recycled. Those are technology standards that are very important to consider.

175 The problems of mine water inflow. The problem that Cigar Lake Mine in Saskatchewan had where it had two cycles of failure of its design that have resulted in major re-engineering of the underground workings to finally get to production, which has been announced. That problem of mine water inflow where workings might be below surface lakes, that is a very important consideration to understand in Quebec.

180 Perpetual care requirements are very difficult problems because the companies are not likely to last as long as the hazard. In some jurisdictions, after sites are closed, ownership is required to be conveyed to a federal authority with a fully-funded monitoring and maintenance program paid for by the operator at the start of the operation. And so that there is no additional expense to the public treasury, but there is a fully-endowed program.

185 I have got a list I prepared of a range of different sites that might be useful for you as Commissioners, or those in the study, to visit many of which I have visited and certainly, I am willing to help people identify interested parties at these places. It is very important for the Commission to address the full range of stakeholders at each setting. There is more than the company operator or their consultants or the regulators involved.

190 Talking to local residents in places of convenience to them, not in a setting outside their community. Talking to local leadership is addition to local residents. Local regulators often have a different perspective than those at a federal level. And there are typically civil society organizations that provide social services or other services in communities that have a very independent view of the effect of mining on nature as well as on people.

195 Advanced-stage exploration projects in Canada include Kativik and Nunavik, the Michelin Property in Labrador, and Eco Ridge in Ontario, where one can see what that stage of mining does

200 in terms of surface disturbance in those areas where there might be traditional trapping and hunting activities that either conflict or overlap, depending on who you talk to.

205 The decommissioning of the Cluff Lake facility at Saskatchewan is very interesting, and has shown a legacy of acid drainage that form the wastes that is continuing to be addressed. The Elliot Lake decommission sites are very important to visit. I participated in the decommissioning hearings on those facilities in 1995, after the decommissioning was done. The hearing was held post-decommissioning. That is the wrong order, but the plan there was to decommission in place, allow lakes to flood the tailings, and so those are examples where a very different approach to long-term control of uranium mine and mill wastes has been selected, and there are those who are proud of it, those who think it is a high-risk method over the long term.

210 Operating mines, mills and ongoing decommissioning activities can be observed in the Athabasca basin; legacy sites there, such as Uranium City where extensive reclamation has been done, or places like the Gunnar Site where reclamation is yet to be done, more than 50 years after the mine closed.

215 So looking at the full spectrum of sites, not just the poster-child is very important. Not just the prettiest pictures in the museum. In the U.S. there are sites that are worth considering visiting. The operating mill and tailings facility at White Mason, Utah, is a useful facility to see, and is one where alternative sources of uranium are imported and treated. So that site manages waste from other facilities, not just uranium mines and mills. And the idea of uranium sites attracting other wastes because of its licensing or environmental properties has both a good and bad indication of a poorly-disposed tailings facility being done in the State of Utah where a site that had to be remediated is being moved to a well-prepared site with this full below-grade technology in place. The once chance to see that in the world is in Utah.

225 There are operating uranium mines in Arizona, there are tailings sites undergoing reclamation decades after closure owned by J.E. Barrick Gold, Newmont. Some of the biggest firms in the world are still struggling with sites that were operated and yet to be fully remediated.

230 The Church Rock site in New Mexico's G.E. owned, the Homestake tailings in New Mexico are Barrick owned, the Midnite Mine at Spokane and the Ross Adams Uranium Mine in Alaska, those are Newmont owned. The Jackpile Uranium mine on Laguna Pueblo was the largest open pit mine in the U.S. and it had a series of inclined shafts – there's over 100 uranium mine reclamation projects ongoing among the 1,000 mines in Navajo jurisdiction.

235 I think it would benefit the Commission and those conducting the study to engage those involved in the uranium inquiry recently completed in the State of Virginia. The study done there set a very high standard for review. The National Academy of Sciences panel was primarily a public

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health-orientated panel rather than a geotechnical or engineering panel, and did a very thorough review of uranium mining and milling methods because they were educating themselves. They were expert in areas that uranium operations may cause effects rather than operators. And the level of detail achieved was very valuable. There was not a strong effort there to establish the public health baseline that might be necessary. There were very few mine sites visited, but a very thorough study.

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In Europe, there are very important examples of reclamation of uranium mines, but in those cases they were all designed and conducted after mine closure. Those in France, for example, all were reclaimed after mines were closed and reclamation was not part of the operating design, as would be the case in a modern mine. The same is true with the giant facilities in Eastern Germany. I was awarded my Master's Thesis for review of the plants reclamation in the East-German sites in 1992, and the 20-year record of reclamation, how choices were made there, is a very important lesson.

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The most recently permitted underground mine in Africa is a very important example to be aware of. The Paladin-owned Kayelekera Site in Malawi. This is an operation that has been built since the – around 2007, went into operation. It has just shut down because of market difficulties, but seeing a brand-new operation in an area where there has been no history of mining in the past. What have the jurisdictions done, what have the communities done, how is the operation performed? That is a really useful example, though it is not the closest in the world.

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As a few final thoughts, the ability of Quebec to do an excellent job, to do a world-class job of its inquiry is a very important standard, I think, for the province has set and to try and attain. Some of the research that might be required in the public health arena, some of the multiple site visits, so where there is a broad set of experience achieved, all of those I think would be valuable. The ability to meet with a range of communities where they are, rather than flying people out of their community and not getting a personal sense of what occurs; those are very important.

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As a last thought, I spent 17 years as an assistant professor at the University of New Mexico and feel that that role is one that requires a balanced view, not neutral, but being able to understand and respect the views of different parties while still having an opinion of what I think is the most appropriate or most protective choice. And being able to look at that full range of opinion as expert as one can gain access to, recognizing local expertise, as well as intellectual and academic and experiential expertise, I think are elements that will make for a strong inquiry as well as finished product when you are completed with your work. And again, I would be available for work on this matter in the future and certainly, if you or any others have any questions, I'm glad to address them now.

Thank you very much.

LE PRÉSIDENT :

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I thank you very much, Mr. Robinson, it was highly interesting. May I ask you a few questions?

Mr. PAUL ROBINSON :

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Certainly.

LE PRÉSIDENT :

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Okay. I'll start with one of your last remarks. You said that it is quite important to recognize the local expertise, and I wonder if it is mostly, I would say, pertinent for when you are designing or when you are evaluating a project than at the level we are, where we are trying to design what are the different problems, challenges that the Quebec Government may face if they go in the uranium mining.

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When you consider the global picture, how would you introduce the local expertise in a debate that is not related to a local project but which is related to, let's say, the design of a policy, if I can say a word which is a bit too big for what we're doing.

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Mr. PAUL ROBINSON :

Excellent question. I think there is a couple of points to try and make. One is that the experience of people who have lived near mines what do the people in the communities near the Saskatchewan, the Elliot Lake operations, think? What is their 50-year view of the role of uranium development in their communities and the performance of the companies? That is a unique perspective, and it will inform you and your colleagues about some of the issues that may not be readily identifiable at the design stage, but they affect the way in which impacts occur.

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Things such as when training occurs, and how schedules are managed to allow cultural activities as well as regular work lives; the role in which communities receive impact assistance to build infrastructure or areas are merely fly in and fly out and the communities are not really integrated in the mines. Those are important distinctions. Certainly, you would learn from the leaders of the Serpent River First Nation in Southern Ontario that has survived the Elliot Lake experience. What did that do to the watershed, to the natural resources and cultural impacts.

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Often, local residents are people who have worked to the mines and they are familiar with what happened at the mines and whether they were integrated well into the community, so that

they were assessing whether they were good neighbours or an isolated fenced-in facility with little contact.

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Those are different conditions, they have different types of consequences, and there is not a perfect solution, but understanding the way in which things were done. Talking to people in Labrador, for example, where there has been a debate over uranium policy, and positions have been adopted and changed, but those positions are one or two vote swings in an assembly; they are not unanimous one way or unanimous in another. So understanding the evolution of a debate in an area, and how the exploration affects traditional activities; and exploration is before there's any proven reserve or thorough environmental assessment, those are very valuable.

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Local people include educators, doctors, other professionals, that kind of expertise. People with long-term experience: local legislative representatives, all of those people have a lot of knowledge based on experience and not getting to those places one often only sees the experts who have been professional travelers or have a long experience or have a good enough contract to appear at the meeting and getting into the communities is very valuable, irreplaceable knowledge.

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LE PRÉSIDENT :

Before I continue with other questions, somebody is asking us, through Internet, if you could present yourself, to present the type of expertise, the field of expertise in which you have worked. What are your professional or academic competences, and what are your actual functions, so that our listeners on Internet could have a better idea of who you are, and I will continue with questions.

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Could you make a small summary on that?

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Mr. PAUL ROBINSON :

Of course, and a brief biosketch and résumé were provided, and certainly you can make that available.

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I am a Research Director at a non-profit Science and Education Center in Albuquerque, New Mexico, called Southwest Research and Information Center, and I have worked here for 37 years.

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Now, New Mexico is the State that produces most of the uranium mined in the history of the U.S.; it also has the largest reserves. I received a Master's Degree from a Community and Regional Planning Program or in a planning for reclamation of the uranium mines and mills of the former East-Germany, and taught environmental assessment methods and environmental policy classes at the University of New Mexico between 1983 and the year 2000.

360 And I have had papers published by the British Columbia Chamber of Mines in their first Uranium Mill Tailings Symposium in 1990, and appeared before the Royal Commission of Inquiry in British Columbia in 1980 that established a uranium moratorium. I have appeared before Canadian Licensing Authorities related to the Elliot Lake facilities, and I was an invited presenter to the Nunatsiavut General Assembly in Labrador.

365 Other articles have been published by the New Mexico Bureau of Mines and Mineral Resources, including those establishing groundwater baseline in areas already affected by uranium mining. I have been an expert in licensing proceedings before U.S. authorities, including the Nuclear Regulatory Commission for uranium mill sites and for in situ mines, as well as hard rock mine sites. And recently, I have provided, I served as a technical assistance contractor to communities at Spokane Indian Reservation near the Midnite Mine, and Navajo Nation near the Church Rock facility, and served as an expert in groundwater licensing proceeding for the Barrick Homestake site.

375 So there is a long history of experience, both academic and in the licencing proceedings and... over the last 35 years.

LE PRÉSIDENT :

380 I thank you very much, it gives quite a good picture. My next question would be the following: you gave us many examples of interesting mines sites that we could visit, but I would like to understand one thing: would it be more interesting for us to visit newer sites so that we would have an idea of the actual technologies, what they can give in spite of seeing old sites like Cluff Lake and Elliot Lake especially, which are, let's say, survivors of another time, and which are not the tech – does not represent the technology now in use?

385 **Mr. PAUL ROBINSON :**

390 Well, I think that it is valuable to consider visiting and studying sites for different reasons in order to understand what a full decommissioning looks like, and the process involved that involves understanding different sites that are operating. Understanding the cycle from preliminary exploration to advanced exploration, and what are the types of consequences that can occur there. Those would require different sites to look at.

395 Looking at operating facilities is more than just seeing what the existing technology is. Many of those sites have had their technology evolved because of problems that have developed or evolution of regulatory crimes. So there are very few facilities that are recently constructed and operated and whether those standards are the ones that would apply for what is done in Quebec I don't think is clear. The various options for tailings management, putting them back into pits; some

400 people like that, some people think that that is requiring long-term active maintenance and should be eliminated as a management option because sites should not require active pumping.

405 So there are issues at the various operating sites, and there is a history that is its own legacy. Cigar Lake, for example, looking at the various tailings releases at Key Lake or Elliot Lake. There is a full spectrum of activities and history to look at, at these sites, just seeing what they're doing now and thinking of that as isolated information, and the only relevant information from those sites. I think that I would not be doing those sites justice or the process of development from cradle to grave looking at the full spectrum of impacts, positive and negative, that they generate.

LE PRÉSIDENT :

410 One of the newest technologies considers the idea of flooding the tailings so that there is no oxygen in contact with the minerals, so that you don't have radon emissions.

Mr. PAUL ROBINSON :

415 Hum, hum.

LE PRÉSIDENT :

420 But I remember, correct me if I make a mistake, that you said in the beginning of your presentation that it's not very safe to use a big hole in the earth because there has been dynamite used, the rock is fractured, and that there could be another set of risks.

Could you give us your feeling on this technology of flooding tailings?

425 **Mr. PAUL ROBINSON :**

430 An important question, certainly. There are two examples that come to mind; one is the backfilling of a former mine pit that has been conducted in Saskatchewan, and the other is the covering of the tailings at the Elliot Lake facilities in Ontario.

435 The filling of the mine pit is done in an engineered manner where there is a drainage blanket between the wall of the pit and the materials placed in. That wall is designed to collect drainage water and that water is pumped up and out to the surface where it is treated as needed, and subject to reuse or release.

440 That requires active operation of that drainage and pump-back system in perpetuity. If the pumps stop, the pit fills and overflows, and there is reactive material in the interior, inside the drainage blanket and there are some jurisdictions that require that licensing actions result in no long-term active maintenance because those technologies are difficult to guarantee over the eons that are required, and they transfer that burden to others, the future generations.

445 At Elliot Lake there were lakes that were flooded with tailings and dams built to divert natural water around lakes and dams built to contain water on top of tailings, and some of the difficulties there are managing peak flows, addressing a freeze and thaw conditions, making sure there aren't any unmonitored beaver dams eating – beavers eating into some of the dams. So the water covers, unless they are in an arrangement where there is no chance for the water to drain out or don't require active pumping to maintain the isolation, those are all different considerations.

450 Water cover is not an easy thing to establish and sustain; it's much easier during operations when you're making water and trying to separate water from solids at the millings process than in the closure and post-closure arena, and that's all future time. We're just talking about 10, 20, 30 years for the operation; is the water cover and the active maintenance good enough for the eons? That's the question, not can it be maintain during operations?

455 **LE PRÉSIDENT :**

In your opinion, what would be the safest known technology for long-term safety?

460 **Mr. PAUL ROBINSON :**

465 The optimizing safety will depend completely on the way in which the resource is accessed. So if there is an underground mine that is a dry environment being able to ensure maximum backfill, so that as much material as possible is returned to the environment, if it is dry and not subject to reactive metal leaching or transport. Often backfill is added to concrete - or concrete is added to backfill, but that will seldom provide capacity for even 50 percent of the total volume of ore that remains after processing.

470 The idea of fully below-grade in a purpose-built pit where you have a liner below and a liner on top and prevent infiltration of liquids, and, or below what might be an active erosion layer, I think that a fully below-grade design is one that is based on good experience and is a way to avoid the long-term active maintenance of water covers.

475 There are – the requirement of below-grade as a prime option, it's a guideline and not a clear requirement, was established in the early 1980s by the Nuclear Regulatory Commission in the U.S. and no sites have been built since that time.

LE PRÉSIDENT :

Could you give us example of sites that are using this technology?

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Mr. PAUL ROBINSON :

The Peña Ranch Mill that Strathmore Minerals proposed, and Strathmore is a Vancouver-based firm with holdings in New Mexico, as well as in Saskatchewan, and Strathmore has been acquired by Energy Fuels. They had prepared a full-scale mine plan, mill tailings management plan that would have produced paste tailings and been fully below-grade. So this was the Peña Ranch which was subject to review, preliminary review by the Nuclear Regulatory Commission. The company has withdrawn the Notice of Intent to apply for a license because it was acquired by Energy Fuels, and Energy Fuels has an already-operating mill, so it doesn't need two mills. But the records that the firm generated will demonstrate how that can be used.

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LE PRÉSIDENT :

To give more or additional confidence to people, and on the very long-term management of those sites, would something like a superfund that would be fed by most of the mining industry operators would give this an additional possibility to manage on the very long-term to bring additional measures if it is required after the mine has been officially abandoned in case of an accident or so on?

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Mr. PAUL ROBINSON :

Superfund, as I understand it, is designed to address sites that were not managed well and caused releases; either national priorities list sites or smaller sites that are subject to emergency removal. So I think that superfund is what, is an approach that fits with the legacy sites where owners and operators abandoned or were irresponsible.

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I'm thinking of some place like the Gunnar facility in Northern Saskatchewan, it's been going through a series of – a halting series of evaluations, and there has not been much preliminary site clean-up while the long-term site clean-up has been done.

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So superfund is a very complex law that is, I don't think useful as a main; it would be useful to think about how the large sites and smaller sites are managed, what were the investigations, what was required but superfund is not an elegant or simple approach, but there are a lot of lessons to learn and there are three uranium mill tailings piles that are undergoing superfund clean-up for – that have lasted since the early '80s, and one uranium mine that is going through a superfund clean-up.

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So there are examples of uranium sites to evaluate the performance of superfund as a regulatory and environmental management tool.

520 **LE PRÉSIDENT :**

Another question: yes, you said that post-mining conditions are very important; and you think that it is -- it seems that you think that it is possible to create a site that would be almost as good as it was before the mining operation. Do you think it is possible, or if I misunderstood you?

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Mr. PAUL ROBINSON :

I think that that is an appropriate goal to try to attain, and it's a standard that I have heard many people ask for, will our groundwater be restored? They don't want just the drinking water standards, they want it as good as it was. And having the landscape usable for a full range of things that occurred, I think that that's a high standard, and I think that there are ways to attain that. When you have the full below-grade disposal, you have an opportunity to have a surface that's returned to previous use, but it's isolated by a thick and durable barrier.

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A mine site, if it is underground, returning that surface to re-vegetation and resurfacing, I think that that's doable; backfilling open pits so that you put most of the waste back in rather than leaving both the pit and the waste as disturbed area is possible certainly with innovative mine planning, where you... and the evolution of coal mining in North-America where one used to leave waste piles, now backfills pits in a cut and fill method that leaves very little disturbance, and the effort is to restore surface to pre-existing use, including livestock and wildlife.

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So I think that those are important standards to evaluate, determine if they are reasonable, if they are attainable. As you can hear, Mr. Chairman, I am not saying that there are right and wrong answers, but there is a wide variety of different approaches, and each of them have assets and liabilities that need to be understood in detail. There are no simple remedies to managing large-volume waste with persistent hazards.

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So thinking that there might be simple solutions is unwise; thinking about what might be innovative approaches to return land to the way it was, and in a safe way, I think that those are appropriate design standards, and I think they are attainable.

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LE PRÉSIDENT :

From your experience, how long do you think that the best available technology now can give us a real safety? And I think it can work -- I would like to have, maybe in your answer, a

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different opinions for traditional mines and uranium mines. Do you think that they can last more than 100 years, 200, 300 years? What is the design? What is the level of reliability of those?

Mr. PAUL ROBINSON :

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I am used to thinking about the requirement of a containment for uranium mill tailings pile being up to a 1,000 years, in no case less than 200, and consider that short-sighted because that does not reflect the full length of the hazard. But being able to design for 1000-year events, be they precipitation events or slow erosive properties, that's a design standard that there is a lot of experience developing in a wide range of climates.

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And so a 1,000 years provides design limits that can be used, and looking at probable maximum flood, probable maximum precipitation events on looking at multi-thousand year scale, and I think that those are responsible criteria to think about because whatever legacy we create as citizens, we are leaving to future generations who may have benefited in a way from what is the source of risk that is left there in their landscape or community.

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LE PRÉSIDENT :

You seem more optimistic than some around here because we were told that almost nothing that can be conceived now and realized can last more than 100 years now. And you seem more optimistic because you think that it can last more. Would you say also that the type of hazards that we are thinking of today may change and make, ultimately, a completely different picture in terms of risk evaluation?

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Mr. PAUL ROBINSON :

Well, yes, I think that is possible. There are many things that people have done that have lasted 1,000 years. Whether they have last in a way which mimics problems of release or capacity to contain, those are interesting evaluations, but 1,000 years is not a long timeframe in society, even much less geologic time, of course.

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So thinking on those terms is very important. The evolution of risk is an important -- risk understanding is very important in the uranium development sector. We have a project in our office that is involved, this Navajo Birth Cohort Study, where one of the major concerns is uranium itself, primarily uranium 238 which has such a long half-life, such a slow decay rate that it's primarily hazardous as a chemical source of risk rather than radioactive, and it targets the kidney.

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So uranium and kidney disease caused by the chemical hazards, that's the basis for the very low public drinking water standards that have been set for uranium in the last decade. There was

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much more attention of course to radon, the radioactive gas that workers were exposed to, and there is health literature now on those exposure of cohorts, but not on the populations near those radon releases or those exposed to uranium, either in the water or in particulates.

600 So the recognition of uranium as a chemical hazard is an important area that needs to be
addressed thoroughly; it's, I think as you can tell, a big counterintuitive. Oh, uranium is a hazard
because it is a chemical, but I thought it was radioactive. So it is both, but the risk is derived from
the chemical source. There is increasing recognition of the risk exposed to multiple metals, and
there is less research on exposure, for example, to arsenic, or rather than arsenic with uranium
605 associated, or other heavy metals that might be in a mix.

There has been heavy focus on containing radon release but not necessarily looking at the
full range of hazards that might be in fine particles that are released from mine waste rock piles.
Mine waste rock piles, depending on the operation, may be larger than the mill tailings released for
610 open pit mines; three-to-one waste rock to ore ratio is not uncommon. So the management of the
waste rock is particularly important.

You will find, in the International Atomic Energy Waste Rock and Tailings Guidelines; waste
rock and tailings are considered the same class of material, and subject to the same kind of
615 containment requirements, since waste rock is from near the ore zone, is likely to have uranium as
well as heavy metal content, it's usually left on the surface, but lining and encapsulating waste rock
as well as mill tailings, it's very important to address the associated heavy metals that are typically
in the area around an ore zone. They are not in all cases, of course.

620 **LE PRÉSIDENT :**

Many people expressed the opinion in front of us that we should take in account the question
of the rare earths, because they say that there is very often some concentration of uranium in them
and that it should be managed roughly the same way. Do you think – what do you think of that?
625

Mr. PAUL ROBINSON :

Well, certainly considering the associated metals in a uranium deposit, and managing all the
different hazardous constituents in an ore mining and processing plan is appropriate. There is a
630 recent bloom in number of rare earth exploration projects, a number of them do have associated
uranium, like the Eco Ridge in Ontario, and others – Thor Lake further north is another Canadian
example. There is the Ross Adam Mine in Alaska is a uranium mine that is undergoing clean-up
under superfund. Next to it is a rare earth deposit being developed by an independent company
just over the property line.
635

So the idea of addressing rare earths as part of a uranium occurrence happens, has happened frequently, and is certainly appropriate to consider. This is the type of deposit that is driving a uranium inquiry in Greenland, currently.

640 Deposits that have very large low-grade rare earth, as well as uranium detected. There is a very -- there is much less literature on the potential health or ecological consequences of rare earths, much less rare earths in association with uranium or other heavy metals and trying to understand the environmental baseline; do the rare earths occur, if they do monitor for them as with other facilities.

645 The environmental assessment for the Thor Lake Project does have some examples of rare earth baseline investigations, and identifies some rare earth health protection guidelines, so expanding the recognition of potential risk from the commonly understood heavy metals to include the rarer, but naturally occurring rare earths, I think, is very important.

650 **LE PRÉSIDENT :**

In your opinion, what would be the standard over which the rare earths should be managed like uranium tailings? Is there a safe level under which we would not have to look at, and over it that we should manage thoroughly?

655 **Mr. PAUL ROBINSON :**

660 As I have [...] the literature, the rare earths have a growing body of knowledge based on field and lab research, and that there are some guidelines that have been developed by international organizations for individual rare earths, but there is very little information compared to most other heavy metals that are regulated by water quality or air quality protection standards. So identifying the literature and looking at what standards are being developed, there are a number of jurisdictions that are having to address rare earth because operations are being proposed.

665 There is a rare earth deposit in Southern New Mexico that is seeking exploration licences, there is a rare earth mine proposed on far service land with associated uranium in the State of Wyoming, and the Nuclear Regulatory Commission is considering whether it should licence that facility as a uranium mill and mill tailings pile because of the throughput. So there is a number of jurisdictions gathering information, trying to establish standards that would be protective of ecological values as well as human health.

670 I have some literature that I can send you or others that explore this, but the standards that are being found are in the subpart per million range, as is typical with heavy metals. They are not without potential effect.

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LE PRÉSIDENT :

680 At the very beginning of your presentation, you said that we should assess very carefully the social aspect, the impacts on traditional activities, and that we should have a very solid social database before we go in the direction of uranium.

685 I would like to understand one point: were you saying this would be kind of a necessity before to assess a project, or if it is a knowledge that the government should have before setting up a policy because it is a huge task, you know, to have a solid database for all the area of Quebec. It could be possible for one project, you know, but before saying: we go in the uranium file, do we have to know all that? And should there be a kind of cumulative impact assessment before going in that direction for the whole province?

Mr. PAUL ROBINSON :

690 Several thoughts come to mind. First, I think that requiring the establishment of a good social and human health baseline before operation is as important as a water quality or ecological baseline. Without really knowing the health conditions one can't really determine if there are effects because there is no capacity to link cause and effect.

695 So one of the challenges for the Commission might be to determine how to establish a requirement to do those baseline evaluations prior to operation in a meaningful manner; what might be the criteria, what might be the timing, what might be the investment. I think doing the idea of a province-wide baseline and following a birth cohort each year through their lives and sustaining that, I think that model is a very important health assessment and monitoring model and there would be a wide variety of benefits beyond, related to the uranium development sphere to look at what other kinds of health conditions are in place, and how communities respond to those.

700 The other aspect of that is understanding traditional practices range from aboriginal hunting and fishing and trapping and gathering, to livestock raising, agriculture, other -- less aboriginal type land uses.

705 So thinking of tradition as applicable in a community impacted and addressing the consequences in that community; how are those assessments defined, how are requirements to conduct them done, and how are they factored into environmental assessments and evaluations? Those are the process of developing the program that, I think, the Commission will struggle with, and those are the kind of things that the Virginia National Academy of Science panel struggled with when they were talking about the steep hurdles Virginia would have to climb in order to have a comprehensive enough program starting from a very low level.

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LE PRÉSIDENT :

720 I see that you are very sensible to the question, to all social aspects. But I would like you to --
I would like to understand how you balance, let's say, the right to people to say no if it affects too
much their territory with the legitimate right of a State to say the national or the general interest
needs that we go in that direction for development, for creating jobs, to develop territories and so
on. So you have – can have here two types of interests, and it can be a general interest but more
local or a general interest which would be wider? How do you balance that? Which one should
prevail?

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Mr. PAUL ROBINSON :

730 The balancing usually involves more than two sides; a coin always has two sides as well as
the edge. There is never just two parts to a story. And providing an arena where one can look at a
policy values and think about short and long-term benefits, try and provide an arena where those
interests can be weighed, and when there is offsets needed, those offsets are authentic enough to
balance a loss, providing temporary jobs when someone is having an area removed from their
traditional use, that's not a very fair balancing.

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So addressing the balancing in detail; it may be that a mine is not a good idea at one time,
but might come back later. One could come back into consideration later. Minerals are materials
that change value dramatically, and one day's waste is another person's value, and trying to
determine what the equity issues are, are very important.

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Canada has an agreement with China to provide access to uranium. Do indigenous people
have to give up their traditional land so the Canadian Government can meet China's uranium
needs? That is not a very balanced playing field for a community to be factored into a decision.
Determining what are the other alternatives for meeting that international market need; maybe
there is some already-mined uranium that can be reused rather than breaking virgin ground in
order to supply a commodity that has already been mined.

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750 The use of weapons-grade uranium to fuel reactors; I think that society greatly benefits by
reducing the amount of weapons-grade material and reducing the amount of that threat while
reusing the material in a productive way, and so trying to develop creative solutions rather than
feeling boxed in by a "got to get to the market now" or "just say no" type of tension.

I think it is important to address and provide a venue for considering the issues in detail and
not let the urgency of the market negate a full consideration.

755 Not easy balancing, not easy weighing and providing those venues where differences can be heard and addressed so that all the parties are left whole; I think that's a good goal for society, a good goal for government, but it is very difficult.

760 **LE PRÉSIDENT :**

I will ask you a more tricky question on the same aspect. When we were in Kuujuaq in the very north of Quebec, some people told us, you know: "When we have no job, we go fishing and hunting because we should put meat or fish on the table." And they say, the guy who comes at the mine next door, he wants also a job to put some meat on the table of his child. But the problem is he has more alternatives than us because we don't have any other alternatives.

765 How do you integrate so different economic value in a rigorous analysis of costs and benefits?

770 **Mr. PAUL ROBINSON :**

Well, very carefully. It is the – not an adequate approach, but certainly those are fundamental considerations. Treating the communities as if they are rare and valuable commodities, as well as minerals that have value is very important. The diversity of the population in Quebec is very, very impressive, and communities have sustained their culture through very difficult times and very aggressive challenges, both aboriginal or francophone and others. And so those are some of the unique things of the region. So recognizing those, trying to develop programs that support sustaining community's traditional values rather than only sustained if they break with some traditions; each different place and community deserves individual attention, and I don't think it is easy to, or wise to generalize, or think that the distinctions can be addressed affectively and respectfully without thorough investigation and communication.

785 In a situation where uranium is dropping in value and there are many other alternative supplies, that is not a commodity that is likely to drive an economic renaissance in an area and where it's occurred, it's been a boom and bust. The lively Elliot Lake district died out as soon as the Saskatchewan mines went into operation because those mines were owned by similar companies and were cheaper to produce at. So there is plenty of uranium left at Elliot Lake, and the sites were abandoned in mid-development because of market changes.

790 Those, and certainly it was unforeseen, no one knew the Saskatchewan mines would be developed when Elliot Lake started. So there is lots of unforeseen situations that change optimistic views, and with uranium being such a volatile market, and high prices being so difficult to sustain – the price has risen, but it is a very sharp peak, and falls, so it hasn't been sustained at a level that

795 will support the \$60-\$70-\$100 a pound deposits that are being explored in almost everywhere but Saskatchewan these days.

LE PRÉSIDENT :

800 But some...

Mr. PAUL ROBINSON :

805 Perhaps I could still answer, I know it's scrambling, but it's a very difficult question and deserves a very thorough and respectful analysis.

LE PRÉSIDENT :

I understand...

810 **Mr. PAUL ROBINSON :**

815 Both are legitimate. One side is not more human than the other, and so being able to recognize values and respect them and not have to pick one over the others is a very important weighing that King Solomon trained many people to do.

LE PRÉSIDENT :

820 But you are right. Putting that in the same economic equation because the values are so different is quite a challenge, you're right. That, we are faced to that.

My colleague has a question she would like to ask you.

LA COMMISSAIRE :

825 My question will be in French, so Mr. Francoeur will translate, okay?

Mr. PAUL ROBINSON :

830 Certainement. Merci.

LA COMMISSAIRE :

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Certains États américains émettent des permis pour la phase d'exploration; est-ce qu'à votre avis, le secteur de l'exploration et particulièrement de l'uranium mérite d'être réglementé, encadré au même titre que l'exploitation?

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LE PRÉSIDENT :

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My colleague said that in United States and even in Canada, some States are making standards for the exploration so that this can be managed by the State more carefully. Some does not, like they do for exploitation, you know, for the mining process itself. Do you think that it should be the object of a set of standards, the exploration level, or if it is no consequence, as we were said?

Mr. PAUL ROBINSON :

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Mineral exploration can have significant consequences and should be regulated, should be managed to minimize or eliminate those impacts.

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The State of New Mexico has an exploration requirement, and there has been a half-dozen or ten different uranium exploration permits issued under the New Mexico Mining Act. Montana also has exploration requirements. In New Mexico there are baseline data gathering requirements so that the exploration area can be understood before drilling is done. Exploration begins with remote sensing data, aerial reconnaissance, so there is a lot that mineral explorationists can learn before they begin to trench or drill holes.

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When they begin to trench or drill holes, there is land disturbance that should be restored, in my view, and in the view of these State authorities, and good baseline, reclamation plans for each drill site, trying to minimize the footprint of the drill sites. It's particularly important how the drilled hole is managed because the less that borehole is cased well and plugged from bottom to top it provides a conduit for water movement between aquifers, and the drill casings and holes, they are permanent features, and how they are plugged. The down-hole plugging, and how it's able to separate water layers is particularly important, and you only need one poorly-plugged hole to connect a shallow good aquifer in a poor, no aquifer, no aquifer, maybe under pressure, and would up-well into an upper aquifer without good exploration completion of the holes.

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There are examples of cross-aquifer communication that have been detected in the last year at the very large Oyu Tolgoi Mine in Mongolia, where wells that were supposed to be constructed in a way that sealed upper and lower aquifers with concrete barriers were merely gravel-packed. And

now, aquifers are draining – shallow aquifers are draining into lower, and that kind of damage can occur from ineffectively-conducted or ineffectively-regulated exploration.

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The noise and light and traffic from exploration will disturb wildlife, and you have a lot of noise and light during spring; it will affect the critical times in animal's rutting or birthing seasons; managing drilling sediments and fluids so they don't enter streams is very, very important from each individual site, ensuring the drilling is done in closed tanks rather than digging pits and putting the mud in those pits and merely covering them over.

880

Those exploration technology and exploration mud management has advanced as much as mine and mill operating technology, and the most advanced methods that isolate drilling muds from the surface should be required.

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LE PRÉSIDENT :

In your opinion, which State in North America has the best guidelines on this question?

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Mr. PAUL ROBINSON :

I think the New Mexico example is a very valuable one. It was adopted in 1993, so it's one of the more recent, and it's one where uranium exploration permits have been issued under that program. Montana is also very concerned about exploration, but doesn't have as much uranium experience.

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LE PRÉSIDENT :

And when governments are checking for the follow-up which is given by the companies to exploration, what are the main problems they face in nature?

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Mr. PAUL ROBINSON :

One of the important problems is that often re-vegetation programs are described as a seeding plan rather than a plan for successful re-vegetation. Successful re-vegetation is measured by the survival rate of seeds, and the ground cover. The survival diversity. So living plant measures rather than "were enough seeds put in" is a very important difference. Ensuring that drilling is conducted with non-reactive and non-toxic muds is very important so that what residues are generated are benign.

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Removing drilling muds from the environment, rather than encapsulating them, where they might be available to burrowing animals or root penetration is very important. Many of the muds

915 used in drilling are designed to swell to, like bentonite clays swell to fill a space, and if animals
happen to drink liquids with that material in it and it swells in their stomach, they can die, and there
is examples of sheep drinking from drilling mud. Sites that can be addressed by having all the
drilling fluids managed in a tank on the back of a truck, and so there is no cuttings put on the
ground, no muds on the ground, everything is contained, so the technology has advanced to
address those kinds of risks, and they should be enforced.

920 **LE PRÉSIDENT :**

Sorry for my poor English, but I think I missed a point when you made your presentation, and
I think that you wish that Quebec should do a kind of new standard in this area by the type of work
or the type of questioning that we start. Did I understand well what you said, that you want, you
925 said that we are in a position to create a kind of new standard, and what is your idea on that? I did
not catch it clearly.

Mr. PAUL ROBINSON :

930 I think that, that is an excellent question. I think the opportunity of the investigation is to – for
Quebec to do a world-class job, do the best with its resources, and to build on the investigations
that have been done.

935 There is no reason to repeat what has been done, but trying to find areas that were -- areas
of future – that need investigation or future work trying to move to those areas. So you're building
on a foundation and expanding the body of knowledge; looking at some of the questions related to
uranium and its chemical risks. Since uranium is naturally occurring in areas with uranium in wood
or rock may be areas of exposure but not uranium development.

940 Similar with other metals in the environment, like arsenic. So thinking about how uranium
risks are managed in addition to how uranium risks associated with development are managed. I
think they are both important for Quebec to consider since it does have naturally-occurring uranium
that is in the environment, and there are exposures, though is not ore-grade material.

945 Looking at health literature, there has been advances in health work in communities affected
by uranium, as well as some of the constituents associated with it, and building on what has been
done, engaging some of the people currently doing that research, rather than merely reviewing
published material would be getting to the cutting edge, to the most current and evolving
information.

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LE PRÉSIDENT :

955 Mr. Robinson, I thank you very, very much in the name of my colleague Commissioners, and
it was really instructive. So we thank you for having taken time to develop all those ideas and
questions with us.

Mr. PAUL ROBINSON :

960 Well, thank you very much for the opportunity, and I look forward to further contact as the
process proceeds. Merci beaucoup.

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MOT DE LA FIN

LE PRÉSIDENT :

970 Alors, pour les auditeurs qui nous écoutent sur internet, alors on va terminer les travaux de la
commission parce qu'il n'y a pas d'autres personnes inscrites ce soir. Alors, ça termine nos
audiences à Québec – il n'y a personne d'autre qui veut s'inscrire? Non? Bon, c'est complet.

975 Alors donc, j'ajourne la séance et je remercie tout le monde de sa participation. Alors,
bonsoir.

SÉANCE AJOURNÉE AU 19 JUIN 2014

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Je soussignée, YOLANDE TEASDALE, sténographe officielle, certifiée sous mon serment d'office que les pages qui précèdent sont et contiennent la transcription exacte et fidèle des propos recueillis par moi au moyen du sténomasque, le tout selon la loi.

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ET J'AI SIGNÉ :

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Yolande Teasdale,
Sténographe officielle

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