MANITOBA PUBLIC UTILITIES BOARD

Re: MANITOBA HYDRO'S APPLICATION
FOR APPROVAL OF NEW ELECTRICITY RATES
FOR 2010/11 AND 2011/12

Before Board Panel:
Graham Lane - Board Chairman
Robert Mayer, Q.C. - Board Member

HELD AT:
Public Utilities Board
400, 330 Portage Avenue
Winnipeg, Manitoba
May 26, 2011
Pages 6415 to 6637

APPEARANCES

Bob Peters	(np)	)Board Counsel
Anita Southall		)
Patti Ramage		)Manitoba Hydro
Marla Boyd		)
Byron Williams		)CAC/MSOS
Myfanwy Bowman	(np)	)
Antoine Hacault		)MIPUG
Michael Anderson	(np)	)MKO
William Gange		)RCM/TREE
Delanie Coad	(np)	)SCO
Denise Pambrun	(np)	)City of Winnipeg
Gavin Wood		)Independent Experts

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LIST OF UNDERTAKINGS

--- Upon commencing at 9:40 a.m.

THE CHAIRPERSON: Okay. Good morning, everyone. We've had a lengthy break. So we're back at it again. Ms. Southall, do you want to bring us up to date?

MS. ANITA SOUTHALL: Yes, good morning, Mr. Chairman, Mr. Vice-Chairman, all in attendance. We have the introduction of some exhibits this morning which we'll proceed with. We also have responses to certain of the pre-asks and undertakings of various parties which will be presented through Mr. Wood. I will start with, please, the introduction of two (2) PUB exhibits, for the record.

The next exhibit number is Exhibit 22, and we enter the set of questions called Undertaking Questions 1 to 25 from the PUB for the Independent Expert Witnesses, dated May 17, 2011, as the next PUB exhibit.

THE CHAIRPERSON: We have it.

--- EXHIBIT NO. PUB-22: Undertaking Questions 1 to 25 from the PUB for the Independent Expert Witnesses, dated May 17, 2011

MS. ANITA SOUTHALL: And then if you would, please, mark a letter from Fillmore Riley to Manitoba Hydro, dated May 24, 2011, as the next PUB exhibit.

THE CHAIRPERSON: Yes.

MS. ANITA SOUTHALL: That would be Exhibit 23.

--- EXHIBIT NO. PUB-23: Letter from Fillmore Riley to Manitoba Hydro, dated May 24, 2011

MS. ANITA SOUTHALL: That letter was circulated to Manitoba Hydro, counsel for all Intervenors, the Board of course, and all email recipients on the general email list on the -- on the dated issue, for the record. And we have now a series of Manitoba Hydro exhibits which I believe Ms. Ramage or Ms. Boyd will be entering. Thank you.

MS. PATTI RAMAGE: Yes, thank --

THE CHAIRPERSON: Ms. Ramage...?

MS. PATTI RAMAGE: Thank you. Manitoba Hydro has distributed a number of undertakings this morning. The first is Undertaking number 91, and that is the December 2010 actuarial evaluation performed on

Manitoba Hydro's pensions, and that would be Exhibit Manitoba Hydro 146.

--- EXHIBIT NO. MH-146: Response to Undertaking 91

MS. PATTI RAMAGE: The next is Manitoba Hydro Undertaking number 138, which is the arrears of customers for Neighbours Helping Neighbours program at the time the customers applied for assistance. That is Exhibit Manitoba Hydro number 147.

--- EXHIBIT NO. MH-147: Response to Undertaking 138

MS. PATTI RAMAGE: The next is Manitoba Hydro Undertaking number 139, and that is Manitoba Hydro undertook to provide what it could in terms of arrears data broken down by mis -- as -- as broken down by Mr. Colton in Table 3, and that's Exhibit Manitoba Hydro number 148.

--- EXHIBIT NO. MH-148: Response to Undertaking 139

MS. PATTI RAMAGE: And then, lastly, we would suggest Manitoba Hydro's letter of May 20th to the Public Utilities Board, which is its objection to the undertakings posed by PUB counsel on May 17th. We're suggesting that be marked as Manitoba Hydro Exhibit number 149.

--- EXHIBIT NO. MH-149: Manitoba Hydro's letter of May 20th to the Public Utilities Board

THE CHAIRPERSON: Fine. Thank you.

MS. ANITA SOUTHALL: Next, if I could turn to Mr. Wood, please, to enter a series of documents based on -- and provide us with a status report with respect to various pre-asks and the PUB undertakings of May 17th.

Mr. Wood...?

MR. GAVIN WOOD: Thank you. There are two (2) additional documents to enter from KM. The first is a response to one (1) of the undertakings. That's the undertaking at page 3,916 of the transcript.

(BRIEF PAUSE)

MR. GAVIN WOOD: And I'll distribute copies in a moment to -- to Intervenor counsel. And then secondly there is a set of answers to the questions that

Ms. Southall has just referred to. These set of questions are marked as Exhibit PUB-22 and the way in which we've set the response up is the actual questions are reproduced and then the answers are attached behind each of the questions. And that is through question 17. And then there's also an answer to question 25. That -- that's what's been answered to date.

MS. ANITA SOUTHALL: If we could just pause and we'll record the proper exhibit numbers for those documents, just confirm with Mr. Singh when he returns to his desk.

MR. BYRON WILLIAMS: And, Mr. Chairman, just for clarity, our clients have received the -- the second document referred to by Mr. Wood, which is labelled at the top "Undertakings, Questions 1 to 25." I'm not sure that we've received the -- the other documents.

MR. GAVIN WOOD: You may not have. And -- and I've got -- I have copies and I'll give them out in a moment.

MS. ANITA SOUTHALL: So just to keep the record straight, please, the first undertaking response referred to by Mr. Wood respecting transcript page number 3,916, I believe would be KM Exhibit 6.

--- EXHIBIT NO. KM-6: Response to the undertaking at page 3,916 of the transcript

MS. ANITA SOUTHALL: Yes, that's correct. And the undertaking answers of KM to questions 1 to 25 from the PUB will be KM Exhibit 7.

--- EXHIBIT NO. KM-7: Response to the PUB questions marked as Exhibit PUB-22

THE CHAIRPERSON: Very good.

MR. GAVIN WOOD: And if I might advise, the doctors are working on some additional answers. We'll have at least one (1) of them ready for filing this afternoon, sir.

THE CHAIRPERSON: Okay. We'll -- we'll review what we have in -- in due course.

MS. ANITA SOUTHALL: I believe the plan in terms of process was now to proceed with Mr. Williams cross-examination of the panel. Mr. Williams, are you ready to proceed?

THE CHAIRPERSON: I think he wants to receive these exhibits.

MR. BYRON WILLIAMS: Subject to that,

yes, I am.

MS. PATTI RAMAGE: I don't think the other parties have copies of these. Certainly Manitoba Hydro doesn't -- hasn't seen these.

THE CHAIRPERSON: Well, we'll have to fix that shortcoming.

MR. BYRON WILLIAMS: Mr. Chairman, I'm -- I'm now prepared to proceed.

THE CHAIRPERSON: Okay. Mr. --

MS. ANITA SOUTHALL: We'll just pause while Mr. Wood circulates, please, to all the Intervenors or their counsel, copies of the documents. Just take a moment to make sure those are in hand.

THE CHAIRPERSON: Yeah, that's what I was about to suggest.

(BRIEF PAUSE)

MR. ANTOINE HACAULT: Mr. Chairman, with respect to the questions and answers by Doctors Kubursi and Magee in the pre-asks, I also have a letter of objection and request to file. We had left the hearing on May 6th on the basis that there would be consultation between counsel with respect to some of the issues on the pre-asks, and my letter sets out some of the extracts of the transcripts, and that hasn't occurred.

So, formally, we wish to put some written objections which we will file by way of letter to -- to the Board. But we have some concerns about the procedural issues of not having the answers at this time and not being able to consider the answers and -- and prepare, so that the letter for -- more fully sets out our concerns. So, with leave of the Board, I'd at least like to be able to file the letter so that we have it.

I don't know if other counsel have any concerns or objections which they want to state for the record.

THE CHAIRPERSON: I'm sure if they do, they'll speak up, Mr. Hacault. Could you provide Mr. Singh with your letter and we'll distribute it.

(BRIEF PAUSE)

MS. PATTI RAMAGE: Mr. Chairman, I think it might be helpful for all parties if Mr. Wood could explain -- or just give us the status because I think there's some confusion about what's been filed here, whether this is the pre-ask prior that were requested prior to May 6th or whether this is the response to undertakings requested on May 17th.

And -- and while I'm on the mic, I would just say there seems to be some confusion also about the status of Manitoba Hydro's motion. I took it certainly, Ms. Southall's letter, as dis -- as dismissing that request and -- and that was dealt with, but if we could get that clarified it would -- I think it would help everyone.

MR. GAVIN WOOD: Certainly, and -- and firstly, Mr. Chair, it -- the one (1) set of responses that have been marked as KM-6 deal with the letter of May 17th, 2011, that is --

THE CHAIRPERSON: Mr. Wood, if you wouldn't mind holding for a minute, Mr. Singh was speaking to me, so I didn't hear what you had to say. Mr. Singh is making copies of Mr. Hacault's letter, and he will distribute it. Maybe we should take one (1) step at a time. So if you wouldn't mind just waiting a second. There are a lot of paper in play, it would appear.

(BRIEF PAUSE)

THE CHAIRPERSON: Mr. Singh has returned.

MR. GAVIN WOOD: I -- just in answer to Ms. Ramage's question, the Exhibit KM-7 deals with the questions raised by the letter of May 17th, 2011, which has been mar -- marked as Exhibit PUB-22, and the other document that's been provided, Exhibit KM-6, deals with one (1) of the undertakings given during the -- the oral evidence, and that is found at transcript page 3,916. That's what's been filed today.

MS. ANITA SOUTHALL: And Mr. Wood, just apropos Ms. Ramage's comments if you could please then update us as to the status of the balance of the pre-asks of the PUB, the balance of the undertaking questions of the PUB, and the -- and the other pre-ask questions posed by, I believe it was, CAC/MSOS and Manitoba Hydro.

MR. GAVIN WOOD: They're -- work is being done on them. There would be at least one more answered in terms of the undertakings given during the tran -- transcript -- the -- the oral evidence. Beyond that, I guess there would be an attempt to provide something further by next Tuesday, but at the moment they're being worked on.

MR. BYRON WILLIAMS: Ms. Southall, if -- if I can just interject in terms of the pre-asks posed by CAC/MSOS, they were really intended, to a large degree, to be almost a notice of question that -- that I intended to pursue through cross-examination. So I'm quite confident that -- that professors Kubursi and Magee will be able to address it through -- through cross-examination and -- and I don't consider those outstanding.

MR. GAVIN WOOD: And in -- and in that regard, Mr. Williams and I spoke and the intention is that most or all of those are going to be asked during the course of the cross-examination.

THE CHAIRPERSON: So things should become clearer as we go ahead.

Mr. Williams...?

INDEPENDENT EXPERTS PANEL:

ATIF KUBURSI, Resumed

LONNIE MAGEE, Resumed

MR. BYRON WILLIAMS: Good morning, Mr. Chairman, and -- and Mr. Vice-Chair, and professors Kubursi and McGee.

There have been some comments -- or, I guess, from MIPUG and Manitoba Hydro, objections to some of the undertakings sought by the Public Utilities Board. And our -- I have no instructions from my clients on that issue. I would simply note that some of the material has been filed today and obviously poses challenges to me given that my cross-examination is scheduled to commence twenty-five (25) minutes ago.

So with the Board's permission, Professor Simpson has kindly joined us today, he's in the -- I've got a back row for perhaps the first time in history. And -- and he is doing a quick study of them and it may be possible to -- to do any necessary follow-up today. I would like to -- I'm not saying we will need to -- to pursue anything further on the 31st, but reserve the option to make that request if that -- if that -- if we deem it necessary.

THE CHAIRPERSON: That's fine, Mr. Williams.

MR. BYRON WILLIAMS: And Mr. Chairman and Mr. Vice-Chair, I -- I hesitate to do so given the deluge of paper that you've already faced, but there are three (3) CAC/MSOS exhibits, which I've distributed to the room with the consent of my learned friend Mr. Wood and I will discuss them in -- for a couple of seconds.

And, Mr. Chairman, the first document you should have received is a white CAC/MSOS book of documents, yes, which I would propose be marked as CAC/MSOS Exhibit 25.

--- EXHIBIT NO. CAC/MSOS-25: White book of documents

MR. BYRON WILLIAMS: And that was, of course, prepared two (2) weeks ago in anticipation of commencing our cross. Since then we've had the opportunity to review the transcript and prepared a supplemental book of documents on yellow paper, which we've also labelled the Yellow Book of Documents, which I would suggest be marked as CAC/MSOS Exhibit 26.

--- EXHIBIT NO. CAC/MSOS-26: Yellow book of documents

THE CHAIRPERSON: I trust they bear no relationship to yellow journalism.

MR. BYRON WILLIAMS: Mr. -- Mr. Vice-chair, you'll have to draw your own conclusions.

Also there is a -- a graph with some supporting material with a lovely blue wavering line going across it labelled "Exchange Rates, Canadian Costs in US Dollars," and we would propose that that be marked as CAC/MSOS Exhibit 27.

--- EXHIBIT NO. CAC/MSOS-27:
Graph containing supporting material

THE CHAIRPERSON: Where was that drawn from?

MR. BYRON WILLIAMS: Do -- do you have the document, Mr. -- I think we have to give credit to Mr. -- to Professor Simpson for that tremendous artwork.

THE CHAIRPERSON: Okay. Thank you.

MR. BYRON WILLIAMS: Mr. Chairman, just in terms of the three (3) documents, exhibits before you, I just have a couple of other notes, first, in CAC/MSOS-25. That's the white book of documents. Most of the material -- if you turn to the table of contents on page 2, most of the material is material already on the record of this proceeding.

But with -- what has been included that was not previously on the record of the proceeding is the -- looking at the table of contents, is the article "Methane and the Greenhouse Gas Footprint of Natural Gas from Shale Formations," the famous or notorious Cornell study.

And I can indicate, and I'll ask my friend, Mr. Wood, to confirm, that we've shared that with -- with his clients some weeks ago, and they've reviewed it, and they're prepared to -- to address questions with regard to it.

MR. GAVIN WOOD: That's correct.

MR. BYRON WILLIAMS: And at page 20 of this -- of the white book is also just a very simplistic, normal distribution graph which wasn't on the record, but I think many of us struggle with probability distributions, some more than others. And at least for my benefit, if for no one else's, I thought it might be useful to have that.

Turning to the yellow book of documents -- already the normal distribution is causing raised eyebrows. Turning to the yellow book of documents, all these documents are drawn from the record of -- of the proceeding with the exception of the document at page 44 in the top right-hand corner.

And the Board will see that this is a in -- page 44 in the top right-hand corner. The Board will see that this is an information request drawn from the 2008 General Rate Application. And I've discussed this matter with my Learned Friend and suggested that his clients review this. We won't get to it until the afternoon. And if they're prepared to comment upon it they're certainly welcome to. If they don't, then we -- we understand.

And, finally, Mr. Chairman, in terms of Exhibit 27, which is the graph, I'll -- I'll suggest and I'll ask my friend, Mr. Wood, to confirm that these are calculations and a graph prepared by CAC/MSOS. They've been shared in advance with his clients, and they are prepared to -- to discuss it is my understanding.

MR. GAVIN WOOD: And they again have seen it prior, and it has been reviewed.

MR. BYRON WILLIAMS: And, finally, Mr. Chairman, just in terms of my cross-examination, you've got the three (3) CAC/MSOS exhibits. I -- I hope we don't need to go much to Professor Kubursi and Magee's actual report. We tried to pull from it. But you may just want to keep it in -- at hand.

And, also, the PUB had sent out a book of documents for the purposes of their cross-examination, and we have one (1) reference to that as well. I don't recall the PUB exhibit number for their cross-examination. It may be twenty (20).

MS. ANITA SOUTHALL: Yes, I believe that's correct, Mr. Williams.

MR. BYRON WILLIAMS: Thank you. And, Mr. Chairman, hopefully you've got all your papers sorted and we're -- we're prepared to proceed.

THE CHAIRPERSON: I was just going to note that the letter Mr. Hacault distributed, I believe it's MIPUG Exhibit number 13.

MS. ANITA SOUTHALL: That's right, Mr. Chairman. Thank you.

--- EXHIBIT NO. MIPUG-13: Letter of Objection from Mr. Hacault to PUB, dated May 26, 2011

THE CHAIRPERSON: Okay, Mr. Williams.

MR. BYRON WILLIAMS: Okay. And I can just indicate that we've not yet received that -- that document. And I --

THE CHAIRPERSON: You will.

CROSS-EXAMINATION BY MR. BYRON WILLIAMS:

MR. BYRON WILLIAMS: Professor Magee, good morning.

DR. LONNIE MAGEE: Good morning.

MR. BYRON WILLIAMS: And we're just going to have a couple of hopefully fun short snappers just to start off with.

Professor Magee, without asking you to elaborate, I will ask you to confirm that you were the co-author of a distinguished report:

> "The National Hockey League Entry Draft 1969-1995, An Application of a Weighted Pool Adjacent Violator's Algorithm."

Is that correct, sir?

DR. LONNIE MAGEE: Yes, it is.

MR. BYRON WILLIAMS: And, Professor -- Professor Kubursi, again, without asking you to elaborate, I will ask you to confirm that you were the author of a very important study explaining the declining demand for beer in Ontario, which was prepared for the brewers of Ontario. Is that correct, sir?

DR. ATIF KUBURSI: Yes, it is.

MR. BYRON WILLIAMS: And without seeking any undertaking from your legal counsel, or in any way attempting to influence your evidence, I have to tell you that I would love the opportunity outside the hearing room to sit down with you, perhaps with one (1) of our favourite beverages, and talk about both those very important studies.

You'll consider that ofter -- offer, gentlemen?

DR. ATIF KUBURSI: Of course, if you're paying.

MR. BYRON WILLIAMS: Professors Kubursi and Magee, we're going to be working out of the yellow book to start with. And it's been a couple weeks since your evidence, so just by way of refresher, I'm going to ask you to turn to page 1 marked in the top right-hand corner, which is an excerpt and actually -- from your report, namely page 228. Do you have that Professor

Kubursi?

DR. ATIF KUBURSI: Yes, I do.

MR. BYRON WILLIAMS: And Professor Kubursi -- Professor Kubursi, and -- and obviously these questions I'll say a witness' name, but you're equally free to answer on them. Professor Kubursi, again, th -- this is kind of by way of refresher, so I don't think we need a lot of details, but if I draw your attention to the second and third paragraphs on this page, without asking you to elaborate, you'll agree that what you're essentially doing in these two (2) paragraphs is setting out the steps leading to the development of your base case. Would that be fair, sir, your Figure 6.1?

DR. ATIF KUBURSI: Yes, it is.

MR. BYRON WILLIAMS: And essentially, you indicate that you estimated the risk exposure of fifteen (15) different variables on Manitoba Hydro's net revenue.

Would that be fair?

DR. ATIF KUBURSI: Yes, it is.

MR. BYRON WILLIAMS: And that was for the purposes of defining a base case to benchmark the behaviour of the system under average conditions between 2001 through 2007, correct?

DR. ATIF KUBURSI: That's correct.

MR. BYRON WILLIAMS: And the averages you employed were simple averages calculated from the day -- the data in Table 6.1?

DR. ATIF KUBURSI: You can't say it's simple because it's weighted by the various values over the period.

MR. BYRON WILLIAMS: Okay. Fair enough, and I was actually using your words, but I'll -- I'll -- I'll accept that edit to them. And essentially what you did is, using these weighted averages and a selected probability distr -- dis -- distribution functions for each one (1) of them for the calculation of net revenue, you generated, using Monte Carlo simulations, the mean, low, and high values of net revenues at the 5 percent and 95 percent confidence levels. Would that be fair?

DR. ATIF KUBURSI: Yeah, that's fair.

MR. BYRON WILLIAMS: And as I understand it, the choice of probability distributions -- the choice of the probab -- excuse me, let me try that again. The choice of the probability density function was based on -- on the famous chi-square scores of the different distributions. Would that be accurate?

DR. ATIF KUBURSI: It would be.

MR. BYRON WILLIAMS: And you actually set out the selected -- and we don't need to turn there right now, but you actually set out these selected density functions in Section 6.5 of your evidence, beginning at page 247. Would that be right?

DR. ATIF KUBURSI: That's correct.

MR. BYRON WILLIAMS: And -- and -- now, Professor Kubursi, would I be -- would I be correct in suggesting that all the probability distributions employed in the base case are set out in Section 6.5 of your evidence?

DR. ATIF KUBURSI: I -- I would say so. As you probably know, the @RISK software, whenever you fit the distribution to the numbers, it will give you about thirty-two (32) different distributions, and they're ranked in terms of their chi-square scores.

So you have a -- a number of them, and then it would be up to you to choose, and we have chosen primarily those that have the lowest chi-square scores on the presumption that this would be the ones from where you would be more comfortable saying that these numbers that you have fitted the distribution to are coming from that distribution.

MR. BYRON WILLIAMS: Okay. Thank you for that, and that's very helpful. Now, when we look at Figure 6.1, which is on page 228 of your evidence, or in the -- page 1 of the yellow book of documents, that figure represents the base case or benchmark for net revenues if all the risk factors that you set out in Section 6.5 are considered. Would that be fair, sir?

DR. ATIF KUBURSI: I don't know whether I would call it exactly that way. What we've really done here is to define the net revenue, and this is total revenue, whether you're getting this from domestic load, given its rate, then the export sales under long-term contracts and also opportunity sales, minus the amount of imports that you get. And then you go through the entire array of costs. And then what we've really done here is to take these various prices, and the general values of generation, and the historical averages of these exports and imports, fitted all these distributions, and this is exactly what we ended up with.

MR. BYRON WILLIAMS: I think we're saying the same thing but I -- in terms of the distributions that you fitted, those are the ones that are set out in Section 6.5 of your evidence, sir?

DR. ATIF KUBURSI: I would say correct, yeah.

MR. BYRON WILLIAMS: And essentially, you made a draw from all these distributions for each period, and -- and ultimately calculated net revenue, and plotted this on a histogram, would that be correct?

DR. ATIF KUBURSI: The -- the software

would do that for you.

MR. BYRON WILLIAMS: That's correct, though?

DR. ATIF KUBURSI: That's correct.

MR. BYRON WILLIAMS: And I consider, given my high respect for your capabilities, you and the software interchangeable, sir, so if -- so if I say you did it, if -- if it's the software, you'll understand that -- that that's what I'm suggesting.

DR. ATIF KUBURSI: Except I'm more expensive.

MR. BYRON WILLIAMS: Please don't tell your price per hour to Professor Simpson, sir. And the histogram that we see marked as Figure 6.1 approximates the probability distribution of net revenues that could arise based upon those inputs. Would that be fair?

DR. ATIF KUBURSI: Yeah, that's fair.

MR. BYRON WILLIAMS: And then, Professor Kubursi, in the rest of this section of your evidence, namely, Figure 6.2 through Figure 6.17, what you do is you compare the probability dis -- distribution of this base case to the probability distribution of outcomes under specific adverse events. Would that be fair?

DR. ATIF KUBURSI: It's fair in the sense that what we do, we keep everything the same, except we fix a particular variable at a given value and see how this would impact the net revenues.

MR. BYRON WILLIAMS: So you -- just if -- if I can interpret that, working off the base case, what you in -- in effect do is, for each of the scenarios ranging from six (6) -- Figure 6.2 through Figure 6.17, you fix particular stress and -- and then let the -- the rest of the simulation proceed randomly.

Would that be fair?

DR. ATIF KUBURSI: That -- that is fair.

MR. BYRON WILLIAMS: Professor Magee, I've been ignoring you. I -- I guess I've been reflecting on your NHL research which really looks fascinating. And I want to direct your attention to, in the yellow book, pages 2 through 4. And certainly, Professor Kubursi, please feel free to -- to -- to follow.

And in particular, Professor Kuburs -- Magee, excuse me -- I'm going to refer you to a reference marked as -- in the top right-hand corner on page 3 of the yellow book of documents, and hopefully you'll see on the right-hand side there's a line indicating that I'm trying to draw that to your attention.

Do you see that, sir?

DR. LONNIE MAGEE: Yes, I do.

MR. BYRON WILLIAMS: And without asking you to elaborate on this quote right at this moment, Professor Magee, you'll agree that you were in a discussion with my gifted and Learned Friend, Ms. Southall, describing some of the elements of Figure 6.1 and -- and how you could conceptualize it.

Would that be fair?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And we'll get to the fact that Professor Kubursi subsequently slightly amended this answer in terms of water flow, but without ask -- but without asking you to confirm the accuracy of this statement, I will ask you to confirm that you describe Figure 6.1 as -- and I -- I'm ho -- this should be in quotation marks for the reporter:

"Figure 6.1 you can think of is summarizing the net revenues if we let all of the random -- all of the variables be random: the water flows, the net exports, everything. "

That's what you -- the transcript reflects, sir?

DR. LONNIE MAGEE: Yes, I was -- I was referring to all of the -- you could think of what I meant by all the variables being random as the variables, the fifteen (15) variables that you were discussing earlier with Atif.

MR. BYRON WILLIAMS: And I -- I thank you for that.

And Professor Kubursi, over to you just for a second to page 4 on the top right-hand corner. And I'm going to suggest to you, without asking you to elaborate, that essentially you noted one (1) additional fact about Figure 6.1, the calculations related to it, namely that the water variable was fixed.

Would that be fair, sir?

DR. ATIF KUBURSI: Sorry, which -- which figure you're talking about: 6.1?

MR. BYRON WILLIAMS: Yes, Professor Kubursi. And I'm -- I'm referring you to your quote on the top right-hand page of the yellow number 4.

And, Professor Kubursi, just by -- by way of background, on the previous page Professor Magee had suggested that -- that the fifteen (15) variables were -- were moving --

DR. ATIF KUBURSI: Yeah, yeah.

MR. BYRON WILLIAMS: -- randomly, but also suggested that water was moving randomly. And -- and you slightly amended that statement to note that the water variable was fixed.

Is that correct, sir?

DR. ATIF KUBURSI: No, I -- you see we have to be careful. I was talking here about 6.2. You see, what happens is that in the benchmark everything we fit is a random variable. 6.2, we put that water level at the minimum level; this is probably where the mix up came up here. When we're talking about the benchmark all the variables are random.

MR. BYRON WILLIAMS: Professor Kubursi, I'm going to ask you to --

MR. GAVIN WOOD: Do you want that -- do you want that once again?

MR. BYRON WILLIAMS: No, I understand what he said.

CONTINUED BY MR. BYRON WILLIAMS:

MR. BYRON WILLIAMS: I'm going to ask you to -- I'm going to ask you just to reflect upon that over the break, in terms of whether Figure 6.1, the water is -- is running randomly as well. And I'll just appreciate confirmation on that.

Would you do that, sir?

DR. ATIF KUBURSI: Yeah, sure.

--- UNDERTAKING NO. 147: Doctors Kubursi and Magee to

review the development of
Figure 6.1 to confirm whether
or not water flows were
presented as a fixed value or
were allowed to flow randomly

CONTINUED BY MR. BYRON WILLIAMS:

MR. BYRON WILLIAMS: And the reason we ask, Professor Kubursi -- there's two (2) reasons, actually. First of all, you see a description for Figure 6.1 in terms of average flows. And I'm -- I'll -- I guess the question we would pose to you is: In terms of Figure 6.1, what does that average flows mean, and...

DR. ATIF KUBURSI: Exactly what we do is the following. We have these numbers between 2001 and 2007, we fit a -- probability distribution to them, and at the end we look at what would be the net revenue that would follow from these things. And then we run a Monte Carlo simulation on them, and these are the ones that are plotted in 6.1.

So the idea of the averages being the exact number we're using, we're basically saying these are the numbers over the entire period to which we fit that distribution.

MR. BYRON WILLIAMS: I thank you for

that. And just -- you'll -- if I was looking for the probability distribution for water flows that you relied upon, would I be correct in suggesting to you that -- that it's not to be found in Section 6.5 of your evidence, sir?

Is it -- is it there?

DR. ATIF KUBURSI: Six point five? Which one is 6.5? Yeah, we're just checking --

MR. BYRON WILLIAMS: So -- and, Professor Kubursi, I'll direct your attention to -- I think Section 6.5 starts at page 247 of your evidence. And we've -- we certainly stand to be corrected, but we've not seen a probability distribution related to water flows.

DR. ATIF KUBURSI: Yeah, it -- it may not be here, but we have fit a probability distribution to the water flows too, and this can be -- can be supplied.

MR. BYRON WILLIAMS: And then I would ask you by way of undertaking to provide the probability distribution for water flows employed for the purposes of developing the base case as represented in Figure 6.1.

Would you undertaking to do so, sir, with the advice of your counsel?

DR. ATIF KUBURSI: Yeah, we would.

--- UNDERTAKING NO. 148: Doctors Kubursi and Magee to

provide the probability
distribution for water flows
employed for the purposes of
developing the base case as
represented in Figure 6.1

CONTINUED BY MR. BYRON WILLIAMS:

MR. BYRON WILLIAMS: And, Professor Kubursi, if we can -- the -- as I understand your evidence in terms of the probability distribution for water flows that you employed, it would have been based only on the period between 2001 through 2007.

Would that be correct?

DR. ATIF KUBURSI: Over for that period, where we benchmarked things, we were looking only at 2001 to 2007. This was the period that we were considering as the benchmark period for us.

MR. BYRON WILLIAMS: So you did not transfer any of the analysis that Professor Magee had done in chapter 4 for the purposes of your benchmark, Figure 6.1?

DR. ATIF KUBURSI: No, we did not use it for the benchmark; we used it when we came in to start fixing the values of water at a lower level.

(BRIEF PAUSE)

MR. BYRON WILLIAMS: And, Professor Kubursi, would it be fair to suggest that if you would have used your analysis from chapter 4 in terms of water flows for the purposes of Figure 6.1, that that result would have been mathematically somewhat different?

DR. LONNIE MAGEE: I think we established before that the -- the water flow over the whole period on average was a little bit lower than it was during the -- that seven (7) year period. So it might have shifted the net revenue a little bit to the left in -- in Figure 6.1 if we'd used the whole period.

But I think if we had used the whole period, I think it seemed to us more coherent to use the seven (7) year period since that's the period we were using for everything else, to also use it for the water flows. But as Atif mentioned, then when deciding what would be an extreme value for some of the other special cases that we plot later, we did refer back to the full water flow period.

MR. BYRON WILLIAMS: And Professor Magee, or Professor Kubursi, I -- I guess the -- one (1) of the reasons we ask this -- and, Mr. Chairman, if you'll just excuse me for one (1) second.

(BRIEF PAUSE)

MR. BYRON WILLIAMS: Professor -- Professor Magee, per -- perhaps in the yellow book you can keep one (1) finger on page 1 at the top right-hand corner and then have one (1) finger on page 31 in the top right-hand corner. Page 31 in the top right-hand corner.

(BRIEF PAUSE)

MR. BYRON WILLIAMS: And Professor -- Professor Magee, you'll see what's displayed on page 1 is Figure 6.1 and what's displayed on page 31 is Figure 6.2.

Do you see that, sir.

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And if -- if I look to the extreme of -- focussing on Figure 6.1, if I look to the extreme left-hand side of -- of the negative results, I see a -- a number a bit less than negative 200 million.

Is that right, sir?

DR. LONNIE MAGEE: That's right, a little -- a little bigger than minus two (2) -- well, it's smaller in magnitude, bigger in the sense of being a smaller negative number.

MR. BYRON WILLIAMS: I understood that, I think. If I look to Figure 6.2, that -- that larger figure, but also a larger negative is -- is close to a billion dollars, correct?

DR. LONNIE MAGEE: Correct.

MR. BYRON WILLIAMS: And I guess the -- the -- the issue for our clients is -- is that that outlier doesn't appear in your probability distribution for Figure 6.1.

Would that be fair, sir?

DR. LONNIE MAGEE: That's right.

MR. BYRON WILLIAMS: And I guess that goes to a certain degree to the challenges one might experience in terms of using just the seven (7) year period, as compared to the entire flow year, for the purposes of establishing your base case.

Would that be fair?

DR. LONNIE MAGEE: The Figure 6.2 would be unrelated to the -- the method we used for the -- the water flow distribution in the base case. Figure 6.1 does, but if it -- I'm speculating that if we'd redone Figure 6.1 using the distribution that we came up with in chapter 4, the distribution compared to what we see on page 1 would be shifted a little bit to the left. But I don't think it's fair to say that we would see that minus one (1) outlier popping up in Figure 6.1.

Because in Figure 6.2 every single simulation has the water flow fixed at the drought level, whereas in -- in Figure 6.1, if we redid it using the entire history, we would have a few drought periods in there, and there are a few in there right now, I -- I think. I -- I -- we'd have to take a closer look to -- but -- because it's not just simply the -- the actual numbers from 2001 to 2007; it's the distribution based on those.

But in Figure 6.1, even if drought cases were figured in there, they would be much less frequent than they are in Figure 6.2, which is always a drought.

MR. BYRON WILLIAMS: So as -- as I understand your evidence, and I'll ask you to confirm, that even if the base case was adjusted to reflect probability risk distribution reflective of your work in chapter 4, the outlier presented in Figure 6.2 is unlikely to -- to appear on it, sir?

DR. LONNIE MAGEE: It -- it would be far less likely. So Figure -- that outlier in Figure 6.2 must have arisen from a combination of other factors along with the drought; probably mainly the high import prices. So in Figure 6.1, to get a similar minus 1 billion number in the Figure 6.1 simulation, we would have had to have a case with that extremely high import price, assuming that's what it was in Figure 6.2, and a drought. So that could happen in Figure 6.1, but it would be a lot less likely than in Figure 6.2.

MR. BYRON WILLIAMS: And as I understand your evidence on that point, the extreme outlier presented in Figure 6.2 is a function of both the fixing of the imports and the fixing of a -- a drought situation. And while it's possible it could be reflected in Figure 6.1, if it was amended to -- to reflect longer averages, it's unlikely.

DR. LONNIE MAGEE: Yes. Now, just as a -- a minor point, I think in Figure 6.2 the minus 1 billion is -- it's an extreme value, but it's not -- you -- we -- you might not -- you could get away with saying it's not an outlier, because it's not that far removed from the rest of the -- the numbers. So, yeah, it would be an outlier if it was in Figure 6.1.

MR. BYRON WILLIAMS: Professor Magee, and -- and again, Professor Kubursi, feel free to chip in -- I'm going to direct your attention again to the yellow book of documents at pages 5 through 8. The yellow book, top right-hand corner, pages 5 through 8. And, Professor Magee --

MR. GAVIN WOOD: Maybe just give -- give

him just a moment to --

MR. BYRON WILLIAMS: Yeah. And -- and --

MR. GAVIN WOOD: -- remind himself.

MR. BYRON WILLIAMS: -- and -- and just for Professor Magee's benefit, in particular I'm directing his attention to the bottom of page 6 and to the top of page 7, and that's marked on the right-hand side.

(BRIEF PAUSE)

CONTINUED BY MR. BYRON WILLIAMS:

MR. BYRON WILLIAMS: And, Professor Magee, without asking you to elaborate at this point in time, essentially in this conversation you're discussing the differences between lines 2 and 4 of Table 6.2, in that line 4 has a fixed price for imports of twelve (12) cents a kilowatt hour, while the information derived from line 2 allows for import prices to vary according to the distributions.

Would that be fair, sir?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And I'm going to, for the purposes of clarification, ask you to turn to pages 9 and 10 of the yellow book, top right-hand corner, 9 and 10. And again, Professor Kubursi, this may be better for you than Professor Magee; either is welcome to respond.

Because in the -- and you'll agree with me, first of all, that on focussing first on Figure 6.3 at the top of page 9 we see a probability distribution of imports from other provinces.

Is that correct?

DR. ATIF KUBURSI: That is correct.

MR. BYRON WILLIAMS: And Figure 6.1 -- excuse me, I misspoke.

DR. ATIF KUBURSI: Three one (31).

MR. BYRON WILLIAMS: Figure 6.31, again on page 9 of the yellow book, we see a probability distribution of imports from the US.

Is that correct?

DR. ATIF KUBURSI: Correct. Yes, that's correct.

MR. BYRON WILLIAMS: And Figure 6.32, we see a probability distributions of prices for imports from other provinces.

Would that be correct?

DR. ATIF KUBURSI: That's correct.

MR. BYRON WILLIAMS: What -- what we don't see, I'll suggest to you, in Section 6.5 of your evidence is a probability distribution of prices for imports from the US.

Would you agree with me that that is not to be found in Section 6.5?

DR. ATIF KUBURSI: Yeah, that's correct.

MR. BYRON WILLIAMS: And, Professor Kubursi, did -- for the purposes of your analysis in developing the base case, I presume you would have can -- developed a probability distribution for the US im -- imports.

Is that correct?

DR. ATIF KUBURSI: Absolutely.

MR. BYRON WILLIAMS: And for the purposes of the record I would ask, via your counsel, that you under -- undertake to provide the probability distribution of prices for imports from the United States.

Mr. Woods, is that -- Wood, excuse me, is that satisfactory?

DR. ATIF KUBURSI: Oh, yeah. We have it already, actually.

MR. GAVIN WOOD: That would be fine.

--- UNDERTAKING NO. 149: Doctors Kubursi and Magee to provide the probability

distribution of prices for
imports in the United States

CONTINUED BY MR. BYRON WILLIAMS:

MR. BYRON WILLIAMS: And again, this can go to either Professor Magee or Professor Kubursi. If you'll turn to page 11 of the yellow book of documents, you'll -- do you have that Professor Magee -- Kubursi?

DR. ATIF KUBURSI: Yes, I do.

MR. BYRON WILLIAMS: And you'll agree with me that this is an excerpt from the integrated model set out in Appendix B to your evidence?

Would you agree with that?

Professor Kubursi, it's page 11 in the top right-hand corner.

MR. GAVIN WOOD: He has it now.

CONTINUED BY MR. BYRON WILLIAMS:

MR. BYRON WILLIAMS: And Professor Kubursi, just to repeat my question, and I apologize for not letting you get to the right page, you'll agree that this is an excerpt from the integrated model set out in Appendix B to your evidence?

DR. ATIF KUBURSI: Yes.

MR. BYRON WILLIAMS: And you'll see in

this very accessible formula that you've set out here, marked on the right-hand side with a -- a line, you see part of the calculations in Equation 10 include a calculation of the loss on imports of electricity.

Do you see that, sir?

DR. ATIF KUBURSI: Yes, I do.

MR. BYRON WILLIAMS: And Professor Kubursi, our clients are having a bit of trouble identifying where a value for this loss is assigned, either probabilistically or deterministically. And I wonder if you can, first of all, indicate how the value for loss on imports of electricity was calculated.

DR. ATIF KUBURSI: I mean, this is primarily the amount of losses that you would have on transmission as -- as you bringing these imports in.

MR. BYRON WILLIAMS: It's not related to import prices then, sir?

DR. ATIF KUBURSI: No, nothing to do. It's just purely a physical parameter.

MR. BYRON WILLIAMS: Now, Professors Kubursi and Magee, I'll direct your attention to page 8 of the yellow book, page 8 in the top right-hand corner. And I'll give you a moment just to review the section marked on the right-hand side.

(BRIEF PAUSE)

MR. BYRON WILLIAMS: Professor -- Professor Kubursi, you make a really interesting statement here. So, first of all, I -- I'm just going to read it in and ask you to confirm that it's read correctly. You indicate that:

> "We did not examine the results of a five (5) year or seven (7) year drought as we did not have and did not think that the actual series would produce the best correlation given that our estimate came from a statistical simulation exercise.
>
> We could use our estimates of a five (5) year drought from Chapter 4, but for comparison purposes we calculated these losses only for the representative year."

Did I read it correctly and well, sir?

DR. ATIF KUBURSI: You read it correctly. But, as you know -- and well too. But, as you know, what we've done is we ultimately calculated the five (5) and seven (7) years. In some sense, I admit it was a bit of a cop-out at that time. I mean, we had so many things to do, and we didn't want to go through these things.

But when we were challenged we went and calculated it because we get these distributions that -- in chapter 4, or Professor Magee, was able to get these numbers.

MR. BYRON WILLIAMS: And -- and I certainly wasn't accusing you of a cop-out or anything like that, Professor Kubursi, but I do want to understand. Leaving aside the fact that you had many things to do, you used some inter -- interesting language here, and I just want to parse your words a little more carefully so I can understand.

First of all, you refer on the second line of that quote to actual series. And -- and perhaps you can indicate what you mean by "actual series," sir.

DR. ATIF KUBURSI: This is the series of water flows that was provided to us.

MR. BYRON WILLIAMS: Which series of water flows, sir?

DR. ATIF KUBURSI: This is the exact water flows that we got from Manitoba Hydro regarding the water flows documented in the table that we put at the appendix of our, you know, chapter 4, but was redacted.

MR. BYRON WILLIAMS: And so at the time you wrote this -- this excerpt, or this comment, you didn't -- you were of the view that the actual series in terms of the information provided by Manitoba Hydro would not produce the best correlation given that your estimate came from a statistical simulation exercise. Would that be fair?

DR. ATIF KUBURSI: That would be fair, but let me explain. I mean, what we really have here is a situation where we get the actual numbers, and this represent a very particular set of numbers. It's a historical series. What we tried to do here is to sample a large number of these that could come from that arena, that autoregressive 3 system.

And on the base of this what we're really trying to say here, that if we were just to basically and exclusively promise everything on the historical one, we would not be able to take advantage of the rich set of simulations that came up.

MR. BYRON WILLIAMS: By statistical simula -- lation exercise you refer to the data collected in Table 6.1 and the base case presented in Figure 6.1, sir. Is that correct?

DR. ATIF KUBURSI: That would be correct.

MR. BYRON WILLIAMS: And you used the words "best correlation." And what do you mean by that, sir?

DR. ATIF KUBURSI: Well, I -- I mean that the historical series would reflect a given correlation as the historical events unfolded. You have a very particular set of relationships serially among the years.

In the random one (1) when we picked five (5) or seven (7), there will be other types of these things. So if we thought that the historical period is the only and the best and the optimum one (1), then we would not have gone into simulating the other things.

The fact that we went and simulated thousands if not hundred thousands of these things were basically reflecting this advantage that this new sample series would give.

MR. BYRON WILLIAMS: Now you mentioned and your -- your words cop-out, not mine, but you -- you mentioned that you ultimately went on to sample historical data. And I take it by that you mean that you did a calculation of a five (5) year -- a five (5) year drought using some of the variables set out in -- in Table 6.1. Is that what you mean, sir?

DR. ATIF KUBURSI: Yeah. These are the numbers that I got from the chapter 4 and the simulations that Lonnie did. And then these were the ones that we used.

(BRIEF PAUSE)

MR. BYRON WILLIAMS: And at the time you wrote this though, sir, you were of the view that that would not be the best fit in terms of correlation. Is that correct?

DR. ATIF KUBURSI: All right. I mean at that time I thought if I were to go back and get the actual historical series and compare them to the one (1) that would come, there would be a discrepancy. At that time I felt like given that we have thousands of these things I was not in a position to say the historical one it could be the better one.

So we ultimately did it. We went and we took the five (5) and seven (7) and now it was an undertaking. We calculated the cost with the five (5) and seven (7) with and without financial things. It -- it may have really been better to have done it right from the beginning, but we did it, in the final analysis we did it.

MR. BYRON WILLIAMS: And, sir, I know you did. And I'm not -- but would it be fair to say that you still have some discomfort with the fit between -- when you're mixing your simulations from Table 6.1 versus the -- the -- the historical series, sir?

(BRIEF PAUSE)

DR. LONNIE MAGEE: I think part of the -- the discomfort is that at this point, given the -- the scale of what we were doing, it wasn't feasible for us to build in correlations between the random variables, both at a given point in time and over time.

So when it got to the -- so at a given -- a one (1) year simulation you could imagine developing this model further and estimating how different random variables are correlated and building that into the -- the simulation, which we didn't do, and that -- but that -- that issue becomes perhaps stronger when you're doing a multi-year simulation because of the strong correlations over time between variables.

So with the multi-year calculations we endeavoured to produce the numbers, given the setup that we had, which was independent random variables. So we -- we did address that undertaking, but, again, a long-run, more ideal approach would be to model the correlations over time.

MR. BYRON WILLIAMS: And -- and again, I don't want you to -- to take this as any criticism of your work. We're -- we're looking at starting with a --

from our client's perspective, starting with a good product and -- and improving it. And -- and certainly what I'm -- I'm hearing from you, and perhaps we'll explore this a bit more after the break, is that you see the potential to enhance and refine this analysis further, especially as it relates to long-run serial correlations, would that be fair?

DR. LONNIE MAGEE: That would be one (1) way of enhancing it, yes.

MR. BYRON WILLIAMS: And what would be another, Professor Magee?

DR. LONNIE MAGEE: Well, it -- it never ends.

MR. BYRON WILLIAMS: But -- okay. Mr. Chairman, I'm -- I -- I think this would not be a bad time for a -- a break.

THE CHAIRPERSON: Very good, sir.

--- Upon recessing at 10:50 a.m.
--- Upon resuming at 11:12 a.m.

THE CHAIRPERSON: Okay. Any time, Mr. Williams.

CONTINUED BY MR. BYRON WILLIAMS:

MR. BYRON WILLIAMS: Yes, and certainly to either witness, but probably Professor Magee, and -- and just for one (1) last moment, if you could again put one (1) finger on page 1 of the yellow book and one (1) finger on page 31, please, sir. Mr. -- Professor Magee, you're nodding your head, which I take it to mean that you have the pages?

DR. LONNIE MAGEE: I've got it, yes, I do.

MR. GAVIN WOOD: Yeah. Maybe just before you go on, sir, there was one (1) matter that the gentlemen were going to check on over the break and, as it turns out, they're -- they're going to have to have some materials reviewed back in Ontario.

So I wonder if, for the transcription, we could show the first exchange that involved Dr. Kubursi indicating that he was going to review one (1) aspect of Figure 6.1 over the break this morning. If we could in -- instead have that referenced as the first of the undertakings, and obviously we'll -- we'll have that answered.

MR. BYRON WILLIAMS: And I will try to refine that, just to put a little greater clarity on it. The -- the undertaking would be to review the development of Figure 6.1 to confirm whether or not water flows were presented as a fixed value or were allowed to flow randomly. Would that be satisfactory, Mr. Wood?

DR. ATIF KUBURSI: I can maybe contribute a bit to it here because what we do is that we link the water to generation, okay? So the variable into the system is generation, and if water and -- and generation is, as you can see in -- in the graphs here, is a random variable. So it couldn't be that we fix water and then talk about generation as a random variable, so -- but I will confirm these things, right.

MR. BYRON WILLIAMS: And, Mr. -- Mr. Chairman, this is a central point to our understanding of the evidence of these witnesses, so I'd certainly want to reserve the right -- well, let me back up. I would appreciate it, Mr. Wood, if your client can provide that undertaking prior to the resumption of the hearing on Tuesday, if -- if that's possible because it's -- and, depending on what the answer is, it -- it may affect our -- our conduct.

DR. ATIF KUBURSI: Yes.

THE CHAIRPERSON: They're nodding yes, and it sounds fine.

CONTINUED BY MR. BYRON WILLIAMS:

MR. BYRON WILLIAMS: And I -- and I thank you for your consideration in -- in exploring that request.

Professor Magee, back to you. Referring you first to Figure 6.1 on page 1 of the yellow book. If I look to the extreme left -- left of that figure I would be correct in suggesting to you that the -- the maximum loss portrayed there is less than $200 million. Would that be fair, sir?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: Now if I direct your attention to page 31 and Figure 6.2.

Do you have that, sir?

DR. LONNIE MAGEE: Yes, I do.

MR. BYRON WILLIAMS: And if I look for that same minus 200 million figure, I would suggest to you that it's -- it's towards the extreme right of Figure 6.2, fairly close to the 95 percent confidence level. Would that be correct, sir?

DR. LONNIE MAGEE: Yes, it is.

MR. BYRON WILLIAMS: And, sir, when I put these two (2) figures together, being Figure 6.2 and Figure 6.1, would I be correct in suggesting to you that close to 95 percent of the values presented in Figure 6.2 do not appear in the base case, i.e., Figure 6.1?

DR. LONNIE MAGEE: That's right.

MR. BYRON WILLIAMS: And just to remind the panel, Figure 6.1 involved approximately one thousand (1,000) simulations, correct?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: So looking at Figure 6.2, 95 percent of those values, roughly, do not show up in the one (1) in one thousand (1,000) horizon, would that be fair?

DR. LONNIE MAGEE: I think if that means what we were saying before, using slightly different language, that would be fair. Sorry, I got a little lost with the -- your wording.

MR. BYRON WILLIAMS: Yeah. And I -- let me -- let me try that a different way, Professor Magee.

In reviewing the base case as set out in Figure 6.1, it suggests that the values presented in Figure 6.2, being those greater than negative 200 million, have less than a one (1) in one thousand (1,000) chance of occurrence.

Would that be fair?

(BRIEF PAUSE)

DR. LONNIE MAGEE: I think it's fair to say that almost 95 percent of the simulated net revenues in Figure 6.2 are smaller than the minimum of 200 million that's in Figure 6.1. Now, is it okay if I just add a kind of --

MR. BYRON WILLIAMS: Oh, please, Professor Magee.

DR. LONNIE MAGEE: Okay.

MR. BYRON WILLIAMS: We're trying to -- to work our way through this.

DR. LONNIE MAGEE: Oh, okay. About the -- the minimum in Figure 6.1, that minus two hundred (200), I wouldn't be comfortable placing too much weight on the fact that the minimum in Figure 6.1 is minus two hundred (200) because some of the random distributions have -- the don't have sharp tails where the -- the edges of the -- the minimum and maximum values are set at finite amounts. So if you look at the distribution, some of them you'll see a minimum is minus infinity or maximum is infinity.

So as you do more in -- if you choose to do more and more simulations, so instead of a thousand, suppose we did a million or a hundred million, you'd get a very similar looking picture to this one, but the minimum would get smaller and smaller but would also be less and less likely to happen.

So in Figure 6.1 we have a minus two

hundred (200), but I'm just speculating that if we did -- did it again with a hundred thousand values instead of a thousand values, the minimum would be smaller but you'd -- you'd see in the picture the -- the tail would be even thinner.

MR. BYRON WILLIAMS: And what -- just what I -- I take you to mean by that, sir, is that at that extreme edge the -- the probability would be even lower than as presented in the current shape of Figure 6.1?

DR. LONNIE MAGEE: That's right. It's kind of similar to this discussion we had before about -- the last time we were here about Black Swan events, that you could -- you know, you'd be getting -- if you -- if you do more and more of these simulations and you looked at the minimum, it's possible but very unlikely it would be getting to be in Black Swan territory.

MR. BYRON WILLIAMS: And -- and figure -- just to confirm, Figure 6.2, roughly 95 percent of the values presented lie outside the one (1) in one thousand (1,000) events set out in Figure 6.1, correct?

DR. LONNIE MAGEE: That's right, but, again, I -- I wouldn't want to characterize the minus two hundred (200) as a one (1) in one thousand (1,000), as if that was some kind of solid probabilistic fact. It was just -- it happens to be the smallest of the thousand from this particular set of calculations.

MR. BYRON WILLIAMS: Sir, would -- would it be fair to characterize the -- the bottom 95 percent of Figure 6.2 as Black Swans?

DR. LONNIE MAGEE: No. No. Well, sorry, let me back up. It -- I -- I don't think it would be with Figure 6.2 because although we do need to keep in mind that Figure 6.2 is fixing the water flow at an unusually small value, and so that makes -- the entire distribution is describing what net revenue would look like under certain conditions if we had a very unusually small amount of water flow.

But we did actually see that water flow once in the last -- is it -- the minimum of the ninety-four (94) years, so. Yeah. Yeah.

MR. BYRON WILLIAMS: Thank you for that. And -- and, Professor Magee, just -- I don't know if the court reporter is going to -- to step in or not, but sometimes when you're speaking you kind of trail away from the mic. So it -- it might help others in the room if you stay with it, for what it's worth.

DR. LONNIE MAGEE: Thank you.

MR. BYRON WILLIAMS: Thank you so much for that. And I'm -- I'll ask Professors Kubursi and

Magee to turn to page 13 of the yellow book of -- of documents. And I'm not sure which witness this goes to properly. This is -- in particular, I'm directing your attention to Figure 6.18, which is titled "The Triangular Probability Distribution of the Exchange Rate."

Do the witnesses have that?

DR. ATIF KUBURSI: Yes.

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And if you need a couple seconds to -- excuse me. If you need a couple seconds to review that, Professor Kubursi.

DR. ATIF KUBURSI: Yeah, sure.

(BRIEF PAUSE)

MR. BYRON WILLIAMS: Now, Professor Kubursi, one (1) of the fifteen (15) variables for which you estimated the risk exposure was the exchange rate, correct?

DR. ATIF KUBURSI: Correct.

MR. BYRON WILLIAMS: And the selected probability distribution -- let me back up. And if we wish to see the selected probability distribution ex -- employed for exchange rates, which you employed in the calculation of net revenue for your base case, we would see that in Figure 6.18, correct?

DR. ATIF KUBURSI: Correct.

MR. BYRON WILLIAMS: And, Professor Kubursi, you -- you look like a trusting person, but if you don't trust me, a -- a couple of the -- the next points that I'm going to put to you appear on the next page, which is marked as page 14. So if you want to have both those pages nearby, you're welcome to that.

Now in terms of this probability distribution, my understanding, based upon the corporati -- excuse me, the witnesses response to CAC/MSOS/KM-44 is that the period used for the information on the exchange rate was 2000 through 2008.

Would that be correct, sir?

DR. ATIF KUBURSI: For the exchange rate, correct.

MR. BYRON WILLIAMS: And employing @RISK, you estimated thirty-three (33) des -- distributions using the time series on the exchange rate between that period of time, correct?

DR. ATIF KUBURSI: Correct.

MR. BYRON WILLIAMS: And essentially, you picked the triangular probability distribution based primarily on its chi-square score, correct?

DR. ATIF KUBURSI: Correct.

MR. BYRON WILLIAMS: And, Professor Kubursi, if I'm mispronouncing that, you'll realize I'm a humble lawyer, so you'll correct me if --

DR. ATIF KUBURSI: No, you're doing all right.

MR. BYRON WILLIAMS: I lack self esteem, sir, so it's always good to get validation. And that's -- and without asking you to elaborate further, that's that probability distribution we see right there, correct?

DR. ATIF KUBURSI: Correct.

MR. BYRON WILLIAMS: And hopefully you can read the small printing on the right side. Before we get to the distribution itself, you will see to the right of the Figure 6.18 is a reference to the minimum observed during the period of one point zero six six zero (1.0660).

Do you see that, sir?

DR. ATIF KUBURSI: Yes, sir.

MR. BYRON WILLIAMS: And if people are struggling to -- to find it, Mr. Chairman, or Mr. Vice-chair, it's on the -- the right -- right-hand side. And what that figure -- Professor Kubursi, what I'll suggest to you, is what that figure 1.066 means is that it would take one dollar ($1) and six point six (6.6) Canadian cents to buy one dollar ($1) US.

Is that correct, sir?

DR. ATIF KUBURSI: Correct.

MR. BYRON WILLIAMS: And, Professor Kubursi, you'll be aware that we often see the -- the relationship between Canadian dollars and American dollars presented almost in a reverse fashion. And -- and I don't know if you need a calculator for this or not, but if you want to accept my calculations subject to check, another way to put that one point zero six six (1.066) Canadian would be to say that it would take ninety-three point eight (93.8) cents US to buy one (1) Canadian dollar?

DR. ATIF KUBURSI: Yeah, I mean, you divide this number -- one (1) by this number, you get that.

MR. BYRON WILLIAMS: And what you're indicating, sir, is to -- to perform that calculation if one didn't trust me, which is not a -- a bad premise to operate from, is to divide the number one (1) by one point zero six six (1.066), correct?

DR. ATIF KUBURSI: Correct.

MR. BYRON WILLIAMS: And also, Professor Kubursi, to the -- the figure to the right of the probability distribution is the maximum observed during the period of one point seven two two six (1.7226), correct?

DR. ATIF KUBURSI: You see the -- the trouble is that you're mixing between what you observe in -- in reality and what the distribution is. This is what you are really looking at the distribution, not the actual numbers.

MR. BYRON WILLIAMS: And I misspoke, sir. And what you -- what you're clarifying, and I apologize for that, and I will strike out the word 'observed', what the distribution indicates is that the maximum that one saw from -- from -- via the --

DR. ATIF KUBURSI: From a triangular distribution --

MR. BYRON WILLIAMS: From the triangular distribution was one point seven two two six (1.7226), correct?

DR. ATIF KUBURSI: Correct.

MR. BYRON WILLIAMS: And again, for those of us to whom this does not come easily, that means that it would take one dollar ($1) and seventy-two point two six (72.26) Canadian cents to buy one (1) American dollar, correct?

DR. ATIF KUBURSI: Correct.

MR. BYRON WILLIAMS: And going back to

that other way to look at it, you'd agree that another way to convey this would be to say that it would take fifty-eight point zero five (58.05) cents US to buy one (1) Canadian dollar?

DR. ATIF KUBURSI: Oh, yes. Okay.

MR. BYRON WILLIAMS: You're agreeing, sir?

DR. ATIF KUBURSI: Oh, yeah.

MR. BYRON WILLIAMS: Now --

DR. ATIF KUBURSI: I mean, what he's doing exactly is dividing the numbers that we have here, use one (1) divided by this number, you should get this. I -- I mean, I'm taking your word. We trust you on this.

MR. BYRON WILLIAMS: You'll -- you'll accept it, subject to check?

DR. ATIF KUBURSI: Subject to check, okay.

MR. BYRON WILLIAMS: And I want to work with that maximum value of -- of one point seven two two six (1.7226) and translate it to the probability distribution. And if I looked for that, I would see it represented towards the extreme right of the horizontal axis, where the small shaded section of the triangle ends just past one point seven (1.7).

Is that right, sir?

DR. ATIF KUBURSI: Yeah, correct.

MR. BYRON WILLIAMS: And for those who -- and if I wanted to describe it in terms of US cents instead, if some want to follow along, I could write the figure fifty-eight point zero five (58.05) US --

DR. ATIF KUBURSI: Yeah, that --

MR. BYRON WILLIAMS: -- at that same place, sir. Would that be correct?

DR. ATIF KUBURSI: That would be correct.

MR. BYRON WILLIAMS: And again, now I'm going to look for the minimum of one point zero six six (1.066). I would see that represented towards the extreme left of the horizontal axis, would that be correct, sir?

DR. ATIF KUBURSI: That's correct.

MR. BYRON WILLIAMS: And if I wanted to, again, translate that into US cents to buy one (1) Canadian dollar, I could write ninety-three point eight (93.8) US cents there.

Would that be fair?

DR. ATIF KUBURSI: That would be fair.

MR. BYRON WILLIAMS: Subject to check.

DR. ATIF KUBURSI: Sub -- that would be fair.

MR. BYRON WILLIAMS: Now, when I look

also at this -- this mean or average, excuse me, that is set out to the right, you'll agree with me that the mean indicated as one point two eight four nine (1.2849), sir?

Would that be right?

DR. ATIF KUBURSI: That would be right.

MR. BYRON WILLIAMS: Meaning, on average, it costs one (1) Canadian dollar and twenty-eight point four nine (28.49) cents to buy an American dollar --

DR. ATIF KUBURSI: Yes.

MR. BYRON WILLIAMS: -- conveyed in this distribution?

DR. ATIF KUBURSI: That's correct.

MR. BYRON WILLIAMS: And again, doing that old Cana -- US to Canadian, that would mean, on average, it costs seventy-seven point eight three (77.83) American cents to buy a Canadian dollar?

DR. ATIF KUBURSI: That's correct.

MR. BYRON WILLIAMS: And as I look at the big picture of this distribution, sir, it implies that the probability of occurrence of an exchange rate rises as you go from the maximum observed during the period of one point seven two two six (1.7226) to buy one (1) US dollar, to the minimum observed during the period of one point zero six six (1.066) to buy one (1) US dollar.

Would that be fair?

DR. ATIF KUBURSI: That's fair.

MR. BYRON WILLIAMS: And I want to now use the more familiar US dollar terms. Would -- another way to say that would be to say that, put another way, movements above the trend, being seventy-seven point eight three (77.83) cents US, are more and more likely to the value of ninety-three point eight (93.8) cents.

Would that be fair, sir?

DR. ATIF KUBURSI: More likely in -- in what sense?

MR. BYRON WILLIAMS: They appear more commonly in the distribution, sir.

DR. ATIF KUBURSI: Once you -- you -- you -- you bracket these things, yeah.

MR. BYRON WILLIAMS: And it would be fair to say that values below the trend, meaning seventy-seven point eight three (77.83) cents US, are less and less likely to a value of fifty-eight point zero five (58.05) cents --

DR. ATIF KUBURSI: That's correct.

MR. BYRON WILLIAMS: -- would that be fair?

DR. ATIF KUBURSI: Yeah, that's fair.

MR. BYRON WILLIAMS: And at the top of Figure 6.18, you see the percentage of 90 percent, sir.

Do you see that?

DR. ATIF KUBURSI: Yes.

MR. BYRON WILLIAMS: And what this implies is that one is 90 percent confident that the outcome will fall between one point five seven six (1.576) Canadian dollars to buy one (1) US dollar and one point zero eight three (1.083) Canadian dollars to buy one (1) US dollar, correct?

DR. ATIF KUBURSI: Yes, I would say so.

MR. BYRON WILLIAMS: And at -- near the extreme left of that 90 percent, or at the extreme left of the 90 percent, you'll see the figure of one point zero eight three (1.083) Canadian dollars to buy one (1) US dollar?

DR. ATIF KUBURSI: Right.

MR. BYRON WILLIAMS: And you'll agree with me, subject to check, that if I converted that to US cents, that would be ninety-two point three (92.3) cents US, correct?

DR. ATIF KUBURSI: Cor -- yes, correct.

MR. BYRON WILLIAMS: Now, I want to focus your attention to the left side of the table at the 5 percent confidence level.

You would agree that as a consequence of this distribution the 5 percent upper window on the left-hand side of the table ranges between one point zero eight three (1.083) to one point zero six six (1.066).

Would that be fair, sir?

DR. ATIF KUBURSI: Yeah, that would be fair.

MR. BYRON WILLIAMS: In other words, you'd agree that the 5 percent uppo -- upper window ranges between ninety-two point three (92.3) to ninety-three point eight (93.8) cents US to buy one (1) Canadian dollar?

DR. ATIF KUBURSI: Yeah, if you -- if you reverse it, yeah.

MR. BYRON WILLIAMS: And staying with the US dollars if we reus -- it -- duce it, and with that ninety-three point eight (93.8) cents US at the extreme left, would it be fair to say that below or to the left of that ninety-three point eight (93.8) cents US the probability distribution becomes the horizontal axis?

DR. ATIF KUBURSI: Yeah, yeah, it would.

MR. BYRON WILLIAMS: Put another way, sir, would it be fair -- excuse me. Put another way, would it be fair to say that the probability of an exchange rate over ninety-three point eight (93.8) cents US to purchase one (1) Canadian dollar is zero?

DR. ATIF KUBURSI: Okay. I mean because

it -- it's right at the horizontal, yeah.

MR. BYRON WILLIAMS: Is that correct, sir?

DR. ATIF KUBURSI: That is correct.

MR. BYRON WILLIAMS: And another way to describe this is to say that the chosen distribution allows for values of the Canadian dollar be -- below ninety-three point eight (93.8) cents US with declining probability, but no value -- but does not allow for values of the Canadian dollar above ninety-three point eight (93.8) cents US.

DR. ATIF KUBURSI: That -- that's correct.

MR. BYRON WILLIAMS: Professor Magee, it's probably for you, but it's -- it's open to either witness again. I like to -- to share the -- share the wealth.

I want to pre -- present you with a -- a very simple hypothetical. If you need a pen to -- to take notes, please feel free to. I don't think it's very complicated, you probably don't need it.

DR. LONNIE MAGEE: Ready.

MR. BYRON WILLIAMS: I'm just waiting for your counsel, who's very helpful, setting a bad example. I'm not sure I can meet with my clients' witnesses.

So Professor Magee, in Example A, researchers are trying -- if you'll consider, reacher -- researchers are trying to determine which of two (2) possible distributions best captures a risky outcome for a certain issue. Okay, you have -- you're with me so far, sir? You're nodding your head.

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: Okay. And they -- let's assume that they have five (5) observations to work with. Will you assume that, sir?

DR. LONNIE MAGEE: Okay.

MR. BYRON WILLIAMS: And let's assume as well that they seek to choose a distribution which presu -- produces the best results employing the best chi-squared statistic, okay?

DR. LONNIE MAGEE: Okay.

MR. BYRON WILLIAMS: Let's take Example B now, sir, and assume that, for the same issue, researchers likewise are trying to determine which of two (2) possible distribution best captures a risky outcome. Same -- same outcome. Okay, sir?

DR. LONNIE MAGEE: Okay.

MR. BYRON WILLIAMS: And they are considering the same two (2) possible distributions as in Example A. Will you agree with that, sir, for the purposes --

DR. LONNIE MAGEE: Okay.

MR. BYRON WILLIAMS: -- of the hypothetical?

DR. LONNIE MAGEE: Yeah.

MR. BYRON WILLIAMS: Thank you. And let's assume that they have the same five (5) observations to work with as in Example A, and also that they have an additional thirty (30) observations of a comparable quality to work with. Are you with me, sir?

DR. LONNIE MAGEE: Yes, I am.

MR. BYRON WILLIAMS: And again, let's assume that they too seek to chose the distribution which produces the best result, employing the best chi-squared statistic.

DR. LONNIE MAGEE: Okay.

MR. BYRON WILLIAMS: And I have two (2) questions I -- I wish to ask you from that, Professor Magee. And I wonder if you would agree with me that even if their set of possible distributions includes the correct one for both Example A and Example B, there is a certain probability that they will choose the wrong distribution. Would that be fair?

DR. LONNIE MAGEE: That's correct.

MR. BYRON WILLIAMS: I wonder if you

would agree with me that, all other things being equal, to the extent that the researchers in Example A have relatively fewer observations, the probability is higher that they will have chosen the wrong distribution, as compared to Example B?

DR. LONNIE MAGEE: That's correct. If -- if in Example B they have thirty (30) more observations from the same distribution that you're trying to capture as -- as the original five (5), then Person B is -- is in a better situation, yeah.

MR. BYRON WILLIAMS: I thank you for that, Professor Magee.

I'm going to move to another area, Mr. Chairman and Mr. Vice-Chair, and I'm -- I'm anticipating that we should be able to finish this particular area before -- before lunch.

And, Professor Magee, I -- I want to direct your attention to page 5 of the yellow book, upper right-hand corner.

DR. LONNIE MAGEE: Okay.

MR. BYRON WILLIAMS: And you'll -- I'll give you a second certainly out of courtesy to just -- you'll see a mark on the right-hand side, just to -- to review those words for a second or two (2). Let me know when you're ready.

DR. LONNIE MAGEE: Ready.

MR. BYRON WILLIAMS: And just to set the context for this question, you'll recall during your direct-examination by my -- my friend, Mr. Wood, that you had reviewed the evidence of Mr. Cormie dur (sic) his cro -- during his cross-examination by myself.

You had discussed it to some degree?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And referring you to this quote, which appears at page 6,093 of the transcript, you indicate that you think there is a lot of common ground between our view and wha -- what was expressed earlier in the hearing.

Do you see that, sir?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And I'm going to suggest to you, and I -- I won't ask you to elaborate just yet, but you'll tell me if I'm correct or not, that you saw some room for common ground between Manitoba Hydro and yourselves in terms of the potential to use quantitative risk analysis to provide better insight into risk issues.

Would that be fair, sir?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And, again,

Professor Kubursi, you may want to step in at some time. I have a few questions more for Mr. Magee though -- Professor Magee, excuse me. And just flipping over to page 16 of the yellow book for -- for a second, Professor Magee, page 16 in the top right-hand corner. And I meant to say Professor Magee. I apologize for that.

DR. LONNIE MAGEE: That's okay. Got it.

MR. BYRON WILLIAMS: And you see a question posed to you by Ms. Southall, and she's asking you whether the use of a Mo -- Monte Carlo simulation of combining the 1940 drought with the high import prices is a good substitute for doing a joint probability.

Do you see that, sir?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And your answer, I'll suggest to you, is that it's a different exercise, and it would be really great to know both.

Would that be fair?

DR. LONNIE MAGEE: Yes.

(BRIEF PAUSE)

MR. BYRON WILLIAMS: And pre -- and I do apologize for making you flip, Professor Magee; flip pages, not intellectually or anything like that. I'm just asking you to flip back to page 3 of the -- the evidence -- the yellow book for a second. And I'm referring you to the second passage marked on the right-hand side.

DR. LONNIE MAGEE: All right.

MR. BYRON WILLIAMS: And, Professor Magee, you -- you'll see in that passage -- and I'm -- for those still flipping, it's page 3 on the right-hand side -- you're discussing the scenario -- well, you're discussing two (2) ques -- questions you might ask in -- in the context of a drought with high import prices. And -- and you suggest, I'll suggest to:

> "How -- how would it change doesn't require saying how likely it is it would change. It obviously would be important to think about the second question, how likely it is."

You see that reference, sir?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And what I took from that is what you were saying is that for the purposes of quantitative risk analysis there are two (2) valuable insights that you're -- you're looking for. One (1) is the magnitude of a potential event, and the other is the probability of it.

Would that be fair, sir?

DR. LONNIE MAGEE: Yes.

(BRIEF PAUSE)

MR. BYRON WILLIAMS: Now -- whoops -- Mr. Chairman, and, Mr. Vice-Chair, there -- there's a couple pages of notes I have to skip over in anticipation of the undertaking and where that leads us. So if you'll forgive me for just one (1) second, I'll set those aside and then -- and then resume our discussion, if -- if you'll let -- let me sit down for a minute.

(BRIEF PAUSE)

MR. BYRON WILLIAMS: And, Professor Magee, I -- I apologize. As I said, I've -- I've had to skip over a little bit, so I'm -- I'm going to direct you to page 17 of the yellow book. And a discussion that you have with Manitoba Hydro in terms of data limitations. And I'll allow you to take a quick look at that, sir.

Excuse me, a discussion with -- with your counsel. And "data limitations" is the wrong word, but a discussion with your counsel about data.

DR. LONNIE MAGEE: Okay.

MR. BYRON WILLIAMS: Now -- and this discussion moves onto the next page, Professor Magee, but you'll agree with me that in this excerpt from the transcript, you're discussing with your counsel potential information dif -- differences between your Statistics Canada data as presented in Table 6.1 and Manitoba Hydro's own data.

Would that be fair?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: Now, Professor Magee, I -- I've never met a social scientist who -- who said that they didn't want more data. And it's -- it's fair to say that you would always be happy to have more -- more information rather than less.

Would that be fair?

DR. LONNIE MAGEE: I think, just to try and anticipate where this might be going, we -- there's also a -- a benefit to having a -- a kind of a -- a tidy easy to describe exercise that has been undertaken. So sometimes you can end up making things more confusing, or it might look arbitrary, if you have a nice tidy data set and then you say, Oh, well, we were able to get these numbers from here and these numbers from there, and we -- we're -- we're throwing them in too. That might have a look of arbitrariness to it. It might make it harder for other people to replicate what you did.

So there is a -- a judgment call involved there, in terms of what extra data you -- you throw into a -- some calculations.

MR. BYRON WILLIAMS: Fair enough, sir. And -- and let me make my question more precise. Really, in this passage, you're talking about a -- a conscious choice, whether to employee Statistics Canada data or Manitoba Hydro data.

Fair enough?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And you would --

DR. ATIF KUBURSI: Can I just jump in here?

MR. BYRON WILLIAMS: Abs -- absolutely.

DR. ATIF KUBURSI: Yeah. Yeah, I -- I just want to share the wealth. The -- the point that is really crucial here for us is that we had a choice, all right? At -- our choices are we use Statistics Canada or we use Manitoba Hydro.

We thought we are independent consultants. As independent consultants would like to use data that we consider to be in the public -- on the public record, independent, verifiable, and we're quite familiar with, and one we could use without being encumbered by revealing any confidentiality.

It's not that we thought that the data from Manitoba Hydro is an inferior or in any way, shape, or form not good to use. No. We said we wanted basically, and fundamentally to use data that Statistics Canada had put on the public record, that we could use it with such a detail and without any consideration or fear that we might be revealing anything confidential, and a consistent set of data that they seem to use for every utility in Canada.

That choice for us was no choice at all. We thought that it would be far more useful for our purposes to get that objective, independent Stat Can data. And if there was any quibbles about it, the quibbles should not be with us; it should be with Statistics Canada.

Why is it that Statistics Canada has chosen to put on the public record this set of data that may not be consistent with what Manitoba Hydro feels that this is a correct representation? But for us, we thought -- and we, as social scientists, we continuously use and reference Statistics Canada -- we didn't think that we are in any position to raise questions about these things.

MR. BYRON WILLIAMS: And I want to follow up that response in two (2) different ways. And let me preface my question in terms of going back to my reference to trying to establish common ground between yourselves and Manitoba Hydro. And so I -- if the Board will allow me, just by way of preamble, my clients are not seeking to criticize what they understand totally is your -- your decision; we're trying to look forward. And I'll go to Dr. -- Professor Magee first, and then I'll -- I'll return to Professor Kubursi, on the -- the second point that you made.

Professor Magee, there's a -- a reference by you on page 17, lines 20 to 22, to the fact that you might have ended up with better data covering a longer period using the second approach.

Do you see that, sir?

DR. LONNIE MAGEE: Yes, I do.

MR. BYRON WILLIAMS: And I'm not asking you to pick and choose between Stats Can and Hydro, but you would concede that there might be utility in using a longer time series of data, one in which Manitoba Hydro and others might be more confident in, than the Statistics Canada data, moving forward?

DR. LONNIE MAGEE: That's possible. Another -- just looking at the other side of it, the -- the format that -- that the Statistics Canada data was presented is also applied to other utilities in there, right? Yeah. So, moving forward, there may also be occasion to access literature or research on what other utilities have been doing and other experiences, and if the Statistics Canada data turns out to be consistent across different utilities, publicly available, I think it could be quite useful then to learn from other utilities' experiences, as well.

MR. BYRON WILLIAMS: And, Professor Magee, my clients don't dispute that with you, and certainly this is open to either witness, but you're aware that built within Table 6.1 of your evidence is estimates of the average export price to the US market, for example, in 2007, in the range of fourteen point six three (14.63) cents per kilowatt, correct?

DR. ATIF KUBURSI: Yeah, correct.

MR. BYRON WILLIAMS: And you'll acknowledge that data such as that poses a challenge to all in the room, not attacking you for using Stats Can data, because it doesn't seem to accord at all with the reality of Manitoba Hydro's sales in that particular year?

DR. ATIF KUBURSI: All right. I -- I -- as I said, and I -- I go again and emphasize it, that if you have a quibble with the Stats Can data, you don't have a quibble with us. I mean, let's bring people from Stats Can to explain how on earth did they get this number, on record?

The other thing, which is probably equally important is that, yes, you'd like to have more data, but you really like to make sure that it's consistent. 1.

2. You want to see this data that you use, even as a short period, how representative -- and -- and you're absolutely justified in raising question about whether it is absolutely consistent with what the objective reality is.

But you also need to look at the two (2) and some of the arguments that have come from that cross-examination with Mr. Cormie is that our data re -- reflects only -- only one (1) side of the -- the data in the sense that it -- it represents high water flow period, but 2002, 2003 was a drought.

So in some sense we -- we tried to see to what extent our data is not reflective of a particular state and that it's rich enough that it covered a variety of states, and -- and we felt confident that that variety is there.

MR. BYRON WILLIAMS: And I thank you for that insight. I just want to make sure I've got you pinned down on -- on one (1) point though.

To the extent that the regulator or others are uncomfortable with certain information found in Table 6.1, you'll agree with me that it is incumbent upon them to -- to explore those and not to rely upon those numbers till they're satisfied that they're accurate.

DR. ATIF KUBURSI: There is no question about it. There is no data that's perfect. And there is no organization, or statistician, or statistical institution is beyond accountability. And if there is sufficient evidence that there is this variance it -- it would be incumbent to see what are the reasons.

It could be that they have used a completely different weighting scheme. They may have really defined it in terms of a different combination between long term and the opportunity. I mean, these things have to be queried from Statistics Canada. And -- and these numbers that you have that are not consistent should be vetted with them.

MR. BYRON WILLIAMS: Now would I be correct in -- and Mr. Chairman, I'm close to wrapping up in this area. But, would I be correct in suggesting to you that the same type of analysis that went into Table 6.1 of your evidence based upon statistic -- Statistics Canada data could be done with verifiable and consistent Manitoba Hydro data? You're not saying that that's not a

-- an approach that one -- one could take?

DR. ATIF KUBURSI: I mean, we're using the common ground as we are using the same software. We're approaching this with the same set of questions that they must be raising. There is nothing that would prevent us from, if this data would become available, to -- to deal with it.

But there is one (1) proviso and you have been looking at it as you were asking us questions. We are not in any way contingent or dependent on a fixed number. We're basically looking at probability distributions over that period. And in that respect it would be -- and -- and this is probably what you were driving at, I mean, would a different distribution, a superior distribution from where you had more confidence that these numbers had come from, used, it would give different result? It would.

But we felt very confident that we used this objective statistical test on each and every single distribution within the same context, using the same measuring rod, that we gave a rich representation of what we considered to be the underlying reality.

MR. BYRON WILLIAMS: Two more questions, Mr. Chairman. You'll agree with me, Witnesses, that in -- in considering these approaches it is important for the tribunal to have insight into the best available data and the best available distributions?

DR. ATIF KUBURSI: I mean, you ask me if motherhood is great. Yes, of course. I -- I consider this to be --

MR. BYRON WILLIAMS: I'll take that answer, sir.

DR. ATIF KUBURSI: Yeah, yeah, yeah. I -- I mean, I absolutely would like to see that alternative data be used, other methodologies be used. It's -- it's something that is so serious here. We're not dealing with something that is about things. People can have good and reasonable arguments.

We've used a consistent, objective data that we consider to be consistent with our role as independent consultants. It would be quite worthwhile to see that other data are used. And then we could maybe meet again and discuss, you know, the differences and -- and see to what extent these could be resolved.

MR. BYRON WILLIAMS: Now, by way of last question and -- and this will have -- I've shared this question with your counsel. I hope he shared it with you. But I'm going to -- to share -- share with the witnesses on this particular point the existing CAC/MSO -- MSOS position in terms of where they'd like to see this discussion to go. And then I'm going to ask you to briefly comment on it.

So -- so by way of preamble, my -- my clients' current position on quantitative assessment of risks facing Manitoba Hydro is, and you may want some notes on this, or you can just -- is that a useful direction for the quantitative assessment of risks facing Hydro would be developing stochastic models to assess the probability distributions of risky outcomes, including water flows, just as you do in chapter 4, and other financial risk factors, and the development of a model of Manitoba Hydro operations that integrates these risk factors, part 1.

This would then allow for the assessment via Monte Carlo simulations of various what-if scenarios. These would consist of a base case in which all material risk factors are allowed to vary, as well as a series of stress tests where one (1) or a series of adverse events are combined to assess or impact Manitoba Hydro financial operations, i.e., net revenues.

How does that sound to you, Professor Kubursi?

DR. ATIF KUBURSI: I thought I wrote it.

MR. BYRON WILLIAMS: Well, then we have some common ground. Thank you, Mr. Chairman.

DR. ATIF KUBURSI: We certainly do.

THE CHAIRPERSON: Thank you. So we'll be back -- if no one objects, we'll come back for one o'clock.

--- Upon recessing at 12:03 p.m.
--- Upon resuming at 1:06 p.m.

THE CHAIRPERSON: Okay, folks, as soon as we could get going.

CONTINUED BY MR. BYRON WILLIAMS:

MR. BYRON WILLIAMS: Yes, good afternoon, Mr. Chairman, Mr. Vice-Chair.

A couple of short snappers, perhaps -- and more like -- I'm not sure who this goes to, but if you could turn to the yellow book, page 23 in the top right-hand corner. And you'll see the response of Professors Kubursi and Magee to Manitoba Hydro Information Request 28.

Do you have that, Professor Kubursi?

DR. ATIF KUBURSI: Yes, I do.

MR. BYRON WILLIAMS: And I just want to make sure I understand your evidence in terms of (c), the answer set out there. You'll confirm that you estimated the cost of a -- the mean cos -- drought cost of a five (5) year drought to be in the range of $3.342 billion dollars, sir, correct?

DR. ATIF KUBURSI: Correct.

MR. BYRON WILLIAMS: And the seven (7) year drought you estimated to be -- the mean cost to be around $4.5 billion dollars, sir, correct?

DR. ATIF KUBURSI: Cor -- correct.

MR. BYRON WILLIAMS: And just to make sure I understand -- excuse me, I...

(BRIEF PAUSE)

MR. BYRON WILLIAMS: Clearly Mr. Surminski was trying to preempt our conversation.

And just to -- to confirm, in estimating both the cost of the five (5) year drought and the seven (7) year drought, I'd be correct in suggesting to you that the underlying data for the estimates, apart from water flow was initiated flowing from the data in Table 6.1 of your evidence?

Is that right?

DR. ATIF KUBURSI: Yes, correct.

MR. BYRON WILLIAMS: And in terms of these estimates, again, leaving aside water flow, would it be accurate to say you employed the underlying probability distributions found in Section 6.5 of your evidence?

DR. ATIF KUBURSI: Yes, correct.

MR. BYRON WILLIAMS: Turning at long last to the white book, which is CAC/MSOS Exhibit Number 25. And -- and, Professors Kubursi and Magee, we are going to come back to quantitative analysis towards the end of our discussion, but I -- I wanted to have a bit of a change of pace. And I'm going to direct you, first of all, to -- in the upper right-hand corner, page 1, which is your response to the PUB Information Request number 8. And I think this goes to Professor Kubursi.

Do you see that, sir?

DR. ATIF KUBURSI: Yes.

MR. BYRON WILLIAMS: And without nee -- needing you to elaborate on your response, this particular response, this is a -- a response to PUB Information Request 8, and regarding your suggestion that the massive capital expense -- expansion will be needed sooner or later to meet existing load.

Would that be fair?

DR. ATIF KUBURSI: That would be fair.

MR. BYRON WILLIAMS: And you -- directing your attention specifically to your answer (a), on the first line you make the point that the issue is the timing of these investments, correct?

DR. ATIF KUBURSI: Correct.

MR. BYRON WILLIAMS: And where I really want to direct your attention is to your discussion of shale gas, first at the -- in the middle of this response, and then towards the bottom. And, essentially, you -- you note that while shale gas has generated an excess supply of gas, its impact on wat -- water and other environmental and technical considerations are being cited as reasons why this excess supply cannot be expected to last for a long period.

Would that be fair?

DR. ATIF KUBURSI: That would be fair.

MR. BYRON WILLIAMS: And -- and towards the bottom fo this response, you note that environmental considerations would have limited volumetric impacts, but could have serious implications for price.

Would that be fair, sir?

DR. ATIF KUBURSI: Yes.

MR. BYRON WILLIAMS: And I do want to ask you to turn to the next page of -- of this exhibit, page number 2, and this is part of your same response to the PUB, and particularly (iv).

Do you have that, Professor Kubursi?

DR. ATIF KUBURSI: I do.

MR. BYRON WILLIAMS: And again, here you'll agree that you're commenting on natural gas prices and noting that, while they are currently low because of abundant gas supplies on account of shale, certain water requirements and quality of water impingements could slow this reliance on shale, and natural gas prices could start rising.

Would that be a fair summary of that response, sir?

DR. ATIF KUBURSI: Yes, sir.

MR. BYRON WILLIAMS: Now, I -- I would like you to -- to turn, if you would, to tab -- or, excuse me, page 3 of this response. There you will see the -- the article -- the article, "Methane and the Greenhouse Gas Footprint of Natural Gas from Shale Formations," which was published by Professors Atkinson, I-N-G-A-F-F-E-A, and Ms. Santoro from Cornell.

Do you see that, sir?

DR. ATIF KUBURSI: Yes.

MR. BYRON WILLIAMS: And without asking you to elaborate on -- at this point in time, this was provided to you in advance, and you've had an opportunity to review this article and been provided notice of the type of question I will be asking.

You'll confirm that?

DR. ATIF KUBURSI: Yes, but we divvied the work between me and Professor Magee. He --

MR. BYRON WILLIAMS: Oh.

DR. ATIF KUBURSI: -- was more responsible for responding for the questions.

MR. BYRON WILLIAMS: So, Professor Magee, just recognizing that -- that not everyone in the room will be familiar with this article, I've got a few questions which go back to the -- your response to PUB-8, but I just want to -- to summarize, at a high level, some of the discussion in this article.

Would you be prepared to assist me in that, sir?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: There's no famous words, "high level." Mr. Vice-Chair caught me again.

And just on page 3 of -- of the white book, you'll see a discussion in the abstract marked 'A'.

Do you see that, Professor Magee?

DR. LONNIE MAGEE: Yes, I do.

MR. BYRON WILLIAMS: And essentially what the authors suggest is that methane is a powerful greenhouse gas with global warming potential far greater than that of carbon dioxide, particularly over the -- the first few decades following emission.

Do you see that, sir?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And the argument that is made in this abstract is that methane contributes substantially to the greenhouse gas print -- footprint of shale on shorter time scales, especially dominating in a twenty (20) year time horizon.

Do you see that, sir?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And they suggest that the footprint for shale gas is greater than for conventional gas or oil, when viewed on -- in any horizon, but particularly so over twenty (20) years.

Do you see that, sir?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: If I could just ask you to flip to page 4, in the top right-hand corner.

DR. LONNIE MAGEE: Okay.

MR. BYRON WILLIAMS: You'll see, as well, marked 'B' on the right-hand side, a concern expressed by the
Natural -- you'll see some concerns expressed by the Natural Resource Council in terms of the concern that

emissions from shale gas may be greater than from conventional gas.

Do you see that, sir?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And a warning from the Council of the Scientific Society Presidents that -- that some potential energy bridges, such as shall gra -- gas, have received insufficient ana -- analysis and may aggravate rather than mitigate global warming.

Do you see that, sir?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: Flipping, if you would, to -- to Tab 11. And, Professor Magee, as I -- I said, I'm trying to kind of go through this quickly, and I'll give you a chance to comment on how it may affect -- and certainly if you have anything else you wish to add at the end you're more than welcome to. I don't want to -- to shorten your responses.

But turning to page 11, in the top right-hand corner, you'll see marked on the right-hand side at -- at -- do you see that marking 'C', sir?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And the authors do note that:

"Our analysis does not consider the

efficiency of final use, and if fuels are used to generate electricity, natural gas gains some advantage over coal because of greater efficiencies of generation."

Do you see that, sir?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: But they also note that:

"This does not greatly affect our overall con -- conclusion, the GHG footprint of shale gas approaches or exceeds coal, even when used to generate electricity."

Do you see that, sir?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And finally, in terms of pages, I'd ask you to turn to page 12 where you'll see on the right-hand side the markings of 'D' -- or, the letter 'D' and the letter 'E'.

Do you see those, sir?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And focussing first on the letter 'D', you'll see the suggestion by the authors that:

"The large GHG footprint of shale gas undercuts a logic of its use as a bridging fuel over com -- coming decades, if the goal is to reduce global warning -- warming."

W-A-R-M-I-N-G. Do you see that, sir?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And they make it clear that they do not intend their study to be used to justify the continued use of either oil or coal, but rather to demonstrate that substituting shale gas for these other fossil fuels may not have the desired affect of mitigating climate warming.

Do you see that, sir?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And focussing you on Item E, or letter 'E', you'll see that the authors argue that the carbon trading market at present under-values the greenhouse warming consequences of methane by focussing on a hundred year time horizon and by using out of date global warning -- warming potentials for methane.

"This should be corrected and the full GHG footprint of unconventional gas should be used in planning for

alternative energy futures that
adecally -- adequately consider climate
change."

Do you see that, sir?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And going back and -- you -- I don't think you need to turn there, but if you wish you could go back to your response to PUB-8A.

With -- with reference to your conclusion that excess supply of natural gas cannot -- excuse me, let me try that again. With reference to your conclu -- your suggestion that environmental considerations might have serious implications for the price of natural gas, I wonder if you could discuss the implications, if any, of this report and its conclusions, or the potential implications.

DR. LONNIE MAGEE: Well, to -- to put a direction on it, it's clear the -- the extra information in the report would lead one to expect higher prices, more serious implications for the -- for gas prices. I think the -- the issue of how much and -- and when relates to something Atif -- Atif was talking about the last time we were here, about all the different lags involved with recognizing a problem. In this case, the global -- or the climate change implications of different methods of producing energy.

And then there are a number of lags involved in recognizing the problem, designing solutions, implementing the solutions, the solutions having an affect. In -- in this case for the Hearing it would be the, I guess, ultimately the effect on the demand for hydro and the price that could be charged for hydro and -- and -- based energy.

And I think this is just -- the -- the evidence in this paper just adds to the, I guess, body of evidence that over time it -- there's a strong possibility that these other carbon based energy sources will become relatively more expensive and restricted, which is good news in the long-run for Hydro.

MR. BYRON WILLIAMS: Now, sir, I -- I just want to -- and -- and this has been helpful and I don't -- don't want to belabour -- belabour this -- is I understood your answer, and I thank you for it, the thrust of it was evidence such as this, and reports such as this, and the growing body of evidence, directionally suggests that -- that there'll be increasing pressure on natural gas prices but you would expect a lag in -- to some degree, in terms of when that occurs?

DR. LONNIE MAGEE: That's right, just based on, you know, viewing the -- the -- what many people are concerned about, the lag in policy response already in North America to these issues.

MR. BYRON WILLIAMS: I thank you for that. We're going to move fairly rapidly, I hope, to another subject. And we're back to the yellow book at pages 24 through 28.

(BRIEF PAUSE)

MR. BYRON WILLIAMS: And, really, for the purposes of the -- the immediate conversation, Professor Magee, you might look at the text on page 24 that's marked. And while he's doing that, Professor Kubursi, you might want to take a peek at pages -- the bottom of page 27, just to anticipate where I'm -- I'm going a little bit.

MR. ROBERT MAYER: Mis -- Mr. Williams, none of page 24 is marked on my copy.

MR. BYRON WILLIAMS: Oh. Okay, well, that's an oversight for which I apologize. And I'll -- just -- just for the -- the Board's attention, it's lines 10 through 23. And I apologize for that.

CONTINUED BY MR. BYRON WILLIAMS:

MR. BYRON WILLIAMS: Professor Magee,

first of all to you, I was certainly struck by the conversation that you had with the Chairman, and Professor Kubursi as well, on the impact, if any, of factors that might distinguish the level of comfort of a private sector monopoly with a certain level of reserves, as compared to a private company and a competitive -- excuse me, let me try that again -- the level of comfort of a public sector monopoly with a certain level of reserves, as compared to the level of comfort of a private company in a competitive marketplace.

And so I wanted to move first to you, Professor Magee. And when you were -- I'll suggest to you that when you were having this conversation with the Board Chairman, you were focussed more on the -- let me back up.

Do you recall that conversation, sir?

DR. LONNIE MAGEE: More or less.

MR. BYRON WILLIAMS: Excuse me. Well, I hope the transcript will refresh your memory.

Does it?

DR. LONNIE MAGEE: Yes, it's -- it's very good. Thank you.

MR. BYRON WILLIAMS: Well, the -- and you -- your response, as set out on page 6,184 of the transcript, focus more on the issue of monopoly, I will suggest to you, and -- and the reality that a company with the benefit of a mon -- monopoly could be more confident about the long-run demand for the product.

Would that be fair, sir?

DR. LONNIE MAGEE: I -- I think it's the -- well, the monopoly aspect is a part of it in -- in the sense that you wouldn't expect some other company to start using the hydro assets in -- in Manitoba to produce energy. But I think it's also -- it -- it's the nature of the product that's being demanded. It's -- it's something every house -- every, you know, elec -- the demand for electricity is something that is relatively stable, compared to say the demand for a certain type of, you know, computer or articles of clothing or, you know, it's -- it's a -- in the long run it's -- it's pretty safe to predict that people will be needing electricity fifty (50) years from now. It's not so safe to say that for other types of products, goods, and services.

MR. BYRON WILLIAMS: And that's very helpful. So when you're speaking of long-term demand, one (1) of you -- one (1) of the points you make is the very nature of this commodity provides a -- a supplier with more confidence that they'll still be in the game in the -- in the long -- in the long run?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: Now, and I accept that and I thank you for that clarification, but if -- if I look to your discussion, whether it's in lines 10 through 14, again, you're talking -- comparing competition to a monopoly, or again at line 22, where you're talking about a private-sector company that was -- that was a monopoly, I would suggest to you as well, and you'll correct me if I'm wrong, that another factor providing assurance of a -- of a long-te -- run demand is the reality that -- that in Manitoba, Manitoba Hydro has a monopoly in the retail pro -- provision of hydro electricity within the province?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And in -- in the context of a company enjoying a monopoly as compared to a cont -- context of a company in a competitive marketplace, you would agree that the consumers of a firm operated -- operating in a competitive marketplace can generally go elsewhere if they don't -- if they don't like the -- the product or the price, whereas those consumers who are captive to a monopoly are essentially always there as a financial backstop to the monopoly?

DR. LONNIE MAGEE: That -- that's true. I -- I should mention though that clearly here it's not -- this is a monopoly that's -- where the -- the company is not free to -- to freely set its price at some profit maximizing level. It's a restricted monopoly.

(BRIEF PAUSE)

MR. BYRON WILLIAMS: Professor Kubursi, do you have something you want to add?

DR. ATIF KUBURSI: I -- I mean I -- I just want to say that probably it's not just the nature of the product, it's the very fact that being a monopoly there's so many barriers to entry. You cannot expect that other firms, like in the competitive markets where entry and exit are extremely fluid and -- and easy, it -- under monopoly conditions the barriers to entry make it very hard for other companies to jump into these -- this market.

So in some sense, a monopoly can, if that product remains variable and the demand remains strong, that could always be assured that there will be no competitors to share this market with.

MR. BYRON WILLIAMS: And I want to -- and I thank you both for that -- the combined very thoughtful answer. And -- and I want to keep that thought of a monopoly in mind and look at -- when we look at the concept of an appropriate level of retained earnings.

And I wonder if you would agree that all thin -- other things being equal, that in the face of a material adverse affect -- event, affecting retained earnings, a company in a competitive context may be hampered in its ability to rebuild retained earnings through rate increases because if it raises rates too much its consumers have the option of fleeing elsewhere?

DR. ATIF KUBURSI: But even a monopoly is not in an extremely protected position, despite all the other considerations. In -- in the sense that people may react by consuming less. They might not have to jump and consume something else, or somebody would be providing this, but the - the market always, under any conditions, there are reasons and logic to believe would -- would come into play. And this logic is higher prices would provoke people to consume less.

MR. BYRON WILLIAMS: And that's very helpful, and I'm going to press you a little bit more on this to see if you'll walk with me down this path or not, Professor Kubursi. Accepting what -- that what you say in terms of people might choose to consume less, would you also agree that in the -- in the context of a firm and a competitive market, they would face a dual risk, a) of consumers choosing to -- to choose -- to use less or b) -- of consumers moving to -- to other firms?

DR. ATIF KUBURSI: I don't want to belittle the fact that a monopoly has market power that it could use but, as Lonnie was mentioning here, in many respects it's a natural monopoly, regulated monopoly. And therefore there are degrees of freedom less here in the sense that this monopoly does not have the full exercise, or is not in a position to fully exercise all its market power because it's a regulated monopoly.

MR. BYRON WILLIAMS: Thank you for that. And I'm going to move to a comment, Professor Kubursi, and I -- I think this is a section of the evidence you're responsible for. So if you'll turn to page 27 of the yellow book of documents, and -- and also keep your hand on page 28. Towards the bottom on page 27.

Do you see that, sir?

DR. ATIF KUBURSI: Yes, I do.

MR. BYRON WILLIAMS: And I'm not sure if this is marked in the Board's text or not. Apparently it is. But, Professor Kubursi, directing your attention to the last paragraph on page 5, and I'm just going to ask you to confirm the -- the paragraph, first of all. You make this statement that:

"The public guarantees of debt can tempt a public utility to undervalue risk and behave more recklessly than if it were to bear alone the consequences of its risky behaviour. This temptation is further complicated by a regulatory regime that may set rates to cover the public utility costs and errors, and that allow it to pass the costs of its mistakes, inefficiencies, and risks to domestic customers."

Do you see that paragraph, sir?

DR. ATIF KUBURSI: I see it.

MR. BYRON WILLIAMS: And you've already discussed the first part of that paragraph with my learned friend, Ms. Southall, so I -- I want to focus you on the second part of that paragraph, which relates to complications from a regutory -- a regulatory regime. And what I -- I took you to mean by that was that any regulatory pass of mistakes, and inefficiencies may create a moral hazard in that it might incent less careful or more reckless behaviour.

Was that your -- your meaning, sir?

DR. ATIF KUBURSI: Yeah, that's absolutely it, and there is a body of literature and there is a general consensus in the profession that moral hazard is a -- is an issue to contend with. It may or may not apply fully to any particular entity, but on a general -- within a general framework, it has been noticed that people who have insurance tend sometimes to feel protected, and may do things under the protection of the insurance that they might not do in -- in its absence. So it's basically -- the extreme case of it is that somebody would insure his bike and steals it, or insures his restaurant and burns it.

So in many respects, the moral hazard is -- is a condition that is now quite established, where any insurance may give the wrong signals and incentives for participants to assume and expose themselves to higher risks than they would in its absence.

MR. BYRON WILLIAMS: But in your evidence, sir, I'd -- I'll suggest to you that you're -- you're making a point that while this may be a -- a common phenomena, whether one is -- is a public or private entity, you're warning that one has to be particularly aware of this in -- in the context of a rate-regulated crown monopoly under a -- a rate-setting regulatory regime.

DR. ATIF KUBURSI: I understand by this -- and the reason for this is that the market establishes a very strong discipline on the participants. They will ultimately have to sink or swim based on their own resources.

Any public utility where the public may have to bear the responsibility for supporting that utility, particularly if it were to go into debt and the debt is guaranteed, these entities tend to feel they are immune from the discipline of the market, and in this respect may invite and may encourage them to assume a greater amount of risk. And the regulation is challenged. The Regulatory Board would -- would really be challenged to make sure that only rates that are justifiably so, that do not represent errors, mistakes, and inefficiencies. There is no sense at all about a regulatory body that does not ensure that efficiencies are all reaped and that the discipline of maintaining costs at the lowest form.

And this -- if you can see I went even to another extreme with my colleague here, suggesting that utilities ought to take as a directive an objective function that should guide their principle is to minimize costs.

MR. BYRON WILLIAMS: And let me just try and sum our conversation. And you'll -- focussing on -- at the level of theory, a rate regulated Crown monop -- monopoly backed by a government debt guarantee, essentially, I'll suggest to you, enjoys a triple layer of insurance in the form of 1) the monopoly, 2) the debt guarantee, and 3) the more nurturing environment of rate regulation, as compared to the competitive marketplace.

Would that be fair, sir?

DR. ATIF KUBURSI: Yes, but only with one (1) proviso: to the extent that the regulatory body is permissive, and to the extent to which that monopoly is in a position to exercise market power. But if the regulatory body is not permissive and would hold these entities to maintain efficiencies, and if and when this monopoly is unable to exercise its market power, then what you've really said may not hold.

MR. BYRON WILLIAMS: And I thank you for that.

This is probably still for you Professor Kubursi. White book of documents, CAC-25, page 15, which is the response of Professors Kubursi and Magee to CAC/MSOS number 11. And I'll give you a minute to -- to look that -- in particular I'm focussing you on your -- the first paragraph of the response to -- page 15, Professor Kubursi.

DR. ATIF KUBURSI: Yeah, I have it. But let me -- if you just --

MR. BYRON WILLIAMS: I'll give you a second.

DR. ATIF KUBURSI: -- bear with me one

(1) minute just to read it.

MR. BYRON WILLIAMS: And it's the -- it's -- hopefully it's marked on the right-hand side, where I'm referring you to --

DR. ATIF KUBURSI: No, it's not marked.

MR. BYRON WILLIAMS: Okay. (a), the first paragraph.

DR. ATIF KUBURSI: Okay.

(BRIEF PAUSE)

DR. ATIF KUBURSI: Okay.

MR. BYRON WILLIAMS: Thank you. And just in terms of the -- the reference, sir, focussing exclusively on (a), the first paragraph, you state that as long as -- you'll -- I'll ask you to confirm that you state that:

"As long as there is not an explicit formula that ties rate setting to net earnings of Manitoba Hydro, and the residents of Manitoba do not have a mechanism where they can influence the distribution of MH's net earnings, the increased earnings from selling electricity at times when a risk exists

that a water flow may decline means
that the reward of risk taking by MH
are reflected in higher earnings for
MH."

Do you see that, sir?

DR. ATIF KUBURSI: I see it.

MR. BYRON WILLIAMS: And it -- it's fair to say here that you are talking about the potential for asymmetric sharing of risks and benefits between Manitoba Hydro and its ratepayers?

Would that be fair?

DR. ATIF KUBURSI: That would be fair.

MR. BYRON WILLIAMS: Professor Kubursi, if you can't answer this I'll -- I'll understand totally. I'm not sure if you're aware that in the course of this proceeding a witness for CAC/MSOS, Mr. Matwichuk, is exploring mechanisms by which we can ensure that there is a transparent mechanism by which ratepayers can share, not only in the Corporation's downside risks relating to variations from forecasts, but in their upside, opportunity relating to variations from forecasts. Are you aware of that, sir, or -- or not really?

DR. ATIF KUBURSI: Not -- not really.

MR. BYRON WILLIAMS: Okay. And so we'll leave aside the specifics of that. But without asking you to elaborate on any particular mechanism, would it be fair to say that from the perspective of symmetry you me -- you believe there may be some benefit in the regulator considering a transparent mechanism by which ex -- ratepayers can expressly share in the good times as well as the bad?

DR. ATIF KUBURSI: I mean, the corollary to what I was saying is precisely that.

MR. BYRON WILLIAMS: So that's a "yes"?

DR. ATIF KUBURSI: It is a "yes."

(BRIEF PAUSE)

MR. BYRON WILLIAMS: Professor Kubursi, again, still with you. I apologize for the volume of questions. I'm going to ask you to pick up the yellow book, put down the white book, and turn to page 30 of the yellow book, which should be Figure 6.3 from your evidence.

DR. ATIF KUBURSI: I have it.

MR. BYRON WILLIAMS: And -- and, Professor Kubursi, you'll see that at the top of this page is -- is the description "Figure 6.3, Net Revenues 2.5 Percent Quantile Minimum with Export Curtailment." Do you see that, sir?

DR. ATIF KUBURSI: Yes.

MR. BYRON WILLIAMS: And you probably don't need it, but just for your benefit, if you're looking for background on -- on what -- the description of that figure, which is on the preceding page in your evidence, I've attached it in the next page if you're -- if you are looking for that. I -- I don't think you need it, sir, but it's there for you if you do.

But as I understand this figure -- let me back up for a second. So that figure's before us. And I don't want to get into any issues of commercial confidentiality with regard. But you've -- you've re -- reviewed a term sheet related -- a confidential term sheet of Manitoba Hydro.

Is -- is that correct?

DR. ATIF KUBURSI: Yes, we did.

MR. BYRON WILLIAMS: And I believe in your evidence you described the curtailment provisions of -- in -- in the term sheet you reviewed as a significant achievement in -- in these new contracts for Manitoba Hydro?

DR. ATIF KUBURSI: Yes, we -- we did.

MR. BYRON WILLIAMS: And I'll suggest to you that what Figure 6.3 represents is a scenario which involved constructing a case with lower water flows than the worst one (1) year drought on record but allowing for the curtailment of exports which are reduced by 29 percent.

Is that correct, sir?

DR. ATIF KUBURSI: It's correct in the sense it was not possible for us to let this water flows go below the worst that was on record without triggering the curtailment provisions.

MR. BYRON WILLIAMS: And what -- what you noted about this Figure 6.3 with the benefit of the curtailment provisions, I'll suggest to you, is -- is that the -- the actual losses associated with -- with a more severe drought were less than the losses associated with the most severe drought on record absent the curtailment cro -- clause?

DR. ATIF KUBURSI: I mean, we wanted -- actually, the whole intention of this is to show that some of the -- the curtailments have made the -- a contribution. We wanted to test to see if this a tre -- this is a stress test, does -- to what extent do the curtailment provisions reduce the stressfulness of a drought, even a drought that is worse than the one on record.

MR. BYRON WILLIAMS: And the insight -- and I thank you for that. And the insight that we get from this is that with the curtailment of exports, mean losses from a more severe drought than the 1940 drought are mitigated to the extent that the losses are below the ni -- the 1940 drought scenario without curtailment, correct?

DR. ATIF KUBURSI: Correct, because this is exactly the way the scenario was constructed, is to keep everything the same except for the curtailment and see to what extent these curtailment provisions are going to mitigate -- cushion the impact of the drought.

MR. BYRON WILLIAMS: Thank you.

THE CHAIRPERSON: Were you assuming that the curtailment had no cost attached to it?

DR. ATIF KUBURSI: Yeah. I mean, the Chair has a -- a very important point here in the sense that if you were to curtail then there would be certain losses that you have to really filter back. We did not take care of that.

CONTINUED BY MR. BYRON WILLIAMS:

MR. BYRON WILLIAMS: That is an important point. Thank you for that, Mr. Chairman. But, Professor Kubursi, let's -- let's follow up on that point for a second, does that affect your overall conclusions in terms of the utility of the curtailment provisions?

DR. ATIF KUBURSI: No, but I mean it's a point to take into account, but the -- the -- the question, and I don't want to go into details because I may slip and say some of the confidential things, we won't, but the curtailment at the level that we did nothing would have made a major change. But depending on what level and what the prices are that would be ruling at the time, these issues may become important. I mean, remember -- I don't know if this is confidential -- can I speak to my counsel?

MR. BYRON WILLIAMS: Please do.

(BRIEF PAUSE)

DR. ATIF KUBURSI: We would like to confer with Manitoba Hydro to see if it is possible for us to talk about it, two (2) minutes.

MR. BYRON WILLIAMS: Certainly. And -- and Mr. Chairman and Mr. Vice-Chair, I should note that Ms. DeSorcy is here taking notes on my performance, so I'll encourage you to be kind to me.

(BRIEF PAUSE)

DR. ATIF KUBURSI: Okay. We got the

clearance. I mean, what -- what we basically --

MR. BYRON WILLIAMS: Just one second. I -- I apologize, Professor Kubursi. Please proceed.

DR. ATIF KUBURSI: Sorry, I didn't notice. No, I mean, we -- we can talk about it. There are -- no liqui -- you know, liquify -- what do you call it? LD is the liquified -- what's the word -- liquidating damages, all right, but there's opportunity cost. But it could also be these things, the market cost could be higher, the contract cost could be higher than the market, or the market could be lower than the contract, so you could buy things, cheaper things and -- and then sell it.

So there are opportunity costs, but these opportunity costs are not in any particular way unless you know the spread between the price of the mark -- of the contract versus the market price.

MR. BYRON WILLIAMS: And just to -- and -- and I thank you for the description. Just to go back to the original question, your conclusions that the curtailments were a -- a major achievement in -- in -- in terms of the new contracts, those are still your conclusions, sir?

DR. ATIF KUBURSI: Yes, to the extent that definitely the opportunity costs are low. I mean, if you could conjure a situation in which the opportunity costs are high, one has to then take into consideration these, and then re-run the situation with these provisions into the equation.

THE CHAIRPERSON: You presumably -- are you suggesting that you could have a curtailment where the -- there's a strong disincentive to actually declare it?

DR. ATIF KUBURSI: Sorry, Mr. Chairman, can I -- I -- I didn't get this one?

THE CHAIRPERSON: There could be a situation in which you have adverse water conditions but the -- the financial conditions be -- be such that the -- that it's a strong disincentive to declare it?

DR. ATIF KUBURSI: Yeah, that's true.

CONTINUED BY MR. BYRON WILLIAMS:

MR. BYRON WILLIAMS: Professor Kubursi, one (1) last question for you and for -- for a few moments anyways, and it's a quick one. I -- I'd just ask you to turn to page 32 of the yellow book of documents, sir. And it's really a definition I'm looking for. On line -- that's page 32 in the top right-hand corner, and it's an excerpt from transcript page 6,335. On line 5, Professor Kubursi, you used the word "covariance." Do you see that?

DR. ATIF KUBURSI: Yes, I do.

MR. BYRON WILLIAMS: Now, I just want to make sure I understand what covariance means and how it compares to correlation, sir. So I wonder if you would agree that correlation and covariance both measure the extent to which two (2) variables move together but co -- correlation removes the influence of the scale of the variables by di -- dividing covariance by the product of the standard deviations of the two (2) variables. Would that be correct?

DR. ATIF KUBURSI: Yeah, that's ab -- that's absolutely correct. I mean, the correlation coefficient is covariance divided by the standard deviation of the two (2) variables, the product of the standard deviation. So it is basically reducing the scale, taking the scale out, but it's about whether variables move in the same direction or in the opposite direction or no direction whatsoever.

MR. BYRON WILLIAMS: And the point you make in this paragraph, it's -- by reference to covariance is you're looking from Mani -- in -- in terms of getting information from Manitoba Hydro in terms of more rigorous analysis in terms of issues like covariance or correlation and the degree to which matters move together.

DR. ATIF KUBURSI: Yes.

MR. BYRON WILLIAMS: And I just want to thank you for agreeing to that definition because it -- it was pretty hard of me -- hard -- hard on me to articulate it. So I thank you for that.

To you, Professor Magee, and we're going to move back into some hopefully not too painful stuff, but a bit painful, I'm going to ask you to turn to the white book of documents at page 20. And to the Chairperson and Mr. Vice-Chair, we're moving along fairly well and I'm -- I'm hopeful that we'll be done for the afternoon coffee break. So, so far, so good.

Professor Magee, you see -- hopefully what you have before you is a -- a document labelled "A Normal Distribution Graph," is that right?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And perhaps you'll forgive me. This was the best I could come up with late on the evening. Just one second. You -- this was the best I could come up with late in the evening of -- of May 5th, so I'm just going to ask you, because I don't think they're relevant, to strike out the word "same as others," "probably more than others." Like, I don't think they're of any purpose to our -- our discussion.

So let's start with the normal distribution. You'll agree that it's -- it's a -- a well-known, perhaps the best known probability distribution, sir. Would that be fair?

DR. LONNIE MAGEE: It's probably number one (1), yeah.

MR. BYRON WILLIAMS: And for those who -- who don't use or are not familiar with the term "normal distribution," it is also known as the -- as a bell curve or a G-A-U-S-S-I-A-N distribution.

Would that be fair, sir?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: You're nodding your head?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And would it be fair to suggest to you that the normal distribution is based on a series of results, the central limit theorems, which suggest that the outcome of a large series of random processes will often approximate the normal distribution.

Would that be fair?

DR. LONNIE MAGEE: That's one (1) of the big motivations for why its used so often.

MR. BYRON WILLIAMS: So, yes?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And would it be fair to say that based on the central limit theorems, if we wanted to look at the outcome of a large series of random processes, we might a priori, P-R-I-O-R-I, assume they follow a normal distribution in the absence of evidence to the contrary?

DR. LONNIE MAGEE: I -- I would want to be more specific, that it's -- that -- that this -- if you're estimating the mean of a distribution by taking the average of a -- a bunch of observations from that this -- that are assumed to have come from that distribution, then that mean of the data is itself an estimate of the true underlying mean of the distribution, that thing has a normal distribution.

But if you observed a -- a whole bunch of observations from a -- any particular distribution, and you used them to draw a histogram, let's say, of -- that's approximating that distribution that they came from, there's no reason why that would be normal, or even remotely like a normal distribution.

MR. BYRON WILLIAMS: And I think -- and -- and we'll see if I've -- I've got your answer correct. And you'll correct me if I'm wrong.

But, if we wanted to look at the mean outcome of a large series of random processes, absent evidence to the contrary, we might assume they follow a normal distribution, a priori?

DR. LONNIE MAGEE: Yes, in the sense that if you repeated the whole exercise over again a bunch of times, and computed the means a whole bunch of times through a histogram of them, it would look like a normal -- yeah.

MR. BYRON WILLIAMS: And if we refer to the gra -- to the graph, an outcome that follows the normal distribution, you'll agree, will be within one point nine six (1.96) standard deviations of its mean 95 percent of the time, correct?

DR. LONNIE MAGEE: Correct.

MR. BYRON WILLIAMS: And Professor Kubursi spoke of this a few days ago and I just thought it would be useful to follow-up on it.

And Professor Magee, you'll agree that two (2) central features of the normal distribution are symmetry and independence.

Would that be fair?

DR. LONNIE MAGEE: Symmetry, yes. Independence, you'd have to say more -- then you're talking about two (2) or more random variables, and you'd -- they can be normal and correlated, or normal and not independent, or they might be independent; that's kind of a separate issue.

MR. BYRON WILLIAMS: Okay. Well, we'll -- we'll start with symmetry then. And symmetry simply means that for each deviation below the mean of the distribution, there is a corresponding deviation above the mean with equal probability, correct?

DR. LONNIE MAGEE: Right. And the -- the way I like to think about it is if you took this picture on page 20, and you put a mirror down right at the middle and you looked at it from one side, it would look exactly the same if the you took the mirror off. So it has the same shape on both sides.

MR. BYRON WILLIAMS: And would that mean that, let's say, an outcome in a certain range above the mean, such as more than one point nine (1.96) standard deviations above the mean, is just as probable as an outcome in the same range below the mean, correct?

DR. LONNIE MAGEE: Correct.

MR. BYRON WILLIAMS: And over a long series of draws from a symmetric distribution the mean outcome should be zero?

DR. LONNIE MAGEE: The mean outcome should be the mean. Should be the -- right in the middle there, yeah. Yeah.

MR. BYRON WILLIAMS: And I apologise for

my inelegant questions about independence before.

DR. LONNIE MAGEE: It's okay.

MR. BYRON WILLIAMS: You -- you'll forgive me for that?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: Let's leave aside -- let's leave aside the normal distribution for a moment and talk about independence.

And in the context of two (2) outcomes, which we will call Adverse Event 1 and Adverse Event 2, would you agree that the term "independent" means that the next outcome is not influenced in any way by the previous outcome?

DR. LONNIE MAGEE: Well, if -- if there's Adverse Event 1 and Adverse Event 2, if they're independent that means that being told whether Adverse Event 1 is occurring or not doesn't help you at all to predict whether Adverse Event 2 is going to occur or not. They're unrelated in that sense.

MR. BYRON WILLIAMS: Yeah, and I should have phrased my question in the sense of probability. If two (2) outcomes are independent, then if the probability of an Adverse Event 1 is 5 percent, i.e., one (1) in twenty (20), then the probability -- let -- let me scratch that question, and -- and I'll move on.

Let's try it in a different way, sir. You're familiar with -- obviously with -- with the term "zero correlation"?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And if we say that there is zero correlation between two (2) events, would it be fair to say that what we mean is that they are independent?

DR. LONNIE MAGEE: It's -- those aren't quite the same thing. It turns out, if they're both normally distributed and have a correlation of zero, then they are independent, but you can come up with cases where two (2) variables are dependent even though they have a zero correlation.

MR. BYRON WILLIAMS: Let's cut to the chase, and maybe this will be more helpful. Let's go to page 40 of the yellow book of documents.

(BRIEF PAUSE)

MR. BYRON WILLIAMS: And, Professor Magee -- it's page 40 of the yellow book of documents.

DR. LONNIE MAGEE: Yes, I have it. Thanks.

MR. BYRON WILLIAMS: Yellow book, page

40.

(BRIEF PAUSE)

MR. BYRON WILLIAMS: And certainly, Professor Kubursi, you can jump in, but I thought I was having this discussion with Professor Magee on -- on independence and other concepts, and I -- I think it might be useful. First of all, what we see here is Figure 6.17, which is described as a worst-case scenario. Do you see that, Professor Magee?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And as I understand it, this worst-case scenario is constructed to include a low water flow at the worst drought on record. Just one (1) second. I'm not sure if we're still -- high import prices at the upset price, which average export prices -- an interest rate that is two hundred (200) basis points above interest, and the dollar at parity. Is that your understanding as well, sir?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And by the upset price are we referring to twelve (12) cents a kilowatt hour?

DR. ATIF KUBURSI: Yeah, that -- that's--

MR. BYRON WILLIAMS: Would that be correct?

DR. ATIF KUBURSI: That's the one.

MR. BYRON WILLIAMS: And the results that flow from this worst-case scenario, you'll agree with me, are fairly grim. Would that be fair?

DR. LONNIE MAGEE: There are large negative net revenues, yes.

MR. BYRON WILLIAMS: That's an add -- a synonym for -- for grim -- for grim. I'll have to remember that, large negative net revenues. But certainly we can take some comfort from your observation just above Figure 6.17 that this scenario has a very low probability of occurrence, especially if it can be argued that these events are independent, correct?

DR. LONNIE MAGEE: Correct.

MR. BYRON WILLIAMS: And you go on to state that:

> "Even when some of these events are not independent, the joint probabilities are low?"

Do you see that?

DR. LONNIE MAGEE: Yes.

(BRIEF PAUSE)

MR. BYRON WILLIAMS: Excuse me for that. And recalling -- or -- my attempts to engage in this conversation with you from a couple minutes ago, I wonder if you can elaborate to a certain degree on -- on what you mean by the very low probability of occurrence, independence, and even if they are not independent, the joint probabilities are low?

DR. LONNIE MAGEE: If -- suppose -- well, one (1) extreme case where things are -- are not independent would be if you had two (2) adverse events and every time one (1) occurred the other one (1) also occurred. Then if -- if that was the case, then let's say a drought of a certain degree of a severity happened 1 percent of the time and high import prices above a certain level happened 1 percent of the time, but if -- if they were independent, the two (2) things would only happen together 1 percent of 1 percent of the time, which would be .01 percent of the time.

Whereas if they were really, really dependent to the extent that they both always happened at the same time, then you'd have a 1 percent chance of them both happening because if one (1) happens they both happen.

So you could have dependence working the other way too, where if the -- the two (2) events might never happen at the same time. In that particular example it's hard to argue, you know, persuasively that they would both always happen or could -- neither could happen. So maybe of the three (3) choices, either never -- never both happening at once, always both happening at once, or being independent, maybe independent is the closest to the truth of -- of -- of those three (3) kind of extreme cases.

But what -- what we had in mind here is that the worst-case scenario has a whole bunch of bad things happening at once. Unless there's some sort of force or reason for you to think that there's a special reason why they should all happen at once, then the chance of this scenario occurring is -- is fairly small -- is small. It's a product -- if they're independent it would be the product of each individual thing happening, which would make it very small.

MR. BYRON WILLIAMS: And let me just follow that through with you because I -- I think, you'll correct me, let's say that we have two (2) events that are independent, both with a one (1) in one hundred (100) chance of occurring. If I wish to calculate their joint probability of occurrence, I would multiply one (1) over one hundred (100) times one (1) over one hundred (100). Is that what you're saying, sir?

DR. LONNIE MAGEE: That's right.

MR. BYRON WILLIAMS: And what's the product of that?

DR. LONNIE MAGEE: Well, one (1) over ten thousand (10,000).

MR. BYRON WILLIAMS: Very good, Professor Kubursi. Okay. So I've got that.

(BRIEF PAUSE)

MR. BYRON WILLIAMS: Moving on, if -- if -- let's say that there was a very strong correlation between them and if I had one (1) one (1) in one hundred (100) event, and another one (1) in one hundred (100) event, let's assume an extreme case that they're perfectly positively correlated, you're prepared to make that assumption?

DR. LONNIE MAGEE: Okay.

MR. BYRON WILLIAMS: Then the joint probability of occurrence would be one (1) in one hundred (100)?

DR. LONNIE MAGEE: That's right.

MR. BYRON WILLIAMS: And let's take the other extreme that they're perfectly negatively correlated, then the joint probability of occurrence be -

- would be less -- zero?

DR. LONNIE MAGEE: That -- it would be zero.

MR. BYRON WILLIAMS: Yeah.

DR. LONNIE MAGEE: And the -- the one (1) --

MR. BYRON WILLIAMS: I needed a bit of help from Professor Simpson on that one (1).

DR. LONNIE MAGEE: So -- so -- I mean, we're -- we're kind of -- if the events are referring to being out in a tail of a distribution, when one (1) -- if they're negatively correlated, one is in one tail and the other one is in -- off in the -- it's just -- it's really far away from being the Extreme Event B, it's the opposite.

MR. BYRON WILLIAMS: Now -- and again, this can go either to, you know -- Professor Magee, you and I are on a roll, so if you wish to continue, you can. I just want to follow up on your point that it can be argued that these events are independent and that even when some of these events are not independent the joint probabilities are low.

And -- and I'd ask you to -- to turn to the white book of documents now, and you'll see the analysis of -- at page 21, the National Bank Report. So that's the white book of documents, page 21, the National Bank Report. Do you have that, sir?

DR. ATIF KUBURSI: Yeah. I -- I looked at the National Bank, so if you want to...

MR. BYRON WILLIAMS: And, Professor Kubursi, thank you for assisting me. And you were -- you -- you've had an opportunity to look at this report, so you -- you have at least some degree of familiar -- familiarity with it, sir?

DR. ATIF KUBURSI: Yes, some degree.

MR. BYRON WILLIAMS: And let me just be clear, if you're uncomfortable with answering any of my questions because it goes beyond your comfort level, you'll let me know, please?

DR. ATIF KUBURSI: Oh, I will.

MR. BYRON WILLIAMS: I thought you might. And before I get to the conclusions or the -- the points that I wish to specifically refer you to, I'm -- it's been some time since the Board has seen this document, and so I -- I was wondering if, at a high level, and I'll walk you through it, you'd be prepared to assist me in reminding persons of -- of what this document attempted to do. Would you be prepared to -- to attempt that with me, sir?

DR. ATIF KUBURSI: Yes, I would.

MR. BYRON WILLIAMS: Excuse me. You might want to start out by turning to the top right-hand corner at page 43.

DR. ATIF KUBURSI: Okay.

MR. BYRON WILLIAMS: And before we get to this section, you'll agree that, at a high level, what the authors of this report were considering was the optimal debt mix for Manitoba Hydro. Would that be your understanding, sir?

DR. ATIF KUBURSI: In terms of fixed versus variable because there are different maturities --

MR. BYRON WILLIAMS: Yes.

DR. ATIF KUBURSI: -- and other issues.

MR. BYRON WILLIAMS: Yes. Thank you for that. And just directing your attention to the section flowing from page 43 through to 47, really what they were trying to do here, sir, was identify the -- some of the key factors in terms of affecting the historical financial performance of Manitoba Hydro. You'll agree with that, sir?

DR. ATIF KUBURSI: Yes.

MR. BYRON WILLIAMS: And -- excuse me. And turning you specifically to page 44, under Section 3.12 --

DR. ATIF KUBURSI: Okay.

MR. BYRON WILLIAMS: -- you'll see that two (2) significant -- they identified at least two (2) significant major macroeconomic volatility factors, being spot forward rate risk in the -- in the MISO system, and foreign currency exchange exposure.

You see that, sir?

DR. ATIF KUBURSI: Yes.

MR. BYRON WILLIAMS: And turning to page 46 in terms of the key risk factors and identi -- turning your attention both to section 3.2.4, you'll agree that another factor identified was short-term interest rates.

Would that be fair, sir? That's in the first --

DR. ATIF KUBURSI: In the first paragraph, yes.

MR. BYRON WILLIAMS: Okay. And another factor that they identified of -- to no one's surprise, is hydrology risk.

Do you see that, sir? Section 3.3.

DR. ATIF KUBURSI: 3.3, yeah.

MR. BYRON WILLIAMS: And we will come to the point in just a few moments, Professor Kubursi, but I just do wish to remind the Board of the methodology.

Turning your attention to page 55 of the report, under Technical Analysis, and the very first two

(2) sentences under that -- that heading.

You'll agree that under their technical analysis, National Bank was attempting to quantify the volatility and correlation of key factors -- of certain key factors, including domestic utility rates, export power prices, including short-term contract spot transactions, and long term contracts, as well as Canadian and US short-term interest rates.

Do you see that, sir?

DR. ATIF KUBURSI: Yes, I do.

MR. BYRON WILLIAMS: And just staying with that same paragraph. They essentially concluded the differences in volatilities between regulated and spot electricity prices, and the correlation to short-term interest rates were a key element of this analysis, correct?

DR. ATIF KUBURSI: Correct.

MR. BYRON WILLIAMS: And turning to page 57 for those who are particularly sadistic, at the bottom you'll see, Professor Kubursi, Table 12, which sets out the variable correlation matrix that they produce.

Do you see that, sir?

DR. ATIF KUBURSI: Yes, I do.

MR. BYRON WILLIAMS: And finally the -- the last background doc -- point I'd ask you to turn to is on page 59, under Scenario Analysis.

DR. ATIF KUBURSI: Yes.

MR. BYRON WILLIAMS: And just drawing your attention to the first paragraph, plus the first sentence of the second para -- paragraph.

You'll agree that they generated a Monte Carlo type analysis by generating a set of ten thousand (10,000) scenarios for each of the identified key fact -- factors which were then applied to a hundred portfolios of different fixed versus floating debt rate mixes.

Do you see that, sir?

DR. ATIF KUBURSI: Yes, I do.

MR. BYRON WILLIAMS: And I apologise for the flipping; we're almost done. Turning back to page 51.

And, Professor Kubursi -- sorry, page 51.

DR. ATIF KUBURSI: Got it.

MR. BYRON WILLIAMS: And specifically at the bottom under Generation Risk, you'll see a reference to the volatility of hydrology and wind levels, and a suggestion on the second last line of this page that this -- this volatility is not a risk that is correlated with macroeconomic metrics such as interest rates.

Do you see that, sir?

DR. ATIF KUBURSI: Yes, I do.

MR. BYRON WILLIAMS: And would you, Professor Kubursi, in terms of this specific con -- conclusion by -- by National Bank that natural weather conditions such as hydrology are not correlated with macroeconomic metrics such as interest rates.

Would that be a conclusion that you subscribe to as well, sir?

DR. ATIF KUBURSI: Well, okay. Can you -- can you take me back to the correlation metrics --

MR. BYRON WILLIAMS: Yes.

DR. ATIF KUBURSI: -- page?

MR. BYRON WILLIAMS: Yes, I can. Just give me -- I think it's the proceeding -- give me one (1) second and I will.

DR. ATIF KUBURSI: Fifty-seven (57).

MR. BYRON WILLIAMS: Professor Magee, good work. Thank you.

DR. ATIF KUBURSI: Okay. And you notice at the top of it in page 57, Table -- Table 12, it's 2005/2009. It's too short a period to make major conclusions.

MR. BYRON WILLIAMS: Fair enough, sir. But in terms of -- let's be clear here though. National Bank, I'll suggest to you, didn't -- didn't compare the relationship of hydrology to -- to interest rates because they were of the view that there was -- as a starting premise, that there is no correlation between the two (2).

DR. ATIF KUBURSI: Yeah, I -- I mean, this is a testable proposition and I would like to see evidence of that.

MR. BYRON WILLIAMS: Have you tested that proposition, sir?

DR. ATIF KUBURSI: No, I didn't.

MR. BYRON WILLIAMS: So you were agnostic on the issue of whether there is a correlation -- positive correlation between hydrology and a macroeconomic metric, such as interest rates?

DR. ATIF KUBURSI: No, I mean, the issue there for us was not that I'm agnostic or not. We were literally trying to establish stress tests. And all the stress tests would be to associate a particular hydrology with a difficult macroeconomic situation, one of which would be maybe high import prices or others.

It's not that we were saying these are highly correlated or not correlated and are they reasonably -- I mean, we know one (1) fact: 2003/2004, the two (2) went together. So we took this as part of the realm of possibility; we did not assign a probability. And we were looking at stress tests when these are corre -- these happen together.

MR. BYRON WILLIAMS: And I thank you for that, but I am focussing you on the relationship, if any, between hydrology and macroeco -- economic metrics, such as interest rates.

And would it be fair to suggest to you that you're a priori assumption would be that there would be no correlation between those factors, or a very modest one at most?

DR. ATIF KUBURSI: I mean, I -- I mean, I will -- it would take a very -- a very special model to see some interconnection among the logic of a hydrology influencing a macro-economy. But the -- the issue here are twofolds.

1. Suppose there is, suppose there isn't. The issue is for me, if I want a stress test where I would look at a drought that is accompanied by a low economic performance or a high economic performance, there are implications that would come, and this was precisely what I was probing for.

MR. BYRON WILLIAMS: And I -- I accept that, but I -- I would just want to make sure that I -- I have an answer to my -- my --

DR. ATIF KUBURSI: Yeah.

MR. BYRON WILLIAMS: -- question.

DR. ATIF KUBURSI: I would say on a theoretical basis, no. But this is a empirical statement for which -- and to which one should really test it.

MR. BYRON WILLIAMS: And on a theoretical basis awell -- as well, a priori, would it be your assumption that hydrology in -- in terms of Manitoba Hydro has a low or close to zero correlation with the relative strength of the Canadian dollar?

DR. ATIF KUBURSI: Okay. I mean, these are certainly and typically created as if they're coming from different systems, all right? But look, I mean, I can conjure a situation, okay? Walk with me. I walk with you several places. Walk with me on this one.

MR. BYRON WILLIAMS: I'll walk with you as long as you come back to my question.

DR. ATIF KUBURSI: I -- I will come back. All right. I mean, if Manitoba Hydro is such an important economic node in the Manitoba economy and a drought is going to compromise its vitality and its earning power, there will be macroeconomic consequences to it. There will be probably higher rates that would eat into the disposable income of people, and probably now that they have to spend more in electricity they spend less on their favourite beer. And in that respect, there -- there would be some implications for this that you need to take into account.

I mean, I could, in some sense, establish some systems where this could be worked and integrated together. But only purely macroeconomic standard, macroeconomic models -- I mean, these two (2) are not systems that people would think of bringing together; they're two (2) separate and different systems.

MR. BYRON WILLIAMS: And I -- I thank you, because that's a -- a very fair and -- and helpful answer. So the a priori assumption would be that the relationship is -- is independent or a modest correlation.

Would that be fair?

DR. ATIF KUBURSI: No, I'm not going to go that far, because I don't -- I don't have a clue.

MR. BYRON WILLIAMS: I was -- I was close though, right?

(BRIEF PAUSE)

MR. BYRON WILLIAMS: I think we've gone far enough on that, and I thank you for your assistance.

(BRIEF PAUSE)

MR. BYRON WILLIAMS: This -- this question can go to either Professor Magee or Professor Kubursi.

But it would be fair to say that you're familiar with the term "price taker"?

Would that be fair?

DR. ATIF KUBURSI: Absolutely.

MR. BYRON WILLIAMS: And could -- could you give us a quick working definition of that term, sir?

DR. ATIF KUBURSI: Yeah, the economic agents, or in this case, the firms are not powerful, have a market share large enough to influence the price.

MR. BYRON WILLIAMS: I apologize for that. And that's a consequence of they -- they not -- they're not being in a position to have enough supply in the marketplace such as to influence price or demand?

DR. ATIF KUBURSI: But the -- the story is more on the supply side.

MS. PATTI RAMAGE: If I could just jump in, Dr. Kubursi, I don't think your mic was on at the beginning of your answer, so I don't think court reporter will have caught that last answer.

DR. ATIF KUBURSI: Last answer, the one about the price taker? Yeah, it --

CONTINUED BY MR. BYRON WILLIAMS:

MR. BYRON WILLIAMS: I -- I think she meant the very last answer, and so maybe I'll just ask it again.

DR. ATIF KUBURSI: Oh, yeah. No, sorry, go ahead.

MR. BYRON WILLIAMS: Or I'll -- I'll attempt to re-ask it, perhaps using different language.

In the context of supply, the reason a firm would be a price taker is that its percentage of the market is not large enough to be otherwise?

DR. ATIF KUBURSI: Yeah. I mean, as you know, we define -- this is the case of what we call pure competition. And for pure competition there are many different attributes, but the most fundamental one is that there are so many setters that no one (1) of them is large enough to influence the price.

MR. BYRON WILLIAMS: And just turning to page 48 of the -- of the yellow book -- the yellow book, page 48 -- you'll see the second part -- page 48, Professor Kubursi.

DR. ATIF KUBURSI: Got it.

MR. BYRON WILLIAMS: You'll see the Corporation's response to Manitoba Hydro number 8. That's page 48 in the top right-hand corner. And in the context of the MISO marketplace, Professor Kubursi, it would be your view that Manitoba Hydro is a price-taker, given that its exports are a very small fraction of the entire market.

Would that be fair?

DR. ATIF KUBURSI: That's correct.

MR. BYRON WILLIAMS: And moving to imports, and again in the context of the MISO marketplace, it's your view that Hydro is a price-taker as well, in terms of imports, given that its imports are a small fraction of total MISO supply?

DR. ATIF KUBURSI: Yeah, I -- I would say so. Yeah.

MR. BYRON WILLIAMS: Professor Kubursi, in -- at page 42 of the yellow book, I'd ask you to turn there now, and you'll see the Corporation -- or Manitoba Hydro's response to CAC/MSOS Information Request 1-62.

Do you see that?

DR. ATIF KUBURSI: Yes, I do.

MR. BYRON WILLIAMS: And I don't want to be unfair to you, Professor Kubursi. Have you had a -- a chance to review this response?

DR. ATIF KUBURSI: Yeah.

MR. BYRON WILLIAMS: Okay.

DR. ATIF KUBURSI: But if you can point

me out so I can...

MR. BYRON WILLIAMS: Well, what I might do, Professor Kubursi, because it's an important response and I -- I want to get your evaluation of it, is -- is walk you through almost the -- the whole response, if that's acceptable to you.

Is it, sir?

DR. ATIF KUBURSI: Yeah, that's fine.

MR. BYRON WILLIAMS: Okay. Starting at the top of the answer, Hydro notes that there are two (2) price -- two (2) types of pricing effects related to market conditions, those being shortage pricing and congestion pricing.

Do you see that, sir?

DR. ATIF KUBURSI: yes, I do.

MR. BYRON WILLIAMS: And they go on to say that:

"Shortage priceage (sic) can occur during tighter supply-and-demand situations when there is a premium over normal prices."

Do you see that?

DR. ATIF KUBURSI: Yes, I do.

MR. BYRON WILLIAMS: And Manitoba Hydro goes on in the third and fourth line of this response to say:

"There was the potential for shortage pricing prior to 2005, when there was no central market in the MISO footprint."

Do you see that, sir?

DR. ATIF KUBURSI: Yes, I do.

MR. BYRON WILLIAMS: And again, I'll give you a chance to comment on this as we go along. I just want to run you through the --

DR. ATIF KUBURSI: Yeah.

MR. BYRON WILLIAMS: -- the response.

DR. ATIF KUBURSI: I mean, one (1) -- one (1) major, you know, just clarification and maybe a comment, is that when we talk about Manitoba Hydro buying imports from the MISO, and it's a price-taker only to the extent, or in any other market, that it is able to access this import from any of the participants in that market.

If, on the other hand, MH is under diversity contracts or is basically into some tight relationship with counterparties, and that it has to be limited to these counterparties, it's not then in that position of being a price-taker.

MR. BYRON WILLIAMS: Okay, and that's a very helpful segue to the next --

DR. ATIF KUBURSI: Because it's coming into this...

MR. BYRON WILLIAMS: -- next part that we're coming into. Now, going to the second paragraph, Manitoba Hydro responds that:

> "Since the establishment of a central market in MISO in 2005, the issue of shortage priceage -- [excuse me] the issue of shortage pricing has been mitigated to a large degree since purchases can now be made from the market at a transparent market clearing price."

Do you see that, sir?

DR. ATIF KUBURSI: Yes, and I concur with it, yeah.

MR. BYRON WILLIAMS: And you agree with that, sir?

DR. ATIF KUBURSI: I agree with it.

MR. BYRON WILLIAMS: And at the bottom of this paragraph, Hydro goes on to say:

> "Hence, in most hours, up to 700 megawatts of imports from the MISO market has a relatively minor effect on the MISO market, assuming no

"...transmission constraint within the market."

DR. ATIF KUBURSI: If there is no transmission constraints and can access and get into the merit price on the day-ahead or in the real time, that's correct.

MR. BYRON WILLIAMS: And in the third paragraph, Hydro goes on to say that:

"The second type of pricing effect related to market conditions is called 'congestion pricing'."

Do you see that?

DR. ATIF KUBURSI: Yes, I do.

MR. BYRON WILLIAMS: And -- and directing your attention to the very last sentence on this page, you see Hydro states that:

"The degree of congestion can be aggravated during severe droughts in the Manitoba Hydro system, where -- when large quantities of imports are required."

Do you see that, sir?

DR. ATIF KUBURSI: Yes, I do.

MR. BYRON WILLIAMS: Now, Hydro suggests in its last sentence in this response that:

"Congestion pricing is expected to have less of an effect on Manitoba Hydro's import prices, compared to shortage pricing prior to 2005."

Do you see that, sir?

DR. ATIF KUBURSI: Yes, I do.

MR. BYRON WILLIAMS: And do you have any response to that point, sir?

DR. ATIF KUBURSI: Yeah. I mean, no question about it, the introduction of the unregulated MISO market gave greater freedom for Manitoba Hydro to access this market and to buy in more opportune times and prices.

But even in this market, there are also issues about congestion. It so happens that some of these nodes, there may be situations in which the transmission capacity is not there to deliver. And -- and in such circumstances charges -- congestion charges could really run high, and these have to be borne by the -- by the buyer, typically.

MR. BYRON WILLIAMS: And I -- I thank you for that, and that's helpful.

Now Hydro's suggestion that congestion pricing is expected to have less of an effect on Manitoba Hydro import prices compared to shortage pricing prior to

2005, do you have any basis to disagree with that conclusion, sir?

DR. ATIF KUBURSI: I mean, I just want to raise some questions here. I -- I mean, I understand fully that now the situation is such that Manitoba Hydro being such a small buyer of power in -- in the MISO market, shortage prices are probably not going to be a prevalent phenomenon. And that's why I'm little bit confused that they have much less congestion, much less than shortage prices.

I would have really thought that shortage prices should now be a situation of the past and that it would not really be such a critical fundamental thing. Congestion prices could still arise and these arise because of certain congestion on a particular node in a particular place.

MR. BYRON WILLIAMS: And just -- just so I understand that last -- part of -- last part of your -- second last part of your response, your expectation is -- would have been that in the open MISO market, 2005, moving forward, that shortage prices -- pricings would have effectively be, by and large, a thing of the past?

DR. ATIF KUBURSI: Well, it's not just the past; it's -- it's not with very high likelihood of occurrence, yeah.

MR. BYRON WILLIAMS: If either Professor Magee or Kubursi would turn to CAC/MSOS Exhibit 27, which is titled, "Exchange Rates-Canadian Cost in US Dollars," two-o-one (201) to two-o-eleven (211).

Is -- is that you, Professor Magee, or Kubursi?

DR. LONNIE MAGEE: We're -- we're both looking at it.

MR. BYRON WILLIAMS: Well, that gives me a little bit of concern.

Well, let's start with the -- the big question. You understand that the underlying data source for this -- for this graph is information provided from the Bank of Canada?

Is that correct?

DR. LONNIE MAGEE: Yes, cert -- yes.

DR. ATIF KUBURSI: Yes.

MR. BYRON WILLIAMS: Okay, good. I don't want you two (2) fighting over me.

And obviously the -- and the underlying data had -- has been provided to you previously and you've had a chance to check it against the Bank of Canada website.

Would that be fair?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And given the authority of -- of the Bank of Canada as a source, you don't take issue, I'll suggest to you -- or, I'll -- I'll ask you, with the underlying data?

Would that be fair?

DR. LONNIE MAGEE: That's fair.

MR. BYRON WILLIAMS: Now if we can, just for the purposes of understanding the graph -- and we'll get to the wavy blue line in just a second -- but I -- just one (1) -- one (1) second.

(BRIEF PAUSE)

MR. BYRON WILLIAMS: Are you having -- are you able to --

DR. LONNIE MAGEE: No, good. We're good, thanks.

MR. BYRON WILLIAMS: Just focussing first on the horizontal axis, you'll agree that the horizontal axis starting at the left and moving to the right represents the months beginning in January 2001?

Do you see that, sir?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And so, for example, the Figure 60 on the horizontal axis, I'll ask you to accept, would represent January 2006, or some sixty (60) months after the starting period depicted on the graph, correct?

DR. LONNIE MAGEE: Correct.

MR. BYRON WILLIAMS: And one hundred and twenty (120) months in would be January 1st, 2011.

DR. LONNIE MAGEE: Right.

MR. BYRON WILLIAMS: Fair enough?

DR. LONNIE MAGEE: Yeah.

MR. BYRON WILLIAMS: And you'll agree that this graph in terms of the underlying information goes out to April, 2011, which is month one twenty-three (123).

Would that be fair?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And the vertical axis represents the value in American dollars to buy one (1) Canadian dollar, correct?

DR. LONNIE MAGEE: Correct.

MR. BYRON WILLIAMS: Now, referring to the two (2) lines on the graph, you'll see the one that is blue, wavy, and fluctuates some -- somewhat up and down.

Do you see that, sir?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And that line represents, at any particular month in time, the amount of American dollars or cents it took to buy one (1) Canadian dollar. Would that be fair?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: So, for example, at month sixty (60), we can see that it took over eighty (80) cents US to buy one (1) Canadian dollar, quite a bit over that, correct?

DR. LONNIE MAGEE: Right. Correct.

MR. BYRON WILLIAMS: And at month one twenty-three (123) we can see that it cost more than one dollar ($1) US to buy one (1) Canadian dollar.

Can you see that, sir?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And you -- you'll also see on -- on the graph a straight line. Do you see that?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And I'll suggest to you and I'll ask you to acce -- accept subject to check that it is a fairly simple trend line derived from the formula printed on the right-hand side of the table.

DR. LONNIE MAGEE: Okay.

MR. BYRON WILLIAMS: I don't know if

you've had an opportunity or you've -- you've chosen to -- to test that or not, sir, or if you're prepared to accept it subject to check.

DR. LONNIE MAGEE: It -- it looks fine. Just -- just a quick -- yeah, the intercept plus the -- looks like set 'X' equal to a hundred, and it's up around point nine four (.94). So, yeah, it looks right.

MR. BYRON WILLIAMS: I wonder if you would agree that if we look to the period from January 1st, 2001, through April, 2011, that we see an upward sloping trend line reflecting the overall appreciation of the Canadian dollar during the two-o -- the period from 2001 to 2011.

Would that be fair?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And you'll agree that depending upon the particular period in question we see movements both above and below the trend.

Would that be right?

DR. LONNIE MAGEE: That's right.

MR. BYRON WILLIAMS: And you would agree, would you not, that, typically, the values around the trend are more likely than values farther than the trend.

Would that be fair?

DR. LONNIE MAGEE: Within the -- well, if you're talking about within the sample period, the...

MR. BYRON WILLIAMS: Yes.

DR. LONNIE MAGEE: Yeah, I guess so. I mean, it's a bit -- a bit of an odd way to look at it because within the sample period we know what the numbers actually were.

MR. BYRON WILLIAMS: Fair -- fair enough. Now, I want to draw your attention to around month eighty (80), being August, 2007. Would it be fair to say that the exchange rate at that point in time was above one dollar ($1) US for a Canadian dollar for that period?

DR. LONNIE MAGEE: Yes, just barely.

MR. BYRON WILLIAMS: And it would be fair to say that the exchange rate at that point in time was well above ninety-three point eight (93.8) cents US for Canadian dollar?

DR. LONNIE MAGEE: If well above means about eight (8) cents above, then, yes.

MR. BYRON WILLIAMS: And if we go to month one twenty three (123), again, it would appear that the Canadian dollar -- excuse me, that it would take more than a dollar US to purchase a Canadian dollar in that period in time?

DR. LONNIE MAGEE: That's right.

MR. BYRON WILLIAMS: I'm going to move on quickly to another subject to fulfill my undertaking to be done by 3:00. The -- and I don't know who this goes to, but I'd like to direct your attention to the yellow book, page 21.

(BRIEF PAUSE)

MR. BYRON WILLIAMS: The yellow book page 21. And -- and I'm not -- and again, if the witnesses feel uncomfortable with this, you'll -- you'll let me know, but just for background of the Board and others, you'll see that between pages 19 and 22 of the yellow book, this is an excerpt from the evidence of Mr. Wallach on behalf of TREE/RCM.

Do you see that?

DR. LONNIE MAGEE: Yes.

MR. BYRON WILLIAMS: And you'll -- you'll agree, I hope, that this excerpt from Mr. Wallach's evidence was provided to your counsel by email a few days ago and subsequently shared with you?

DR. ATIF KUBURSI: Okay. Yes.

MR. BYRON WILLIAMS: And so you've had an opportunity to -- to review this excerpt. Would that be correct?

DR. ATIF KUBURSI: That's correct.

MR. BYRON WILLIAMS: And again, Professor Kubursi, if there's anything that you're uncomfortable with in terms of answering, given that it's not your work, you'll let me know, please?

DR. ATIF KUBURSI: Sure.

MR. BYRON WILLIAMS: And directing your attention specifically to page 21, and I hope it's marked on the right-hand side, although not all of it is apparently, directing -- directing your attention to lines 9 through 17, you'll see a comment by Mr. Wallach in terms of stress tests -- stress tests as presented in the KPMG Report.

Do you see that, sir?

DR. ATIF KUBURSI: Yes, I do.

MR. BYRON WILLIAMS: And just by way of background, I'm not trying to look to create any dissension between you and the PUB in terms of choosing between stress tests and Monte Carlo simulations, I just want to refine our understanding of the concepts.

And -- but you'll see a -- a description by Mr. Wallach. I'll ask you to confirm that:

"Stress tests or scenario exercises to determine financial losses that might occur under unlikely but plausible circumstances, traditional stress testing is conducted on a stand-alone basis, and the stress-test results are highly subjective because they depend on scenarios constr -- chosen by the stress tester. As a result, the value of stress testing depends on scenario choice and skill of the modeller. A related problem is that stress-test results are difficult to interpret because the scenarios are not probabilistic."

And I'm not going to ask you to comment on this just yet, but I'll ask you to confirm that I correctly presented that infor -- that information.

DR. ATIF KUBURSI: You correctly presently this information.

MR. BYRON WILLIAMS: And we're going to come -- go down -- and we'll come back to that in a few seconds, sir, but -- now directing your attention to lines 22 -- still on the same page, lines 23 through 27, and -- and then the first full paragraph on the next page, Mr. Wallach suggests, and I'll ask you to confirm that -- that he suggests this in his evidence, that:

"Stress testing involves making

substantial discrete changes to one (1) or more input assumptions, e.g. water flows, market prices, in order to forecast outcomes, e.g. retained earnings, under unlikely conditions that are considered to be worst case. In contrast, Monte Carlo simulation represents key inputs, not a single expected value, but as probabilistic distributions around expected values. A Monte Carlo simulation will generate multiple, typically one thousand (1,000), forecasts of outcomes, with each forecast relying on a random draw of input values from the probability distribution of each input value. Thus, the Monte Carlo simulation generates a distribution of forecast outcomes, with the expected outcome value reflecting the average over the entire distribution of outcomes and probabilities of extreme outcomes defined by the distribution of outcomes."

A mouthful, but did I essentially read

that correctly, sir?

DR. ATIF KUBURSI: You read it correctly.

MR. BYRON WILLIAMS: And I want to start first of all with Mr. Wallach's description of Monte Carlo techniques. In general, do you agree with his description of it, sir?

DR. LONNIE MAGEE: He's captured the -- the main idea of Monte Carlo, that the distinction between Monte Carlo and the stress tests, I think he's describing the two (2) extremes, and just thinking of what we do in chapter 6, Figure 6.1 that we talked about earlier is like a Monte Carlo simulation, and we viewed Figure 6.2 as being like a stress test.

But in its -- in his formulation here -- excuse me -- it's -- what we did is because we had a whole lot of different random variables, the stress test involved pinning down just a couple of them, the export prices and the water flow, and leaving the other ones still to be random. So in that sense, it's kind of an like an -- it's somewhere in-between. It's a stress test, but it -- on those two (2) variables, but it's still like a Monte Carlo simulation on all the other variables.

DR. ATIF KUBURSI: But -- but more in -- in what Mr. Wallach wanted with the alternative. We're much closer to Mr. Wallach, except that he assumed that any time you pick something as if it's something that you shouldn't do. No. I mean, the stress test here, what we're doing, leave everything random, fix one (1) or two (2), and then use the Monte Carlo, allowing all the other variables to be drawn from their respective probability distributions that we have defined.

MR. BYRON WILLIAMS: And this is a very helpful discussion, and -- and I'm going to come back to both of you, but I am going to start with Professor Magee. And, Professor Magee, as I understood your evidence, if one was looking for a pure expression of Monte Carlo in -- in chapter 6, as presented in -- in your -- as presented by Mr. Wallach, in your view, one should look to Figure 6.1, correct? And you point out that the subsequent figures, being Figure 6.2 through Figure 6.17, are hybrid, in effect, in that they have some fixed variables and some probabilistic elements, correct?

DR. LONNIE MAGEE: Correct. 6.1 is the one that doesn't have any -- by design doesn't have any stress-testing element to it, and the others are -- are all, yeah, stress testing, but still with Monte Carlo simulation, because we haven't fixed all the values of everything, just of some of them.

MR. BYRON WILLIAMS: And just following up -- and this can go to either of you because it follows up on both your comments -- Figure 6.2 through Figure 6.17, by virtue of the fixing of certain variables, can be characterized as generating values but not probabilities.

Would that be fair?

DR. ATIF KUBURSI: No, it's not correct. I mean, ours is ultimately a probability distribution. I mean, all these figures that you're looking at, they're probability distributions. We have -- you know, we have the confidence levels, we have the full map of everything. The only thing we've done, and we wanted to basically stress the situation that this is the six point one (6.1), the benchmark, but now I want to literally allow a drought in, and I want to see how the system is stressed and what's the probability distribution of the net earnings. Not as one (1) figure, there is a minimum and a maximum, there is a 95 percent, there is a -- the 5 percent. We have a probability distribution and this has been generated by Monte Carlo simulation.

MR. BYRON WILLIAMS: Now if I -- now, let's just follow that answer through. If I -- if I went to your worst-case scenario, Figure 6.17, is there a confidence level that you can associate with that result?

DR. ATIF KUBURSI: On the net earnings, yes, but not on every single variable that we introduce, it's only on the outcome.

MR. BYRON WILLIAMS: Just one (1) -- one (1) moment.

(BRIEF PAUSE)

MR. BYRON WILLIAMS: Professor Kubursi, in terms of the worst-case scenario, being Figure 6.17, it would be fair to say that there is no probability association -- no probability distribution associated with the fixed variables that you're testing.

DR. ATIF KUBURSI: That's a fair statement.

MR. BYRON WILLIAMS: Mr. Chairman and Mr. Vice-Chair, I -- I thank you for your -- your patience.

There are two (2) undertakings that we'll be reviewing with interest from our cross-examination which may invite more questions. And then, I've not had an opportunity to review the material file -- filed this morning. So subject to those three (3) caveats, I'll be resting my cross-examination. And I will notify Board counsel if I anticipate that we may require furthering -- further questions.

And I thank professors Kubursi and Ma -- Magee and we do look forward to further discussions.

THE CHAIRPERSON: Thank you, Mr. Williams. We'll take our break, when we come back we'll come back with Mr. Hacault. And for Mr. Hacault's benefit and the -- of course, the panel and everyone else, we're planning to carry on till 5:00, if that's all right with you, to give you a good start.

MR. ANTOINE HACAULT: Mr. -- Mr. Chairman, two (2) things: I'll go through as best as I can, but also part of what I had done today -- I need to go through my questions because I don't want to repeat them needlessly. That would have -- initially we had thought Mr. Williams would take the day and that would allow me to -- to vet some of my questions and my areas of questions for Tuesday. So I'll do my best to go through that.

The second thing I also need to do is to consider the answers that have been given. So I will go through what I have that I think I can do without duplicating things and it will take us to where it takes us, I guess. I'm not too sure whether that will take us to five o'clock, it may -- I may end a bit earlier.

THE CHAIRPERSON: As best as you can do. Thank you, sir. Okay, we'll be back in no more than fifteen (15) minutes.

MR. BYRON WILLIAMS: Mr. Chairman -- Mr. Chairman, I might have just -- I apologize for this, one (1) -- one (1) final question, if I -- if I might.

THE CHAIRPERSON: Well, you might as well ask it now.

MR. BYRON WILLIAMS: Yeah.

CONTINUED BY MR. BYRON WILLIAMS:

MR. BYRON WILLIAMS: Yellow book, Professor Kubursi, page 8, top right-hand corner. Yellow book, page 8, sir. Professor Kubursi, if I turn to Table 6.2, the fourth line, "Drought (1940 Flows, High Import Prices)." Would it be fair to -- and that's the fourth line. Would it be fair to say that there is no probability of occurrence associated with these results?

DR. ATIF KUBURSI: You -- if you mean no probability distribution assigned to imports or to flows, yes.

MR. BYRON WILLIAMS: Okay. Thank you, Mr. Chairman.

THE CHAIRPERSON: Thank you. Okay, we'll see you back no later than 3:15.

--- Upon recessing at 3:01 p.m.

--- Upon resuming at 3:20 p.m.

THE CHAIRPERSON: Okay, Mr. Hacault.

MR. ANTOINE HACAULT: Thank you very much, Mr. Chairman, Vice-Chair, and all. I have distributed to the Board secretary, as if we don't have enough paper, two (2) additional pages which are to be inserted at Tab 75 of our book of documents, and I've given copies to Doctors Kubursi and Magee. So if those --

THE CHAIRPERSON: We haven't got them yet.

MR. ANTOINE HACAULT: Yes, I hadn't put it on your chairs. I had assumed the process you wished was that the Board would have them. We are having them distributed to all parties now.

THE CHAIRPERSON: We have them now, sir.

MR. ANTOINE HACAULT: A short explanation, and there's one (1) typographical error. If everyone has the coloured graph, on the left-hand side at the very bottom there's a number, six nine eight (698). That's incorrect. It should be five nine eight (598). This table is already in the book of documents but not with the additions to the left which are in red and without the black line that goes through the centre of the graph.

THE CHAIRPERSON: We should probably give it an exhibit then, number.

MR. ANTOINE HACAULT: Well, it has --

MR. ROBERT MAYER: Okay, where -- where in the book again?

MR. ANTOINE HACAULT: It would be -- we have empty tabs, and the intent was to have them added. And we'll give you an updated index so that we wouldn't have a whole bunch of documents in a loose format. We had hoped to consolidate everything.

THE CHAIRPERSON: Very good.

MR. ROBERT MAYER: So this just goes in the back of the book?

MR. ANTOINE HACAULT: Correct, and they're all given consecutive pages so that you have the typewritten document with a graph at page 311 and 312. And, finally, the coloured graph is given page number 313.

(BRIEF PAUSE)

MR. ANTOINE HACAULT: While people are organizing those two (2) pages, could they also pull out the direct examination of Doctors Kubursi and Magee, which I understand was marked as Exhibit 4. It was presented in May.

(BRIEF PAUSE)

MR. ROBERT MAYER: Mr. Hacault, what is three twelve (312)? I have three eleven (311) and three thirteen (313).

MR. ANTOINE HACAULT: If you flip to the other side, Vice-Chair, of three eleven (311) --

MR. ROBERT MAYER: Oh, okay.

MR. ANTOINE HACAULT: -- you will have another page, 312.

MR. ROBERT MAYER: Thank you.

MR. ANTOINE HACAULT: I'm trying to save the forests.

CROSS-EXAMINATION BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: Now, if all could turn to the direct evidence at page 13. This is where Doctors Kubursi and Magee give their estimates of the dollar impact of a five (5) year drought.

And also keep these additional pages that I've distributed handy because I'll be asking some questions in correlation with that. So without getting into the details of how you've arrived at a five (5) year drought, there's some dispute about that, my understanding is that it's the impact on net income as opposed to actual losses. Is that correct?

DR. ATIF KUBURSI: Yes, it's correct.

MR. ANTOINE HACAULT: Okay. And Manitoba Hydro, as part of PUB/MH Interrogatory 81, filed a response with respect to the revenue impact based on IFF -- or the load forecast 2009 and the forecast export/import prices updated. And as I understand it, that's listing, historically, from 1912 up to 2005. Have you seen that table that I've distributed, sir?

DR. ATIF KUBURSI: Yes, I see it.

MR. ANTOINE HACAULT: And when we talk of a variation of net revenue from average in that table, although I wasn't able to find a consequence of a one (1) year drought at 788 million, which is shown on page 13, there are two (2) instances where the financial impact come fairly close to that. One (1) being in 1940, if everybody locates 1940 and goes across the line, there's a variation of net revenue of 747 million. Have you found that?

DR. ATIF KUBURSI: Yes, I have it.

MR. ANTOINE HACAULT: And the other one (1) in 1988. There's, again, a variation of 744 million.

So am I correct in understanding that even though there is that impact on net income, it really depends as to what your projected average income is going to be as to whether you're actually going to have a loss and have to dig into retained earning or some other form of borrowing. Is that correct?

DR. ATIF KUBURSI: That's correct.

MR. ANTOINE HACAULT: And if we look at the graph at page 313, what that graph on the left-hand side has in red, it refers to the interrogatory that we just have looked at, being Manitoba Hydro Interrogatory 81. And from the Manitoba Hydro information, which is at page 312 of the document I've given, Tab 75, at the very end of that table, there is, in bold, a heading, "Average." And then there are numbers across from that heading. Have you located that?

DR. ATIF KUBURSI: I have.

MR. ANTOINE HACAULT: Okay. So that the net revenue with the variations in -- in the rates that have existed over the years on average is $202 million, correct?

DR. ATIF KUBURSI: Correct.

MR. ANTOINE HACAULT: So that one (1) of the things I had gone through with previous witnesses is that there's two (2) ways to look at the variation of flow and the impact on revenue. One (1) has been depicted by the Manitoba Hydro table, which is now amended with the big black line. It shows a zero with about a third, I think, according to the evidence, of the green bars above that line, and about -- or, sorry, two-thirds (2/3) above the line and one-third (1/3) below the line.

Correct? Are you following me?

DR. ATIF KUBURSI: Yes.

MR. ANTOINE HACAULT: Okay. So that -- am I correct, then, if I looked at the table, and based on your understanding of the review of the evidence, that there are many years which are -- have been categorized with big circles as drought years, where there is still net income being produced by the Corporation.

So, for example, when the Chairman has been referring to the long period with the two circles on the left-hand size of page 313 of -- of being more than a five (5) year drought, and we see that there's -- of all those years, there are more years where there is still net income than losses. Is that correct?

DR. ATIF KUBURSI: Maybe it would be better if we go through the table because the table is showing that over the years -- like, let's look 1937 to 1942, they're all negative.

MR. ANTOINE HACAULT: Okay. That's the variation of -- from net revenue --

DR. ATIF KUBURSI: From -- from --

MR. ANTOINE HACAULT: -- average.

DR. ATIF KUBURSI: From average, yes.

MR. ANTOINE HACAULT: And then, if you go to the line immediately next to that --

DR. ATIF KUBURSI: Yes.

MR. ANTOINE HACAULT: -- which is the net revenue, would -- that's the line that would show you whether you --

DR. ATIF KUBURSI: Right, so --

MR. ANTOINE HACAULT: -- actually have a profit or loss, correct?

DR. ATIF KUBURSI: Right. 1936 would be 43 million. 1937, 104 million. And they become negative afterwards till 1941.

MR. ANTOINE HACAULT: So out of the seven (7) years of -- that have been categorized as a drought, 1936 is a $43 million profit. Correct?

DR. ATIF KUBURSI: Yes, correct.

MR. ANTOINE HACAULT: And 1937 is $104 million profit. Correct?

DR. ATIF KUBURSI: Correct.

MR. ANTOINE HACAULT: And that's what

we've been talking about as drought years. Correct?

DR. ATIF KUBURSI: Correct. But -- but why is this number more important than the opportunity, which is you usually make money, and now you're making much less.

MR. ANTOINE HACAULT: Okay. Well, and that's -- that's, I guess, a debate that we'll have in -- in submissions and -- and arguments, Dr. Kubursi. If the purpose -- and -- and that gets to some of the recommendations that you had on mitigating and providing kind of -- I'm going to practically say an insurance fund. Do we need to insure against profits is the question we'll have to ask ourselves. If we're still being profitable and adding to our retained earnings, do we need to insure against making profits?

DR. ATIF KUBURSI: Okay, yeah.

MR. ANTOINE HACAULT: Do you understand -- is that a normal thing that you would see if a company is profitable, to ensure against profitable years?

DR. ATIF KUBURSI: Yeah. See, because there are two (2) concepts of profit. The concept of the accountant is whether you have positive or negative. The concept of the economist is: What are your opportunities?

MR. ANTOINE HACAULT: Okay. And I gather

you probably wouldn't have surveyed Manitobans to ask them whether they want to have rates increased in years where they make profits. A drought year, they're making profits. Why should they put money aside when they're still making profits? They -- they maybe have a view that, while they're making profits, they don't need to put aside for that eventuality.

DR. ATIF KUBURSI: Yeah, yeah.

MR. ANTOINE HACAULT: Is that fair?

DR. ATIF KUBURSI: Fair enough.

MR. ANTOINE HACAULT: So when we -- when you have talked about the consequences of a drought, letting aside for the time being whether or not there's agreement on how you got there with the inputs, et cetera.

It's not from an accounting perspective. The public, when they see three point three (3.3) might think, Oh, well, we're gonna have losses of 3.3 million -- billion dollars, but that's not the case, correct?

DR. ATIF KUBURSI: That's correct.

MR. ANTOINE HACAULT: Now, I'd like to take you and have you explain to me -- and I apologize if I'm asking some of these questions, and you'll have to help me, maybe, in the vocabulary.

I'm now switching you to what Mr. Williams was referring to as -- as his yellow book of documents because conveniently on the first page of that book there's Figure 6.1, which is the base case that has been used by both of the doctors.

DR. ATIF KUBURSI: Correct.

MR. ANTOINE HACAULT: And my question -- and not under -- understanding your software well -- well enough, are you able to produce or have you saved -- I'm maybe calling it incorrectly, but a pro forma -- the data that underlines a particular result?

So, let me try to explain that a bit further. In the extreme left, as I understand it, there's about $186 million loss is one (1) of the scenarios, correct?

DR. ATIF KUBURSI: Yes.

MR. ANTOINE HACAULT: Now what data does the software use or what were the base of the fifteen (15) points that were inserted that makes it such that you arrive at a number of negative $186 million? Are you able to print that out? Is that something that we can see?

DR. ATIF KUBURSI: Yeah, yeah, we can print it.

MR. ANTOINE HACAULT: I would request that as an undertaking.

And would you be able to do it for -- and it can be arbitrarily chosen, but in the left five (5) percentile choose the most extreme to the left, somewhere in the middle of that data point, and somewhere closer to the ninety-five (95) percentile number just so we have a little bit of a sampling as to what data the computer was putting to arrive at those numbers. Could you do that?

DR. ATIF KUBURSI: Yeah. As you know the computer would use the probability distributions. And I can provide you the numbers and the probability distributions with them.

MR. ANTOINE HACAULT: That would be fantastic. So for three (3) points there.

(BRIEF PAUSE)

MR. ANTOINE HACAULT: Now, for example --

MR. GAVIN WOOD: Just one (1) second.

CONTINUED BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: Okay. Maybe I could explain a bit more on the --

DR. ATIF KUBURSI: Yeah, yeah.

MR. ANTOINE HACAULT: -- record. For example, there's an underlying value for each of -- for example, wages would be derived from Figure 6.33 -- one for the exchange rate six point one eight (6.18).

Would there be an underlying value at a specific point on that graph that you could give us?

DR. ATIF KUBURSI: Yeah. Mr. Hacault, I mean, what we do is we have the input data that goes into @RISK, it generates this probability distribution. This is why probably I got confused.

You can't see from the data anything more than what we have in this figure. But what I could give you is the set of data and the distributions of each of the variables that went into generating it. But once the output comes it's nothing more than the picture that you see.

MR. ANTOINE HACAULT: So there's no way to understand, for example, if on the extreme left when we show the $186 million, whether the exchange rate was at seventy (70) cents or whether it was at ninety-three (93) cents?

DR. ATIF KUBURSI: No, thi -- this -- this is -- this is not something that I -- we could go and deconstruct the system to do. It just basically takes these variables and then generate thousands upon thousands, you see, and these are the one that plotted here. But I can't go and refer from this to any particular value of the variable that really gave rise to it.

MR. ANTOINE HACAULT: So --

DR. ATIF KUBURSI: I can give you a much bigger or, you know, wider description, but I would not be able to go to one-to-one basis.

MR. ANTOINE HACAULT: Thank you. And -- and that's why I prefaced my question. I am not -- I wasn't too sure whether your software would be able to do that. Because it would have been useful for us to know, for example, say -- I shouldn't put it this way, but how unlikely and maybe unreasonable from, you know, just a conceptual perspective you'd say, Well, listen, you know, it's assuming fourteen (14) cent power. Well, that's not happening, you know. But we can't tell -- we can't have that kind of precise data as to what the machine was thinking when it spit out the $186 million dollars.

DR. ATIF KUBURSI: The logic that you are describing is exactly where it goes, but we can't go and get for one (1) -- for every one of these one thousand (1,000) runs the specific values it picked from the random distributions for each and every variable.

MR. GAVIN WOOD: So -- so as I'm understanding then, sir, there is no undertaking then?

MR. ANTOINE HACAULT: Well, I think the

undertaking is we can't provide it.

CONTINUED BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: Now, if I ask you to turn to page 59 of your direct testimony, please.

DR. ATIF KUBURSI: I have it.

MR. ANTOINE HACAULT: This is Table 6.2, where you describe certain values of the net impact and impact on net revenue without interest costs. And there are different scenarios which are ascribed here. One (1) would be high import prices, that's in the middle of the table, together with the 1940 flows, correct?

DR. ATIF KUBURSI: Number 4?

MR. ANTOINE HACAULT: I believe it's a four (4) -- yeah, the fourth -- fourth line.

DR. ATIF KUBURSI: Yes.

MR. ANTOINE HACAULT: Mr. Williams went through with you where Hydro is exporting and importing basically through the MISO market. What's the likelihood that the high import and export prices would be identical if you're in the same market?

DR. ATIF KUBURSI: I mean, the -- the question is quite -- quite relevant in the sense that you're in the same market whether you're a buyer or a seller, and there is an equilibrium price or merit price that is available for both. The -- the issue is, if you are able to access the same amount exactly from that market that you're in, you can't -- it's -- it's -- I don't know to what extent could you possibly think that you will be a buyer and seller in that market at the same time.

MR. ANTOINE HACAULT: So I don't want belittle the two (2) examples, but, again, we don't know anything about the probability of that event occurring. It's just a stress test.

DR. ATIF KUBURSI: Precisely, it's a stress test.

(BRIEF PAUSE)

MR. ROBERT MAYER: I -- this issue of buying and selling into the same market, Manitoba Hydro's been clear that on the same day they may be buying off peak and selling on peak, which presumably is into the same market, so I'm not sure that that's as absurd as it seems to sound.

DR. ATIF KUBURSI: But -- but at different times. You see my worry was -- is that, you know, how could these prices be different. Yeah, they could be different. You could be selling off peak, you could be buying on peak. You could be selling in this market tomorrow and you're buying today. And these prices are not necessarily exactly one (1) and the same. That's the one (1) I wanted to establish.

CONTINUED BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: And that would be a useful exercise if we knew the probability of those items and -- and that spread occurring with any measure of accuracy, correct?

DR. ATIF KUBURSI: Correct.

(BRIEF PAUSE)

MR. GAVIN WOOD: Could I just have a moment, please?

(BRIEF PAUSE)

MR. GAVIN WOOD: Mr. Hacault, as you can see, there -- there just was a discussion, I think they -- they want to consider again that request to provide an undertaking of seeing whether they can show some meaningful data as to how the -- the runs were performed. And I think the concern is they don't want to undertake something that ultimately they can't -- they can't give, but they obviously would like to cooperate so that you have some data that you can take a look at to see if that charting does -- is -- is meaningful.

DR. ATIF KUBURSI: You see, we can stop at the 10th percentile, the 20th percentile and go on, but there would be no chance, given the software, that we can make these correspondences between that level of net revenue and a particular exchange rate at that level.

CONTINUED BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: Can we leave it this way then, that you'll do your best to try and provide some kind of a response, and if that means having a brief discussion with your counsel or with yourself to see whether something meaningful can be provided, we can -- we can have that discussion.

MR. GAVIN WOOD: And just one (1) moment.

(BRIEF PAUSE)

DR. ATIF KUBURSI: We're trying to see if we can do it before Tuesday. The -- you see, I'm staying around, you know. I'm not going and coming. And -- and we have a number of undertakings, but later on, if this is okay, we -- if the panel would allow it, we would be more than happy to do it.

CONTINUED BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: Could you, because I'm going to royally screw this up, try to explain what you're going to try to do with respect to Figure 6.1 and, I'm going to say, the tail end to the left of the $200 million number? Can you describe that right now for the reporter so -- because we need some kind of a description of the undertaking.

DR. ATIF KUBURSI: Yeah. I mean, what we typically do is we get the input data -- it will be old numbers, just one (1) column -- and then we have the formula at the end that will say price times quantity, and this is the total revenue minus the total costs, all the elements of cost. And then you make every one of these variables a random variable, and you go back to the numbers that you have over five hundred (500) --

MR. ANTOINE HACAULT: If I can -- if I can just interject, we're not looking for a full explanation of the model. We're just looking for an explanation of the data you're going to try to provide us because she needs --

DR. ATIF KUBURSI: Yeah, yeah.

MR. ANTOINE HACAULT: -- some kind of a description.

DR. ATIF KUBURSI: Okay, but -- but that's precisely what I was trying to do, but ultimately what we will do, instead of producing the full distribution here, we will only concentrate on giving you all the data in an exaggerated way, so you could see it at the tail end of it, which I thought that's what you were asking for.

MR. ANTOINE HACAULT: Thank you very much.

--- UNDERTAKING NO. 150: Doctors Kubursi and Magee to provide data re: Figure 6.1

CONTINUED BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: Could you turn to page 24 of your direct evidence, Doctors, please?

DR. ATIF KUBURSI: We have it.

MR. ANTOINE HACAULT: Page 24 is preceded on page 23 by a heading Misalignment Problem or Issue, and it talks about the risk and -- and your views of the risk issue of various stakeholders involved in -- in this process.

My question is: Have either of you

doctors had the opportunity to meet with representatives of the province to get a better understanding of the risk tolerance that the province wishes and is prepared to accept with respect to the Utility and its plans?

DR. ATIF KUBURSI: I mean, if you -- counsel, please, tell us who do you mean represents the -- I mean, are you talking about the minister, the deputy minister, the premier? I mean --

MR. ANTOINE HACAULT: Well, it would be anybody from the assistant deputy level above.

DR. ATIF KUBURSI: I mean, we -- we did not.

MR. ANTOINE HACAULT: Okay. You wouldn't be aware, sir, then, of the meetings that would occur between Manitoba Hydro representatives and representatives of the province with respect to the Utility, its plans, and its financial status?

DR. ATIF KUBURSI: No, we're quite aware and we know how many oversight committees and with whom they meet. I mean, that one (1) we know, but we have not gone to these committees ourselves and asked them: Is your risk tolerance exactly similar to the one (1) of Manitoba Hydro? No, we didn't do that.

MR. ANTOINE HACAULT: And I'll go to the -- the next level. You make some statements with respect to tax payers, generally Manitoba tax payers, and I distinguish those between ratepayers and I'll explain why later.

You haven't had any statistical study or any kind of survey information as to what the risk tolerance of Manitoba tax payers would be, would you?

DR. ATIF KUBURSI: You see, the story is misalignment. And our proposition was -- and this is basically the whole story that came with Bernoulli who said that people pay the same price but they have different utilities, and even two (2) individuals will have two (2) different assessment of the risk. What we were basically and fundamentally underlining here, that there is a misalignment problem whenever you have more than one (1) party dealing with a particular issue of risk.

And here we aggregated -- one (1) on -- on the one (1) side we have the Corporation, on the other side the ratepayers, and also the tax payers, because each and every one of them, at one (1) level or the other, would be involved either in the decision or the consequence.

MR. ANTOINE HACAULT: But my point to you and -- and the point of the question, sir, is that it's speculation by yourself as to what the -- their tolerance is for risk. You don't know because you haven't done a survey of those people to know whether there is a misalignment or whether they're unanimous with the province on what their risk tolerance is.

Isn't that correct?

DR. ATIF KUBURSI: It is correct in the sense that we did not have a survey. Our issue is that there is ample reasons to believe, and there is quite a bit of literature on this, there is a misalignment problem among even two (2) parties with identical utilities, because of the way they perceive these things.

So we we're raising here the issue about the existence of multiple parties and the theoretical issue of having difference tolerance for risk. That's all we need. We don't need to know whether it's a -- you know, this much or that much. All that we really need is that the two (2) are not identical.

MR. ANTOINE HACAULT: So am I to take it you believe that they may not be identical, but you wouldn't be able to tell us because you have no specific literature on Manitoba tax payers to base that conclusion on; it's just general literature with respect to that in a very general way?

DR. ATIF KUBURSI: No, I mean, I won't go that far. But all I would like to really say, is that we know that people in general -- and we know it from the way they behave with respect to lotteries, or casinos, or other betting, that they are risk adverse. Corporations are typically more tolerant of risk, even when they're conservative, and that there is very little likelihood that the two (2) risk tolerance and appetites are identical and equivalent.

MR. ANTOINE HACAULT: So am I understanding you correctly, if I switch to ratepayers, even between the Manitoba Hydro ratepayers, it's your view that there would be different risk tolerances, depending on whether -- what type of consumer they are of electric power and what type of entity they are?

DR. ATIF KUBURSI: Yeah, well, in general the people are more risk adverse than corporations.

MR. ANTOINE HACAULT: But you would agree then, sir, that tax payers in this province are comprised both of corporations and of individuals, correct?

DR. ATIF KUBURSI: Yeah, but primarily individuals.

MR. ANTOINE HACAULT: And if we switch to ratepayers, you would agree that ratepayers may have different priorities than a tax payer?

DR. ATIF KUBURSI: In -- indeed.

MR. ANTOINE HACAULT: So if we have a

northern person that has different consumption of electric power than a City of Winnipeg person who has options as far as gas, they may have different priorities?

DR. ATIF KUBURSI: Yes, it is a possibility.

MR. ANTOINE HACAULT: And the -- the same thing; you heard the presentation of one (1) of the members of MIPUG who consumed -- I think it was $48 million of hydro electric power. That company might have different priorities and risk tolerances than say, for example, another company in the City of Winnipeg, like Great West Life, that has an office building with employees and doesn't consume very much power as part of its output of services?

DR. ATIF KUBURSI: Precisely. That's why I say there's misalignment.

MR. ANTOINE HACAULT: How do we know what the misalignment is if we have different people with different priorities in the same group of ratepayers?

DR. ATIF KUBURSI: I mean, I'm willing to concede that there are in among the ratepayers, even among individuals, there are -- people are risk lovers. But, in general, the consensus is, and lots of experiments have been made, that these people have what we call technically quadratic utility functions, which means there is marginal -- there is decline in the marginal utility of wealth. A dollar gain -- the utility of a dollar gain is not equivalent to a dollar lost.

MR. ANTOINE HACAULT: I think I'll move on to another subject, which is: There was some suggestion at page 22 and 23 in the discussion, that there was moral hazard problems within the utility.

Sir, are you aware as to whether Manitoba Hydro employees have any incentives to take additional risk, such as private corporations might have, in the nature of stock options or increased compensation?

MR. ATIF KUBURSI: No, I -- I -- you know, there was never any -- and I want to make it very clear, any intention or any suggestion here that people at Manitoba Hydro undertaking of certain risk is for any self-enrichment or aggrandisement. But what we really said, that the incentive regime that governs the way corporations and individuals behave, whenever you have a situation in which you have an entity that is insured for its mistakes and for its risk taking, it would behave differently than an entity where this regime or insurance does not exist.

MR. ANTOINE HACAULT: And, as I understand your evidence, that's why you recommended the middle office function.

Is that correct?

DR. ATIF KUBURSI: In -- in many respects, yes, we would like to really see that the middle office vets and -- and that multiple checks and balances exist within the organization.

MR. ANTOINE HACAULT: Now, this is a question I've asked all the consultants, because there were various risk issues that were identified. And I just want to make sure I have your complete answer on this issue because I see there was part of an undertaking provided earlier today. The first thing was with respect to the organizational structure of Manitoba Hydro. In the scoping of this Hearing there was a question as to whether the internal capabilities and governance structures of Manitoba Hydro are sufficient.

So, firstly, with respect to the internal capabilities and governance structures, is there anything that has come to your attention during the course of this Hearing that is not dealt with in your report, or answers to undertakings, that you wish to add with respect to the internal capabilities of Manitoba Hydro?

DR. ATIF KUBURSI: As you know, I mean, there were issues involving the proper placing and the -- the positioning of the middle office. The risk management and governance at Manitoba Hydro is an evolving one and has moved considerably in the past few years.

There are ways in which we felt that this governance could be strengthened, all right? And now it's becoming clearer that some of these things have really been addressed. We wanted to see that an individual office and person is associated to generate a sense of ownership on ever single risk. We have now, and we're being given an undertaking by the panel to look further into it and we are.

We wanted to see that the Risk Management Committee is put in a way in which it can exercise its functions at a responsible and authority level commensurate with its responsibility, and we wanted to see it elevated to report and even sit into the senior vice-president office.

There are a number of issues that we have raised in our report that we feel will strengthen, will align more the risk governance in management at Manitoba Hydro with what we call best practice.

MR. ANTOINE HACAULT: And do you have any sense, Dr. Kubursi, whether there is resistance at Manitoba Hydro to any reasonable recommendations that are being made?

DR. ATIF KUBURSI: Actually, I would probably go even the contrary. I mean, we've seen and we were discussing this actually at lunch. We're quite impressed with the responsiveness in things, but there are certain things we'd like to really see more and faster.

I mean, I've seen quite a bit of things coming from Manitoba Hydro about emergency training drills and things. I -- I'd like still to put my hand on a drought prepara -- preparation manual.

MR. ANTOINE HACAULT: And we understand it, but -- and thank you for your answer, but do you understand the line of questioning, firstly, is there a problem with the organization; you've answered that. Secondly, is -- because some corporations might have, I'm going to say an attitude problem, they -- they know everything, they -- they don't -- aren't open to suggestions or recommendations, and what I'm hearing from you is the Public Utilities Board and the Manitoba ratepayers don't have to be concerned; they've got a responsible corporation that takes reasonable recommendations in a very serious manner.

Is that correct?

DR. ATIF KUBURSI: It's correct. And I just put an undertaking and it's with you -- I don't know what exhibit it is -- in which I looked at KPMG recommendations and the way -- responses that Manitoba Hydro had made, and I found that there are certain areas that I had flagged -- that we had flagged, that we would like to really see a continuation and a quicker delivery, and that some of the responses we are reviewing. And this is not anymore the time for review; it is time for action. Let's see what -- what things are coming up from it.

It is Exhibit KM-6.

MR. ANTOINE HACAULT: The next area that I covered with most of my witnesses was the -- or the witnesses I was cross-examining is the Crown Corporation's approach to risk management, whether it was appropriate or not.

Do you have anything further to add, apart from what's in your report, or answers to undertakings on that issue, on the approach to risk management?

DR. ATIF KUBURSI: We've never been -- we cannot be accused of being short on recommendations and things.

MR. ANTOINE HACAULT: But there's nothing further to add that hasn't been put in -- in the reports?

DR. ATIF KUBURSI: No, no, I mean --

MR. ANTOINE HACAULT: I just want to make sure you had the opportunity to answer that.

DR. ATIF KUBURSI: Right. I mean, pages 27 and all the way to -- yeah, 27 and 28, we -- we -- we have summarized some of the things. But our report outlines and details, you know, the concerns and recommendations and what we would like to see take place to -- we've always seen our -- our position as being helpful.

MR. ANTOINE HACAULT: Next I'm going to ask some questions with respect to -- there was some issue as to whether or not Manitoba Hydro should be maximizing profits or not. And I just want to make sure I understand your -- the evidence of -- of the doctors on this.

Is it your view that the way Manitoba Hydro is approaching income generation inappropriate?

DR. ATIF KUBURSI: Okay. I'm -- I'm glad you're asking me about this. And in our evidence we explained it. Maybe it's -- it's also a good opportunity to go through the logic that we have been suggesting here.

We said that Manitoba Hydro cannot set its own price, all right? It cannot even choose its quantity. It has made it -- its overriding objective to meet domestic load. So it's quantity constrained, price constrained, in the domestic market.

It has long-term contracts where it would be also quantity and price constrained in the export market. The only little place where is left for it to make any choices would be in the opportunity market, and that is really a small -- a 14 percent or something, 16 percent, all right?

We said that probably a far more meaningful objective would be here, is -- and over which it has considerable control, is to minimize costs, to be extremely efficient. Given all these revenue values set, it would maximize its profit by minimizing its costs. You can't do much about the price, about the quantity. Let's make sure that we have the most efficient organization and the most efficient production, the most efficient generation by reducing losses, the most efficient transmission that we could possibly have.

And that's why -- and -- and there is an optic things -- you're a natural monopoly, regulated Crown corporation; it would make much more sense to look more responsive and responsible by minimizing costs and creating the greatest efficiency, then seeking the same way as any private corporation: the maximization of profit.

MR. ANTOINE HACAULT: Now, you may not

have seen that, but in the -- some of the cross-examination I conducted before, I asked whether or not there were any directives from the Chief Executive Officer, Mr. Brennan, and some memos were provided indicating some concerns, I'll parafry -- paraphrase it that way, with respect to cost control cutting measures. And I had also gone through a number of extracts of decisions from Board members in previous hearings where they were concerned about that issue.

Do you have any specific recommendations that you might make to this Board as to how, with respect to a Crown ol -- monopoly, there's some mechanism to encourage cost control and -- and measure it? For example, universities might have to, or hospitals might have to, do a zero budget or a cost-of-living budget and explain how that might achieve and what they might have to cut.

Is there any kind of recommendation, based on your experience, as to how the Board could be assisted in its concern, and how we could measure those things in upcoming hearings?

DR. ATIF KUBURSI: I mean, this has not been a major focus of our reports. I mean, our terms of reference were, to a great extent, to the risk management.

But Manitoba Hydro has a number of models, and the objective function that they use in the optimization is maximize net export revenue. I would like to see that this can be turned around and run as minimize the costs of a given level of generation that is required for domestic and long-term things. And you would see that there would be solutions that would come, optimizing solutions that would come. I would like to compare them to the ones that would come from just purely maximizing net export revenue.

MR. ANTOINE HACAULT: But I don't understand how a model could -- could tell you that. For example, how does a model tell you that about how many -- you've -- you've asked that they add some employees to enhance their capabilities; how can a model tell you whether you have to add or remove employees, and whether they're running the operation efficiently?

DR. ATIF KUBURSI: No, a model would, all right, in the sense that what the model would do, any -- any of these optimization models would literally compare different specification of costs, whether it's labour or machinery or depreciation or assignment of people, and will give you a complete different menu of ways where you would have rooms to compare alternatives.

I mean, you can't expect anybody to be in their chair and then to know exactly how much they produce, at what time, and -- and what hour and what market. Usually the models will -- will give you some outposts that will guide you in this way. It will do the same thing by telling you that you -- there are efficiencies that you could generate in this area if you were to use this time or at night or at day or this type of labour or that type of labour, or that you buy this purchase fewer here -- I mean, I cannot sitting down here, but I can assure you that a person like me who works with these models, that I could give you a number of examples that these models would tell me that you could optimize and minimize your costs, subject to these constraints that are typically specified, and you'll -- you'll get a different solution than a profit maximization or a net revenue maximization would have suggested.

MR. ANTOINE HACAULT: I'm not too sure I understand how the Board might be able to use this in -- in future hearings and -- and even how Manitoba Hydro might be able to use what -- what you're saying. Are there any models that tell us, for example, how you run projects more efficiently in northern Manitoba where you have to train people and -- and house people, et cetera?

DR. ATIF KUBURSI: No. I mean, you're --

you're only looking at it as if it's only training people, firing people. No, there are many other efficiencies that could come, efficiencies in -- in the way you produce particular set of outputs, the way you combine your inputs, the way you would assign different functions.

I mean, I cannot, just sitting in here, but these are the same models that we're using. I mean, I'm talking nothing new here. I mean, HERMES and SPLASH and other ones, by looking at a different objective function, will gen -- will generate different bases, which we call solutions, and these solutions may really look different than the ones that we are using now in order to maximize net revenues.

MR. ANTOINE HACAULT: I'll move on to another subject. Thank you very much for your thoughts. You've suggested in your report that water and storage might also be used to deal with risk issues, correct?

DR. ATIF KUBURSI: Correct.

MR. ANTOINE HACAULT: Are -- do you know, for example, how long it takes, if we decide -- if Manitoba Hydro decides to release water from Lake Winnipeg into its dams up north, now long it takes to get to the dams?

DR. ATIF KUBURSI: Yeah, I know it's a

long distance and a long period of gestation, but we had a much serious issue for us than the amount of money or the amount of time it takes.

Our argument was the following: We did not want to depend solely, exclusively on retained earnings. We felt that retained earnings as a financial fund can be used for other things and -- and lots of rating agencies and other groups that always look at the retained earnings, accumulated retained earnings, whether it is the investment-coverage ratio or the debt-equity ratio and things. We wanted basically to have adequate amount, but also complement, supplement, add on things.

And we felt like three (3) other things could come to play here, one (1) of which is the amount of water storage. We know that, you know, one foot extra is about 2,000 gigawatt hours and, at fifty dollars ($50), it means 100 million or something like this. I mean, the amount of money we're talking about is not very much, but -- but not -- but not anything to forget about.

But we've also been concerned that that might be another way of giving incentives to the management to be more conservative and leaving more water into the system to meet expected shortfalls in the future. So this is basically part of our mitigation, part of our conceptualization of what a risk-management strategy would be.

We also said we wanted, and I'm sure you're not happy about this, an -- a rider to the -- to the rates. And we suggest that --

MR. ANTOINE HACAULT: I -- I will deal with that issue. Could we just, you know, stick with the water.

DR. ATIF KUBURSI: All right.

MR. ANTOINE HACAULT: So water storage. And -- and I'll let --

DR. ATIF KUBURSI: Water storage, okay.

MR. ANTOINE HACAULT: I'll give you the -- the opportunity to talk about --

DR. ATIF KUBURSI: All right.

MR. ANTOINE HACAULT: I didn't want to interrupt you with respect to as long you were talking about the water storage.

DR. ATIF KUBURSI: That's fine.

MR. ANTOINE HACAULT: Have you done any analysis, Doctor, as to, with your recommendation, how often Manitoba Hydro would have to spill water?

DR. ATIF KUBURSI: You know, I mean, one (1) thing we know, and, I mean, I would take that figure that you gave, but we -- you could also look at the corresponding one (1). There -- there's one (1) which is the revenue-related variation with water flow. There is one (1) which is purely water.

As we have shortages, we have surpluses of water. I mean, if you're talking about conditions that prevailing -- at this time I'm sure you're spilling, all right. I mean, the issue here is that there are limited capacity. This is one (1) of the problems that we have here, is that we don't have much storage capacity. The only two (2) areas, I guess, Cedar Lake and Winnipeg. And they have limited capacity. And there's certain times, you know, you can't store much, especially in the winter. Then you have really problems with extraction and so on and so forth.

No, the issue is primarily one (1) of orientation, all right, and that you want to diversify the sources that you depend on to insure yourself, okay.

MR. ANTOINE HACAULT: But could I have just a very quick answer to my question? My question was: Have you analyzed over any time period how often Manitoba Hydro would have to spill water, in other words, not --

DR. ATIF KUBURSI: No.

MR. ANTOINE HACAULT: -- put it through the generating station?

DR. ATIF KUBURSI: No. I mean, we did --

MR. ANTOINE HACAULT: Have you done that? Okay. You wouldn't have also calculated, sir, then how much losses in revenue would be caused by the spills and caused by implementation of your conservative plan, have you, sir?

DR. ATIF KUBURSI: No, I mean, whether we've really conducted analysis of how many times there was spilling? No, we didn't do that. Whether we know that there are times in which they have really been spilling? Yes, we know, and we have a good, you know, handle on the number of times that they've done it. But the -- the issue here, as I said, it's diversification.

MR. ROBERT MAYER: Mr. Hacault, the -- this issue of spilling water, I'm sort of getting the impression that for about almost two (2) years now those floodgates have been open pretty much moving the water down to the lower Nelson.

Each time I've crossed one (1) of those generating stations the flood -- the -- they've been spilling water. I suspect that until you can get all that water out of Lake Manitoba and Delta Beach they're going to be spilling water there -- well, spilling water as much as they can there too if they can get it into Lake Winnipeg in order to get it out the other end. I -- I'm not sure where this line of questioning is going.

CONTINUED BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: Well, the point of the line of questioning, and I was trying to get there, Mr. Vice-Chair, is that if you run your water levels on a consistent basis even higher than they currently are you're going to be always spilling.

And my -- the line of questioning was to test this witness as to whether or not he had any idea of the reduction in net revenue that would be caused by this conservative plan where we already are spilling water. If you run the lake levels even higher you'd be spilling even more, and you'd -- you wouldn't -- you wouldn't -- because you wouldn't -- in times where you could have put it through, you're keeping the water levels high, then you get the rain, and you -- you have to spill it again.

So that if you run the levels at the lake where they are on the basis that they are now running it, they spill less often than if you run it a foot or two (2) higher. And if you run it a foot or two (2) higher you're going to be spilling more off. And if you spill more off, then you lose revenue. And that kind of analysis has not been done by Dr. Kubursi, correct?

DR. ATIF KUBURSI: Yeah, but -- but what we're -- you know, we're -- first of all, there are two (2) things we have to take into consideration. First, we're not unreasonable and we don't think Manitoba Hydro is ignorant of -- of opportunity costs. What we're really saying here is that, on average, at the end of the period, and we have had so -- several cases in which the -- the lake -- the -- the ending balances of lakes were below what would have been required to maintain the minimum amount to meet the critical period.

What we're suggesting here that, in such circumstances -- I mean, if the choice is raising it and spilling it, I want to raise it so that I make money. I don't want to raise -- raise it so that I lose money. I mean, I -- I want this to be a complement to beefing up the fund, not as a way in which I am just, for the sake of it, raising water and then I have to spill it.

We're assuming that there is really some way and a trajectory of water husbanding or water warehousing that would be consistent with the level of retained earnings that you are -- and -- and amount of money in that fund that you would be targeting.

MR. ANTOINE HACAULT: So, Dr. Kubursi, I'm suggesting to you that the evidence on record so far is that if your conservative plan would be implemented, and I had gone through a cross-examination with Mr. Cormie on that, is that it wouldn't be a positive thing. There would be further losses caused over the long run.

You would defer to the specific knowledge and analysis done by Manitoba Hydro, would you not? Because you have not done your own analysis of that.

DR. ATIF KUBURSI: But I am also looking at the picture you gave me, and show me in this picture that there is always continuous really amount of water above the -- the level. I can see more times that this water is not really at this high where you would spill.

MR. ANTOINE HACAULT: So two-thirds (2/3) of the time, you would be put in situations, because you've got higher flows and that graph is at a higher amount, where you would be put at a situation where you would have -- have to spill and lose revenues because you're spilling, based on a visual.

DR. ATIF KUBURSI: Yeah. I'm not going to claim I know more than Manitoba Hydro, or I am going to really impute any lack of consciousness on the part that they would like to optimize, but all we were really saying here, we want to be a little bit more concerned about beefing a fund to ward off these incredible costly droughts that we have really gone into and are likely to go into again. That's all.

MR. ANTOINE HACAULT: As long as that doesn't cause Manitoba Hydro to lose money on the long run.

DR. ATIF KUBURSI: I -- I would -- I would put this as a constraint, yeah. Why not?

MR. ANTOINE HACAULT: Thank you. I think over the next ten (10) minutes I can cover the rate rider issue. First, I just want to clarify, either of you doctors -- neither of you doctors have been qualified as rate-structure experts, correct?

DR. ATIF KUBURSI: No.

MR. ANTOINE HACAULT: Okay. Neither of you have analyzed the impact on rates and rate structure of having a rate rider, correct?

DR. ATIF KUBURSI: Okay, let -- let me explain this a bit. I am involved in rate setting on water, and I've published actually a -- a paper coming into the Encyclopedia of the Environment and Management on -- on rate set -- setting, and what are the implications of different rate sets, and what are the qualifications and the structures that would really go with this. And I don't think this is very much different than what we're talking about here.

MR. ROBERT MAYER: You want to try to qualify it, Mr. Hacault? You might make it.

CONTINUED BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: With respect to the rate rider, would you agree that there's other options to achieve the objective that you're talking about?

DR. ATIF KUBURSI: All right. I mean, there are questions about whether we can really push further the DSM, we can use more non-renewables -- sorry, more renewable sources, more conservation and -- and different ways of getting some good balances between the environment and the revenue sufficiency considerations.

What we wanted here, and -- and this is why probably it's worth explaining, is that we want all the stakeholders to be partners into this endeavour to -- and because they are the people who would bear the consequences, they would also benefit. There are inter-generational issues that were also raised by the Chair and the Vice-Chair.

And -- and the issue here, we're basically saying, look, there is high probability we're going to be into a drought. There are going to be losses. We want to be in a position that the financial viability -- and we -- we dismissed any of these claims that we're going to be going into blackouts or things, but we said this is a financial issue and that there are going to be losses.

And then these losses, you could meet them by a sufficient amount of retained earnings, but we felt like that these retained earnings should not be totally exclusively earmarked for this because they play so many other functions. And it assumes that the onus is going to be totally on the Utility.

We want to really say that if any time there going to be a drought, which is a forced measure and something that is imposed on us by nature, we would like that all the stakeholders would put shoulder to shoulder and share these things, and the ratepayers wou -- would share, especially if they need -- if they can be shown that they're doing this in a very transparent way and that whatever they -- they're paying for it, but they're paying for it as -- as they pay for any insurance, in order that in the future they can avoid any rate shocks that may be necessary to compensate for the losses that would come from a drought.

MR. ANTOINE HACAULT: So if you have a company that's spending $48 million in hydro-electric power in one (1) year, and for whatever reason they stay around for two (2) or three (3) years, are you suggesting they get all their money back if there's a rate rider that gets put in place because they're definitely not going to benefit going forward?

DR. ATIF KUBURSI: Well, I mean, you can -- you see, I'm suggesting this to be an insurance scheme, and I'm sure there could be -- there -- there would be actuarial houses that would give you exactly what would really be the appropriate rate structure that would build things, that would compensate you for whatever shortfall that -- that may be expected.

MR. ANTOINE HACAULT: So is this a hundred-year plan?

DR. ATIF KUBURSI: Well, I mean, you see, we're not -- and we're not actuarial people. We know probability, and he knows much more than I do. We're looking at it in terms of a mechanism, a structure, an economic arrangement regime, so to speak, that would ward off the society and this economy from rate shocks.

MR. ANTOINE HACAULT: But I still haven't heard you tell me how it's going to work.

DR. ATIF KUBURSI: Well, it works like any -- any insurance fund, you see.

MR. ANTOINE HACAULT: Is it -- is it based on a hundred years for -- for --

DR. ATIF KUBURSI: I mean.

MR. ANTOINE HACAULT: Is it based on fifty (50) years? Do people get it back if they put an amount in it? Because you said --

DR. ATIF KUBURSI: You see -- you see --

MR. ANTOINE HACAULT: -- that they're supposed to --

DR. ATIF KUBURSI: Yeah, yeah, yeah.

MR. ANTOINE HACAULT: -- have some vested interest in it.

DR. ATIF KUBURSI: I --

MR. ANTOINE HACAULT: They invest.

DR. ATIF KUBURSI: Yeah, yeah.

MR. ANTOINE HACAULT: So if they invest, they should get back if --

DR. ATIF KUBURSI: I know, but --

MR. ANTOINE HACAULT: -- if they -- they leave.

DR. ATIF KUBURSI: Okay, you see, there are all these inter-generational things. I mean, I'd -- I'd like it to be in the lifetime of a -- of a generation. A lifetime of a generation is forty (40) years. We have overlapping generations. We can shift it over.

So if you push me, to me, and I'm not an expert and I'm not going to pretend I'm one, and if you really want me to -- to give you a number, the best number I can give you without any inter-generational problems, I will say the lifetime of this present generation, which is forty (40) years.

MR. ANTOINE HACAULT: We've heard that some of the generation facilities are still in place and they've been there for a hundred years.

DR. ATIF KUBURSI: Yeah.

MR. ANTOINE HACAULT: Does that change your answer?

DR. ATIF KUBURSI: No, there is overlapping generation. But I don't want this generation to pay for the next generation, all right. I want at least some sort of inter-generational equity, and that's why I'm building it on a forty (40) year basis.

You see, if I make this generation to pay for more than forty (40) years, then -- then the next generation is being con -- you know, gaining at the expense of this generation. If we do it less, we're making the next generation pay for this one (1). So I want really some sort of a balance between generations.

And typical models, you know, that are used in -- in inter-generational equity they've put in the cutoff over the forty (40) years.

MR. ANTOINE HACAULT: So if they pay today do they get the same amount back when it starts --

DR. ATIF KUBURSI: I --

MR. ANTOINE HACAULT: -- generating profits?

DR. ATIF KUBURSI: No. I mean -- you see, I'm -- I'm not going to be in a position, and I'm sure you don't expect me to solve a insurance problem right here. I'm just giving general ideas.

All I really want is this present generation, if it really has concerns, that these droughts that are likely to happen are going to impose on them the possibility of a rate shock. And if they want to protect themselves against it, and if you want to make sure that the financial viability of this Corporation is not compromised by a drought, and if everybody that gains would chip in, that would be the best way to do it.

MR. ANTOINE HACAULT: But we don't have any concrete plan as to how that works and who does it --

DR. ATIF KUBURSI: Yeah --

MR. ANTOINE HACAULT: -- and what -- how it gets shared between companies and when they get money back if they leave, or whatever, all of that is --

DR. ATIF KUBURSI: You could work --

MR. ANTOINE HACAULT: -- very vague.

DR. ATIF KUBURSI: -- you could work this out you know, I -- I'm not the guy who could do it, but I -- I'm telling you this had been done in other places and -- and could be designed. I mean, there are people who specialize in these things and they're extremely competent and they've done it.

MR. ANTOINE HACAULT: Well, thank you

very much for answering that for me. And that -- with that, Mr. Chairman, I'll thank everybody for their patience. And see you on Tuesday.

THE CHAIRPERSON: Okay. Just before you shut down I -- I believe Mr. -- or Dr. Magee has to leave by 4:45. Is that correct?

I just want to follow up on a couple of things that came up. Mr. Hacault got into the -- the issue of what is a profit, in a sense. If the number was black all is well, and then if it's red there's a problem. And basically the -- the issue being is, what is the return on -- on -- on the assets, in a sense?

I'm wondering, Dr. Kubursi, from an ang -- an economists per -- perspective, is it not possible that even an accountant could agree that a reasonable return would be a return that would be comparable to some other form of asset that involves risk?

DR. ATIF KUBURSI: You're absolutely right. I mean, I drew a distinction, Mr. Chairman, between accounting profits and economic profits. Economic profits would really mean that you earn your opportunity cost, whatever you could -- the best rate of return you could get on the assets. You have assets invested in here and then if you didn't invest them here and you locate them someplace else they would have earned a particular return.

The -- the way you would consider something to be a fair return, it would be that fair rate that could be generated, the best next alternative return on these assets.

THE CHAIRPERSON: Thank you, sir. One (1) other question. This -- this arose out of something that Mr. Williams said and you commented on it. It had to do with the understanding of M -- Manitoba Hydro's place in the MISO market. And I -- I apologize if I misheard you, but I -- I just want to check.

Would you agree that within the MISO market a significant portion of the total energy generated is committed to specific customers and is not available by -- for purchase in the market?

DR. ATIF KUBURSI: Mr. Chairman, I -- I also drew a distinction here. If you are doing long-term contracts, if you conclude long-term contracts then you're basically tied to particular counter-parties, and this is not an open market access.

The only open market is when you're in that market in the non-committed firm exports. And -- and there the -- the -- you represent a very small proportion and that is the reason we said you're a price-taker.

THE CHAIRPERSON: Yes, that's what I heard. And I'm just wondering from other information that was in evidence and had been raised previously, in the real-time or day -- day-ahead MISO market, does not Manitoba Hydro play a larger role?

DR. ATIF KUBURSI: It's not my understanding. I -- I thought that the -- you know, the capacity in that market is in the upward of a hundred thousand (100,000) megawatts, and that we only have there about seven hundred (700) to eight hundred (800), so it's not really that big a proportion.

But the -- the story is to what extent are you entering into a market where you can influence the price?

And the way I understand the way the market works is that you put these offers, whether in the real market or for the day ahead, and then there is a price -- merit price that would really be established. And then those who are bidding below will get it; those are really above it would be weeded out.

And in that respect, whatever price you put there you're basically competing against others, and whether you are able to influence the outcome of that price is not very clear.

THE CHAIRPERSON: Would you grant that at certain times and in certain circumstances you may have an effect on the market?

DR. ATIF KUBURSI: Yeah, I mean, I'm -- I'm sure it depends on the circumstances and -- and things. I mean, I -- I would say, in -- in general, you are one (1) of the participants and you are very small compared to the total capacity, and that the way the market works is that you have these bids, and then there is a certain process that will ultimately determine the intersection between demand and supply, and that would be the market price.

I -- I think this would conjure a situation that you really have a competitive market and you don't have really influence to put the price at a particular level of the other. I could easily conjure a situation where there may be not too many participants and you're in this market at a particular node, at a particular place, and you represent a very large proportion of that node that you would be considered to be with some market power to influence it.

THE CHAIRPERSON: You haven't specifically examined Manitoba Hydro's participation in the day-ahead market over a period of time then?

DR. ATIF KUBURSI: I -- I did not go into details. I went into the MISO market. I spent a couple of days and I saw how the work -- how it works and where Manitoba Hydro -- but if you ask me, Mr. Chairman, that -- did we go and look at and examine at -- exactly the prices and things in other than the general numbers that we looked at, no.

THE CHAIRPERSON: Thank you very much, sir. So thank you to the panel. Thank you to the Intervenors and Board counsel. And we will adjourn for the day and see you back on -- Ms. Southall, is it Tuesday at 9:30?

MS. ANITA SOUTHALL: It is Tuesday at 9:30, May 31st.

THE CHAIRPERSON: Very good. Thank you.

MS. ANITA SOUTHALL: Thank you.

(PANEL RETIRES)

--- Upon adjourning at 4:41 p.m.

Certified Correct

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Cheryl Lavigne, Ms.