



LEGISLATIVE ASSEMBLY OF THE NORTHWEST TERRITORIES

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Speaker: The Honourable Donald M. Stewart, M.L.A.

LEGISLATIVE ASSEMBLY OF THE NORTHWEST TERRITORIES

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YELLOWKNIFE, NORTHWEST TERRITORIES

THURSDAY, FEBRUARY 26, 1981

MEMBERS PRESENT

Mr. Appaqaq, Mr. Arlooktoo, Hon. George Braden, Hon. Tom Butters, Mr. Curley, Ms Cournoyea, Mr. Evaluarjuk, Mr. Fraser, Mr. Kilabuk, Hon. Arnold McCallum, Mr. McLaughlin, Mr. MacQuarrie, Hon. Richard Nerysoo, Mr. Noah, Hon. Dennis Patterson, Mr. Pudluk, Mr. Sayine, Mr. Sibbeston, Mrs. Sorensen, Hon. Don Stewart, Hon. Kane Tologanak, Hon. James Wah-Shee

ITEM NO. 1: PRAYER

---Prayer

SPEAKER (Hon. Don Stewart): Turning to the orders of the day for Thursday, February the 26th, Item 2, oral questions.

ITEM NO. 2: ORAL QUESTIONS

Mr. Curley.

Question 109-81(1): Research On Water Level In Rankin Inlet

MR. CURLEY: (Translation) Mr. Speaker, I would like to ask the Deputy Commissioner why DPW did not do any research on the water level in Rankin Inlet. Can he answer me?

MR. SPEAKER: Mr. Pilot.

Return To Question 109-81(1): Research On Water Level In Rankin Inlet

DEPUTY COMMISSIONER PILOT: Mr. Speaker, the water supply in Rankin Inlet is provided by a reservoir which they call Williamson Lake. This reservoir is filled during the summer months and fall of each year from Nipisar Lake. This past year there was noted a seepage of water near the top level of Williamson Lake or the reservoir and as a result of that, the pumping from Nipisar to the reservoir was terminated. During the winter months, there was some water left within the line. It was apparently blown out as they call it but some water did sit in the low levels of the line and froze up and created the problem that we have in Rankin Inlet at the present time.

I should say that when the water level dropped to a point where the community felt that it was time to refill the reservoir, it was at that point that we discovered that the line had been frozen in certain areas and required the extensive repair that was given to it. Thank you.

MR. SPEAKER: Oral questions. Mr. Arlooktoo.

Question 110-81(1): Assistance For Hunters And Trappers Of Cape Dorset

MR. ARLOOKTOO: (Translation) Mr. Speaker, thank you. These are the questions that were asked from Cape Dorset to the Minister of Renewable Resources. The hunters and trappers of Cape Dorset wanted to go to -- the fishing and wildlife people in Frobisher and Cape Dorset, they stated that they did not know how to assist them. I wonder if the Minister could look into this possibility of assisting the hunters and trappers of Cape Dorset as to how they can get some assistance or whether they cannot be given assistance. The hunters and trappers of Cape Dorset would like to get a reply to go to Inuksulik Lake to go trapping for foxes. Maybe I think they want to be assisted in a grant from the government.

MR. SPEAKER: Mr. Arlooktoo, really that question probably should have been a written question. Mr. Minister, Mr. Nerysoo.

HON. RICHARD NERYSOO: Yes, Mr. Speaker. If the Member would give me at least a day to look into the matter, I will respond with an answer as soon as possible.

MR. SPEAKER: Thank you, Mr. Minister. Then you are taking this as notice?

HON. RICHARD NERYSOO: Yes.

MR. SPEAKER: Oral questions. Mr. Sibbeston.

Question 111-81(1): High Frequency Radios Used By Hunters

MR. SIBBESTON: Mr. Speaker, a question for the Minister of Renewable Resources. It has recently been brought to my attention that the high frequency radios which are used by trappers in this part of the North have been experiencing problems mainly to do with the overuse of the frequencies which have been allotted by the Department of Communications. Could the Minister communicate with the Department of Communications to see if different frequencies can be given to different areas of the Northwest Territories?

MR. SPEAKER: Mr. Minister.

Return To Question 111-81(1): High Frequency Radios Used By Hunters

HON. RICHARD NERYSOO: Yes, Mr. Speaker. In replying to a question from the honourable Member for Baffin Centre, I replied that there was a question of concern with regard to usage of radios and that at present, because of the numbers of radios that have been issued, we are experiencing problems. We also recognize the fact that many areas in the Northwest Territories may require different frequencies due to languages. We are willing to assist the hunters and the trappers in regions to obtain their own frequencies if that is possible.

MR. SPEAKER: Thank you. Oral questions. Mrs. Sorensen.

Question 112-81(1): Member's Statement Re Changes To Student Grants And Bursaries

MRS. SORENSEN: Thank you, Mr. Speaker. I have an urgent question here for the Hon. Minister of Education, Mr. Patterson. I wonder if Mr. Patterson could oblige me by coming into the ropes. Mr. Speaker, my question is of an urgent nature as I said and it refers to a small item on page three of yesterday's Yellowknifer.

The Minister has obviously indicated to the Yellowknifer journalist that the special committee on education recommendations concerning changes to the Student Grants and Bursaries Ordinance will save the government considerable amounts of money. Yet in reviewing the transcript, Mr. Speaker, yesterday on page 1702, the Minister of Education said and I quote: "I would like to say that quite candidly we do not have a detailed cost benefit and analysis of the implications of the recommendations."

Further, Mr. Speaker, on page 1705, he said: "However, I do not think it is fair to give anyone the impression that these recommendations are going to result in a net reduction of the cost of the program, because our other recommendations are going to cost money. I am sure that the committee would not disagree with me in pointing out, first of all, that we are going to not double but considerably enhance the levels of aid in recommendation number eight." Further, on page 1706, Mr. Speaker, and I quote again, Mr. Patterson says: "I think we should be frank that if the Executive Committee were to go full bore on all these recommendations all at once, the whole program would cost considerably more."

I wonder, Mr. Speaker, if the Minister is prepared to retract his statement to the press and apologize to my constituents for misleading them on the financial implications of the special committee on education's 15 recommendations. Thank you, Mr. Speaker.

MR. SPEAKER: Mr. Patterson.

Return To Question 112-81(1): Member's Statement Re Changes To Student Grants And Bursaries

HON. DENNIS PATTERSON: Thank you, Mr. Speaker. Unfortunately the remarks in the press were an oversimplification of what I had told the reporter when asked about the recommendations. I certainly would not hesitate to apologize for any confusion I may have caused in the honourable Member's constituency. I trust that the more detailed discussion which took place yesterday about the recommendations, prior to the motion to adjourn that discussion to March 9th, provided more elucidation to the honourable Member's constituents and that the recommendations and the details of the recommendations will be discussed in detail and in public by this House when we resume the debate on March 9th.

MR. SPEAKER: Thank you. Mrs. Sorensen.

Supplementary To Question 112-81(1): Member's Statement Re Changes To Student Grants And Bursaries

MRS. SORENSEN: Yes, thank you, Mr. Speaker. Just further to that same article, the Hon. Mr. Patterson apparently indicated to the same reporter and I quote: "Deleting the reference to the means test shows how responsive the government is to the wishes of the public."

I wonder if the Minister could tell me what he meant by that statement, particularly since the recommendations of the special committee, while they do not say specifically that a means test applies, certainly have recommended through recommendation number five that the loan of \$1800 and the grant of \$1500 be subject to a means test. I wonder if he could explain that?

MR. CURLEY: Point of privilege, Mr. Speaker.

MR. SPEAKER: Point of privilege, Mr. Curley?

MR. CURLEY: Yes. The item in question has been deferred to March 9th. I would ask that she ask those questions on March the 9th.

MR. SPEAKER: Mr. Curley, that is not a point of privilege. This is a question period related to quotes in the newspaper that are relevant and timely. The Member has every right to continue her questioning. Mrs. Sorensen.

MRS. SORENSEN: I have completed, Mr. Speaker. Would the Member respond?

MR. SPEAKER: Mr. Patterson.

Return To Supplementary To Question 112-81(1): Member's Statement Re Changes To Student Grants and Bursaries

HON. DENNIS PATTERSON: Thank you, Mr. Speaker. Yes, unfortunately, since the reporter for the Yellowknifer was seeking a quick comment in order to include something in the paper prior to deadline, the shortness of the means test has prevented the true context of my remarks from being reported and, therefore, I am quite happy to explain in more detail what I had meant in my remarks to that particular reporter.

What I had meant to say is that the committee had deleted a very controversial recommendation in the original recommendations, which went something along the lines of Dene, Inuit and Metis will not be subject to a means test. I felt, and I told the reporter, that deleting that reference to the means test showed that the committee had listened to the strong concerns expressed by the honourable Member's constituents, amongst other people. I did not mean to imply to anyone that the Canada Student Loans plan did not incorporate a means test. However, that means test is not racially oriented and neither, I submit, are the committee's current recommendations phrased in such a way as to promote the sort of racial divisiveness and adverse comments that the earlier comment had provoked, and that was the reference that I was referring to as having been deleted. I hope that assists the honourable Member, Mr. Speaker.

MR. SPEAKER: Thank you, Mr. Patterson. A supplementary. This is your last one, Mrs. Sorensen.

Further Supplementary To Question 112-81(1): Member's Statement Re Changes To Student Grants And Bursaries

MRS. SORENSEN: I wonder, Mr. Speaker, if I could have the assurances of the Hon. Mr. Patterson, Minister of Education, that he will write a letter to the editor of the Yellowknifer explaining that he felt that, while he may not have been misquoted, that all the facts were not given in the short story. I ask that, Mr. Speaker, simply because not all my constituents are able to be here. They work during the day and they are not able to take part in the deliberations that have been going on concerning the special committee on education's recommendations, yet they read the local newspaper. So, I wonder if I could get the assurances of the honourable Member that he will write a letter to the editor, clarifying what he has just indicated for the public record in this House.

HON. GEORGE BRADEN: Put it on the CBC. They will get it right.

MR. CURLEY: It will be on the record.

MR. SPEAKER: Mr. Patterson, do you care to answer that question?

Return To Further Supplementary To Question 112-81(1): Member's Statement Re Changes To Student Grants And Bursaries

HON. DENNIS PATTERSON: No, I will not make that assurance, Mr. Speaker.

---Applause

If I were to clarify and write a letter to the editor every time I had been misquoted...

MRS. SORENSEN: You were misquoted, were you?

MR. CURLEY: Hear, hear! Other times.

HON. DENNIS PATTERSON: ...in the News/North or the Yellowknifer, or my remarks had been taken out of context, or the wrong impression has been given from what I have been saying, I would be writing a weekly column...

---Laughter

...and I have other more important work to do, Mr. Speaker.

MRS. SORENSEN: I will be sending this to the publisher.

MR. SPEAKER: Thank you. Oral questions. Mr. Noah.

Question 113-81(1): Water Survey On Williamson Lake

MR. NOAH: (Translation) Thank you, Mr. Speaker. I am going to add to Mr. Curley's question regarding Williamson Lake in Rankin Inlet. Was the lake too small for the water survey of Canada to do a survey or is there nobody who looks after or studies water in Rankin? I guess water survey of Canada does not work in the wintertime, and why was it never clearly surveyed? I do not think that is going to be the only one in the future that is going to have a problem, and perhaps this is going to come up again. I wonder if the Commissioner could answer this?

MR. SPEAKER: Mr. Deputy Commissioner, Mr. Pilot.

Return To Question 113-81(1): Water Survey On Williamson Lake

DEPUTY COMMISSIONER PILOT: Mr. Speaker, the situation in Rankin Inlet is one in which we were planning to phase out Williamson Lake as a reservoir and to pump water directly from Nipisar Lake to Rankin Inlet, when the utilidor was completed. That investigation has been ongoing and the survey of the lake for a number of years, and was to be completed, perhaps, this summer or in a year or two. So, the situation there was that Williamson Lake really is an interim situation, until Nipisar Lake and the pipeline and the utilidor all came into phase.

MR. SPEAKER: Thank you. Oral questions. Mrs. Sorensen.

MRS. SORENSEN: I have another question, Mr. Speaker, to the Minister of Education. I wonder if he would be so good as to come back within the ropes.

MR. CURLEY: Smile, Mrs. Sorensen. Smile.

MR. SPEAKER: Mrs. Sorensen.

Question 114-81(1): School Supplies For Sir John Franklin High School

MRS. SORENSEN: Yes. Mr. Speaker, during the last session a motion was passed that authorized the Executive Committee to find money for school supplies for Sir John Franklin High School. I wonder if the Minister could tell me whether that motion has been proceeded with and whether Sir John Franklin has had an increase in its budget for school supplies and materials.

MR. SPEAKER: Mr. Patterson.

Return To Question 114-81(1): School Supplies For Sir John Franklin High School

HON. DENNIS PATTERSON: Thank you, Mr. Speaker. Yes, I am happy to say that as a result of submissions from a number of MLA's, including myself may I say, and the honourable Member for Yellowknife Centre, the budget for supplies in schools has been substantially increased in the coming year and now provides \$175 per student per year, which is considerably higher than the level from last year, which I think was approximately \$130. Thank you, Mr. Speaker.

MR. SPEAKER: Thank you, Mr. Minister. Thank you, Mr. Commissioner and Mr. Deputy Commissioner. Oral questions. Item 3, on your orders of the day, written questions and returns. Are there any written questions? Are there any returns?

ITEM NO. 3: QUESTIONS AND RETURNS

Mr. Nerysoo.

HON. RICHARD NERYSOO: Yes, Mr. Speaker. I have a number of returns, so may I remain standing to reply?

HON. TOM BUTTERS: Agreed.

MR. SPEAKER: Yes.

Return To Question 71-81(1): Use Of Pesticides And Insecticides In The NWT

HON. RICHARD NERYSOO: Yes, Question 71-81(1), asked by Mrs. Sorensen regarding use of pesticides and insecticides in the Northwest Territories. Over the past three years, pesticide and insecticide permits have been issued as follows: 1978, none, one refused; 1979, none; 1980, one, one refused.

The Prince of Wales Heritage Centre was granted approval for the use of PRO-3ULV concentrate insecticide for use in the north and south galleries and the reserve collection storeroom. Very rigid conditions were outlined in a letter to the museum director, Dr. Janes, dated October 21, 1980. The environmental services division relies on the specialist advice of the federal environmental protection service, Department of Environment, to assist in the administration of the Pesticide Ordinance.

Return To Question 75-81(1): NWT Game Council Status

In reply to Question 75-81(1), asked by Mr. Curley on February 17th, with regard to the Northwest Territories game council status: Technically, the Game Advisory Council has not been disbanded. However, I am presently reconsidering their terms of reference and membership in light of the suggestions from COPE and ITC on the organization of structures for consultation in the Western Arctic region and Nunavut.

The Game Advisory Council has been relatively inactive this fiscal year, mainly because of my uncertainty about their role. The wildlife service has continued to keep the old members informed about plans for changes in regulations and has asked for advice from them. Their only meeting in the past 12 months was one I convened on the 27th and 28th of January, 1981. I asked members to give me their thoughts about Northwest Territories-wide consultation of hunters, trappers, naturalists and sportsmen. No further meetings are planned for this fiscal year or early in the new year.

Further Return To Supplementary To Question 26-81(1): Management Agreement
Re Caribou

A reply to Mr. Curley regarding the plans of action regarding the caribou herds, Question 26-81(1). A meeting of the interprovincial caribou management group was held in Edmonton on the 30th of January, 1981. Members of the group are directors of wildlife management agencies of Manitoba, Saskatchewan and the Northwest Territories, and senior representatives of the Department of Indian and Northern Affairs and the Canadian Wildlife Service. The Keewatin regional superintendent of my Renewable Resources department was among the observers invited to the meeting.

In response to directions from federal, provincial and territorial Ministers who met in Winnipeg on the 12th of December, 1980, the caribou management group prepared a draft of a barren-ground caribou management agreement. This draft will be submitted to me and to the other ministers who met in Winnipeg for review and eventual approval.

I have been advised that the essence of the draft agreement is:

1. The formation of a caribou management board that will replace the present caribou management group.
2. The appointment of board members by the Ministers of wildlife management, Governments of the Northwest Territories, Manitoba and Saskatchewan.
3. The appointment of both representatives of the native caribou hunters and government wildlife managers. The caribou management group recommended that the Northwest Territories Minister of Renewable Resources appoint two native caribou hunters, one from the Keewatin and one from the southern Fort Smith region, and one senior government person as our members of the new board. The provinces would be allowed one government and one native member each.
4. One of the responsibilities of the new board would be to come to an agreement on research on and management of the Kaminuriak and Beverly caribou herds. The caribou management group has prepared a draft caribou management plan which would be given to the new board to do with as it wishes.

The draft agreement will be in my hands this week, and I intend to give it my prompt attention and submit it to the Executive Committee for review upon completion of review from the native organizations.

Return To Question 79-81(1): BC Hydro Proposal, Mackenzie River

A reply to Ms Cournoyea to Question 79-81(1), asked on February 18th, 1981, regarding the BC Hydro proposal, Mackenzie River: The Mackenzie River Basin committee was established in 1977 under the provisions of the Canada Water Act. The committee consists of 12 members; four representing Canada, one representing the Northwest Territories, one representing the Yukon Territory, two representing British Columbia, two representing Alberta, and two representing Saskatchewan.

The committee is continuing the exchange of information on water and water related matters commenced in 1972 between the various governments and their agencies regarding investigations, research and possible developments within the basin that may affect its water resources. However, the committee is not in a position to judge existing developments in the basin, nor to recommend for or against present or future development proposals. The committee is currently directing the Mackenzie River Basin study which is a three year study of the water and water related resources of the basin. The \$1.6 million study is being carried out under a federal and provincial agreement signed on April 1st, 1978. The final report is scheduled for August 31st, 1981.

The committee's continuing work is aimed at providing a better understanding of the Mackenzie River Basin as a whole, so that it will be possible in future to determine how proposed developments in one part of the basin may affect other parts of the basin. The committee is currently working toward this understanding through a program of gathering base line data and compilation and evaluation of existing information relating to the water and related resources of the basin.

This government is pressing and will continue to press for the role of the committee to be changed from merely a study group to a planning and management group modelled on the prairie provinces water board to deal with questions of water apportionment, such as the one raised by Ms Cournoyea, and also matters of water quality, navigation improvements, shared benefits and hydro development and so on. I am making arrangements to meet with my opposite member in the British Columbia government shortly to pursue the matter and some of the questions that were asked by Ms Cournoyea with regard to proposals for hydro development that are being considered by the British Columbia government.

MR. SPEAKER: Thank you. Returns. Mr. Tologanak.

Return To Question 51-81(1): Oil Tanks At Lake Harbour

HON. KANE TOLOGANAK: Mr. Speaker, I have a return to Question 51-81(1), asked by Mr. Arlooktoo on February 13, 1981, with regard to oil tanks in Lake Harbour. All current tank farm construction specifications include dismantling and removing old tank farms. In the past, new construction did not include the removal of old sites. This occurred in Lake Harbour. The removal of all old Lake Harbour tank farms will require the allocation of capital funding for the fiscal year of 1982-83. There have been no capital funds allocated to that project in the 1981-82 main estimates. The Baffin regional director will be advised of this capital expenditure request so that he may consider it in his capital priorities for 1982-83. Thank you.

MR. SPEAKER: Thank you, Mr. Minister. Are there any further returns?

Mr. Nerysoo.

Return To Question 101-81(1): Funding For Caribou Hunts In Settlements

HON. RICHARD NERYSOO: Yes, Mr. Speaker. A reply to Question 101-81(1), asked by Mr. Fraser on February 24th, 1981, regarding the funding for caribou hunts in settlements. When we get to the department's budget, you will see that \$22,000 has been provided for caribou hunts. As stated previously to the House, I intend to regularize the distribution of these funds. The funds will be available to other settlements and not just those in the Yellowknife area.

Return To Question 37-81(1): Recovery Of Polar Bear Tags For The Northwestern Arctic

A reply to Question 37-81(1), asked by Ms Cournoyea, regarding the recovery of the polar bear tags for the northwestern Arctic: Although no formal or informal agreement presently exists between the Government of the Northwest Territories and the Government of the Yukon, the Yukon has suggested the following provisions with respect to its polar bear quota:

- (a) That on a year-to-year basis, the Government of the Yukon will grant the Government of the Northwest Territories the use of five of the Yukon's polar bear quota;
- (b) That within any given year, the Yukon government reserves the right to revoke this agreement;
- (c) That the Government of the Northwest Territories will provide, through its regulatory and administrative process, these five additional Northwest Territories polar bear tags to members of the Yukon's North Slope group trapping area;

(d) That this additional quota of five polar bears must be harvested within the Northwest Territories, that is, the Beaufort Sea.

I am concerned about the implications of the foregoing conditions and am therefore not prepared to sign an agreement with the Yukon government until I have thoroughly studied the matter. Representatives of the Department of Renewable Resources have played no direct role in the negotiation of the above four points and have only discussed administrative mechanisms with officials of the Yukon government. Hence, they cannot comment on why only five of six tags are being turned over to the Government of the Northwest Territories or the benefit of the one tag to the Yukon.

MR. SPEAKER: Thank you, Mr. Minister. Are there any further returns?

Item 4, on the orders of the day, petitions.

Item 5, tabling of documents.

Item 6, reports of standing and special committees.

Item 7, notices of motion.

ITEM NO. 7: NOTICES OF MOTION

Item 8, motions. Mr. Butters.

Notice Of Motion 21-81(1): Principles For The Development Of An Agricultural Policy Referred To Committee Of The Whole

HON. TOM BUTTERS: Mr. Speaker, you missed my hand on the item with regard to notices of motion. May I give notice? I give notice that on March 2nd, I will introduce a motion to put Tabled Document 11-81(1), Principles for the Development of an Agricultural Policy, into committee of the whole for discussion.

MR. SPEAKER: Thank you. Notices of motion.

Item 8, motions. Mr. Clerk, there are no motions for today?

Item 9, notices of motion for first reading of bills.

Item 10, introduction of bills for first reading.

Item 11, second reading of bills.

The House at this time would like to recognize Miss Debbie Dobson from Sir John Franklin High School and the members of her debating club, Tim Shopa, Mary Ann Madsen, Jim Terry, and Ken McDonald.

---Applause

Item 12 on the orders of the day, consideration in committee of the whole of bills, recommendations to the Legislature and other matters.

ITEM NO. 12: CONSIDERATION IN COMMITTEE OF THE WHOLE OF BILLS, RECOMMENDATIONS TO THE LEGISLATURE AND OTHER MATTERS

Uranium Exploration and Mining; and Bill 1-81(1), An Ordinance Respecting Expenditures for the Public Service for the Financial Year Ending the 31st Day of March, 1982, with Mr. Fraser in the chair.

---Legislative Assembly resolved into committee of the whole for consideration of Uranium Exploration and Mining, with Mr. Fraser in the Chair.

PROCEEDINGS IN COMMITTEE OF THE WHOLE TO CONSIDER URANIUM EXPLORATION AND MINING

Uranium Exploration And Mining

CHAIRMAN (Mr. Fraser): The committee will come to order, and deal with uranium exploration and mining. Mr. Braden.

Motion Establishing Guidelines For Witnesses On Uranium

HON. GEORGE BRADEN: Thank you, Mr. Chairman. Before we get into discussion with the witnesses, I would like to move a motion: That the following guidelines with respect to the appearance of witnesses be adopted and applied throughout the debate on uranium exploration and mining:

- (1) that initial presentations by each witness not exceed 30 minutes;
- (2) that a period for questions by MLA's immediately following each witness's presentation not exceed 15 minutes; and
- (3) that each witness be allowed opportunities for a concluding statement and to respond to questions thereon by MLA's, for a period not to exceed a total of 20 minutes. That is my motion, Mr. Chairman.

CHAIRMAN (Mr. Fraser): Thank you, Mr. Braden. To the motion. Mr. Patterson. Mr. Braden. To the motion. Thank you. Sorry.

HON. GEORGE BRADEN: Thank you, Mr. Chairman. I am moving this motion primarily to ensure that we provide an opportunity for witnesses to make a presentation and also to MLA's to ask questions. If we look at the number of witnesses here, I think there are around 10. For each witness, if we allow a maximum of an hour, we are talking about 10 hours and that pretty well takes up Thursday and Friday. Now, I think we have to show some respect and some concern for the witnesses from out of town who are here and if we can have a good discussion and debate on this issue over the next two days, I think we will have done fairly well. We also have to recognize that we still have 10 departments and an agricultural policy to get through in the next four weeks. That is all I have to say. Thank you.

CHAIRMAN (Mr. Fraser): Thank you. Mr. Patterson, to the motion.

HON. DENNIS PATTERSON: Mr. Chairman, with all respect to Mr. Braden, I find the principle of the motion acceptable, but the guidelines quite unacceptable. I think it is an insult to the Members to suggest that questions should be limited to 15 minutes and I know that the witness I invited, Dr. Gordon Edwards -- or I should say, the witness I suggested the Assembly invite, Dr. Gordon Edwards, has a presentation of an hour, which will be rushing him, in view of the problems that we are going to have with translating technical terms. I suggest that at least the principal witnesses who were invited by original motion in Frobisher Bay, by myself and Mr. MacQuarrie, Dr. Meyers and Dr. Edwards, should at least be given the dignity of a decent opportunity to make a presentation.

Amendment To Motion Establishing Guidelines For Witnesses On Uranium

Accordingly, therefore, Mr. Chairman, I would move an amendment to the motion, to substitute "60" for "30" in part (1), so that initial presentations by each witness would not exceed 60 minutes. If they want to talk for 10 or five minutes, that is fine, but if they have prepared for some months for an hours presentation, they should have that time. Part (2) would be amended to change

"15 minutes" to "60 minutes" and part (3) would be amended to read: "That Dr. Meyers and Dr. Edwards", in place of the words "each witness", "be allowed opportunities for a concluding statement", add the words "at the end of the debate and to respond to questions thereon by MLA's", delete the words "for a period not to exceed a total of 20 minutes", and add "within the guidelines set out in (1) and (2) above".

CHAIRMAN (Mr. Fraser): Could we have a copy of that, please, Mr. Patterson? Sorry for the delay. I will just have the Clerk read the amendment to the motion. Mr. Clerk.

CLERK ASSISTANT (Mr. Hamilton): The amendment in part (1) would be to change "30 minutes" to "60 minutes", in part (2) from "15 minutes" to "60 minutes", and in part (3) would read: "That Dr. Meyers and Dr. Edwards be allowed opportunities for concluding statements at the end of the debate and to respond to questions within the guidelines set out in (1) and (2) above."

CHAIRMAN (Mr. Fraser): To the amendment. Mr. Butters.

HON. TOM BUTTERS: Just to observe, Mr. Chairman, that as long as we are talking, our guests cannot be talking. The other point I would make is that I think the instruction to them is to be brief and to the point and anything they miss we will bring out with questions.

CHAIRMAN (Mr. Fraser): To the amendment. Mr. MacQuarrie.

MR. MacQUARRIE: I support the amendment, Mr. Chairman. I think we are dealing with a very important topic. I can see no reason at all why we should rush it and if we have to sit an hour or two extra that would be fine with me.

HON. TOM BUTTERS: A day or two.

Opportunity For Questions And Response

MR. MacQUARRIE: I think with respect to the initial presentation, 60 minutes is probably more than necessary. I am sure there are very few people other than perhaps my honourable colleague from Frobisher Bay who could speak for an hour and keep people listening, but if someone feels that that amount of time is necessary to make an adequate presentation, I believe they should have it. With respect to part (2), I will accept the 60 minute limit on questioning but my own preference would be for an open question period. As long as there is something still bothering someone, I would like to see opportunity for questions and response.

MRS. SORENSEN: Hear, hear!

MR. MacQUARRIE: With respect to part (3), I do agree that in a sense we have two people who were initially invited who probably are quite competent to sum up presentations that have been made and ought to have the opportunity to do so. So I definitely support the amendment.

CHAIRMAN (Mr. Fraser): To the amendment. Mr. Noah.

Problem Of Translating Scientific Terms

MR. NOAH: (Translation) Thank you, Mr. Chairman. This amendment I will also support for reason that when Dr. Edwards is going to be here as a witness and as an expert, he will not be able to speak in Inuktitut and these scientific words that you have in English are going to be quite difficult to translate. Maybe even some of them will not have any words to describe them. They are scientific words that do not exist in the Inuktitut languages. It will be

even better if he can have a longer period to make his presentation, because if we have some questions -- it is okay for other people that do not have usual means for these presentations. I want to understand what this is all about. I am in full support. Thank you.

AN HON. MEMBER: Question.

CHAIRMAN (Mr. Fraser): A question being called. I hear question. To the motion. To the amendment. All in favour? I am sorry. Mr. Stewart. To the amendment.

HON. DON STEWART: Thank you, Mr. Chairman. The original motion, of course, was to try and save some time and put some guidelines on. However, if it is the feeling of the majority of the House that these time limits are too restrictive, that is fine. They should be raised. However, on your part (3), it seems to me to be only fair that if you are having a debate of this nature, that any speaker should have time for a rebuttal at the end and not restrict it to two people. People have come a long way to make their case here and now, with this motion, you are restricting it to only two that can summarize on the debate.

I feel that this in part is an insult to the other people that have been asked here and not given this opportunity, the same as the other two speakers. So the first two parts of extension of time I have no basic objection with. I do have an objection to the third one and I think that that should be changed so that all speakers are given the same opportunity in this House and not be restricted. The rules should be the same for everybody.

CHAIRMAN (Mr. Fraser): To the amendment.

HON. DENNIS PATTERSON: To the amendment.

CHAIRMAN (Mr. Fraser): Mr. Patterson. To the amendment.

HON. DENNIS PATTERSON: Thank you, Mr. Chairman. Just very briefly -- this is not a debate on the price of rice in China. This is one of the most important environmental and public health issues that this Assembly will deal with in this session and I would like to ensure that if witnesses have something to say, that they not be cut short by rules. At the same time, I do agree that we have other important business to get on with in this Assembly. I trust that all Members and witnesses will try and keep their questions short and relevant. We all can do our part in that regard.

Now, as to part (3), I only suggested that Dr. Meyers and Dr. Edwards be allowed rebuttal opportunities because -- I respect the Members' concern that if we allowed every witness an opportunity to appear twice, it would prolong the debate considerably. So I had only suggested that the two be invited in the interest of saving time and I would suggest that if Mr. Stewart feels strongly that that is discriminatory, then he should propose an amendment. I do not even think I could amend my own motion but that is no reason for not permitting us more than 15 minutes to ask questions. Thank you, Mr. Chairman.

HON. KANE TOLOGANAK: Question.

CHAIRMAN (Mr. Fraser): Mr. Stewart.

Amendment To Amendment To Motion Establishing Guidelines For Witnesses On Uranium, Carried

HON. DON STEWART: Yes, I would like to move an amendment to the amendment. Part (3); it now reads that each witness be allowed an opportunity for concluding statements and to respond to questions by MLA's.

MR. MacQUARRIE: Question.

CHAIRMAN (Mr. Fraser): The amendment to the amendment. A question being called. All in favour? Down. Against? Contrary? The amendment to the amendment is carried.

---Carried

To the amendment. Mr. Wah-Shee. To the amendment.

HON. JAMES WAH-SHEE: Mr. Chairman, could we have copies of the amendment that has been made so far because it is rather confusing?

CHAIRMAN (Mr. Fraser): I beg your pardon. You want copies of the amendment that has been made so far?

HON. JAMES WAH-SHEE: Yes, I would not mind.

CHAIRMAN (Mr. Fraser): I will just have the Clerk read it out -- or do you want typed copies? Do you wish that we type them out?

HON. JAMES WAH-SHEE: No, I am not asking for that, Mr. Chairman. I just want to make it quite clear what the amendment is.

CHAIRMAN (Mr. Fraser): I will have the Clerk read out the amendment to the amendment first. Mr. Clerk.

MR. MacQUARRIE: A point of order, Mr. Chairman. A point of order. The amendment to the amendment is passed already.

CHAIRMAN (Mr. Fraser): Well, we will read out the amendment to you, Mr. Wah-Shee. Mr. Clerk.

CLERK ASSISTANT (Mr. Hamilton): The amendment would be to change part (1) to read: That initial presentations by each witness not exceed 60 minutes -- a change from 30 to 60 minutes. Part (2) would read: That a period for questions by MLA's immediately following each witness's presentation not exceed 60 minutes -- a change from 30 to 60. That is the amendment to the amendment.

CHAIRMAN (Mr. Fraser): Mr. Wah-Shee. To the amendment.

HON. JAMES WAH-SHEE: Mr. Chairman, I was just inquiring about the amendment, not the amendment to the amendment. Thank you.

CHAIRMAN (Mr. Fraser): All you got was -- okay. To the amendment.

MR. MacQUARRIE: Question.

Amendment To Motion Establishing Guidelines For Witnesses On Uranium, Carried

CHAIRMAN (Mr. Fraser): A question being called. All in favour? Down. Opposed? The amendment is carried.

---Carried

To the motion as amended.

SOME HON. MEMBERS: Question.

Motion Establishing Guidelines For Witnesses On Uranium, Carried As Amended

CHAIRMAN (Mr. Fraser): A question being called. To the motion. All in favour? Sorry. Someone was sleeping at this table here. We will try that again. To the motion. All in favour? Down. Against? The motion is carried.

---Carried

CHAIRMAN (Mr. Fraser): Mr. Braden, seeing as this is your motion, I believe, do you have any preference as to whom you want into the chambers? Does this list agree with you, or have you got a list?

HON. GEORGE BRADEN: I do not have a list. This is being organized by the Speaker's officers.

CHAIRMAN (Mr. Fraser): I think it was agreed in caucus that the Speaker set up a list of priorities and I have first on the list Dr. G. Edwards. Would the Sergeant-at-Arms please see that Dr. Edwards is escorted in to the witness table? We have Dr. Edwards at the witness table. Mr. Patterson, have you a comment before we go to the witness?

Permission For Use Of Overhead Projector

HON. DENNIS PATTERSON: Yes, might I ask the committee, through you, Mr. Chairman, if it be agreed that Dr. Edwards be permitted to use an overhead projector in making his submission, to assist Members in understanding the issues?

CHAIRMAN (Mr. Fraser): Is it agreed that the witness be allowed to use an overhead projector? Agreed.

SOME HON. MEMBERS: Agreed.

---Agreed

CHAIRMAN (Mr. Fraser): We will take, then, a five minute break while they set it up and come back in five minutes, with Dr. Edwards. Thank you.

---SHORT RECESS

CHAIRMAN (Mr. Fraser): The Chair recognizes a quorum. Before we go into the witness on uranium, I would like to recognize Chief Cec McCauley and her band members from the Inuvik Dene Council here to meet with government officials about government programs. With her are Florence Thomas, Colleen Moore, Ruby McLeod, Annie Cook, and Terry Norwegian. If you will, please.

---Applause

We have Dr. Edwards as our first witness on uranium. I would like to just say a few words to Dr. Edwards prior to starting his presentation. Any time you speak, you will have to speak very slowly for the benefit of the interpreters, any highly technical words you will use you will have to explain, maybe, to the people as to what they mean, or say them in English.

---Laughter

Thank you very much. Mr. Curley.

More Information On Uranium Witnesses Necessary

MR. CURLEY: (Translation) Mr. Chairman, when we sat in caucus last week, we agreed that we should get some information on them first, regarding uranium mining and there are a lot of people who wanted to be able to talk. Maybe it would be better if we get some information passed on to us, when we meet and they are talking about uranium mining. The public wanted to talk about uranium mining, they would be able to speak then. I wonder what the rest of the people think.

CHAIRMAN (Mr. Fraser): Thank you, Mr. Curley. Any further comments before we go into the witnesses, as to a suggestion made by Mr. Curley that we, maybe, obtain some pamphlets or information leading up to the uranium debate? Am I right, Mr. Curley? Mr. Curley.

MR. CURLEY: Yes, what we decided at the caucus was that we would ask the Speaker of the House to try and organize the forum for discussion or debate on the uranium mining, or whatever, but during this session, if it is clear that we are not going to be able to allow all those who want to take part, and those who propose exploration, or mining exploration, or mining as a whole, or those who control uranium mining -- we are not going to be able to allow them to complete all that they wish to say. There may be more and more people who will want to make a presentation on this issue.

Presentations From Interested Groups

So, during the caucus meeting -- I do not know why the Speaker did not explain it -- we decided, why not break them into two. You know, that we would just hear from the experts now, during this session, because not many of us know anything about uranium mining and that we would refer the public interest groups, for instance, the Chamber of Mines and ITC, or Dene Nation, or other public interest groups who may want to make a presentation, to be able to appear during the May session in Hay River. I would just like to hear from the Members to see whether or not they would be in favour of that, unless someone is actually going to come up with a motion actually either calling for a moratorium or pro development. I would welcome comments from Members.

CHAIRMAN (Mr. Fraser): Thank you, Mr. Curley. Mr. Stewart.

HON. DON STEWART: Thank you, Mr. Chairman. In reply to Mr. Curley's remarks about hearing experts, I have been assured that everybody that is appearing here today, tomorrow and probably next Monday and Tuesday are all experts. That was the point of the caucus, that the people that had been invited would attend at this particular session. They are all, to my knowledge, all experts.

CHAIRMAN (Mr. Fraser): Thank you, Mr. Stewart. Any further comments to the suggestion made? There being no further comments, we will go to the witness here for his presentation. I will again remind the witness -- he heard the motion -- that your presentation will be 60 minutes and a question period of 60 minutes. Thank you very much. Proceed.

Presentation By Dr. Gordon Edwards

DR. EDWARDS: Thank you very much, Mr. Speaker and Members of the Assembly, ladies and gentlemen, and children. I am very glad to be back in Yellowknife and I am very appreciative of the opportunity of talking to you about the subject of uranium mining. I think it is a very important subject and I can gather from the comments, that you agree on the importance of this issue.

I was last in Yellowknife in 1962. At that time I spent two months in Snowdrift, on the East Arm of Great Slave Lake, visiting my brother, who was the first teacher in the federal day school at Snowdrift. He taught there for three years and he was very actively trying to promote the native handicrafts from Snowdrift. I understand that Snowdrift handicrafts have been doing quite well and I am glad to hear that. At that time, 1962, I had no reason to think that there was anything particularly troublesome about nuclear power or about uranium mining. If anyone had asked me, I would have said, sure, why not? Nuclear power sounds like a good idea. Nuclear power needs uranium and uranium mining is like, I suppose, other types of mining.

Since then I have learned a great deal and I would like to take this opportunity to share with you some of the things I have learned over the last 10 years. I find that it is very difficult to understand the debate about uranium mining without having a clear grasp, a clear understanding of the context in which that debate takes place. So, I have given each Member of the Assembly an outline of my remarks today. I intend to spend roughly five minutes per topic. What we are doing in talking about uranium mining is, we are discussing what risks might be encountered and what benefits might result. I think it is very important to understand what those risks are and what those benefits are supposed to be and in particular, who takes the risks and who gets the benefits. Frequently we find that they are not the same people.

Two Uses Of Uranium

To begin with, I would like to talk about the uses of uranium. There are really only two uses of uranium. One is to make atom bombs and the other is to build nuclear power plants for making electricity. I would like to say something about both of those. First of all, atomic bombs. When I was five years old, two atomic bombs were dropped on Japanese cities and since that time, the world has lived under the threat of nuclear war. This is a very serious issue as everyone knows because, for the first time in the history of human civilization and in fact for the first time in the history of life on earth, we have the possibility of making planet Earth unlivable. This was not a possibility before 1940.

Now, atomic bombs all start with uranium. You cannot possibly make an atomic bomb without uranium. There are two types of uranium and correspondingly there are two types of atomic bombs. One type of uranium is called uranium 235 and you can make an atomic bomb out of uranium 235. That was the bomb that was used on Hiroshima. The other type of uranium is much more plentiful, much more abundant and you cannot make an atomic bomb directly from it. It is called uranium 238. You can make an atomic bomb from uranium 238 if you first change it into something else called plutonium. Every atomic bomb begins as uranium.

Now, why is it that atomic warfare is considered to be so threatening? It is not only because the atomic bomb has a tremendous blast, a tremendous explosion that can destroy a city. Of course, you could destroy all the cities on earth and that would not destroy life. The difficulty is that in addition to destroying cities, the atomic bombs produce large quantities of poisonous substances called radioactive substances as by-products. These radioactive substances are harmful to all living things and in large enough quantities can kill most forms of life that we know by poisoning the air, poisoning the water and poisoning the food. So it is this that makes atomic warfare a particularly vital issue.

Radioactive Material In Food

In the early days when they were testing atomic bombs down in the southern United States, these poisons were sent high up into the air and of course all people living in North America got tiny amounts of radioactive material in their food and into the air as well. It turns out that the North Americans who got the most radioactive material in their bodies were the Inuit and I think it is important to understand why.

The reason why is because the Inuit eat a lot of caribou. Now the caribou eat a lot of lichen. They eat vast quantities of lichen. These plants, the lichen, are very unusual plants. They have roots but the roots are not used to feed the plant. They are only used to hold on. The lichen take their food directly from the air in the form of minerals, in the form of dust. As a result, the lichen eaten by the caribou are very effective in accumulating and delivering the radioactive material to the caribou. Other plants that feed themselves through their roots do not get as much radioactivity in them and the animals that eat those plants do not get as much radioactivity in them. The people who eat those animals do not get as much radioactivity in them. That is a story from the past but it has relevance to today.

So moving on to the next topic, we all agree, without any exception I am sure, that if we had the choice to do away with all nuclear weapons all over the world, we would do so.

Peaceful Use Of Uranium

There is also another use for uranium and that is a peaceful use, supposedly, to generate electricity and without going into details, the same energy that can be released very quickly in an atomic bomb can be released very slowly in a large machine called a nuclear reactor. What happens is a great deal of heat is generated. This heat can be used to boil large quantities of water. The water turns to steam. The steam can be used to turn the paddles of a turbine and this generates electricity. I have a transparency here -- a picture -- showing a very simplified version of what happens. The uranium fuel sits here and this is where the energy is released. The water...

MRS. SORENSEN: Take your microphone.

DR. EDWARDS: I am sorry. I have to use the microphone?

HON. ARNOLD McCALLUM: Just use a pointer.

DR. EDWARDS: I think I can just point to it with a pen. The uranium sits here in the reactor, it is called, and water circulates through and is used to boil more water which turns to steam. This generates electricity. So the only difference between a nuclear power plant and any other kind of power plant that uses steam is how you boil the water. Everything else is the same.

Uranium After Being In A Nuclear Reactor

This is a picture of a uranium fuel bundle that goes into a nuclear reactor. When that fuel bundle is put into the reactor for the first time, it is quite safe to handle. I could pass it around the room and you could all look at it very closely and you would not have to be afraid of doing yourself any harm. After that fuel bundle has been inside the reactor and when it is taken out of the reactor, it would be suicide to hold that fuel bundle in your hands or even to be in the same room with it because, even at a distance, it can kill you. Now, this is difficult to understand because you cannot see anything different; you cannot taste anything different; you cannot smell or hear anything different, but it is different. Before it goes into the reactor, it is relatively safe. After it comes out of the reactor, it is extremely dangerous. The reason is because it has inside of it all of the poisons that are made inside an atomic bomb when the atomic bomb explodes, except those poisons are not pushed out into the environment. They are contained inside that fuel bundle.

Now, you may wonder -- where do these poisons come from and what are they? Well, I wish to try and explain to you a little bit as to why they are harmful and that is the next section of my presentation. Before doing that, let me give you just a very simple explanation. The way the energy is released from uranium is by -- let me start again. Science teaches us that everything is made up of tiny little things called atoms, tiny little particles called atoms. These particles are so small they cannot be seen even under a powerful microscope. Science has discovered that if you split the atoms of uranium, you achieve enormous power. This is the basis for the atomic bomb. The atoms of uranium are split. One atom of uranium will not produce enough energy for anybody to notice. It takes billions and billions and billions of atoms to split before you get an atomic bomb or a nuclear power plant.

Problems Of Storing Poisons Generated By Uranium Atoms

Now, the poisons, the radioactive substances, are really the broken pieces of uranium atoms. That is what they are. Nobody knows what to do with them except to lock them away somewhere safe, deep in the earth, so that it cannot get into the food. This poses a very serious problem because these poisons do not exist in nature at all and nobody knows how to get rid of them at all. There is no method known to science to destroy these substances once they have been made. There are a few ideas that have been suggested but nothing that works on a practical basis.

These poisons remain dangerous for a very long time and inside a nuclear reactor, in one year, there is more of this poison created than you would get by a thousand Hiroshima bomb explosions. So this is a lot and the problem is what do you do with this waste. It turns out that the answer is not yet known, because these wastes have to be stored somewhere safely for a million years. Twenty thousand years is not at all long enough. Human history that has been written down is only about 5000 years. Many people think that because of this, nuclear power should not be used. These broken atoms should not be made until all the answers are known as to how the waste should be disposed of because if we try to dispose of this waste and fail, then we may poison our food in the future. That is the basic argument against using nuclear power and many government bodies have recommended that there should be a stop to the building of more of these nuclear reactors until the answers are completely known.

Now, my last point about the uses of uranium -- so far I have mentioned something about atomic bombs. I have mentioned something about nuclear reactors. They are not unrelated. Not only do they produce the same poisons, but nuclear

reactors can also be used as a way of making bombs, because when the spent fuel comes out of the reactor, not only does it have a lot of poisons in it, as I mentioned, but it also has this new substance called plutonium that I mentioned before. In other words, the uranium 238 has changed into plutonium, and that plutonium can be taken out using very sophisticated equipment and it can be made into bombs.

Increasing The Threat Of Nuclear War

Now, what the Canadian government is doing is they are exporting, they are selling overseas, a lot of uranium and they are trying to sell nuclear reactors without very much success. If uranium mining goes ahead in the Northwest Territories, it will almost all be sold to other countries. This is very serious because it means that Canada is increasing the threat of nuclear war by making the materials available from which atomic bombs can be made.

Now, it is often said that while the uranium is sold -- is not sold for making bombs, it is sold for making electricity, that is absolutely true. Unfortunately, once it has been used for making electricity, it can still be used to make bombs. There is no contradiction between using the same uranium twice -- once to make electricity and again by taking the plutonium out, you can make bombs.

Now, when you look at the customers that Canada has been selling their uranium and their reactors to, it is not a very happy story. We gave nuclear materials and assistance to India and in 1974, India exploded an atomic bomb. We sold a nuclear reactor to Pakistan and recently it was in the news that some Canadian connections in Montreal have been helping Pakistan develop to the point of having their own atomic bomb. Some of our customers that we have sold nuclear reactors to include some very brutal military dictatorships such as those in Argentina and South Korea. We may be helping those countries to acquire atomic bombs.

This is the reason why many churches, like the United Church of Canada and the Roman Catholic bishops of British Columbia and the Roman Catholic bishops of Saskatchewan, have expressed great concern about the continuation of selling these materials overseas when the threat of nuclear war is in fact growing. It is not getting less. It is getting greater. Many people believe that it is wrong for Canada to continue to do this until the world has shown that it is on a course of peace.

Effects Of Radioactivity

Now, let me move to the second point which is more directly relevant to the effect that uranium mining would have here in the Northwest Territories. I would like to say something about what is radioactivity and what are its effects. Let me move on into the radioactivity that you encounter when you actually mine uranium, when you take uranium out of the ground. It turns out that -- as I mentioned earlier, everything is made up of atoms. Now, up until about 100 years ago, it was believed that atoms were always the same. They just combined in different ways, but they are always the same. So that when you eat food into your body, the atoms in the food stay the same inside your body. The difference with radioactive atoms is that they do not stay the same. They explode inside your body. When they explode, they give off a burst of energy and particles called radiation and this picture just shows that there are four different types of radiation that are given off by radioactive atoms. The danger is that if this happens inside your body, it can damage the living cells of your body. Even though you do not feel hurt, the little cells of your body are hurt and they can later develop into unusual cells which sometimes become cancerous.

Now, it is impossible for you to read this. I do not expect you to read it, but let me just tell you what it is. That is what happens to uranium as it sits in the ground. Uranium is radioactive which means that it does not stay the same forever. When it explodes, it turns into another substance which is also radioactive and when that explodes it turns into another substance which is also radioactive and it goes down, down, down, down, down, down, until it reaches the bottom which is not radioactive. That substance remains the same forever.

Radioactive Wastes From Uranium Mining

When you mine uranium, you take the uranium away from all the rest of the material that is there, but all of these radioactive substances are left behind where the uranium mining is taking place. Those are the radioactive wastes left over from uranium mining. It turns out that when you look down this list, probably the least dangerous of all of these substances in terms of human contact is uranium. Uranium is not harmful to the same extent as, for example, this substance here which is called radium. Now, radium is a very dangerous substance. In fact, it is so dangerous that you can hardly sell it anymore. People used to sell radium but unfortunately, the people who handled radium, many of them died. They developed illnesses, cancers; bone cancer, leukemia, and so on and a lot of people died from handling radium. The result is that now almost nobody wants radium. It is considered too dangerous to handle as a commercial product. So it is left behind as a waste product. All of the radium, that is too dangerous to use, is left behind as waste at the site of the mine, wherever the mine is.

Well, of course, the radium was there before the mine existed, but before the mine existed the radium was down underground as a hard rock. When they mine uranium, they take that rock up to the surface and they grind it up into a powder and they dissolve it with acid, and then they take this powder and they dump it in a great big huge pile, and these are called the tailings, the uranium tailings. This is the crushed rock left over after the uranium mining. It contains all of the radium that was in the rock, but now that it is in the fine form of a powder, it can very easily get into the water. It can very easily be blown as dust and is washed by the rain, and it causes a great many problems.

Radon Gas

There is another radioactive substance in this list, which is very dangerous and that is this one right here. It is very hard to read, but that is called radon. Now, radium is a solid and it gets into the water and it gets into the fish, it gets into the plants. Radon, on the other hand, is a gas. It is a radioactive gas, so you breathe it. One of the problems with uranium miners is that when the people who are digging out the ore go down into the mine, they breathe a lot of this radon gas which is there and experience has shown that they get a lot of lung cancer. So that, in fact, it has become quite a disgrace as to how many men are dying of lung cancer because they worked in uranium mines.

Now, in recent years they have made the standards more strict, so that the miners do not breathe as much radon gas, but this does not eliminate the problem. It is still expected that uranium miners will get more lung cancer, which kills you -- hardly anybody ever survives lung cancer -- it is still expected that uranium miners will get more lung cancer as a result of breathing the radon gas.

So, apart from the uses of uranium, we have the problem of what to do with the wastes that are produced as a by-product when you take the uranium out of the ore or the rock. In order to understand the problem, there are a number of questions that should be asked. One is, how dangerous is it? Is it really that dangerous or is it exaggerated? Secondly, how much is there and how difficult is it to dispose of? Thirdly, how much is it going to cost? Well, it turns out that the answers to these can be given as follows.

Disposal Of Dangerous Uranium Tailings

Firstly, these wastes are extremely dangerous. Nobody disagrees that they are very toxic and very dangerous. In 1979, there was a dam behind which these tailings were stored in New Mexico which broke and the tailings went into the river. They had to slaughter cattle along the river because the cattle got the radioactivity into their bodies and this would go into their milk. Everybody agrees that if these materials get into the environment in large quantities, it would be a very bad situation and it would cause a lot of damage. So, there is no disagreement about that. The answer, of course, is to try and contain these wastes so they do not get into the environment.

That raises the question, how much waste is there? The answer is, there is an awful lot. It turns out that in Canada right now there is about 100 million tons of this type of waste, called uranium tailings. If you go to Elliott Lake and take a look at the uranium tailings, it looks like a very large sea of sand, radioactive sand, and it stretches very far. It stretches just about as far as your eye can see and they are held behind large dams, which in some cases are also made of the same material. Now, there is so much of this material that nobody, in fact, has a method for safely disposing of it. The problem has to be asked, what happens after the uranium mining companies go away, after they have finished getting all the uranium out of the ground and now they are going to leave? Who is going to look after these tailings then?

So, there are two problems. One is the problem of looking after these tailings when the mine is operating, and there have been big improvements made in that area. The tailings are managed much better now than they used to, but there are still a lot of problems. The second problem has not been solved at all -- not at all -- and that is the problem of what happens when you walk away and leave the tailings, because in fact, the tailings remain dangerous for many, many thousands of years.

Cost Of Disposal Of Uranium Tailings

The third question, how much will it cost? Well, since nobody knows how to do it, it is rather difficult to say how much it will cost, but if you take a look at the tailings that are now at Elliott Lake, the estimates that have been made run from about \$30 million up to about \$18 billion to dispose of the tailings that are already there. That is an awful lot of money.

There is another thing to think about here and that is, what happens if all of a sudden there is no market for uranium, nobody wants to buy it any more? Now, that may sound like a funny question, but as a matter of fact, the price of uranium has dropped steadily over the last couple of years. For example, it has gone from \$40 a pound down to \$27 a pound and as far as I know, it is still going down. We have already had experience before in Canada. In 1960 the price of uranium went down, the demand for uranium went down, and a lot of the companies in Elliott Lake closed their businesses and people moved away. The question should be asked, if that happens, who is going to pay? Who is going to look after these tailings? Who is going to even try to dispose of them when it costs so much money to do so? What happens if you do not dispose of them? How dangerous could they be?

I would now like to show you some more pictures and I hope that they make sense to you, because they are mathematical graphs, but I will try to explain what they mean. I have water on my transparencies. It shows up as grey.

Exposure To Radiation Causes Cancer

Let me say a little bit about cancer. When people are exposed to very large doses of radiation all at once, they get very sick. That is what happens after an atomic bomb, for example. They get very sick, immediately and they have to go to the hospital and many of them die. That is a lot of radiation at once, but if you get only a little bit of radiation, it does not have any immediately harmful effects, but what they find is that if you wait, then sometimes many years later, these people will get sick and die of cancer, as a result of being exposed to radiation. It is kind of invisible damage. You feel fine. You do not feel any worse than you did before, but maybe 10, 15, 20 years later you get cancer.

Now, this is from a medical study that was dealing with mice. What they did was, they took mice and they gave the mice radium in their diet. They found that if they gave the mice the radium all at once, then -- well, what happens is that this is supposed to measure how many of them got cancer. This is supposed to be time, as time goes on, and this bottom line, right here, this bottom line here is what happened to the mice who were given the radium all at once. It turned out that after a period of time, eight per cent of the mice got cancer.

Now, this line here is another group of mice who were given exactly the same amount of radium except they were not given it all at once. It was given slowly over a period of four weeks, the same amount. It turned out 22 per cent of them got cancer. This is another population of mice. They got exactly the same amount of radium but it was spread out over 12 weeks and they ended up having much more cancer, about 62 per cent. Finally, this group of mice had exactly the same amount of radium but it was spread out over 36 weeks and 92 per cent of them got cancer.

Now this graph is the result of a medical study and what it shows, as you can see, is very disturbing because it indicates that if you give the same dose slowly over a period of time, the effects can be worse. It seems to affect the cells of the body worse, to be exposed to it chronically over a period of time rather than just to get it suddenly all at once in terms of cancer. We are not talking at all about so-called radiation sickness where you get sick immediately. That is not going to happen. These are all long-term things, things that happen over long periods of time.

Effects Of Various Levels Of Radiation

These are some more mathematical graphs. Let me explain what they mean. Here we have a measurement of how much cancer was produced and here we have a measurement of how much radiation the animals were exposed to. Now it so happens that the animals here are human. This is radium exposure of humans. I must explain to you that the people who set the standards, the safety standards for the nuclear industry, they assume that the relationship between how much radiation you get and how much cancer you see follows this line. This line is a theoretical line. It is called the linear hypothesis. It is a guess. What it says is that if you cut the dose in half, you get half as many cancers. If you cut the dose even down less, to one quarter, you get a quarter as many cancers. If you make the dose very small, you get a very small number of cancers. So this line is supposed to tell you how many cancers you get for a dose of radiation.

The problem is that medical studies are showing that that line underestimates the number of cancers that are observed. You see this many cancers when you have this dose instead of just this many cancers. So the number of cancers you see at the low doses is higher than you expect. The same thing happens here.

This is polonium 210 in hamsters. The same thing happens here in plutonium 238 in rats. What this means is that there is now a serious controversy among doctors as to what the effects of low level radiation are. It seems, from some of this medical evidence, that low level radiation may be much more harmful than was thought just a few years ago.

This is a similar study. This is again cancer and radiation exposure and these lines represent different populations of miners -- uranium miners and also other types of miners. It shows the same thing. At the low doses, more cancer is observed than would be expected by the straight line. It means that the standards are not protecting people as much as it was hoped. More cancer is seen than was expected.

Low Levels Of Radiation Proven Harmful

I have many, many more transparencies of the same type here. Some of them are charts but I think it would be foolish to go through all of them. I just want to let you know that there is a lot of evidence on this and the evidence is so strong that in British Columbia, the association of medical doctors, which is called the British Columbia Medical Association, studied this problem very carefully and decided that in their own minds, the medical harm from low level radiation is much worse than the nuclear authorities have told us. For this reason they believe there should be a stop to any further development until more is understood of what the medical harm is and how it can be controlled and how these wastes can be disposed of. So this group of medical doctors has taken a very strong stand and they are opposed to any further licensing of uranium mines or other facilities, on medical grounds.

Now, my time is nearing conclusion. I hope you will forgive me for going into these technical points but it is very difficult to understand the nuclear debate without understanding this information and what is behind it. I would like to return to my outline and summarize what I have said so far. We all know that in life there are risks and we all accept risks. You cannot live a life free of risks. None of us do. When you are being asked to accept risks, there are a number of important questions to be asked. Number one is: Why are we accepting these risks? It turns out, in the case of uranium mining, there are many people who do not believe that the benefits are worth the risks.

Then I pointed out to you that besides these risks about how the uranium may be used and how it may affect other people -- of course it will come back to us as well if it is used in atomic weapons, but besides that question, there is also the question: What does it do to the Northwest Territories? What does it do to the people who live and work near the uranium mine? The answer is these people are exposed to dangerous radioactive substances, highly dangerous radioactive substances. Now these materials are called low level radiation but do not let that fool you. They are among the most dangerous of all the radioactive substances that science knows. Radium, that I mentioned before, is still considered to this day to be one of the most dangerous radioactive substances in its effect on human health and animal health.

Dangers Of Uranium Tailings

I have also mentioned about these huge quantities of tailings, crushed rock, which are radioactive. Now why is that dangerous? It is dangerous because the winds can blow the dust hundreds and hundreds of miles and it can fall on the foliage. It can fall on the lichen, and the caribou eat the lichen and the caribou store it in their bodies. It also gets into the water where the fish concentrate it into their bodies. So that over a period of many years, the fish have much more radium in their bodies than is in the water. The reason for that is because as the fish eat and eat and eat, they hold onto the radium. They do not let it go again. It stays in their bodies and builds up. So this can cause serious problems, not immediately, but over a period of time.

There is another problem which I must mention and that is that when the crushed tailings are left on the surface, a very large quantity of radon gas comes into the atmosphere. Now this gas is very heavy and it stays very close to the ground and as it goes along, it rains out radioactive material onto the foliage too. That is another problem. In fact, it is now recognized that the radon gas that is given off by these tailings piles can easily travel a thousand miles and more and it can have effects very far removed from where the uranium mining operation actually takes place. Our understanding of these things is still very much in its infancy. All we know is that it is quite harmful and that it is more harmful than we thought. Any method that we have so far proposed to deal with them does not seem to be nearly good enough.

Inadequate Regulations For Disposal Of Wastes From Uranium Mining

I move to my fourth and concluding part having to do with adequate regulation. Right now the disposal of the wastes from uranium mining is not required for licensing a uranium mine. This means that a uranium mining company can start mining uranium in the Northwest Territories. There is no need for them to have any plan for finally getting rid of that waste. It is not required. That is shocking but it is a fact. It is especially shocking when you consider that the costs of actually disposing of those tailings may be far more than any economic benefit you might get from the uranium mining while the uranium mines are operating. Generally speaking, these mines are only expected to operate for 10 or 15 or 20 years, not much longer. The wastes will be sitting around for thousands of years after the mine has been shut down.

Secondly, in addition to no requirement for disposal of wastes, we are also finding that the safety standards for exposure to radiation are not good enough. In fact, it seems that these standards of safety are unacceptable. I say this not in my own name but I am quoting the British Columbia Medical Association again who have looked into this and who have found that the present, not the past, but the present standards for radon gas exposure in uranium mines will lead to more than a doubling, more than a doubling, of the lung cancer among the miners. The standards for the safety of the public is also not protecting the public enough.

One example of that is Elliott Lake. They have radon gas inside the new homes they are building. They are building thousands of new homes in Elliott Lake, brand new homes, thousands of them, and they have a problem of radon gas in the homes. According to the standard that the Atomic Energy Control Board has set as being acceptable, you could expect about a 30 or 40 per cent increase in lung cancer of the people living in these homes. That means an extra 25 lung cancer deaths per every thousand people living in the homes.

Those are serious things and, in fact, many people, myself included, have come to the conclusion that there is simply no adequate regulation of the uranium mining industry in Canada. The Atomic Energy Control Board, which is supposed to exercise this responsibility, is not doing a good job. Once again, the British Columbia Medical Association has written a 450 page document talking about all of these problems from a medical point of view, and chapter 22 of that document is entitled, "The Atomic Energy Control Board: Unfit to Regulate".

Moratorium On Uranium Mining

In conclusion, I would say that from what I have found out about the effects of radioactivity and the problems of uranium mining, it would be foolish to proceed with further uranium mines at the present time. There already are other political jurisdictions which have forbidden uranium mining until these problems are solved. In British Columbia, there is a seven year stop to all

uranium mining or exploration. In Newfoundland there is a stop to all uranium mining until the waste disposal problem is solved. I think that is a wise decision. Otherwise, the Government of Newfoundland may find itself with a multimillion dollar clean-up job.

Now, what is the advantage in having a so-called moratorium that means not allowing uranium exploration or uranium mining to go ahead? Well, the first advantage is that the uranium is not going to disappear. It is not going to melt like an iceberg from the ground. If it is there, it is there. If it is going to increase in value in the future, it is still there. It is still an option. Having a moratorium does not get rid of the uranium. It is still there. The advantage of waiting is that it may be in the next five or 10 years that some of these problems will be solved. They are certainly, in the nuclear industry, trying hard to find solutions. Would it not be a shame to go ahead now and make the same mistakes that have been made in the past, when you can wait five years or 10 years and perhaps do it properly, without running the same risks?

Technology For Dealing With Waste Does Not Exist

Some of the most attractive methods that have been suggested for dealing with this terrible problem of the radioactive waste are to change the process, so instead of just taking away the uranium from the ore, you take away the other dangerous materials as well. So, you take away not only the uranium, but you also take out the radium and the thorium and the other substances which are dangerous, and when you get them all separated, you can dispose of them more easily, because there is a much smaller amount to deal with. However, if you allow uranium mining to go ahead now, that technology does not exist yet. You will not have the advantage of it.

Another advantage in having a moratorium is that you can wait and see what is happening to the uranium market. Right now the uranium price is going down. Some people are predicting that the uranium market may collapse all together. The state of the nuclear industry is not very healthy, either in Canada or in other countries of the world. Most importantly, however, I think that it will give you time to allow yourselves and your fellow citizens in the Northwest Territories to become more familiar with these problems and to listen to the evidence on both sides, and to come to a decision based on a full understanding and appreciation of what the risks and benefits may be.

Documentation Available On Uranium Mining

I would like to close by making an offer that there is a good deal of documentation available on these problems. Here, for example, is one such document. It is not very easy to read, but it is not very hard to read either. It comes from the United States Geological Survey -- these are professional geologists who work for the United States government -- and it deals with the disposal problem of uranium mill tailings. It is published in 1980 and it says there are dozens and dozens of unanswered questions and there are no proper answers. Now, this information is available and I would like to suggest that your Science Advisory Board should, perhaps, take the time to read this document and study it and to also read and study the document I mentioned from the British Columbia Medical Association about the medical effects of radiation associated with uranium mining, and then, perhaps, make a new report, a more detailed report. I have read the three page report that the Science Advisory Board has made already, and I am afraid that perhaps they did not read these documents or documents like them.

There is a problem. The problem is that here in Canada millions of dollars

are spent in promoting uranium mining and nuclear power and almost nothing, certainly nothing in public funds, is spent in pointing out the disadvantages and the dangers. It is possible that the Science Advisory Board, in its desire to get information, simply went to the federal government, through official federal government channels, and one of the disappointing things is that, even though it is tax money, almost all of the information that is available from the federal government is promoting the idea that uranium mining is good and must go ahead, nuclear power is good and must go ahead. There is very little balance.

Fortunately, south of the border in the United States, there are a good many independent bodies, some of them government bodies such as the United States Geological Survey, who have studied the problem and who are much more frank in their expressions of what those dangers and difficulties may be. Thank you very much.

---Applause

CHAIRMAN (Mr. Fraser): Thank you, Dr. Edwards. We will take a 15 minute coffee break and then another coffee break at 4:30. We will come back with a question period after coffee. Thank you very much.

---SHORT RECESS

CHAIRMAN (Mr. Fraser): The Chair recognizes a quorum. Before we give the floor to the Members, I would like to recognize in the gallery, Mr. Sam Raddi, president of COPE and Mr. Peter Green. Please stand.

---Applause

We have a question period now, for the presentation that was just made to the Assembly. I have Mr. MacQuarrie first on the list. Mr. MacQuarrie.

MR. MacQUARRIE: Thank you, Mr. Chairman. Over a period of time I will have quite a number of questions. I think they are important, because the witness has said quite a number of things and I hope that the Assembly is resolved to take their time and do this very thoroughly. I will ask, first of all, what I hope will become a procedure, Mr. Chairman, and that is that we learn a little bit about who is making a presentation to us. So, in asking Dr. Edwards these questions, it is not a challenge in that sense. I will be asking the same questions of all witnesses. Could you tell me, Dr. Edwards, what your job is, in what area do you have professional training, and how did you gain the knowledge that you brought to us this afternoon?

CHAIRMAN (Mr. Fraser): If you will just wait for the light, Dr. Edwards. There is a little pause for completing the translation and if you would address the Chair when you answer your question. Thank you.

DR. EDWARDS: Mr. Speaker, in answer to the question...

CHAIRMAN (Mr. Fraser): It is Mr. Chairman.

DR. EDWARDS: Mr. Chairman.

CHAIRMAN (Mr. Fraser): Thank you.

Background Of Dr. Gordon Edwards

DR. EDWARDS: In answer to the question, I am a professor of mathematics and science at Vanier College in Montreal. I have a Ph.D., that is a doctorate degree, in mathematics from Queens University and I have taught science and mathematics at the university level for close to 20 years. As to how I came by the information I presented today, it was over the course of the last 10 years that I have accumulated this information.

Beginning in 1970 when I became the editor of an international ecology magazine called "Survival", and in the process of publishing this paper, I printed many articles by scientists who worked in the nuclear industry and that is how I first learned about some of these problems. Since that time, I have -- in 1975 -- become the chairman of an organization called the Canadian Coalition for Nuclear Responsibility, which is an umbrella organization of over 300 groups across Canada who are concerned about these same issues. In that capacity, I have functioned as an expert witness at many inquiries. For example, five weeks I spent at the Cluff Lake board of inquiry into uranium mining in Saskatchewan; three months -- four months I spent at the royal commission on electric power planning in Toronto cross-examining nuclear safety people on waste disposal matters and the safety of nuclear reactors, etc. I have also testified at a number of environmental assessment hearings such as the Elliott Lake environmental assessment hearing concerning the expansion plans. I could go on at some length but I have basically picked up my knowledge through correspondence with concerned individuals across Canada and through direct involvement in many different official inquiries into the subject.

CHAIRMAN (Mr. Fraser): Thank you, Dr. Edwards. Mr. MacQuarrie.

MR. MacQUARRIE: Thank you. A couple of follow-up questions on credentials. Rather than just saying that you have taught science for many years, would you tell me what your professional training is in the field of science?

CHAIRMAN (Mr. Fraser): Dr. Edwards.

Dr. Edwards' Professional Training In Science

DR. EDWARDS: Yes. Well, I graduated in 1961 from the University of Toronto with a gold medal in mathematics and physics. I then went to the University of Chicago where I got a masters degree in mathematics under a Woodrow Wilson fellowship. I then got a masters degree in English literature at the same university. I then taught for four years at the University of Western Ontario before going to Queens University to obtain my doctorate degree in mathematics.

After obtaining my doctorate degree in mathematics, I did post-doctoral research in the economics of ocean fisheries which introduced me to biological and economic modelling methods and at that time, that was 1973-74, I worked for the Science Council of Canada in Ottawa as the assistant director of a nationwide study of the role of the mathematical sciences in Canada. That study was subsequently published as a background study, as a form of advice to the Canadian government, and there were also eight other volumes published with that study. I was in charge of that study from beginning to end.

CHAIRMAN (Mr. Fraser): Mr. MacQuarrie.

MR. MacQUARRIE: Thank you, Mr. Chairman. Very impressive credentials in many ways, and yet it would seem to me that in what you described, Dr. Edwards, the extent largely of your training in science would have been in the area of physics in your basic degree at the University of Toronto. Is that correct?

CHAIRMAN (Mr. Fraser): Dr. Edwards.

DR. EDWARDS: Yes, Mr. Chairman. Physics and mathematics.

CHAIRMAN (Mr. Fraser): Mr. MacQuarrie. Subsequent.

Dr. Edwards' Personal Scientific Research

MR. MacQUARRIE: Also with respect to the knowledge then that you have gained, it seems to me, from your description, Dr. Edwards, that the knowledge generally has been gained as a result of the reading and listening which certainly I do a lot of myself, so I do not want to down-play that unduly, but I would like to ask you: Have you actually done research, experimentation studies with radioactive materials yourself, Dr. Edwards?

CHAIRMAN (Mr. Fraser): Dr. Edwards.

DR. EDWARDS: No, Mr. MacQuarrie. I have not. It so happens that scientific research is scarcely ever carried out by a single individual these days. When an epidemiological study is done -- this is a study where you actually study the medical effects of radiation -- there is usually a team of scientists involved and one essential member of the team is a mathematician. You must have a mathematician or statistician who is capable of interpreting correctly the significance of the results and it is in this area that I claim special expertise, and it is in this area that I was retained as a cross-examiner at the various inquiries because when you talk about the effects of radiation, or

when you talk about nuclear accidents, or even when you talk about the adequacy of a waste disposal method, it turns out that the crucial arguments in the end are mathematical.

CHAIRMAN (Mr. Fraser): Mr. MacQuarrie.

MR. MacQUARRIE: I wanted to find out whether you had that practical personal experience with radioactive elements and so on, because I know that some of our Members -- because you are a very notable gentleman, some of our Members believe that you are the foremost expert on uranium mining, milling and so on. I would concede that you obviously have a great deal of knowledge but I would like to point out to other Members that there will be people coming here who have extensive years of study and practical experience in these areas.

HON. DENNIS PATTERSON: No speeches.

MR. CURLEY: So be it.

MR. MacQUARRIE: Two questions then, Mr. Chairman, if I may.

CHAIRMAN (Mr. Fraser): Mr. MacQuarrie.

Dr. Edwards' Presentation One-Sided

MR. MacQUARRIE: I like to think of myself as a reasonably objective and fair person. I was hoping for a very powerful objective argument that demonstrated with proof that the risks inherent in this area that we are studying were unacceptable, that you would push proponents to the limit, and I could respect that kind of presentation. Frankly, I do not think we got it. I am not an expert in the areas of nuclear physics or radiation but I do know something about the manner in which argumentation is presented, and I will be able to demonstrate in a moment that you have chosen to emphasize certain things and left other things unsaid that perhaps would make me think that you have been less than candid and would make me wonder as to the sincerity of your presentation. If I could first of all -- you did mention the fact -- you started out with atomic bombs and fall-out. To me that would seem that it would have a parallel in that if we were to study the mining of aluminum, that you would perhaps start by describing the double jumbo jet crash on the Canary Islands a few years ago.

MR. CURLEY: Oh!

HON. DENNIS PATTERSON: For sure.

Studies Proving Minimum Effects Of Radioactive Fall-Out

MR. MacQUARRIE: I think that there are many other areas that need to be emphasized. An example: You did say that the people who have suffered most from radioactive fall-out are the Inuit. I have studies here: One from Acta Radiologica, the official organ of the radiological societies of Denmark, Finland, Norway and Sweden. This is December, 1967, and the title of the article is "Cesium 137 Burdens in the Canadian North" by V.K. Mohindra. At the end, the summary conclusions and health significance -- and perhaps, if I am wrong or if these people are wrong in what they said, you are welcome to correct. According to the ICRP recommendations, that is the International Commission on Radiological Protection, I believe it is: "...the maximum permissible body burden of cesium 137, that may be accumulated by any individual member of the general population is three units." I am not sure what those units are exactly. "It is evident that the body burdens of the northern residents referred to in this study are generally well below the acceptable level. The

highest amount calculated was just slightly higher. It should be noted that the maximum acceptable body burden implies a continuous lifetime exposure. The cesium 137 concentrations are expected to decrease in the absence of further large-scale nuclear testing. There will therefore be no expectation of a significant effect on the health of the population and no necessity to consider restricting the normal consumption of caribou meat."

Would you care to comment? I got the implication from what you said, Dr. Edwards, that because of that fall-out, there were at that time serious health risks. This seems to say no, but I would welcome a comment.

CHAIRMAN (Mr. Fraser): Dr. Edwards, would you care to comment on that presentation?

DR. EDWARDS: Yes. First of all, with regard to the style of my presentation, I really believe in trying to present information so that people can better understand and better judge for themselves whether risks are acceptable or not acceptable. I do not believe it is my place to tell anybody what is acceptable to them.

International Commission On Radiation Protection Confusing The Issue

Moving to the second point, it seems the ICRP does believe that they can tell people what is acceptable. They say that what the Inuit got in their bodies was acceptable. I would say, acceptable to whom? Acceptable to the ICRP?

You are going to have an expert here, a medical doctor, Dr. Bob Woollard, who is engaged and, in fact, was the co-author of that British Columbia Medical Association report, and you may question him, if you like, at length, as to what the British Columbia Medical Association thinks of the ICRP's reassurances of safety. My understanding is that they think very little of those reassurances of safety, partly because the same standard -- the same body, rather, the ICRP, had a standard in 1967 for uranium miners, which would lead to a tripling or worse of lung cancer, and they considered that acceptable. The ICRP presently has standards which lead to a doubling or more of lung cancer and they call that acceptable.

So, I would say the ICRP is, perhaps, confusing the issue by saying that it is below an acceptable limit. What they should be saying is what is written in every regulatory document that I have ever seen, and that is, that all unnecessary exposure to radiation should be avoided, that all exposure to radiation must be presumed to be harmful and, therefore, the question of acceptability becomes a value judgment. I wonder what gives the ICRP the right to make that value judgment.

CHAIRMAN (Mr. Fraser): Mr. MacQuarrie.

MR. MacQUARRIE: Perhaps, because it is an international body, as I understand it, of scientists who are very knowledgeable in the field -- more so than the rest of us, but that is a value judgment and I will respect the fact that you maintain that it is, and someone might judge otherwise. I am glad that you mentioned the British Columbia Medical Association, because that was my second point about being less than candid. Did the British Columbia Medical Association attempt to persuade anyone else, Dr. Edwards, that their resolution with respect to a moratorium on uranium mining was desirable and attempt to get others to support them in that? Do you have any knowledge of that?

CHAIRMAN (Mr. Fraser): Dr. Edwards.

Medical Reasons Not To Proceed With Nuclear Expansion

DR. EDWARDS: Yes, Mr. Chairman, I do indeed. The British Columbia Medical Association, having decided that there was good medical reason not to proceed with nuclear expansion, took their resolution to the Canadian Medical Association and the Canadian Medical Association has been deliberating on the resolution for some time. The British Columbia Medical Association has been attempting to inform the Canadian Medical Association of the medical evidence that is in their possession, so that other doctors may take a stand on the issue. It is my understanding that the British Columbia Medical Association believes that this being a medical problem, a problem of preventive medicine, that doctors should -- professional associations of doctors -- should take a stand on this matter.

CHAIRMAN (Mr. Fraser): Thank you. Mr. MacQuarrie.

MR. MacQUARRIE: Yes, Mr. Chairman. The information that I have is that they did indeed take the resolution to the Canadian Medical Association. So, the British Columbia Medical Association is an august body of doctors, but so, certainly, is the Canadian Medical Association I would think. The list that I have here from their council...

CHAIRMAN (Mr. Fraser): Can you just slow down, just a bit, please?

MR. MacQUARRIE: Thank you, Mr. Chairman. ...their council on community health, to which the resolution was referred, I believe, as I am given to understand, and you may correct me if I am wrong, that they spent considerable time hearing witnesses -- and I do believe that you were one of those, Dr. Edwards -- on the question as to whether there should be a moratorium and that, in fact, they did not support that resolution, but they do recognize the seriousness of radiation hazard. Certainly, so do I and so do many people. We are not playing with a toy. I am not trying to pretend that, but at the same time, they passed other resolutions that will tighten controls here and there, as I understand it, but that they would not agree with a moratorium. Is the information that I have right or wrong, Dr. Edwards?

CHAIRMAN (Mr. Fraser): Dr. Edwards.

Position Of The Canadian Medical Association On A Moratorium

DR. EDWARDS: Well, Mr. Chairman, I am not privy to the deliberations of the Canadian Medical Association. I did, indeed, make a brief presentation, so did the Atomic Energy of Canada Limited, so, I believe, did the Atomic Energy Control Board, and I am sure that there were many other people who made presentations as well. As far as I know, and this can easily be verified by questioning Dr. Woollard when he is here -- but as far as I know, the Canadian Medical Association has simply not yet made a decision as to whether or not to endorse the moratorium stance. They have not rejected -- to my knowledge, they have not rejected the idea of accepting and endorsing the moratorium position. They just are not yet at that point. Now, that is my understanding. It is possible that in the meantime, unknown to me, that they have reached a decision on that matter, but I just do not know.

CHAIRMAN (Mr. Fraser): Thank you. Mr. MacQuarrie.

MR. MacQUARRIE: I recognize the logic of what Dr. Edwards says, but it would seem to me that if they recognized a serious danger, that they would immediately have voted to support the moratorium. The fact that they did not, at least seems to me, that these responsible gentlemen would feel that it is not that critical. I just want, at this time, before I yield the floor, and I hope I will have a little time later too, but to ask questions in one other area. Is radiation only man made? The chain of explosions that you demonstrated on the screen, is that only a man made process, Dr. Edwards?

CHAIRMAN (Mr. Fraser): Dr. Edwards.

Man Made Radiation

DR. EDWARDS: Mr. Chairman, I thought I had made it clear that the uranium decay series which I had on the screen, which included radium and radon gas, were all naturally occurring substances. I thought that was clear. These are contained in the rock and when the ore is brought to the surface, most of those radioactive substances are left as waste. Those are naturally occurring radioactive substances.

The point that I made in my presentation is that while they do occur in nature, they are not available to the environment in an easily accessible form. Once they are brought to the surface and ground up, they are made available in quantities which far outweigh any natural process that could make them available. So, that is really the distinction I was trying to make. I am sorry if I did not make that clear. The radiation is certainly -- that radiation is not man made. It is only in the nuclear reactor or the atomic bomb that you have man made radiation.

CHAIRMAN (Mr. Fraser): Thank you. Mr. MacQuarrie.

MR. MacQUARRIE: So, I understand that radiation, the decay of radioactive elements, the emission of radiation occur in nature and have occurred in nature from, well, whenever. Would you agree to that?

CHAIRMAN (Mr. Fraser): Dr. Edwards.

DR. EDWARDS: Yes, Mr. Chairman, that is indeed true. This is called technologically enhanced radiation and the concern about it is that it is being made available on a scale and at a rate which is unprecedented in history.

CHAIRMAN (Mr. Fraser): Mr. MacQuarrie.

Exposure To Radiation Occurring From Natural Sources

MR. MacQUARRIE: Thank you. The radiation that we get from natural sources then, from rocks, from the sun, from other sources -- what level of dosage do we get from those sources per year, approximately? I gather that the technical term is millirems, but just units we will say. Approximately what level is the average person exposed to from those sources each year, presumably, Dr. Edwards.

CHAIRMAN (Mr. Fraser): Dr. Edwards.

DR. EDWARDS: You have touched, Mr. MacQuarrie, on a very important and somewhat complicated point, because usually, when they talk about this unit of millirems, it usually refers to penetrating radiation, known as gamma radiation, or X radiation. We are exposed naturally to approximately 70 millirems per year and we are exposed, on the average, to about another 70 millirems through diagnostic medical treatment and therapeutic medical treatment per year, so that there is a total exposure of between 140 and 200, let us say, millirems per year, on the average, that people are exposed to, but there is a very important distinction.

Alpha Radiation

The substances that are in the chart which I had on the table, on the screen, such as radium and radon and even uranium itself, give another type of radiation called alpha radiation. Alpha radiation does not register on a Geiger counter, and if you hold a Geiger counter up to alpha radiation, you just do not get any reading. However, it is known, and I do not think anybody will dispute this, that once these alpha emitters are inside your body, they are far more dangerous in terms of their medical effects than the penetrating radiation.

So what we are talking about is a situation where these materials, were they to remain outside of our bodies, would not be a major hazard at all. It is only through the inhalation into our lungs or the ingestion into our bodies where they go to certain critical organs such as the bones, the blood forming marrow, and the lungs and other critical organs where they can do a tremendous amount of damage. As a matter of fact, it is not out of place, I do not think, that one medical doctor from the United States who is extremely experienced in this field -- his name is Dr. Carl Morgan -- compared the difference between a gamma ray which is very penetrating and an alpha particle which cannot even go through a sheet of paper, as comparable to the difference between a rabbit and a bulldozer going through a cornfield. The difficulty with alpha radiation is that outside of the body, it is harmless. Inside the body it is devastating. For that reason, Mr. MacQuarrie, I would say that you are quite right. There is a natural background exposure which has incidentally some alpha in it too. We do get naturally exposed to some alpha radiation. Most of the 70 millirems is penetrating radiation. These alpha emitters that I am talking about here have a hazard that is not easily compared directly with that external penetrating radiation.

CHAIRMAN (Mr. Fraser): Mr. MacQuarrie. Final question.

MR. MacQUARRIE: Yes, I was going to point out that, at least in my reading, I find that we do have that type of radiation in us as well from just functioning in nature. If there is to be enhanced radiation then, as you term it, how would we get that into our bodies?

CHAIRMAN (Mr. Fraser): Dr. Edwards.

Technologically Enhanced Radiation

DR. EDWARDS: Well, Mr. Chairman, we will not get it into our bodies if we do not breathe, eat or drink but as long as we breathe, eat or drink, we run the risk of getting it into our bodies. Radon gas is very easily inhaled into the lungs. It is also very easily exhaled from the lungs, but the difficulty is that radon gas is not the end of the chain. There are a number of other substances which are very dangerous called radon daughters and these are solid. In the process of breathing the radon gas, the radon daughters deposit in the lungs and you build up over a period of time a deposit of radioactive alpha emitting particles inside the lung, and this is what does the bulk of the damage. In fact, the people who study this field believe that 85 per cent of the damage done by breathing radon gas -- done to the lungs -- is not done by the gas itself but by the radon daughters that are deposited inside.

Now, they have done careful computer studies in the United States. I have a volume at home about this thick which is the result of one study done by the Oak Ridge National Laboratories, a nuclear laboratory in the United States, computing the health effects of people living all over the North American continent from uranium piles in the southwest United States. The thing is that you can model where the radon goes, how much people are going to breathe and what the effects are going to be.

The conclusions of these studies have been that the number of deaths expected from the inhalation of the radon gas given off by these tailings piles is, in fact, the number one health hazard from the peaceful uses of nuclear power if there are no serious accidents. In other words, in the absence of serious accidents, the radon gas coming off those piles is the number one health hazard. That is really what we mean when we talk about technologically enhanced radiation. I might add that the amount of radon coming off these tailings piles is thousands of times greater than the amount coming off the undisturbed ore, and if you are interested, I can explain the reason for that.

CHAIRMAN (Mr. Fraser): Mr. MacQuarrie.

MR. MACQUARRIE: Does the gas -- I mean it was a facile answer to say that if we breathe, eat or drink we will get it, but that is providing it is there in dangerous quantities. I am sure you would agree with that. Are there circumstances in which it is more dangerous than others? In other words, does this gas, once released into the air, simply remain in concentrations that are dangerous or does it disperse into the atmosphere? I will just ask that question later. I hope that we will get on to mining and exploration which the Science Advisory Board's paper was on, but I felt that since Dr. Edwards raised a lot of these questions, they had to be addressed. If you would answer that please.

CHAIRMAN (Mr. Fraser): Dr. Edwards.

Biological Effects Of Low Level Radiation

DR. EDWARDS: Yes. This, Mr. Chairman, is one of the most perplexing aspects of the biological effects of low level radiation. The radon gas, of course, is diluted by the air with which it mixes. There is absolutely no evidence to indicate that it is less harmful when diluted. In other words -- as a matter of fact there is some evidence to show that if you get the same dose in a more dilute form over a longer period of time, the effects may be worse and that was the reason I showed you, for instance, the transparency regarding the radium that is injected into the mice. Your normal intuition would tell you that if it is diluted down and watered down and given at a lower concentration, that surely you must reach a point where it is safer. Yet with the case of the radium, the opposite appears to be the case, that as you dilute it, the same dose becomes more harmful.

Now, there is evidence to indicate that that same phenomenon occurs with radon gas. However, in order not to exaggerate the harm, the people who do these calculations assume that there is no enhanced danger. In other words, they assume that the same dose will have the same effect whether it is delivered quickly or slowly. There is a real possibility that in doing that, they are underestimating the actual harm. So I do not know if that answers your question but the answer is yes, there is dilution; no, there is no reason to believe that that makes it safe.

CHAIRMAN (Mr. Fraser): Thank you, Dr. Edwards. Mr. Patterson.

HON. DENNIS PATTERSON: Thank you, Mr. Chairman. Would the danger be greater for people who live closer to a mine than for those who live, say, in Yellowknife? We are expecting mines in the Keewatin. Could you comment on that?

CHAIRMAN (Mr. Fraser): Dr. Edwards.

A 50 Mile Radius

DR. EDWARDS: Yes, Mr. Chairman. It would definitely be a greater hazard to live within a 50 mile radius of the mines and in fact, when they do these studies of so-called radon gas -- I forget the technical term but it is radon exhalation -- from the piles, they usually classify the study into two categories. One is within a 50 mile radius and outside a 50 mile radius.

What happens within a 50 mile radius is that, for one thing, a smaller number of people are exposed to larger total doses of radon. When you get outside the 50 mile radius, you have large, much larger numbers of people exposed to smaller doses of radon. So there are two different things really. There is an extra effect that occurs within the 50 mile radius, and that is you have serious problems of dust blowing in the wind. This material is extremely fine. In consistency it is between a very fine sand and a flour and on an even mildly windy day in Elliott Lake, you can see this stuff blowing in great gusts of clouds. You can see it blowing in the wind. The danger of people living close is that not only do they get the radon gas, but they also get dust in their lungs and this dust enhances the radiological hazard.

CHAIRMAN (Mr. Fraser): Mr. Patterson.

HON. DENNIS PATTERSON: Thank you, Mr. Chairman. You talked about the poisoning of the environment in Texas, I believe it was, in your presentation. I think we may be invited to tour various uranium mining sites in Canada by the Chamber of Mines. Has this sort of environmental poisoning you described taken place in Canada and if so, where, and if we are to see sites of mines and tailing sites, where would you suggest we could learn a lot?

CHAIRMAN (Mr. Fraser): Dr. Edwards.

Environmental Poisoning In Elliott Lake Area

DR. EDWARDS: Yes, Mr. Chairman. There certainly has been environmental poisoning in the Elliott Lake area. The entire Serpent River system downstream of the mines is very badly polluted and in fact, there is no fish life 55 miles downstream. There are a lot of lakes -- I do not know how many. There are more than 18 lakes, many of them unfit for swimming or drinking or any human use. Now, I must add that we are dealing here with a combination of chemical pollution and radiological pollution. The death of the fish is largely due to the acidity which is also from the tailings but which is chemical pollution from the tailings. There are also other chemical pollutants from the tailings as well.

The strange thing about the radiological hazard is that yes, it is definitely present, even at the mouth of the Serpent River where it enters into the north channel of Georgian Bay. The levels of radium in the water are above the Ontario drinking water standard for radium but radioactivity is, as I mentioned earlier, strangely invisible to our five senses. So in some parts of Elliott Lake you can see a very beautiful looking brook which seems delightful in every way and in which the water quality seems fine, but when you take it to the laboratory and analyse it, you discover that it has impermissible levels of radioactive materials in it. These radioactive materials do not announce themselves to our senses in the same way that chemicals do. What you will see in Elliott Lake are visible signs of extensive chemical damage from the tailings. You will not see visible signs of the radiological damage, but it is there.

The best place -- I would suggest that if you visit Elliott Lake, that you contact Mr. Homer Seguin, who is one of the town councillors in Elliott Lake and who is also a representative of the United Steelworkers of America, which is the union of uranium miners, representing the uranium miners. He can escort you to some of the most awesome tailings disposal areas, which I would not have believed if I had not seen them with my own eyes. I am sure that, if Assembly Members see these, they must be impressed at the scope of the problem.

I might also mention that the Steelworkers Union has officially told the Ontario legislature that they are opposed to further expansion of the uranium mines in Elliott Lake, because uranium mining and nuclear power have already cost, quote, "an unacceptable toll in human life", unquote. So that the union, which actually stands to gain jobs in Elliott Lake, is opposed to further expansion of the mines under present conditions, because of the radiological and chemical contamination of it.

CHAIRMAN (Mr. Fraser): Mr. Patterson.

Government Agency Promoting Nuclear Power

HON. DENNIS PATTERSON: Just one more, Mr. Chairman, because I would like to give somebody else a chance. Dr. Edwards, you suggested that Atomic Energy of Canada Limited and the Atomic Energy Control Board, the regulatory board, who I believe will be presenting a witness here for this debate, in fact -- correct me if I am overstating this -- promotes nuclear power and is not objective. Now, I would like to hear from them, of course, but I would like to hear from you some expansion on that and particularly, why you think a government agency would be biased and not present both sides of this question.

CHAIRMAN (Mr. Fraser): Dr. Edwards.

DR. EDWARDS: Yes, Mr. Chairman. That is a very good question. I might begin by saying that everyone who has so far studied the Atomic Energy Control Board from the outside has concluded that there is a kind of an incestuous relationship between the control board and the industry that it is intended to regulate; beginning with the Senate report on science policy, that goes way back, before nuclear power was even an issue in Canada. They concluded that it was alarming to see that the Atomic Energy Control Board members were representatives of the very industries that they are supposed to regulate.

Today, the situation has improved somewhat, but not nearly enough. The president of the Atomic Energy Control Board, Mr. John Jennekens, worked for many years at Chalk River with Atomic Energy of Canada Limited, before he joined the Atomic Energy Control Board, and is now its president. The man who is in charge of radiation safety standards is a chemical engineer, named Mr. Bush, who is not a biologist or a medical doctor, not even a mathematician, but he is the man in charge of setting the radiation standards and before he joined the Atomic Energy Control Board, he spent his entire career working for Atomic Energy of Canada Limited at Chalk River.

Senior Staff With Entire Careers In Nuclear Industry

When I was recently giving a presentation about the Eldorado refinery that is planned for Blind River, Ontario, in Ottawa, there were two representatives of the Atomic Energy Control Board in the front row. I later discovered that they were both ex-employees of Eldorado Nuclear.

There is a problem, and the problem is that the senior staff of the Atomic Energy Control Board is dominated by people whose entire careers and whose entire livelihood has been tied up with the nuclear industry. I think it is really unfair to expect those people to change their attitude. I mean, they have made up their mind a long time ago that nuclear power is a good thing and should be promoted.

The difficulty is that when you have a regulatory agency with a bad attitude, that is, a non-aggressive attitude, toward the industry it is supposed to regulate, then -- and a bad attitude toward the public, I might say, because they tend to regard the public as interfering busybodies -- then I think it is time to really perhaps wipe the slate clean and start with a body whose sole purpose is to protect the public health and welfare. Part of the reason why the Atomic Energy Control Board is the way...

CHAIRMAN (Mr. Fraser): I am sorry, the interpreters did not get some of the terms. I wonder if you could maybe just explain a bit.

DR. EDWARDS: Just the recent terms?

CHAIRMAN (Mr. Fraser): Yes, just back there -- the last paragraph.

DR. EDWARDS: How far back, several sentences?

CHAIRMAN (Mr. Fraser): I got the light just before you finished up there. Maybe you were just going a little fast for them to pick it up.

DR. EDWARDS: Okay, perhaps I was going too fast. The note I ended on is when you have an agency which is supposed to regulate an industry where the senior people have attitudes that are not well equipped to the jobs that they are supposed to be performing, then something has to be done. Either you need a new agency or you need to clean house. These things have not happened.

Attitude Of Atomic Energy Control Board

Now, I was starting to say that the reason I think the Atomic Energy Control Board has got itself into this position is -- two reasons. In the early days, the Atomic Energy Control Board was there primarily for security reasons, to prevent the theft of nuclear materials for atomic bombs, and to make sure that the sale and the handling of these materials did not fall into "evil" hands. So that their primary purpose was to look after, you might say, the military aspects of nuclear power. Therefore, there was not such a great emphasis on the public health and welfare in the early history of the Atomic Energy Control Board. That is point number one.

Point number two is that the Atomic Energy Control Board and the entire nuclear industry operated in such secrecy during their early years -- and they still have quite a bit of secrecy, incidentally -- but especially during their early years, that nobody except themselves, people in the industry, were considered competent to deal with the issues. So it was only natural that when they turned to technically qualified people, the only people that came into their view or came into their attention were other people in the industry. Perhaps that explains how they got into this situation, but whatever it is, it is a bad situation. I believe you can ask other witnesses about this as well.

CHAIRMAN (Mr. Fraser): Thank you, Dr. Edwards. Any further questions?
Mr. Braden.

HON. GEORGE BRADEN: Thank you, Mr. Chairman. I just have some brief and simple questions. I know that 4:30 is fast approaching.

HON. DENNIS PATTERSON: I cannot hear you.

CHAIRMAN (Mr. Fraser): Do you think you are going to die?

---Laughter

HON. GEORGE BRADEN: Mr. Chairman, thank you. I have some brief and simple questions and I know that 4:30 is approaching and you will want to break for coffee. Mr. Chairman, the witness in his remarks indicated that uranium was used for making bombs and it was used in nuclear reactors to generate energy and power. I am just wondering, are there any other uses for uranium besides bombs and electricity?

CHAIRMAN (Mr. Fraser): Dr. Edwards.

Uranium Only Used For Nuclear Reactors And Atomic Bombs

DR. EDWARDS: Yes, Mr. Chairman, I think this is why the aluminum example perhaps is not a good comparison. Aluminum, of course, and steel and other minerals are multipurposed, they are used for any number of things. The point I was trying to make is that there are exactly two uses for uranium, exactly. Now, it so happens that years ago uranium was used in certain types of potters' glazes, but that is the only other use of uranium that has even come to my attention. The only uses are nuclear reactors and atomic bombs.

CHAIRMAN (Mr. Fraser): Thank you. Any further questions of the witness? Mr. Patterson.

HON. DENNIS PATTERSON: Thank you, Mr. Chairman. One of our Members for Keewatin North, in a speech in reply to the Commissioner's Address earlier in this session -- that sounds like radiation!

AN HON. MEMBER: Radiation!

HON. DENNIS PATTERSON: ...expressed the fear that these mines and the low level radioactivity from the tailings that would be left behind could affect the animals themselves. You have talked about the effects on humans and cancer. I would like to know, can you express an opinion on whether or not low level radiation could affect animals like caribou and would there be effects in animals and/or humans other than cancer? I have heard some talk about birth defects and mutations and this sort of thing. Would you comment, please?

CHAIRMAN (Mr. Fraser): Dr. Edwards.

Low Level Effects Of Radiation On Animals

DR. EDWARDS: Yes, Mr. Chairman. There is absolutely no doubt that it will affect animals as well as humans. The animals that are more susceptible in any species are the young and particularly those that are in the womb. It is well known that, for example, embryos or fetuses are many times more sensitive to the effects of radiation than adults. The effects are much more serious. If the embryo is exposed while it is still developing in the womb to a certain dose of radiation, it will have far more harmful effects, by and large, than that same dose administered to an adult animal.

For this reason there is a special worry because radium behaves very much like calcium and when it gets into the diet of anything, including a human, it goes to the same places, the same parts of the body that calcium goes to, which is the bone, where it can cause bone cancer and leukemia; the teeth, where it does not seem to do very much harm; and the milk, where it can be passed easily on to the young. So that is a concern indeed.

As for genetic damage, there is also little doubt that radiation causes genetic harm which means that even if you do not have an animal in the womb, but just the gonads of mature animals being irradiated can lead years later to defective offspring. This is a well established problem with radioactivity. It is much more difficult to obtain concrete scientific evidence as to the exact nature of the effect because of a variety of reasons which Dr. Woollard would be better equipped to explain. When a cancer occurs, you know it is a cancer. When a genetic effect occurs, you are not sure what to call a genetic defect and what not to call a genetic defect. That is one problem. So there is not any serious doubt that genetic effects occur, because they have done enough experiments with enough animals in laboratories to convince themselves that genetic effects occur. To measure it is difficult.

Genetic Effects Of Radiation On Man

The second thing is that the radiation has to be delivered to the gonads, or to the reproductive cells, which means, in the case of men, it has to go to the spermatozoa, or the sperm, and in the case of women, the eggs. Now, I am not sufficiently familiar with the way in which these alpha emitting substances that we are talking about distribute themselves in the body to know whether that would be a particularly serious hazard with radium or radon. I can say with a pretty high degree of confidence that radon gas would not be a genetic hazard, because it goes to the lungs and because the alpha radiation has such little penetrating power. I do not believe that it or its daughters migrate to the gonads, but I may be wrong. In the case of radium, I simply do not know. So there may be a genetic hazard there. It is not something that I have seen any documentation on. There are, however, other types of medical effects over and above the cancer and genetic effects, and these run a whole gamut of other types of ailments that can occur, once again, particularly to the very young, who are exposed to radiation. So, there are other effects. Dr. Woollard, I think, would be better equipped to give you some specifics on that.

CHAIRMAN (Mr. Fraser): Thank you. Mrs. Sorensen.

MRS. SORENSEN: Yes, thank you, Mr. Chairman. Many of the questions that I would have asked have already been asked, so I will not repeat them, but I do have one hypothetical question. I hope, Mr. Chairman, Dr. Edwards will bear with me. If, Dr. Edwards, we had the technology as you say to remove all the dangerous things along with the uranium in the mining process or if we had the technology to handle what you have claimed is the dangerous aspect of the mining tailings themselves, if we had the technology to address all those aspects of your concern, would you then personally support the exploration and mining of uranium?

CHAIRMAN (Mr. Fraser): Dr. Edwards, I will let you answer that, and then we will break for coffee.

MRS. SORENSEN: I may have a supplementary. I would like to finish it off.

CHAIRMAN (Mr. Fraser): I will let Dr. Edwards answer and we will break for coffee.

Moral Reservations About The Use Of Uranium

DR. EDWARDS: Yes, Mr. Chairman, the reason that I began my discourse or my presentation by talking about the problems related to atomic bombs and nuclear reactors, which are the only two uses of uranium -- I would still have reservations on moral grounds about the use of the uranium elsewhere, and the problems that it might engender. As far as the environmental and health impact in the location where the uranium mining took place, obviously if you have got the problems in hand, then they are not really problems anymore, provided that you can have confidence that you are not putting future generations at risk. I do not believe we are at that point at all at the present time, and so, my opinion, I think, is fairly clear.

I could envisage a possibility of a world which was much more peacefully oriented than ours, where the threat of nuclear war was rapidly diminishing instead of rapidly increasing, and where the technological problems of waste disposal at both ends of the fuel chain -- that is, at the uranium mine and also at the reactors -- if those problems had been effectively solved and the safety problems had been solved, and the world was not seeming to drift closer toward nuclear war, then I would think that the whole subject of nuclear power would be seen in a completely different light, and I would have to reassess it. So I am not saying that under all hypothetical conditions, I would be opposed to nuclear power. What I am saying is that under the present conditions, I really do not see how I can, in good conscience, be in favour of it.

CHAIRMAN (Mr. Fraser): Thank you, Dr. Edwards. We will have a 15 minute coffee break, and you will have another six minutes for questions.

MRS. SORENSEN: And will you get back to me?

CHAIRMAN (Mr. Fraser): And we will get back to Mrs. Sorensen first. Thank you.

---SHORT RECESS

CHAIRMAN (Mr. Fraser): The Chair recognizes a quorum. The committee will come back to order. Dr. Edwards, we have six minutes left, and Mrs. Sorensen here is number one. Supplementary question.

Peaceful World Will Not Come About

MRS. SORENSEN: From your response then, Dr. Edwards, I take it that you have, I guess I would call it a vision, so to speak, of a peaceful world, a world in which there are no nuclear bombs, and no warring nations, and that as long as the exploration and mining of uranium continues, it then is your belief that a peaceful world, the world that you envision, will never come about. Am I right in assuming that?

CHAIRMAN (Mr. Fraser): Dr. Edwards.

DR. EDWARDS: Mr. Chairman, I believe that puts my belief very well in fact. There are many scientists, myself included, who believe that with the splitting of the atom, the world has fundamentally changed. We must learn to live without war and without nuclear weapons if we are going to survive on this planet for more than a few more decades. I apologize to the translators. I am sure I am going too fast.

Some of the people who have been most outspoken about the way in which the world is currently drifting toward disaster have been the very scientists who were instrumental in developing the atomic bomb in the first place, and unfortunately, most people, through ignorance, continue to act as if we were still living in the 19th century, and that these dreadful realities did not exist, but it is certainly true that as long as the world depends for energy supply on finite, non-renewable resources, such as oil and uranium, that war seems inevitable because of aggravated competition for these resources.

If the world can find a way of meeting its energy needs through things like solar power, wind power -- that is, the sun, the wind, the water, the waves -- then I think there is a chance to have a peaceful world. I think there is no chance of having a peaceful world as long as we depend, for the very guts of our civilization, on these highly competitive, fastly diminishing non-renewable resources.

CHAIRMAN (Mr. Fraser): Thank you, Dr. Edwards. You have one more question, Mrs. Sorensen.

Other Uses For Uranium By-Products

MRS. SORENSEN: I would take it then, and I would describe you -- and it is not being critical -- as a man with a passion and a man with a cause, and I certainly can understand that. Now, I do have one more question, and it concerns the uses, again, of uranium. Are you sure that uranium and uranium by-products, or the by-products from uranium mining, are not used for anything else but bombs and nuclear reactors?

CHAIRMAN (Mr. Fraser): Dr. Edwards.

DR. EDWARDS: The only other thing that they would be used for -- uranium itself has very limited uses. It is used for bombs and nuclear reactors and it could also be used for certain types of scientific research, relatively minor. I do not know of any important uses of uranium, other than those two.

Radium is used still as radiation sources. For example, you can still purchase radium sources which go with Geiger counters to give you a way of testing the validity or the accuracy of your radiation measuring equipment. There is one

expert, who testified at the British Columbia royal commission inquiry into uranium mining, who said under oath that radium was so dangerous that nobody wanted to experiment with it, therefore not all that much research is done with it. Radium may have a few uses. Radon gas is sometimes used in small quantities for various things. But I do not know of any really significant commercial uses for any of these things, no.

CHAIRMAN (Mr. Fraser): Mr. Curley, have you a question? You have got a couple of minutes. Mr. Curley.

Northern Uranium Mining More Risky Than That Of The South

MR. CURLEY: A couple of minutes? Yes, I have only one question. Considering that the North has a pretty harsh climate and lack of modes of transportation and all the kinds of technology that southern Canada has, do you think in your view uranium mining would be more risky than in any other parts of Canada; also taking into account that the use of land is possibly more important to the people, particularly the native people, and considering also the fact that the migration of caribou is sometimes unpredictable? Taking these factors into account, do you think that the uranium mining would have more possible risks than some southern centres or Canadian mining in southern Canada normally experience? Thank you.

CHAIRMAN (Mr. Fraser): There seems to be an awful lot of noise. I think it is in the hotel system here. Did you get the question, Dr. Edwards? Do you care to respond? I do not know if this noise is going to maybe be hard for hearing. Go ahead.

A Man Of Conscience

DR. EDWARDS: Yes, Mr. Chairman. In order to answer this question, I would like to briefly mention that, more than a man with a cause, which I think is the case with most of the people I know in the nuclear industry -- they definitely do have a cause, which is to promote nuclear power -- I would describe myself as a man of conscience, who feels that since I have been blessed with a better education than most people can afford, I have an obligation to share my knowledge with others so that they can form better judgments.

I do have my own opinion, and I do not try and hide it. I think it would be dishonest and irresponsible for me to try and hide my opinion. On the other hand, I try and stay to things that I think I know. By "I think I know" I mean that there is always the chance that you have been mistaken, but I sincerely believe that what I have been telling you today is the best information that is available on these particular topics.

Now, this question that Mr. Curley has asked me would require me to speculate completely. I simply do not know enough about northern terrain. Because of the difficulties of permafrost, because of the flatness of the land, and particularly because of the caribou lichen food chain, which I mentioned earlier, I can speculate that perhaps there would be greater environmental damage or impact, but that is only a speculation. It is not based on any careful scientific studies. It is not a fact. There may very well be special hazards in the northern environment. I think it deserves very careful consideration. I would hope that before anybody in a position of responsibility in the Northwest Territories would consider approving such a project, they would insist that very detailed studies be done of the potential impact on the delicate northern environment.

CHAIRMAN (Mr. Fraser): Thank you, Dr. Edwards. That concludes your presentation and question period. Members may have another chance to get to ask questions after we have heard from other witnesses. I would like to thank you very much on behalf of the Assembly.

---Applause

We have now Dr. Meyers. Would the Sergeant-at-Arms see that Dr. Meyers is escorted to the table? Mr. Patterson.

HON. DENNIS PATTERSON: Mr. Chairman, Dr. Edwards had certain materials that he thought the Assembly should see. I am sure other witnesses may have materials. Rather than tabling tons of paper, I wonder if we might ask witnesses to leave certain reports that they might have with the Clerk, so that we could have in one location, a small library of this valuable material.

CHAIRMAN (Mr. Fraser): Thank you, Mr. Patterson. I think that is a good suggestion. If he wants to leave it with the Clerk, the Clerk will see that the Members that are interested can have them picked up in the Members' lounge. Dr. Meyers, I will remind you again -- I do not know if you were in the back listening to the first witness that was up -- you will have a one hour presentation and then there will be an hour for a question period. I will ask that you talk slowly because of the translation and a lot of the words probably that you will be coming out with, we will not understand, so you will have to probably explain. We will be asking you to explain a lot of things. You can proceed now with your presentation.

Presentation By Dr. David Meyers

DR. MEYERS: Thank you Mr. Chairman, Members of the Legislative Assembly. My name is Dave Meyers and I work for Atomic Energy of Canada Limited at Chalk River. Unlike most of the other people who will be talking to you, I am a research scientist who has been working on the biological effects of radiation for about 22 years in a research laboratory. That is to say, I spend my life learning and studying, gaining knowledge about the effects of radiation on humans and other living things.

To avoid some possible confusion, I would like to explain that Atomic Energy of Canada Limited is not a private company. It is a federal crown corporation. It is quite separate from the Atomic Energy Control Board, with which one of our next speakers will be associated. The control board is concerned primarily with regulations governing various aspects of uranium mining and the operation of nuclear reactors. The Chalk River laboratory, where I work, is a national laboratory which is concerned with research and development in the field of nuclear reactors and with the lifesaving medical uses of radiation.

My own area at Chalk River is the effects of radiation on people and on other living things in the environment. Research on these topics has been supported by the federal government at Chalk River since these laboratories were established in 1945. At Chalk River there are currently, at the moment, employed about 2200...

CHAIRMAN (Mr. Fraser): I am sorry, I wonder if Mr. Patterson could come back within the rope so we have a quorum here.

MRS. SORENSEN: Hear, hear! He should be sitting down anyway, listening to this.

HON. DENNIS PATTERSON: I am listening.

AN HON. MEMBER: Yes, mam.

MRS. SORENSEN: Very poor.

CHAIRMAN (Mr. Fraser): Thank you. Well, I am sorry, proceed.

Programs Being Studied By Atomic Energy Of Canada

DR. MEYERS: Thank you. So at Chalk River there are currently about 2200 people in engineering, physics, chemistry, health sciences and other areas. They are concerned not only with the nuclear reactor program, which already supplies about one third of the electricity that is used in Ontario, they are also concerned with the use of radiation for the treatment of cancer, with the production of special radioactive materials which are used by medical doctors in hospitals to help them understand various diseases in sick people and to treat these diseases. They are also concerned with the design of other smaller and less complex reactors, which are at the moment used by universities in Canada for research and which could be used for the central heating of buildings. The health sciences division, in which I work, employs about 30 professional people. Of these 30, four are trained as medical doctors. I am not a medical doctor myself, but am closely associated with them.

My purpose here today is to try to answer your questions on the health effects of radiation. I might add that my wages are being paid by the taxpayers of Canada. As such, I as a scientist, am responsible to the people of Canada. None of the research that we carry out on health effects is secret. All of it is published in scientific journals, along with research from other countries, and is available to anyone who wishes to read it.

I understand that some Members of your Assembly may be visiting mines in various sites across Canada. I would sincerely like to invite you to visit one of the research sites of Atomic Energy of Canada, either at Chalk River in Ontario, or at Pinawa in Manitoba, on your trip. I think you will be most interested in the research that is being carried out there, in talking to people who are dealing with radioactive materials every day of their life -- of their working life.

Presence Of Radioactive Materials In Drinking Water

I would like to leave with the Clerk several documents for perusal -- for reading by any Members of the Assembly at a later date. One of them is called "Guidelines for Canadian Drinking Water Quality". It is put out by the Department of National Health and Welfare. It deals with various possible materials that may be present in water. At the end of the book, there are also guidelines on the amount of radioactive materials that may be present in drinking water. It is clearly explained in this section on radioactive materials that the guidelines which are used are designed to be 1/100 part of the maximum permissible concentration for occupational workers. Occupational workers are in general monitored very carefully. We know their radiation doses, and they are allowed greater exposure to radiation than is the general public. So the maximum acceptable concentration according to Department of National Health and Welfare for radium and for various other radioactive materials is laid down by the Health and Welfare, and it is set at 1/100 of the concentration permissible for occupational workers.

They have another target. They have two figures. One is a desirable target concentration. This is one 1/1000 of the maximum permissible concentration for workers. When Dr. Edwards right now was talking about the effects of radium in the Serpent River system, he was explaining that these concentrations may exceed, on occasion, 1/1000 of the maximum permissible concentration for workers. The actual concentrations in the drinking water of people living in Elliott Lake are much below this target of 1/1000. The water is not unsafe.

Disposal Of Radioactive Materials From Reactors

I would also like to leave with you an Atomic Energy of Canada Limited publication which is simply a list of the papers that have been published by health scientists at Chalk River and at Pinawa on the effects of radiation on living materials. You will find a list of about 300 publications. It is not up-to-date, but it is an indication of what we are doing, in connection with the disposal of highly radioactive materials from radioactive reactors. It was mentioned by Dr. Edwards. I must say, I am not an expert in this field. I am not certain that this program is directly relevant to the purposes of this hearing, but I would like to leave three documents with you in the event that any of the Members of this Assembly would like to know what is going on in the way of research, and to the disposal of highly radioactive materials coming out of reactors.

The general principle, I think, is well known to many people. It is to take the highly radioactive materials and put them underground in the rock of the Canadian Shield at a depth of approximately one kilometre -- that is roughly 1000 yards -- and to seal them up and leave them there. It is not yet certain what political decision will be made on the use of this uranium, and therefore, there are two programs going on simultaneously.

Dr. Edwards mentioned that you can only use uranium for two purposes. I have mentioned some of the other purposes for which it is used in the medical field in which Atomic Energy of Canada is intimately involved. I might point out that it can be used for another 50 purposes if necessary, if deemed necessary in future. If one burns oil, for example, you have essentially nothing left. It is all burned up, disappears into the atmosphere. When you burn uranium in a CANDU reactor, if you were to extract some of these poisonous materials that Dr. Edwards was talking about you can reuse the uranium another 50 times. In other words, you can get 50 times as much energy out of the fuel bundle, as you get on the first cycle through, and there are, of course, many people who are interested in conserving fuel sources, energy sources for the future, and some of these people would like to retain this uranium for future use.

Publications On Radiation Effects

I would also like to leave with you another book. It has nothing to do with us. It is called "Radiation and Life". It is by Professor Eric Hall from New York. I believe that he has nothing to do with the nuclear power industry in any way. He is a professor in the medical faculty which is associated with the uses of radiation in hospitals. I believe that he has explained fairly clearly to you in this book what radiation is and what its effects on living organisms are. I will leave that with the Clerk with your permission.

I might also leave one of my own more recent publications here. It is called "The Health of Radiation Workers". I believe in there you will find clearly explained what happens to people working in nuclear power reactors who are exposed to relatively high amounts of radiation, what is predicted to happen. In general, one finds that people who have been working in nuclear reactors for some years are healthier than the average person in Canada. These studies have been carried out in Canada as well as in the United States and in the United Kingdom. I leave this with you because the principles, I think, are fairly clearly stated. Unfortunately, there is not too much on uranium miners, although at the end of the book, in answer to some questions, there are data on uranium miners.

Many Known Radioactive Materials In The World

I would like to turn my attention now to the tabled document. I think it is Tabled Document 24-80(2) called "Uranium Exploration in the Northwest Territories", which was prepared by the Science Advisory Board of the Northwest Territories. In my opinion, if the intent was to produce a short, understandable and reasonably accurate document, I would say that the authors of this document have succeeded extremely well.

I would, however, like to add some further comments to some of the statements in this document. For example, we start off, "Uranium is a radioactive material." That is perfectly true. Of course it is. There are about 40 to 50 other radioactive materials known in the world. The ones with which we are most concerned in the health sciences are uranium and the products of uranium that were explained to you by Dr. Edwards, thorium, which also occurs universally, and the products of thorium, and potassium. Potassium is essential for life for all living organisms, including people. It happens to be radioactive. We cannot live without it, though.

We go on to the second statement: "It emits harmful radiation and minute quantities of radioactive radon gas." This statement is also completely accurate. One might, however, add a few comments on that.

Radiation A Natural Life Source

First of all, radiation is a natural life force. It has been here ever since the universe was created. It is a natural part of our world, indeed, of the whole universe. It can be used for harmful purposes, it can be also used for our own benefit. What we are concerned with in the health sciences is that it is not abused, in other words, that people are not exposed to amounts of radiation which would have harmful effects, either on their health or upon the health of their children. One might make an analogy, for example, with fire. Fire, as you know, in one form or another is considered essential to life by most people. It can also be very destructive if it is not properly controlled. The situation with uranium is very similar to this.

I might point out, one of the beneficial aspects of natural radioactivity is that it helps to keep our earth warm. This is evidenced in the hot springs, such as radium hot springs. As you know, the deeper layers of the world are believed to be warmer than the surface, and as is also sometimes evidenced in volcanoes, much of this heat is derived from the natural radioactivity of the earth.

The power reactors that we are currently building are man made. I might point out that there have been natural reactors. We have evidence of this. There are none operating at the moment, but we can find evidence that similar reactors have existed on the surface of the earth many years ago. What we are currently trying to do is to harness the same types of natural phenomena for our own benefit and our own purposes.

The document prepared by the Science Advisory Board states that radiation is not a new hazard for man and this is perfectly accurate, and it goes on to explain it. I would like to explain a little more about it. All of the food that we eat, all of the water that we drink, all of the air that we breathe contains radioactive materials. It has always contained them, ever since the world was created. So, what we are trying to do is to relate the results of our own activities in the nuclear power area to the natural levels of radiation. Dr. Edwards mentioned a figure of 70 millirem. I do not wish to quarrel with him. The values that are quoted usually range between 80 and 120 millirem, and one normally says, let us say about 100 of these dose units. I do not want to use the word millirem all the time. Let us call them dose units again.

Radiation In Caribou Is From Natural Sources

Dr. Edwards was also quite correct in saying that the caribou are more radioactive than most other living organisms. What he was incorrect in stating, and it was quite wrong, was that this radiation was derived from fall-out. There is a very minute amount of radiation added to caribou from fall-out. Most of the radiation, radioactive materials in caribou, are from natural sources. It has to do with the way they eat, as Dr. Edwards was explaining. People that eat say a half a pound to one pound of caribou every day of their life will have a larger amount of radioactivity from natural sources in their body than the average person in North America.

I do not wish you to be alarmed by this fact. Radiation from natural sources varies from one place to another. It varies by a factor of about 10, let us say -- not the caribou -- the caribou is a factor of about two, but the radiation coming from the sky, the cosmic radiation, the radiation in the food that we eat and the water that we drink and the radiation that reaches us externally from the ground varies by a factor of about 10 from one part of the world to another.

Studies Done In Different Countries On Radiation Levels

Now, there have been studies done, a number of studies, on the health of people and the health of other living animals living in areas where the natural radioactivity is much higher than normal. These studies were carried out in China. Most recently, there was a study in China where the natural radiation levels differed by a factor of two. They could not find any difference in the health of people who had been living there for several generations. The numbers of people involved were fairly small, about 100,000 in each of two locations.

A much larger study was carried out in the United States some years ago, which was published in a number of places. In this case, we are looking at six million people in the United States, who lived in a portion of the United States -- it is in the Denver area, the Colorado area and surrounding territory -- where the natural radiation levels, again, are about twice the average for the rest of North America. Again, no health effects were observed. The drawback on that particular study is that the people in the United States tend to move around, move from one place to another, so they have not been living there for several generations, in contrast to the Chinese study, but let us say that within the 30 to 40 years that most of the people have been living there, the doubling of the natural background level of 100 units per year has not had any detectable effect upon their health. Other studies have been carried out in India, in an area where the average natural radiation levels are up to five times normal. This is mainly from sand which is very rich in thorium. Again, no effects have been observed. The drawback with that particular study is that in India, which is a very poor country, most of the people simply do not live long enough for any radiation effects

to be very great. One would expect, in general, to see any increment in cancers in older people and if we were talking about animals, again, you only see an increase in very old animals. You do not see it nearly as often in younger people. The people there are not living long enough, perhaps one could say.

We have also looked for genetic effects on animals living on an island in this area. The animals have been there for many generations. They have not been moving back and forth across the continent. Again, no genetic effects were observed. Genetic, I should explain, means things that are inherited from the parent to the child and possibly to the grandchild.

Purpose Of Regulations Is To Bring Radiation Level Down

I believe that one of the most important statements in this document that was prepared by the Science Advisory Board is at the bottom of the first page. "The board has concluded that suitable methods are available to reduce to an acceptable level the risk from radiation at all stages in the uranium cycle, from exploration and development through mining, disposal of mine wastes, production of nuclear fuel, operation of reactors, to the final permanent disposal of radioactive wastes."

I do not wish to comment on the legislation that is involved. The methods are there. We know that we can bring the radiation level exposures down to very small percentages of our natural radiation exposures. I believe that the other speakers who will be following me will, perhaps, have something to say about the regulations. What I would like to point out is the purpose of these regulations, which is to bring any increase in radiation exposures down to a small fraction of natural background levels, those natural levels to which we are all exposed, inevitably, every day of our life.

Radon Daughters Cause Lung Disease

The question of hazards from radon has been raised. I might point out that one of the main reasons that people are now aware of these hazards is because of the nuclear power industry. There are two small villages in Germany in the mountains -- I will not give you the names, they are too complicated -- where miners had been digging up gold originally. Later they were after silver, cobalt, various other elements that people wanted to use. It has been known since the year 1500 approximately, that is somewhat over 400 years ago, that these miners died of a chest disease. It was not known what the chest disease was. This went on for approximately 400 years until 1951. In 1951 it was noted, or it was pointed out, what the cause of this chest disease was, and it was primarily radon daughters.

In Newfoundland, we have another tragic story. There were people mining fluorspar for some years in the 1930's. Again, many of the people developed lung cancer. This was a combination of the radon daughters to which they were exposed and the cigarette smoking. It is known that there is an excess of lung cancer in certain iron mines, certain cobalt mines, various other mines of this type around the world. Only with the advent of modern methods has it been pointed out that in almost every mine you will get an accumulation of these radioactive materials in the air. If the uranium concentrations in the rock nearby happen to be higher than normal, you will have higher concentrations and you will have unfortunate and frequently fatal results.

Since it was identified, the cause of these lung cancers was identified, the exposures in all mines in Canada have been carefully monitored and kept to extremely low levels. I might point out that there is a slight problem with uranium, the history of uranium mining in Canada. The uranium mining was started in the 1950's and there was essentially very little regulation of the concentration of radioactive materials in the air. There was considerable attention paid to ventilation to reduce the amount of silica in the air and this did keep the concentrations of radon daughters down.

Costs Money To Ventilate Mines

In 1959, the International Commission on Radiological Protection, which has already been referred to, did make a recommendation on the maximum permissible levels of radon daughters in mines. This was not immediately adopted in the United States and because it cost money to ventilate mines -- I think this is the primary reason, that is my personal opinion -- it was not adopted in Canada either. The level was set at three times the recommendation of the international commission.

In the nuclear power reactors, on the other hand, I might point out the exposure of workers has always been within the limits recommended by the same international commission. The levels were gradually reduced and are now, since 1975, are now all well below, I believe on the average, well below the maximum permissible concentrations that have been recommended, and the Atomic Energy Control Board has played a major role in this reduction.

Positive Uses Of Radioactive Materials

The knowledge that we gain in our research laboratories is shared with other countries around the world. The equipment that is being developed by our country for medical uses of products produced in reactors is also shared around the world. The figure that is normally quoted is the therapy units; that is, these are units for the treatment of cancer using radioactive materials. They have saved or prolonged over eight million lives. These radioactive products are used also to check pipelines, for example. You do not want a pipeline to have a crack or to blow up if you are piping some gas or oil through it, and the easiest and most effective method of looking for potential cracks is using radioactive materials which are manufactured in nuclear reactors.

If for example, you had a well and there was something nasty that came into it, some gasoline or some other pollutants, and you wanted to prove where it came from, you can also do this with radioactive tracers, very small amounts that are manufactured in these reactors.

Dr. Edwards mentioned -- I just do not want to dispute him. I just want to correct a statement he made about the danger of irradiated fuel bundles coming out of a nuclear reactor. The statement that he made is, I believe, correct. If you were to stand long enough close to one of these irradiated bundles, it would be lethal but you are not allowed to. No one is. The fuel bundles are carefully shielded and they are stored in water filled pools. The water cools them and protects people walking around from the radiation. I have seen these pools. I have stood beside them many times.

Effects Of Radiation Producing Cancer

As for the effects of radiation in producing cancer, I might point out one or two facts about it. This hazard was first raised by people within the nuclear power industry and it was a person called Dr. Newcombe at Chalk River who was one of the first to attempt to work out quantitatively the effects of low amounts of radiation from nuclear weapons on the health of people in general.

If one looks at people who were exposed to very high radiation doses during the war in Japan, that is the people who survived the effects of the atomic bomb explosions over Hiroshima and Nagasaki, you will find that actually very few of these people have died of cancer that was caused by radiation exposure which was on the average about 1000 times that which we receive from natural sources every year of our life. The number of people killed during the actual explosion and who died within a week after the explosion due to the blast effects, burns, is not known exactly. It is certainly in the tens of thousands. It is usually estimated to exceed 100,000 people. Of most of the people, something like 75 per cent of the people who survived the radiation effects are still alive today. There is approximately 100,000 of these people in a particular study group. Of these 100,000 people, roughly 25,000 have died by now. Approximately 300 of them are estimated to have died from the cancers induced by this high radiation exposure.

Experimental Results Published

The type of publications that we put into scientific journals go along with publications from many other countries and are considered by national and international groups of scientists who are specifically appointed for this purpose. We do not make our own estimates of the radiation hazards. We publish our experimental results and whatever these national and international committees agree upon, we accept. The data on radium in animals that Dr. Edwards was showing you, the data on radon in humans that Dr. Edwards was showing you, are all taken into account in the conclusions of these groups.

The other thing that I should point out is there was something mentioned about alpha particles. If we express the dose from alpha particles in millirems, that is the standard dose unit everybody has been using, the difference in the biological effects is already incorporated into this dose unit and an exposed...

CHAIRMAN (Mr. Fraser): I think the interpreters are having trouble with that last sentence. Explain please.

DR. MEYERS: The differences in the biological effects of alpha particles and -- alpha is a terrible word. I am sorry. I cannot explain that. It is a little particle that goes charging off at high speed -- and of other types of radiation are taken into account when we express radiation doses in the usual unit of millirem. That is to say, if you are exposed to one millirem from an alpha particle or from any other type of radiation, that one millirem will have exactly the same effect no matter where the radiation was received from.

The recommendations that are made on acceptable exposure levels are derived from the -- oh, just before I mention that, I might mention two of the outstanding reports I have brought along. One is this document which is produced by the United Nations. It is a document which comes out about every four to five years with an update, bringing everything up to the last available information. This has about 700 pages. It is concerned with the sources and effects of radiation. I do not expect you to read it. You are welcome to if you want. That is quite something. That document was published in 1977. It is the most recent one available. The next one is expected in 1982.

Operation Of Scientific Community

The other interesting document from a scientific point of view is this one which is published by the United States Academy of Sciences and it is called "The Effects on Populations of Exposure to Low Levels of Ionizing Radiation". Again that is some 650 pages. This is the type of information that I am required to study, understand what it is saying. If we object to anything in

these publications, our route would be to publish something in a scientific journal stating the objection. The next report would consider this objection and would either disagree with it or not. That is the route by which the scientific community operates.

Based on the results that are obtained, the conclusions that are arrived at by these groups of scientists -- I might point out that the United Nations group includes about 80 scientists from 20 different countries in the world. There is at least one country represented on every continent. Canada happens to be one of the 20 countries and Russia, France, Germany, England, United States. All of these countries are represented. They have to agree on the statements that are made in these reports, otherwise the report will not be issued.

These conclusions are then considered by the International Commission on Radiological Protection. This is an organization which was set up by the medical profession in 1928 under a different name in order, at that time, to protect medical practitioners against undue exposure to large amounts of radiation. Its name was changed in 1951 to the one, International Commission on Radiological Protection, and it has continued to operate and it issues reports with recommendations on exposure levels from time to time. I think the number of reports is now up in the 30's.

Recommendations Do Not Have Force Of Law

These recommendations do not have the force of law. They are made by scientists from about 13 different countries, I believe, at the moment. Again, this is a consensus among this group as to what would be acceptable and I keep using that word "acceptable" and I will explain that in a moment. The Government of Canada, as the government of any other country, has the right to accept these recommendations or not to. Until the present, I believe that the Government of Canada has used these recommendations as the basis for its laws.

Acceptable -- I want to come back to that term. In 1977 the international commission went through this in some detail and they said "Well, what we want is to have the radiation exposures for workers" -- I am talking about maximum for workers -- "at a level which will not produce any more harm to these people than working in other safe industries." At the maximum permissible exposure, the amount of harm that is predicted to occur in workers is approximately equivalent to that which would happen if you were working in a construction industry. To get down below the amount of harm that might happen to persons working for the government, for example, you would have to work at about one third to one quarter of the maximum permissible exposures.

Fatalities In Industry Due To Accidents And Not Radiation

I might point out that construction industry is a moderately hazardous occupation. You might care to compare it with things like fishing and hunting which are two of the most hazardous occupations in Canada. Mining, underground mining, in itself is rated second in the number of fatalities. This is due to accidents. It is not due to radioactive materials. Somewhere below that, I have forgotten the exact figures, these figures are published by -- oh, forestry, cutting down trees is the next most hazardous group of occupations. So what we are trying to do with the recommendations is to keep the hazards to workers, due to radiation exposures, well below those that would occur in hunting, fishing, forestry and to keep them down to levels that might occur if the same worker had been employed in a government for example. Thank you very much. I would be very happy to answer questions.

---Applause

CHAIRMAN (Mr. Fraser): Thank you very much, Dr. Meyers. The Members will note that tomorrow at 1:00 o'clock the session opens, and after the formal session, there will be a one hour question period to answer any questions of the Members. The time being 6:00 o'clock, the rules of the House say that I report. Thank you very much again.

MR. SPEAKER: Order in the House, please. Mr. Fraser.

REPORT OF THE COMMITTEE OF THE WHOLE OF URANIUM EXPLORATION AND MINING

MR. FRASER: Mr. Speaker, your committee has been studying the uranium report and wish to report progress.

MR. SPEAKER: Thank you, Mr. Fraser. Are there any announcements from the House? Mr. Clerk, announcements and the orders of the day, please.

CLERK OF THE HOUSE (Mr. Remnant): Friday, February 27, at 11:00 a.m., is a meeting and luncheon with the Science Advisory Board, in Katimavik A.

ITEM NO. 13: ORDERS OF THE DAY

Orders of the day, 1:00 p.m., Friday, February 27.

1. Prayer
2. Oral Questions
3. Questions and Returns
4. Petitions
5. Tabling of Documents
6. Reports of Standing and Special Committees
7. Notices of Motion
8. Motions
9. Notices of Motion for First Reading of Bills
10. Introduction of Bills for First Reading
11. Second Reading of Bills
12. Consideration in Committee of the Whole of Bills, Recommendations to the Legislature and Other Matters: Uranium Exploration and Mining; Bill 1-81(1); Ninth Report of the Standing Committee on Finance; Report of the Special Committee on Education Respecting Student Aid
13. Orders of the Day

MR. SPEAKER: The hour being 6:00 p.m., this House stands adjourned until 1:00 p.m., February the 27th, at the Explorer Hotel.

---ADJOURNMENT

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