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
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Pages 6638 to 6859

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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--- Upon commencing at 9:35 a.m.

THE CHAIRPERSON: Okay. Good morning, everyone. Is there any further exhibits to be filed, Ms. Southall, before we return to Mr. Hacault?

MS. ANITA SOUTHALL: Yes, Mr. Chairman, we have one (1) further PUB exhibit, which will be Exhibit number 24. This is a letter of May 30, 2011, from Fillmore Riley to Thompson Dorfman Sweatman to the attention of Mr. Hacault. It was emailed to the GRA email distribution list yesterday. And so that would be PUB Exhibit 24.

--- EXHIBIT NO. PUB-24: Letter of May 30, 2011, from Fillmore Riley to Thompson Dorfman Sweatman to the attention of Mr. Hacault

THE CHAIRPERSON: Very good.

MS. ANITA SOUTHALL: We also have a series of KM responses to undertakings, and Mr. Wood will identify those at this time.

THE CHAIRPERSON: Mr. Wood...?

MR. GAVIN WOOD: Good morning. Firstly, there is an additional exhibit answering one (1) of the

older undertakings given on May 5th, I believe. It's a transcript page 6,268. It's Undertaking nu -- number 162, and that would KM Exhibit number 8.

--- EXHIBIT NO. KM-8: Response to Undertaking 162

MR. GAVIN WOOD: There is in addition, as well, turning to page 6,419 of the transcript where the list of undertakings are located, there is additional material to be filed in answer to numbers 149 and 150. The first of those is headed, "Imports from US." It's a -- a single page. It's an answer, in part, to number 149. There has to be a supplement yet filed to that, I'm -- I'm told by Dr. Kubursi. And it would be KM Exhibit Number 9.

--- EXHIBIT NO. KM-9: Response to Undertaking 149

MR. GAVIN WOOD: And then there's a further one (1) page set of data in answer to Undertaking number 150. That's at page 6602 of the transcript. And again, it's a single page. That would be KM Exhibit number 10.

--- EXHIBIT NO. KM-10: Response to Undertaking 150

MR. GAVIN WOOD: And then Dr. Kubursi had undertaken to check with regards to Undertakings number 147 and 148. And I believe he's in a position to respond to those verbally at this time.

THE CHAIRPERSON: Dr. Kubursi...?

DR. ATIF KUBURSI: Yeah, good morning, Mr. Chairman. We checked the answers to both the number 147 and 148 that -- we're here to confirm that we did not use water into these calculations. The numbers that we use are generation.

And whatever water flows that we have used were basically following the two (2) statistical processes that we've used. The one (1) is the auto-regressive 3 and extreme value distribution. They were all random numbers.

THE CHAIRPERSON: Thank you, sir, just give us a second.

(BRIEF PAUSE)

THE CHAIRPERSON: Ms. Southall, now we're onto Mr. Hacault?

MS. ANITA SOUTHALL: Yes, that's correct.

THE CHAIRPERSON: Mr. Hacault, anytime.

INDEPENDENT EXPERTS PANEL:
ATIF KUBURSI, Resumed
LONNIE MAGEE, Resumed

MR. ANTOINE HACAULT: Well, after the knockout punch filed by Exhibit 24, I'll continue my cross-examination. Thank you very much for responding, Ms. Southall. I do have some preliminary comments. I'll do the best I can ask questions with respect to the information that's on file.

I still request, based on the initial correspondence to the PUB, the opportunity to ask questions with respect to responses to the MIPUG undertakings, to the CAC undertakings. We've cooperated with CAC in trying to get that information and we note also that we haven't received responses to the PUB's pre-asks. At least I don't have a record of receiving them, or the Manitoba Hydro pre-asks marked as Exhibit 145. So we'd like to reserve the right to ask any questions with respect to those responses because they're fairly important answers, I believe.

Just a -- a note for the -- the record, we've -- I've cooperated... I note that we have had a revised schedule distributed and I thank Mr. Peters for that. I just note for the record that since last year I

had advised counsel that I had a 30th anniversary trip and vacation starting June 11 to June 27 that I wasn't able to displace. I displaced a lot of other hearings and commitments to make sure I was available, but I would only be available via email during that vacation time, out of the country.

So I will be making a -- a formal request, I guess, that MIPUG be granted a little bit more time to file its written submission, which is requested to be provided on June 23, while I'm away.

With respect to -- those are all my preliminary comments. I understand Mr. Williams also has some preliminary comments. So before I start asking questions, I'd put the matter over to him.

THE CHAIRPERSON: Mr. Williams...?

MR. BYRON WILLIAMS: Just very quickly, Mr. Chairman. And I wasn't able to -- the undertakings hadn't been distributed when you handed out exhibit numbers.

But, just a question of clarification for Mr. Wood, if I -- I might. At the back of our handout is a -- that you distributed there is a table, "Imports from US."

MR. GAVIN WOOD: And that's Exhibit number 9. And the -- the second-last document is

actually Exhibit number 10.

MR. BYRON WILLIAMS: And was Exhibit number 9 intended to be responsive to Undertaking 149?

MR. GAVIN WOOD: It is, but it -- it isn't a complete response to it, as it turns out, and it has to be -- it has to be supplemented. Dr. Kubursi can explain that.

MR. BYRON WILLIAMS: And -- and just -- and Mr. Chairman, I'm sorry, I just need this for clarification. And just -- obviously the undertaking was for the probability distribution of prices and it doesn't appear that -- that this is the probability distribution of prices.

DR. ATIF KUBURSI: Yeah, that's -- that's precisely true. It was my -- my mistake where we asked our people to produce the import prices, they sent us the total imports, but this will be filed either today, at the latest tomorrow.

MR. BYRON WILLIAMS: And just -- just so I understand, Mr. Chairman, I apologize for circumventing Mr. Hacault's questions.

Will the witnesses be available if we -- tomorrow if we have any questions on this? I'm just trying to -- and I don't know if we will, but we've not seen the undertaking.

THE CHAIRPERSON: Ms. Southall, do you have any comments?

MS. ANITA SOUTHALL: Well, I haven't canvassed that with Mr. Wood. I think --

THE CHAIRPERSON: Why don't we get back --

MS. ANITA SOUTHALL: -- I think we --

THE CHAIRPERSON: -- to Mr. Williams after the break.

MS. ANITA SOUTHALL: I think that's a good idea. Thank you, Mr. Chairman.

MR. GAVIN WOOD: And -- and what they'll undertake -- they're gonna try to do is get it here by the -- or early afternoon then because they're not available tomorrow.

THE CHAIRPERSON: Okay. Mr. Hacault...?

CROSS-EXAMINATION CONTINUED BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: Thank you. I had explained to the doctors that I would be referring to the -- the table of numbers at Tab 75 again. As I understood the further clarification this morning, the doctors did not use water flows, but rather used generation for their modelling.

Is that correct?

DR. ATIF KUBURSI: That's correct.

MR. ANTOINE HACAULT: And you would agree that there exists a difference between flows and generation, they aren't always correlated one to one, is that correct?

DR. ATIF KUBURSI: I mean, of course there is a formula for that which is dependant also on the energy efficiency that translates flows into energy.

MR. ANTOINE HACAULT: So that -- for example if we look at the table at Tab 75, and in particular, page 312. So I'll let everybody get that table, Tab 75, page 312.

(BRIEF PAUSE)

MR. ANTOINE HACAULT: If we, for convenience sake, pick the first number on that table across the flow year 1912 we see an annual system inflow of a hundred and eleven (111).

Do you see that?

DR. ATIF KUBURSI: Yes.

MR. ANTOINE HACAULT: And then across from that we see that that flow, according to Manitoba Hydro, would have generated thirty-five thousand two hundred and two (35,202) gigawatt hours per year.

Do you see that?

DR. ATIF KUBURSI: Yes, I do.

MR. ANTOINE HACAULT: Okay. And if we just go down the table to 1923 we also see an annual inflow of, again, a hundred and eleven (111).

Do you see that?

DR. ATIF KUBURSI: Yes, I see.

MR. ANTOINE HACAULT: And across from that number, for the record it's thirty thousand thirty-two (30,032) gigawatts per year, correct?

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

MR. ANTOINE HACAULT: So -- 'cause I just got this answer this morning, but that's a fairly -- it's a material percentage difference with the same flows, correct?

DR. ATIF KUBURSI: As I said there are differences that could come from head and also the energy coefficient.

MR. ANTOINE HACAULT: And just one (1) further example of how this would probably skew your calculations. If we could go to one of the worst flows on record at 1940 on the table, have you located that? It shows an inflow of fifty-four (54), correct?

DR. ATIF KUBURSI: Yes, correct.

MR. ANTOINE HACAULT: Generating nineteen

thousand three hundred and eighty-nine (13,389), correct?

DR. ATIF KUBURSI: Correct.

MR. ANTOINE HACAULT: And then, if we go across to 1988, we see the flow as, I would suggest --

DR. ATIF KUBURSI: Seventy-two (72).

MR. ANTOINE HACAULT: -- seventy-two (72), so it is higher. It's a material difference, you would agree, sir?

DR. ATIF KUBURSI: Yes, sir. It is.

MR. ANTOINE HACAULT: Okay, but that the generation is very similar in that it's nineteen thousand four hundred and forty-five (19,445)?

DR. ATIF KUBURSI: Yeah, yeah, but I will interpret it exactly, that what counts is not the flow. You get your money on generation, and therefore that's the thing that we use to anchor our calculations.

MR. ANTOINE HACAULT: But you would agree, sir, that the generation is a function of how the flow is managed?

DR. ATIF KUBURSI: How it's managed, and the efficiency with which, and, you know, the head. It's a -- it's a very standard formula, but what counts is -- and that's exactly probably why we have anchored everything on generation because we have the same flow but different generation and, therefore, if we anchored

everything on flow, we would not capture the variations that could come from the generation. And your money is generated by the amount that you're able to serve from this generation.

MR. ANTOINE HACAULT: So you believe that your model can capture the subjective and discretionary operation by Manitoba Hydro of its water flows?

DR. ATIF KUBURSI: I -- I don't know whether this is -- yeah, I don't think -- I don't really believe that Manitoba Hydro would try to reduce the efficiency with which it transforms water into -- into generation. It -- it so happens that certain flows would create larger or smaller heads, and the efficiency is one where they would target to be as efficient as -- as one can imagine using these choices that come from HERMES.

MR. ANTOINE HACAULT: I don't know, Doctor, if you had the opportunity to read the transcript evidence as to how the flows were managed in what we've referred to as drought years 2003 and 2004, where Hydro, as I understand the evidence -- and I'm paraphrasing, the transcript will speak for itself -- went into kind of a conservative mode and held a lot of water back as a result of an anticipated drought in that year. And that, in effect, had an impact on the generation in that particular year, correct?

DR. ATIF KUBURSI: Yeah, that's -- that's correct, and -- and that's precisely what we're talking about, is that the ultimate difference here is going to come from the way you manage your generation.

MR. ANTOINE HACAULT: So does your assumption and your model assume that they manage the system as they did in 2003/2004, or as they managed it in a non-drought year?

DR. ATIF KUBURSI: No. I mean, the way we deal with this is to look at the generation and look at the prices, look at all the costs, and try to see what would really be the probability distribution of all these components and, ultimately, how do they impinge on net revenue.

MR. ANTOINE HACAULT: But you'll agree, sir, that a model has to have certain assumptions, and I'm asking you, sir, if you can clarify as to whether the assumption that you based your model on is the conservative gen -- management of water that happened in 2003/2004, or the assumption that the management of the water flow is that of a, I'm going to say, more regular year?

DR. ATIF KUBURSI: As I'd mentioned before, what we did, we looked at all these variables between 2001 and 2007, and 2001 and 2007 included both a

very low flow and a very high flow. So we were able to look at all the different values that would come, and these were the one (1) that we tried to capture because you want to get a rich distribution of all the variables that would influence your net revenue. And we felt like 2001-2007 was a representative period where you were able to capture both low and high flows.

And what we wanted to basically feel confident about is that we are not looking at a very unrepresentative distribution. And we felt confident that covering this two (2) large and low flows gave us a good representation of this flow.

MR. ANTOINE HACAULT: Do I take your answer then to mean, sir, that your model assumes the 2003/2004 management, the way it was managed in actual fact in those years in addition to the other years, from 2001 to 2007?

DR. ATIF KUBURSI: Yeah. What -- what counts for us is not one (1) particular year but the distribution over these years, and this we thought we captured.

MR. ANTOINE HACAULT: So then flowing from that you're aware, sir, that Manitoba Hydro's ability to deal with drought situations in its opinion, according to the evidence as a -- and the transcript will

seek -- speak for itself, has materially changed because of their new contracts in the MISO market, but your model assumes that none of those new efficiencies are in fact available to Manitoba Hydro.

You haven't modelled the new situation that would arise in a drought, correct?

DR. ATIF KUBURSI: I -- I won't say so because, as you know, 2005 was the year that MISO was introduced. And since we took 2001 and 2007, we probably took three (3) years within MISO and four (4) with -- that were not within MISO. But we -- we have some representation of MISO, values and variables, in the distributions that we took care of.

MR. ANTOINE HACAULT: But my question was more specific, sir, as to whether or not your model has taken into account in a drought year all the efficiencies that now are gained through the new contracts and the new MISO market. And my understanding is that it does not. Isn't that correct?

DR. ATIF KUBURSI: No, I -- I won't go that far. What -- what we basically and fundamentally have done is to look at these representative years, fit the distributions to them. They include both MISO and non-MISO periods. And we -- we feel that the distribution is rich enough that it would allow us to

capture these MISO efficiencies.

MR. ANTOINE HACAULT: Sir, I don't hear an answer to my question in what you've said. And my question was very specific to drought --

DR. ATIF KUBURSI: Yeah, all right.

MR. ANTOINE HACAULT: -- and whether or not you have in your sample from 2001 to 2007 a drought year with the new MISO circumstances and the new contracts. And I would have thought the answer would have been simply, no. Isn't that correct?

DR. ATIF KUBURSI: No, it's not. Absolutely, yes, and I'll tell you why. And the reason for this is the following. What we've really done here is that we looked at distribution that included all these years. And I'm sure you would admit that if I use 2005, 2006, and 2007, these are periods where the prices would reflect the new regime that came from open access and competitive pricing.

Now, when we pulled a year where there is a low flow we did not in any way fix the other years to be the year of the drought that was before the MISO period. We allowed the distribution that includes information from the MISO market to be embedded into the system.

So in my res -- and -- and simply to say

this. It would not be correct to assume we did not take into account some MISO efficiencies during our drought. We did.

MR. ANTOINE HACAULT: So, as I understand this fairly lengthy answer, your distribution includes non-MISO samples and MISO samples, correct?

DR. ATIF KUBURSI: That's correct.

MR. ANTOINE HACAULT: Even though today we are in a MISO market. We are no longer in a non-MISO market, correct?

DR. ATIF KUBURSI: Correct, but if -- if you -- if you really assume that when we're talking about a single array of numbers, and then we fit a probability distribution. It's a very rich number of observations that would come. That it would not be up -- fair to characterize it as if it's not able to capture some of these efficiencies, when in fact we have a very rich, dense probability distribution with lots of information embedded into it.

MR. ANTOINE HACAULT: Thank you for your answer, sir. While we have this table at Tab 75, page 312, could I ask you to identify the first five (5) year time period in terms of when the years start to when they finish, of the first scenario of drought that you've considered?

DR. ATIF KUBURSI: Yes, the -- we -- we picked 1937 to 1942. So this is the one (1) corresponding to 96 cubic -- the cubic feets per second, all the way to 1942. So we're talking between a variation of ninety-eight (98) to one-oh-one (101), so it is 1937-1942.

(BRIEF PAUSE)

MR. ANTOINE HACAULT: So you didn't take into account the 1936 year, sir, you didn't consider that to be part of the drought?

DR. ATIF KUBURSI: No, we wanted to take it five (5) years.

MR. ANTOINE HACAULT: '37 to '42, I think in my count is six (6) years if we count each of the years.

DR. ATIF KUBURSI: No. Yeah, nine (9) -- nineteen thir -- to '41 then, 1937 to 1941.

MR. ANTOINE HACAULT: Okay. If you consider that the drought period, you've considered a period which is slightly different than most consultants who had started in the year prior to that, which would have been 1930 -- sorry --

DR. ATIF KUBURSI: '36?

MR. ANTOINE HACAULT: '36, correct.

DR. ATIF KUBURSI: Yeah, correct.

MR. ANTOINE HACAULT: Would you agree that it's fair to include 1936 as other consultants did?

DR. ATIF KUBURSI: I -- I -- I don't think it make much of a difference, I tell you why, because if you look at this ninety-six (96), then we -- the other one (1), ninety-eight (98), eighty-eighty (88), seventy-nine (79), fifty-four (54), ninety-two (92), I mean the...

(BRIEF PAUSE)

THE CHAIRPERSON: We thought it would be the NHL expansion announcement.

DR. ATIF KUBURSI: Okay. I mean the -- the most important year, Mr. Hacault, is -- and -- and this is really where we wanted to anchor things, the lowest one (1) recorded is 54 kilo cubic feet per second, and -- and -- and that's the -- the most important anchor year that we worked on with.

CONTINUED BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: Thank you. So using your parameters, which is six (6) years instead of

seven (7), KPMG and ICF had used seven (7), could we add the total net revenue for those years to determine what the net loss is to the Company, how -- how much would it reduce its retained earnings?

DR. ATIF KUBURSI: I mean, you -- you certainly can add and subtract any number of years. The issue here is that what would be the lowest revenues that you're likely to contend with that will characterize the largest downside risk of flow revenues. And that one (1) would definitely come when you're operating with nineteen thousand (19,000), I mean the gigawatt hour that we talked about. And -- and -- and that's the one (1) actually we anchored everything on.

We took -- you know, we wanted minimum regret, we wanted to take the worst possible loss and see how this would affect your net revenue and -- and -- and that's the one that we have focussed on.

MR. ANTOINE HACAULT: So, subject to check, if we exclude the 1936 year which generated a little bit of net revenue, we have a net loss of $1 billion 6 million, correct?

DR. ATIF KUBURSI: Yeah. But as you can tell, you know, from your table, Mr. Hacault, 1936 would have really reduced net revenues further because it's a nine -- one fifty-nine (159) loss.

MR. ANTOINE HACAULT: But I'm not talking about net reduction in profit, sir, I'm talking about an actual loss. And in 1936 there was not an actual loss, correct? There was actually profit that year of $43 billion.

DR. ATIF KUBURSI: Yeah, yeah, but again, I mean, we're going back into that question the extent to which accounting profits is the one that we ought to be looking at rather than the rate of return -- opportunity rate of return on your assets.

MR. ANTOINE HACAULT: Correct, sir. But you're aware that the legislation requires Manitoba Hydro to provide service at cost. This is not a private utility where we determine what an appropriate rate of return is, correct?

DR. ATIF KUBURSI: Yes, but it's not to provide this service outside Manitoba at cost.

MR. ANTOINE HACAULT: But in any event the modelling and the average over this time period would result in Manitoba Hydro, according to the calculations here, earning on average over $200 million per year, correct?

DR. ATIF KUBURSI: Yeah, okay.

MR. ANTOINE HACAULT: So that although you may have some bad years, or not so good years, in the

sense that your profits are not as high, on average, based on this lengthy time period, Manitoba Hydro will be earning an average of $200 million per year?

DR. ATIF KUBURSI: It should.

MR. ANTOINE HACAULT: I don't know whether the Chairperson had a question, or...

THE CHAIRPERSON: No, I just -- just a comment. And I -- I don't know if it's particularly useful or not, but I -- you're assuming rate increases at the same time in part of your calculations, I suppose, eh?

DR. ATIF KUBURSI: Sorry, I didn't hear it well because I had my mic on, so I didn't...

THE CHAIRPERSON: As a part -- as a part of arriving at your -- of your simulated net income going back, assuming the generation is -- as it is now and the transmission is as it is now and being in the MISO market and everything else, you're also presumably assuming expense growth and rate increases as well, correct?

DR. ATIF KUBURSI: Correct.

CONTINUED BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: But in your table, sir, as I understand it, the distribution of revenues is -- there's a distribution, but you have, for example, a

particular revenue ascribed in your calculations, correct?

DR. ATIF KUBURSI: I mean --

MR. ANTOINE HACAULT: It's Figure 6.21, I believe.

DR. ATIF KUBURSI: If you -- you want to go to the table exactly the one we just distributed?

MR. ANTOINE HACAULT: Well, Exhibit 10, I believe, you have a domestic price -- yeah, you have the different values.

DR. ATIF KUBURSI: Exhibit 10.

(BRIEF PAUSE)

MS. PATTI RAMAGE: If -- if I could just interject, I don't think we have KM Exhibit 10 on this side of the room.

THE CHAIRPERSON: Mr. Singh --

MR. ROBERT MAYER: If you did it might be difficult to figure it out. Yeah, it's not making much sense to us up here.

THE CHAIRPERSON: The Vice-Chair is basically, I think, suggesting that a layperson's explanation of the import of KM-10 might be helpful.

DR. ATIF KUBURSI: Yeah. All right.

Everybody has a copy now?

CONTINUED BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: Yes, that explanation would be useful --

DR. ATIF KUBURSI: Okay.

MR. ANTOINE HACAULT: -- because then we need time to digest it and -- and make sense of it, Mr. Chair. Thank you very much.

DR. ATIF KUBURSI: All right. This is basically a set of inputs that we use in order to generate the numbers and the graphs that you have in tables -- in -- in chapter 6. And this is exactly the numbers we used to generate particularly graph 6.1, all right?

What we do is we begin with a set of numbers, and as you can see, we tried to put age in every one of them, which one were the random and what type of distribution. If you can see some of the things I said random, if you go into the actual chapter 6, you could find exactly the distribution that was used for each and every one, like, in the -- in the event of you look at your imports, you know, it was an extreme value distribution -- well, specific distributions.

But let's begin. We begin with

generation, all right? This is the average over the period, and the wind then the coal, and this -- the total generation, and we look at the domestic load, and then we look at the exports and all their components, then at the imports. And then you get to the operating expenses. You have the wages and salaries, the costs of fuel, costs of material used, costs of purchases, maintenance, royalty, indirect taxes, other expenses.

THE CHAIRPERSON: Dr. Kubursi, just to stop you for a minute, when you're getting into the expenses, you're taking into account the deferred and capitalized. This is net of expenses that have not been treated as a period cost, I take it?

DR. ATIF KUBURSI: Yeah, they are -- they're just net.

THE CHAIRPERSON: In other words, they're the -- if you want to call it, the financial statement numbers?

DR. ATIF KUBURSI: It's absolutely the financial statement.

And then we go into domestic prices, export prices, then the import prices, then the exchange rate, and all these numbers that you see here are the averages, but then they are part of the distribution. And when we do the calculations to generate the Figure

6.1, the distributions are entered into the calculations.

Cross-revenue would be basically the prices times the generation, and the export revenues minus the import revenues. And then we get the domestic revenue component, which is just coming from load times the rate. Then you have the US revenues, then the provincial revenues, and then we have the total import costs, and then you get the net revenue, which will be the gross revenue minus all these expenses.

And then we run the Monte Carlo on these net revenues, allowing all these variables to vary according to distributions that are on the right-hand side, and then you get that graph where you get the average, the mean value, the 95 percent value, the 5 percent value. You get the full distribution.

THE CHAIRPERSON: There's no disc -- sorry, go ahead.

MR. ROBERT MAYER: Doctor, if I recall correctly, this Exhibit 10 was produced in response to Mr. Hacault's question about could you change this input and run it again. And this is showing us why you can't do that, right?

DR. ATIF KUBURSI: No, no. What -- what we do is, we begin -- we need a benchmark. We need basically a distribution anchored around the averages

without changing any of the critical variables. One of the critical variables would be to change the flow. So we get exactly what is the average revenue under all these assumptions that we have here. Then the next one, we do the stress test. Suppose that all these variables remain the same, except now we change the flow. That would change the generation. And we anchored that flow to be exactly the lowest flow between the period 1937 and 1941 and look -- nothing else changes except this variable. With all this random distribution what will be the net revenue, and that's exactly that one comes to six point two (6.2).

And then we do this and change another one, keep everything else random. We fix the low flow and the import prices that were in the worst period and see what would the combination of a low flow and high import -- what would it do to your net revenues. And we get this very strong stress test that this is going to end up being a very hefty, large net revenue loss.

And this is the one that you might want to look as your downside risk, that you have to be prepared to -- to deal with this extreme situation. And what we did, we did lots of stresses, and we tried to see how these stresses worked in combination, but, particularly, one (1) by one (1).

For example, we found that the exchange rate changed. It doesn't make much of a difference. The interest rate change makes a major difference. We -- we -- a change in the cost of fuel made some difference. But we will be able to see each contribution, how each one (1) of these variables -- or we could do it for every variable that you see in this table.

We only chose twelve (12), but we could have done it for every one (1) of them. We -- I mean, when you change wages and salaries it makes -- it makes a difference. If you change the domestic rate it would make a difference. And we wanted to know the sensitivity of that revenues to changes in one (1), keeping everything else exactly within the distribution that we have defined here.

THE CHAIRPERSON: Dr. Kubursi, another way of describing this. This distribution that you've developed that has arrived at this simulated net revenue of two hundred and two (202) --

DR. ATIF KUBURSI: Yes.

THE CHAIRPERSON: -- represents the status quo system, generation as it is, transmission as it is. In other words, left alone, no new development. This would be the expectation --

DR. ATIF KUBURSI: As -- as captured --

THE CHAIRPERSON: -- based on historical past events?

DR. ATIF KUBURSI: And the distributions that fit and represented these past events. That's exactly it.

THE CHAIRPERSON: So potentially you could do a prospective one then --

DR. ATIF KUBURSI: Ye -- yes, you can.

THE CHAIRPERSON: -- involving a development plan of a variety of different ways and different assumptions for exchange rates, interest rates, et cetera, et cetera?

DR. ATIF KUBURSI: Precisely. Actually, in -- in one (1) of the answers to the questions that came from PUB we suggested that maybe we're -- we're moving into this new development, another benchmark should really be done, assuming that these developments are all complete and you allow this distribution and see what are your downside risks now that you have really put all these expansions in.

THE CHAIRPERSON: But you have not done that, have you?

DR. ATIF KUBURSI: No.

THE CHAIRPERSON: Thank you. Mr. Hacault...?

CONTINUED BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: Just a point of clarification arising out of the discussion between the Chairman and -- and yourself, Dr. Kubursi. The table that I've shown to you at page 312, Tab 75, is numbers -- or are numbers produced by Manitoba Hydro and not by yourself, correct?

DR. ATIF KUBURSI: Yeah, correct.

MR. ANTOINE HACAULT: So that the line of -- or the exchange appeared to assume that those were your numbers, but those are Manitoba Hydro's numbers based on its operations and experience, correct?

DR. ATIF KUBURSI: Correct. But our numbers, given the numbers you use from Statistics Canada, would give you also an average revenue, but it would be based on -- on different numbers than the one that we have here.

MR. ANTOINE HACAULT: And for the prospective evaluation, as the Chairperson was asking, in fact, Manitoba Hydro does have that modelling in, and they call it SPLASH, correct?

DR. ATIF KUBURSI: The one -- the one that is closest to the things we're doing here is -- is basically PRISM.

THE CHAIRPERSON: Just for the understanding, following up on Mr. Hacault's question, when you respond that these are Manitoba Hydro's numbers, okay, but they're historical representations of past events, but you're putting it through your own program to develop this?

DR. ATIF KUBURSI: Correct. I mean, what would -- what would be shared would be the flows. We use the same flows that came from the first column. The generation, we use the second column. What the differences would be in net revenues, because we have used different prices and exports, volumes and import volumes, that Manitoba Hydro have different numbers.

THE CHAIRPERSON: Thank you.

CONTINUED BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: I'm not so sure if I'm clearer or more confused on the issue of flow and generation. I had understood your initial answer, Dr. Kubursi, to be that your modelling was based on the generation numbers.

DR. ATIF KUBURSI: Yeah, and -- and as you can see --

MR. ANTOINE HACAULT: And not on the flow numbers. There isn't any distribution that you actually

-- where you actually plicked -- picked the flow numbers, the numbers on the extreme left of the table I've shown you from Tab 75, page 312.

You didn't use those numbers, you used the generation numbers, correct?

DR. ATIF KUBURSI: Yeah, correct, but in all our analysis, and ultimately the stress things, Mr. Hacault, we ultimately brought in the first column. All right. In a sense, what we really said, okay, and -- and this is something that you referred to and -- and -- and it's important that we clarify this.

The number you -- you see in the Exhibit 10, thirty-five-o-eighty (35080), all right, this -- this is the generation, all right. And this corresponds to an average between 2001 and 2007.

MR. ANTOINE HACAULT: Correct. And -- and Manitoba Hydro's average, historically, as we see it on that table is --

DR. ATIF KUBURSI: Thirty (30).

MR. ANTOINE HACAULT: Thirty thousand (30,000).

DR. ATIF KUBURSI: Yeah.

MR. ANTOINE HACAULT: So there's, what I would say, a material difference between your assumptions and historical records and production, correct?

DR. ATIF KUBURSI: No, it's not correct, because that number, thirty thousand sixty-seven (30,067) is over the entire period, 1912 to 2005. And our average is 2001 to 2007.

MR. ANTOINE HACAULT: I won't get into all the questions that Mr. Williams asked, but you've chosen then a very small sample as opposed to the large historical sample?

DR. ATIF KUBURSI: Yeah. Okay. The -- the -- the issue is that, yes, I have generation and I have water flows over a much longer period, but the numbers in terms of finances and prices, and we were restrained and constrained by what's available from Statistics Canada, and Statistics Canada was 2001 to 2007.

MR. ANTOINE HACAULT: Thank you. Perhaps we can now go to the undertakings, which were distributed on May 26th. They're answers to the undertakings that you provided. I believe it's marked as KM-7, for the record. It contains the questions posed and the answers provided.

(BRIEF PAUSE)

DR. ATIF KUBURSI: I have it now.

MR. ANTOINE HACAULT: In particular, I'll want to ask a couple questions with respect to the question posed on the first page, which is identified as (d). And I'll read it in for the record:

> "Assumes that beyond 2035, market conditions will likely yield higher prices than would be achieved by an extrapolation of term-sheet prices, this based on the assumption that significant CO2 pricing will come into effect?"

And then if we flip to the next page...

MR. GAVIN WOOD: I'm sorry, what question are you on?

MR. ANTOINE HACAULT: That was question 1(d) is what I read into the record.

MR. GAVIN WOOD: Sub -- sub (d), thank you.

MR. ANTOINE HACAULT: And --

MR. GAVIN WOOD: Could you start that again, please?

CONTINUED BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: Well, perhaps just take time to read that question and the answer and then

I'll proceed with a couple questions. Thank you.

DR. ATIF KUBURSI: Yeah, thank you.

(BRIEF PAUSE)

MR. ANTOINE HACAULT: Okay?

DR. ATIF KUBURSI: Yeah, I read, sorry.

MR. ANTOINE HACAULT: Now, in your direct evidence, and in some of the information requests, I understood that both yourself, Dr. Kubursi, and Dr. Magee wrote the report and Grant Graham (phonetic) edited the report.

Is that correct?

DR. ATIF KUBURSI: Sorry, Graeme MacQueen.

MR. ANTOINE HACAULT: Oh, so it's Grant -- sorry, spell that, please.

DR. ATIF KUBURSI: No, no, Graeme, G-R-A-E-M-E.

MR. ANTOINE HACAULT: Now in the answer to question 1(d), in the middle of that response, and I'm quoting for the record:

> "There exist now some calculations that would suggest a carbon level of eighty dollars ($80) per tonne is required

before this tax would make future electricity prices high enough to warrant a future expansion plan."

My first question is: Did you, or Mr. Graeme, or Mr. Magee perform those calculations?

DR. ATIF KUBURSI: Well, Mr. -- Mr. MacQueen only read the English and tried to put it in Scottish. But the -- just for Gavin. Okay.

Dr. Magee and I -- and Lonnie will speak for himself -- we did not perform the calculations, but we have literature that we reviewed that showed two (2) graphs. One (1) is the price of electricity at different carbon taxes. And the only time when the two (2) intersect would be at the eighty dollars ($80), which means that you can get a sufficiently high electricity price only to the extent that an eighty dollar ($80) per tonne tax is put because at twenty (20), or thirty-five (35), at forty (40), they showed the impact on electricity prices are likely to be quite low.

MR. ANTOINE HACAULT: Sir, are you aware that there are different -- differing opinions on that produced in different papers than the one that you apparently have read?

DR. ATIF KUBURSI: Yes, and we evaluated quite a bit of this literature. This was, and we can

produce it, was quite persuasive because it went into the detailed calculations of how each tax, and given elasticities of substitution between gas, hydro, and coal, they got this.

Most of the others assumed that no matter what the tax is you're going to use the same amount of carbon. This is heresy for an economist. In many respects we believe the price of a particular product rises there will be enough incentives for people to economize on it. And in that respect we felt that this paper dealt very sophis -- in a very sophisticated way, in a very credible way, with what the carbon tax would likely bring about to the price of electricity. And there that calculation of eighty dollars ($80) seemed to be the most credible for us.

Now we're aware there are a number of things, but -- a number of papers and num -- number of opinions. In our opinion -- and we can maybe send this part of evidence and the reasons why we felt that the -- that paper was most credible in our view.

MR. ANTOINE HACAULT: Now, did that paper deal with the MISO market and Manitoba Hydro's circumstances?

DR. ATIF KUBURSI: It was not dealing in any specific way with Manitoba Hydro case, but it was

basically on the side -- on the US side and it dealt with more than MISO, but also the New York and the eastern one too.

MR. ANTOINE HACAULT: So the one (1) statement I'd like to explore a bit here is that, as I understand this particular statement that you've made and I quoted into the record, that eighty dollars ($80) per tonne is required before this tax would make future electricity prices high enough to warrant future expansion plan.

Am I correct in understanding that it's your opinion that prices need to get that high before Manitoba Hydro can justify any future expansion plan? Did we just look at that item?

DR. ATIF KUBURSI: Yeah, yeah. Okay. I mean, at -- at this point, what we were basically looking at is the following. At the present time, the prices of electricity are quite low, and one (1) of the major, crucial, critical factors for a future expansion would be the negotiated price that you would be able to get for your long-term contract, and an expectation of a high electricity price in the opportunity market.

And the way we felt, like, this would be a very crucial factor, because there is some general presumption that the increase in the price of electricity

is going to be very much contingent on a greater awareness and, ultimately, the change in the carbon tax. And we felt that it's not just that you bring a carbon tax, that this carbon tax must be at a particular level, because only at that level of eighty dollars ($80) would this really raise the price to a level considered to be sufficiently high enough to bring about a -- a price that a future expansion would be profitable at.

MR. ANTOINE HACAULT: I'll try and break that answer down a bit. Thank you for your answers, but they're pretty lengthy. You talked about the negotiated price for long-term contracts being important. If the price is equal to the marginal cost of bringing that additional generation online, does that make a difference in your opinion?

DR. ATIF KUBURSI: Yes, but we've always argued, too, that the price equal to the marginal cost is a necessary condition, all right? In economics, you really need to make sure that there doesn't exist an extra unit of production that you would bring to the market, that you would not fetch a price that's equal to it. I mean, it doesn't make sense for anybody to bring or to produce one (1) extra unit if it costs them more than the price they're going to fetch for it, all right? But this is the necessary condition for what we call

profit maximization.

But there is also another thing that we need to worry about, and this is the price that should cover what we call total cost, which would be your av -- you know, that the price should be larger than your average variable plus your average fixed cost because if you only cover in the short term the variable cost and some part of the fixed costs it's okay because if you were to shut down and don't do this the only thing that you would wash out would be the variable cost, but the fixed cost would remain because this fixed cost, by definition, is the amount that you would pay whether you produce or not.

In the long run, everything becomes variable, and therefore, what you really want to target is the price at which the marginal cost is equal to the price, but that the price is high enough to pay for all your costs. And now, and one (1) of the reasons in expansion where these prices would rise is because you put so much capacity, and this capital is -- is a fixed cost because you put that capacity. Whether you produce this amount or that amount, it doesn't vary with the amount of output, and you want to make sure that this price is high enough that it would pay for your variable costs, whatever you need to produce this extra unit, plus

whatever fixed cost that you end up with, having made the expansion.

MR. ANTOINE HACAULT: So if you have those elements, then carbon tax becomes irrelevant, correct?

DR. ATIF KUBURSI: If -- if you get that price without them, you're right.

MR. ANTOINE HACAULT: Now, with respect to this carbon level, you would also agree, sir, that for major additions which are required in hydro-electric utilities, such as Manitoba Hydro, to serve domestic load, that there needs to be some caution and, I'll say, prudence in planning the online demand for domestic needs. You can't wait until the last minute to start building these projects which take maybe ten (10) to twelve (12) years to bring online, correct?

DR. ATIF KUBURSI: Correct.

MR. ANTOINE HACAULT: And would you also agree that given that we have evidence that some of these generation facilities continue to generate power, although they've been built over a hundred years ago, or approximately a hundred years ago, that it would be shortsighted to just look at a very small portion of that economic life and physical life of that asset in making a decision?

DR. ATIF KUBURSI: Yeah, I mean, this is something that we had a good discussion with the Chair. And the issue here is two (2) things. There is a physical life and there is an economic life, and one is usually shorter than the other.

The real challenge here is to make sure that your economic life is taken into account. You can't possibly look and say, Well, I'm going to recover my costs in a hundred years. You -- you -- and why? Because the average fixed cost is so low because we spread that fixed capital over a hundred years.

If I have a $100 million in a hundred year, each year is a million dollar, all right. If I have fifty (50) --

MR. ANTOINE HACAULT: That's on a straight line depreciation --

DR. ATIF KUBURSI: Okay, let's make it --

MR. ANTOINE HACAULT: -- as opposed to a regular depreciation table, correct?

DR. ATIF KUBURSI: No, no, I want to make the best case for you, and then try to show you that it may not work, okay. I'm -- I'm making it the -- the easiest possible way, a hundred years, a hundred million, one (1) a year.

Now, suppose that all of a sudden we have

a technological change and hydro is no longer the cheapest. We can get and deliver electricity using fusion that they keep threatening us with, and we can do it, and it's safer, it's not nuclear, and we can deliver it on any computer it takes.

Your -- your hundred years, you're stuck with about fifty (50) or sixty (60) years of a physical asset undepreciated as you -- you did not use in your calculation to recover it and it becomes a sunk cost on you.

What you really want to do here is to balance your perspective in a way in which the economic and the possibility of technological change is there. And -- and most prudent would be to use not a linear, but maybe double-digit, you know, declining balance, any one (1) single method that would allow you to recover the economic value of what you have sunk rather than the physical value, just on the uncertainty that the future may bring a major technological change that this hundred years where your assets would last may not really be economically serviceable or they deliver economically the potential that you thought it would on a physical basis.

MR. ANTOINE HACAULT: So your recommendation is to -- sorry if I'm maybe putting this in strong words, but to speculate as to what might arise

in the future even though we don't know to discount the projected economic life of a facility?

DR. ATIF KUBURSI: I -- I won't call it speculation. I call it risk management.

MR. ANTOINE HACAULT: But is it fair when we talk about economic life, sir, that it's the period over which the asset is expected to be economically useable by one (1) or more users?

DR. ATIF KUBURSI: Tha -- that would be a good definition.

MR. ANTOINE HACAULT: Okay. So that, at least for the current assets by -- that Manitoba Hydro operates in its water -- hydraulic generation, none of them have had their economic life spent. In fact, the hydraulic generation in Manitoba results in the lowest rates in North America, correct?

DR. ATIF KUBURSI: Correct. And I could not really go ahead and say that because we didn't have something happening in the past it's not going to happen in the future.

(BRIEF PAUSE)

MR. ANTOINE HACAULT: Could you now turn to the same exhibit, but Question 8 of the KM-7, the

answers to the undertakings request posed by the Board.

MR. GAVIN WOOD: He has it now. Just review it for a moment.

(BRIEF PAUSE)

MR. GAVIN WOOD: Please go ahead. Please go ahead.

CONTINUED BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: Okay. It's just basically a follow-up to the questions that I had. There's one (1) statement in there:

> "KM are not in a position to determine the length of the useful economic life of dams."

That's at page 6. Is that correct?

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

MR. ANTOINE HACAULT: Okay. Now I just have one (1) or two (2) other questions with respect to the eighty dollar ($80) carbon tax issue. What's the breaking point, in your opinion, as to when Manitoba Hydro should not be building a dam on that price? And I've read your evidence and some of your evidence I understand brings in a whole bunch of other factors, but

it seems in this answer that you're suggesting that we ignore all the other factors.

If we don't hit eighty dollars (80), you don't build. Is that your opinion?

DR. ATIF KUBURSI: No. No. I mean, this is really -- I'm going to go into a -- a very simple logical structure here for the argument. What we are arguing is for sufficient conditions. We say it's a sufficient condition that eight dollars ($80) a tonne would warrant these things. It's not necessary. There's other factors that come into the picture.

You see, I would say if there is clouds is sufficient condition for rain, but I won't argue that clouds is necessary in the sense that if it is -- if it was necessary then the minute you have clouds then you have rain. No, I mean, I could have clouds, but no rains.

So I'm really saying here that if you have eight (8) -- eighty dollars ($80) it's a sufficient condition to make it profitable, but it need not be, because you could get a contract negotiated long-term price that's high enough to warrant it. And when you asked me this I said, Yes, of course. The economy could be so buoyant, so strong, that electricity demand is so high that the eighty (80) -- you know, that it would

really fetch a price higher than eighty dollars ($80) of the carbon.

But if you really have an eighty dollar ($80) a tonne price of carbon, that's a sufficient condition for a very high electricity price, but not necessary.

MR. ANTOINE HACAULT: And you'll agree a lot of that is a judgment call because I think you had one (1) quote, I forget from whom, with respect to the future, The only thing we know about the future is that we don't know what it will be and people have to make educated guesses as to what's going to happen in the economy, gas prices, as to whether the generation costs when we defer building them are going to increase significantly and whether that's going to have an -- an effect.

There's a whole bunch of facts that are discretionary that need to be considered in a hearing that would relate to that, correct?

DR. ATIF KUBURSI: Yeah. I mean, the -- the -- the person you're referring to is Plato, and the way he said it is, The future -- The trouble with the future, actually, is that there will be more things that are likely to happen than what will happen. That the br -- there are greater possibilities than things that would

happen.

And the -- the thing we're talking about here is that if anybody, other things being equal, is betting on a -- an expansion solely, exclusively, on the environmental set-up framework that would be accommodating, which is a carbon tax, then you better not do it unless the carbon tax is eighty dollars ($80) a tonne and that's all I'm saying.

MR. ANTOINE HACAULT: Doctor, Mr. Hacault got to the end of a sentence, but he didn't get to the one (1) thereafter. I'm on page 6 of Exhibit KM-7. You go on from KM:

> "We're not in a position to determine the length of the useful economic lives of -- life of dams. We are confident, however, that it is shorter than the physical life."

How do you come to that conclusion in light of the fact that Manitoba Hydro's -- the -- the oldest dam on the system is now almost -- I believe in 2012 will be a hundred years old. It is still functioning, it is still economic, they are still producing power.

How do you come -- are -- are there dams that you are aware of that have continued to produce

power and have yet not been economical? I -- I'm not -- I don't know how you come -- can be confident of that statement.

DR. ATIF KUBURSI: Yeah. We're confident because of the world of technical and technological change and technical and technological obsolescence. There is no question about it, in every field that we look at the new technologies that have emerged have made things totally obsolete.

I mean, at one time even something that was considered to be technologically superior -- actually most people assume that Betamax was far superior than VCR, but it didn't live and completely was a major economic catastrophe for -- for the people who produced it.

What we're really confident about is that there are so many technological changes, particularly now with all the new developments in wind and photocells and some new technologies where they can transform kinetic energy into useful energy -- what we're really saying here is that there's ample evidence in every field, and I won't in any respect feel that this is going to be strange or different in the electricity field, that these technological changes are making economic life far shorter than the physical life.

That's -- that's all that we're saying. Whether it would be absolutely, totally, exclusively going to happen in electricity we don't know. But the record of so many products and industrial things, particularly now -- they're saying the shelf life of any product actually 70 percent of new -- of products by major corporations are products they did not have two years ago. Seventy percent of the revenues that are derived by major industries are from products and services that did not exist two years ago.

I mean, in a world like this it becomes extremely different to argue that the physical life is going to be equal or longer than the economic life. If anything it really -- it persuasively suggests that the economic life is -- is shorter than physical life.

THE CHAIRPERSON: On that note let's take a break. Thank you.

--- Upon recessing at 10:45 a.m.
--- Upon resuming at 11:10 a.m.

THE CHAIRPERSON: Okay. Welcome back, everyone. We're a little bit later than we planned, but such as life.

I'm sure everybody realizes that we are

getting back this hockey team, so, yeah, that's all done. Apparently everybody has signed. That was that yelp that was out there, and --

MR. ANTOINE HACAULT: So do we get to do the rest of the hearing at Portage and Main, Mr. Chairman?

MR. DAVID CORMIE: So, Mr. Chairman, is it -- is it a term sheet or not?

THE CHAIRPERSON: Actually, Mr. Cormie, you're correct, because it's subject to the NHL's approval, so you'll have to buy at least four (4) season tickets. That'll be, what, twelve thousand eight hundred dollars ($12,800) a year, so I'm sure you'll rush out for that.

Mr. Hacault, you can start up whenever you wish.

CONTINUED BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: Thank you, Mr. Chairman. Dr. Kubursi, I'll be taking you to the Exhibit 10 in -- in due course, but firstly, Exhibit 8 is a response with respect to drought costs when costs of financing are included. It's the first page of the handout that you provided to us today. It's a response to Undertaking number 142, transcript page number 6,268.

Have you located your answer, sir?

DR. ATIF KUBURSI: Yes, I did.

MR. ANTOINE HACAULT: Now, just to again refer to Tab 75, page 312, I just want to use some of those numbers to get an understanding of what your response means. Am I correct, firstly, you're essentially taking the worst five (5) year drought costs, and they may be different, but they could be similar to the example we started with this morning, which was a six (6) year period from 1937 to 1942, correct? And you started in 1937. That was the first year of -- of what you considered to be the drought period, correct?

DR. ATIF KUBURSI: Correct.

MR. ANTOINE HACAULT: So am I correct in -- in understanding then, based on your previous answers, that we're looking at opportunity cost, so that if we use 1937 as a particular example, your answer in Exhibit 8 would have us adding interest to arrive at the total costs of five point three (5.3) in a year like 1937 where Manitoba Hydro actually made a profit of $104 million, or whatever that number was?

DR. ATIF KUBURSI: It -- it's correct to go this way. What we have without the interest cost, we go and find the net revenues that would come when you have a very low flow, and low generation, and all the

prices that we talked about that are in Exhibit 10.

What we add now is the interest rate on whatever debt you started the period with, and this debt accumulates, and the interest rate that is imposed on that debt. So we ultimately end up paying not only the costs of production and imports, but also -- and that's only cost here is the interest rate, we don't allow any amortization of the debt. We're just simply charging an interest on that debt at that interest rate that is on the income -- on the probability distribution between 2001 and 2007.

MR. ANTOINE HACAULT: So again, I just want to make sure I've understood, and I'm sorry for repeating my question, but it assumes, because your calculation is on loss of opportunity, that Manitoba Hydro, in my example in 1937, will have to go borrow money when it made $104 million of profit, and it will have to pay interest with respect to loans that it's had to take, theoretically, even though it made $104 million of profit.

DR. ATIF KUBURSI: No. No, I -- sorry if I gave you that impression. No. The debt is basically accumulated on the actual net revenue, not on the opportunity cost. But the costs in terms of the one I calculated here, for example, the number that you have

for the five (5) years is basically, when financing costs are included, okay...

MR. ANTOINE HACAULT: Sir, do you have the sheet for that? Because we -- you've clearly explained that the $3.3 billion, that's lost opportunity cost. Have you rerun your model to show what the net loss is as opposed to the net opportunity loss?

DR. ATIF KUBURSI: Yeah, these are definitely opportunity costs. The three point three (3.3) is opportunity costs. The debt, five point three (5.3) when you include the interest cost, is not on the debt that is calculated on opportunity but on the actual debt that would accrue.

MR. ANTOINE HACAULT: But how does your model change to convert the numbers that you've inputted, which is the opportunity cost, to the net loss? I mean, what are you assuming as far as average revenue and -- and actual losses? So if you had a hundred million dollar loss you might have to go on the market to get that hundred million dollars.

DR. ATIF KUBURSI: No.

MR. ANTOINE HACAULT: How does your -- do you have a sheet that shows how your model works to decide how much the loss is, and then convert that into a loan?

DR. ATIF KUBURSI: No. No, I -- I don't calculate -- I don't calculate the debt that would emerge from these losses. What I am doing here is I'm looking at the debt as it progresses over the period, and I am taking the interest costs on this debt as it is reflected in an actual number, not my calculations.

And -- and in a nice way, I -- I see your question. In -- in a perfect world what I should really do is I benchmark at a particular year, and every year I get a cost. I add it. I assume that it is financed by debt. And then I raise the debt. And then the interest now is not only on the debt I started with but on the new debt from which the losses have added to. I don't do that.

I -- I literally take the debt that is embedded in that period, and I apply the interest rate to it, and I add it to the costs.

MR. ANTOINE HACAULT: So it's not the new debt and the incremental cost of the new debt that you're trying to identify here. You just put an interest amount to the existing debt and say, Well, if you continue -- and that's part of your operating cost, isn't it, already?

DR. ATIF KUBURSI: No, it's not in the operating cost because now I'm adding it. You see, all

the calculations of net revenue were made exclusive of the interest. So all I'm doing now, I'm adding.

But in -- in a nice neat calculation, you're absolutely right, it would be nice. I benchmark the debt, and I augment to the debt the losses as we go. And then it will become an extremely important question. Would you include the opportunity losses or the actual losses? And -- and if I were to make a judgment, it should be the actual losses.

THE CHAIRPERSON: But in any effect, if you drop five (5) -- say $500 million, absent losing that $500 million you would pay down debt and have a lower interest cost, so, either way, there's costs associated with a loss?

DR. ATIF KUBURSI: No -- no question about it. But the -- the point that I am -- we're trying to really get here is that there is an interest cost because if you go into debt and this debt is going to rise as you lose because of the -- the interest cost is not going to be only on the average debt that prevailed but on the increased debt that this drought had occasioned, and we didn't do that.

THE CHAIRPERSON: Yeah, we have your point.

CONTINUED BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: Thank you. So these calculations tell us nothing about the debt which is actually caused by the drought. It tells us about the interest that the corporation is already bearing in its operations, correct?

DR. ATIF KUBURSI: Correct. It -- it just -- what it does is that whatever the debt that we began the period with, we put an interest rate on it and we add it to the costs.

And -- and this -- the -- the -- the issue here is that because of this interest rate your debt is going to get bigger. And -- because your net revenue is going to be much smaller, and the losses are going to be exaggerated. And this should have added to the next debt and the debt after it. In some sense we're underestimating the -- the -- the cause of the debt.

THE CHAIRPERSON: Well, I think we all understand that the -- the -- the numbers here on net revenue are -- are basically accounting numbers, and in actual fact when you're arriving at debt, you're looking at cash flow. And cash flow, for example, is, absent amperdite -- amortization, it's plus principal repayments, anything -- any costs that are deferred or capitalized aren't included. You could have a profit and

still be borrowing more.

DR. ATIF KUBURSI: Absolutely, because it's not a cash flow.

(BRIEF PAUSE)

CONTINUED BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: Thank you, Dr. Kubursi. And flipping to the next page immediately after, which has two (2) probability distribution diagrams, one (1) for a seven (7) year drought with interest, and one (1) five (5) year drought with interest, could you explain how these tables help us understand what you put on the first page?

DR. ATIF KUBURSI: All what -- all what this would do is to look at a particular year. It doesn't do it over the five (5) or seven (7) years, only particular year. You raise, you know, the -- the -- the -- the debt is at the particular interest rate. This is the way it would affect your mean revenue.

That mean revenue -- and this is the actual, not the opportunity, all right, is -- is negative. Remember in the ben -- in the benchmark case the net revenue was about four hundred forty-five (445) positive. Now it's a negative 12 million. So you're

basically beginning the period, even with positive gross, net -- I don't want to use gross, net revenue exclusive the interest, it's positive.

The -- the minute you include the -- even in the benchmark, you include the borrowing cost, your net revenue becomes a negative number. And this becomes even bigger when you have a drought. So this is basically the mean number -- the minus twelve (12) is primarily the difference from a benchmark when you have the cost of that drought because of reduction of generation from 35 to 19, all right, and the fact that you have to pay the interest.

MR. ANTOINE HACAULT: So this table is generated from the base case, which is all the numbers that you've given us on --

DR. ATIF KUBURSI: Six.

MR. ANTOINE HACAULT: -- Exhibit -- Table --

DR. ATIF KUBURSI: Yeah.

MR. ANTOINE HACAULT: -- 6.1, Exhibit 10.

DR. ATIF KUBURSI: Right, but with two (2) things. One (1) is the change in generation because now it's adjusted to the low flow of five (5) or seven (7) years, and these are the numbers that could come from the random distribution that we talked about coming from

the flows that Lonnie had generated.

He would take the minimum of five (5) years, all right, different five (5) years minimum, and he takes them and gives me the average. So the average five (5) year minimum. This is the one (1) I adjust the flow for this number, and I adjust the generation corresponding to this low flow, and then in my calculation of net revenue -- before I used to only get gross revenue minus the cost. Now I add one (1) new cost, which is the interest rate.

And here all these numbers are not opportunity. Just -- what they are, I have to subtract them from the benchmark number to get to the opportunity cost.

MR. ANTOINE HACAULT: Contrary to the table I've been referring you to that shows average net revenue of 202 million which is the Manitoba Hydro numbers.

DR. ATIF KUBURSI: Right.

MR. ANTOINE HACAULT: First, am I correct in understanding that your average is put somewhere around four forty-five (445)?

DR. ATIF KUBURSI: Right.

MR. ANTOINE HACAULT: Correct. And that's based on Stats Can information, correct?

DR. ATIF KUBURSI: Right. And the -- the seven (7) -- the seven (7) -- the 2001-2007.

MR. ANTOINE HACAULT: In 2001-2007 --

DR. ATIF KUBURSI: Correct.

MR. ANTOINE HACAULT: -- sample? So what you're calculating is the diversion from that average revenue, how much down it will go both from the net revenue excluding interest and, now if you add the interest, how much down will it go further from the average that you had come out at four forty-five (445).

DR. ATIF KUBURSI: Correct.

MR. ANTOINE HACAULT: Okay. Now just help me understand this part because you say that the mean is minus 12 million, is that correct?

DR. ATIF KUBURSI: Correct.

MR. ANTOINE HACAULT: And the average is four hundred and forty-five (445) --

DR. ATIF KUBURSI: Right.

MR. ANTOINE HACAULT: -- million, correct?

DR. ATIF KUBURSI: Right.

MR. ANTOINE HACAULT: Okay. What does that give me? That is, do I add the twelve (12) to the four forty-five (445), or do I subtract the twelve (12)--

DR. ATIF KUBURSI: No, you --

MR. ANTOINE HACAULT: -- from the four forty-five (445)?

DR. ATIF KUBURSI: No, you add it.

MR. ANTOINE HACAULT: Okay. So then I get 457 million.

DR. ATIF KUBURSI: Right.

MR. ANTOINE HACAULT: Correct.

DR. ATIF KUBURSI: Which --

MR. ANTOINE HACAULT: And --

DR. ATIF KUBURSI: -- which on average, we multiply by five (5) years and added would be the two (2) billion, but it's not because there were also different variations in the level of water between the period.

MR. ANTOINE HACAULT: Okay. So this is not a mean of what we might expect because if we do it times five (5) or times (7) it would give us a number substantially lower than what you've responded to in this answer, correct?

DR. ATIF KUBURSI: Correct.

MR. ANTOINE HACAULT: Okay. Now what additional data would you have to print out to help us understand the -- the tables there?

DR. ATIF KUBURSI: Yeah. I'm -- I'm going to give you a spreadsheet that would include all

the information that you have in Exhibit 10 and the corresponding numbers that are brought from Statistics Canada. So I'll -- I'll submit this as an undertaking. I have it with me here, all I need to do is to print it and give it to you.

MR. ANTOINE HACAULT: Thank you. Could we turn to Exhibit 10, which is the sheet with the inputs.

Just for the reporter, we will record that as an undertaking. Thank you.

--- UNDERTAKING NO. 151: Doctors Kubursi and Magee to produce a spreadsheet including information from Exhibit KM-10 and Statistics Canada

MR. GAVIN WOOD: I think he meant he -- he'll produce it over the -- by -- over -- over the lunch break. So it's -- it'll be something that will be before you today.

MR. ANTOINE HACAULT: Thank you.

CONTINUED BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: Going down the

table in Exhibit 10, did I understand your answer correctly that you believed that the first line, which is identified as "Hydro Generation," and then thirty-five thousand eighty (35,080), is an average over the period?

DR. ATIF KUBURSI: That's correct.

MR. ANTOINE HACAULT: Could you turn to page 227 of your report which is, as I understand, the numbers that you got from Stats Can. So page 227 of the original report there's a table there.

DR. ATIF KUBURSI: I have it.

MR. ANTOINE HACAULT: So before I turn to that table -- or actually, going to it, if I look under 2007, going down to the heading "Generation," I see the number thirty-five thousand eighty (35,080), which is exactly what you put in this Exhibit 10. Are you sure that you averaged the numbers?

DR. ATIF KUBURSI: No, no.

MR. ANTOINE HACAULT: Just visually looking at the numbers, they don't look like an average.

DR. ATIF KUBURSI: No. This one is -- is this number here, but we used the average, so I have to check this to make sure that we used the average over the period.

MR. ANTOINE HACAULT: So are you saying this printout may be the wrong printout that we're

looking at?

DR. ATIF KUBURSI: No, just only this number, but I'll check it out and report, and -- and during lunch break I'll open the -- the account.

MR. ANTOINE HACAULT: Could you go, then -- and I'm just taking this randomly, but down in Exhibit 10, if we go to the heading "US Exports Firm." It's about seven (7) or eight (8) lines down, and there's the number three thousand five hundred and thirty-eight (3,538) and beside it the word "random." Have you found that?

DR. ATIF KUBURSI: Three five three eight (3,538), yes, and the number is -- where is it?

MR. ANTOINE HACAULT: And if we go to the table --

DR. ATIF KUBURSI: Yeah.

MR. ANTOINE HACAULT: -- under "Export Firm," if I go to 2007, again I see the identical number: three thousand five hundred and thirty-eight (3,538).

DR. ATIF KUBURSI: Yeah, okay. I -- I see what -- what the point. All these things are random numbers. We just put this 2007, but when we use it, we use the distribution, because if you look I put 2007 everything here. If you look at costs of fuel -- where is it, costs of fuel? I -- you know, I have only the

distribution. All these numbers are distribution. They're coming from distributions.

I'm representing only 2007 numbers here, but they're all -- when we run the system, they are basically the distribution, not the number, because everything here is exactly the -- the 2005, except maybe some numbers. Let me see the price, export price. Export price.

You see, I'm putting the 2007 numbers, but when we run the system, it's -- these numbers are replaced by distribution, because everything random except, as I said, the -- when -- when we run the first benchmark, all these numbers that you have is 2007, but when we run them, they're not the 2000 number. We pick the distribution numbers, okay, and put 2007 here so that you could see it one to one, so you know that this is coming exactly from Table 6.1.

But when we run the PRISM, you don't run it with these numbers. You run it with the distribution, okay?

MR. ANTOINE HACAULT: I'm thoroughly confused because --

DR. ATIF KUBURSI: Okay. No, no. Let me go --

MR. ANTOINE HACAULT: -- you -- you

indicated Table 6.1, which was the base case --

DR. ATIF KUBURSI: Right.

MR. ANTOINE HACAULT: -- that you used --

DR. ATIF KUBURSI: Right, right. Okay. Let --

MR. ANTOINE HACAULT: -- was based on all these numbers.

DR. ATIF KUBURSI: No. No, no. Let me -- let me --

MR. ANTOINE HACAULT: And now you're indicating to us that this sheet that you've given us basically repeats 2007 numbers, and that something else generates the base case.

Is that what you're saying?

DR. ATIF KUBURSI: No, I -- I know exactly what I've done. I'm putting all -- all these numbers here are exactly the last column of 2007, but this is not what we start the system with. When we start the system, we use the distribution. That's why all these things are random. Even generation is random. Nothing in the 6.1 is fixed. The base case is basically on the average distributions of these things. I put these numbers here so you could see one to one correspondence with 6.1.

But when we run the system, we don't use

these numbers. We use the distrib -- the distribution number, you see? Anyone who is familiar with PRISM would know -- or @RISK is that you have to basically put numbers, and then you put the distribution, and you allow the distribution to overrule these numbers. And we made this very clear in our evidence, that when we did the benchmark everything was random, and the random was basically 2001-2007.

And then we ran the numbers and get the net revenue, and this became the mean net revenue that comes from all these random numbers coming in. Each one (1) of them is random. I'm representing here -- because if I just said random numbers, and gave you these things as this distribution, that distribution, like the way I put it in the things in operating expenses, you probably would have no clue where these things are coming from.

So I went and put 2007 -- actually, you know, the person who helps me with this, Steve, put all the 2007 so you could see the one-to-one correspondence between Table 6.1 and this one. But when we run it the benchmark is basically fundamentally overruled, these numbers, not using them but the distribution from which they came.

And that's why we said in six point two (6.2) we keep everything random, we fix the amount of

generation. And we fix the amount of generation to correspond to the new flows, like the minimum flow that we have. Everything else remains.

MR. ANTOINE HACAULT: Well, you say "minimum flow," but that's confusing. You never actually use the flow. We cleared that up.

DR. ATIF KUBURSI: No.

MR. ANTOINE HACAULT: You use generation, not flow.

DR. ATIF KUBURSI: But the -- you know, like, okay, let's say that the number is one thirteen (113) is the average flow and the minimum flow is fifty-four (54). Okay, you have it from your table just to show you how we -- how we do this because we did exactly almost the same.

You -- you're with me in -- in Tab 75? Okay, the average is a hundred thirteen (113) KCFS, right?

MR. ANTOINE HACAULT: I see that.

DR. ATIF KUBURSI: You're with me. And in 1940 the flow is fifty-four (54), correct? The similar things what we do is we look at this one thirteen (113), and then I take the average of the minimum that Lonnie gave me from the random distribution of the flows, and I correct the generation by the ratio of the average

of the minimum to the average, and that will be the fixed generation that corresponds to that drought.

MR. ANTOINE HACAULT: Now, again, you've thoroughly confused me because what's the ratio you use? We -- there's no correlation between flow and generation. We've seen that.

DR. ATIF KUBURSI: Yeah. I mean, you -- you can't judge, you know, no correlation by two (2) numbers. I mean, there is a formula, all right. There is a formula that is on page -- in -- in our report, we have it on a particular page. It's the formula that translates flow into generation.

MR. ANTOINE HACAULT: So your model is making some kind of assumption on storage and water flow?

DR. ATIF KUBURSI: No, no, noth -- nothing at all. All I'm really saying, corresponding to a particular flow, there is a generation level. And that flow and generation has this formula. We assume everything to remain the same in that formula, except now instead of the -- the hundred thirteen (113), we put the new flow.

MR. ANTOINE HACAULT: So what's your generation value that you've assumed in your calculations? Because you said you've assumed some kind of a value. You've assumed some kind of a calculation.

You think that it's derived, but -- but you've taken a sample from 2001 to 2007. What -- what did you assume Hydro would do in its operations of its storage and water flow?

DR. ATIF KUBURSI: We didn't -- all -- all we really needed to know, that now there is a -- as you can see, for example, the nineteen thousand (19,000) corresponds to the -- to the -- you know, from thirty thousand (30,000). I mean, there is a relationship between the two. All we -- all we have really to do here is to basically say that now drought is not about generation. Drought is about flow.

The water flow is low, therefore, generation is going to be low. And we say there is a cor -- one-to-one correspondence between flow and generation. That's all we've done.

MR. ANTOINE HACAULT: But how -- how do you know what the storage was at the beginning, and you're looking at inflows here, and your -- what formula did you use? I mean, did you assume that the water levels in the lake were high? Did you assume they were low?

DR. ATIF KUBURSI: All -- all we did is basically say that there is a particular relationship between flows and generation. And we looked at our

average flow and -- that corresponded to that average of the period. And then we looked at that low flow and adjusted the average to the low, that's all.

MR. ANTOINE HACAULT: But you see, why I'm asking that question, sir, is that the average flow is about thirty thousand (30,000), correct? Aver -- average generation.

DR. ATIF KUBURSI: Yes.

MR. ANTOINE HACAULT: Okay. In the lowest flow on record at fifty-four (54) --

DR. ATIF KUBURSI: Yeah, it was nineteen (19).

MR. ANTOINE HACAULT: It's -- it's -- it's less than half that average flow, correct?

DR. ATIF KUBURSI: No. It's above that, it's nineteen (19).

MR. ANTOINE HACAULT: Well, it's -- it's from a hundred (100) and --

DR. ATIF KUBURSI: The flow -- the flow -- the flow, yes.

MR. ANTOINE HACAULT: The flow --

DR. ATIF KUBURSI: Fifty-four (54).

MR. ANTOINE HACAULT: -- was a hundred and thirteen average (113).

DR. ATIF KUBURSI: Fifty-four (54) over

one thirteen (113), yeah.

MR. ANTOINE HACAULT: That's -- it's less than half.

DR. ATIF KUBURSI: Yeah.

MR. ANTOINE HACAULT: And I want to know whether your model assumed that there would be half the generation?

DR. ATIF KUBURSI: No.

MR. ANTOINE HACAULT: What is the formula that you used?

DR. ATIF KUBURSI: Well, you know, I'll -- I'll share it with you. All right. We have a formula, it's a little bit more complicated than that because it's not just fifty-four (54) divided by one thirteen (113) times really the -- the average flow -- the average generation.

Because, you see, you're taking the average to be the thirty thousand (30,000). We took the average over our own period, all right, which is the 2001-2007, then we looked at the, you know, the average flow over that period, and then the minimum that is to that average. That's -- that's the way we did it.

All right, 2001-2007. Okay. You have a generation. I can -- I can read it to you, between -- it goes between basically thirty-four (34) to thirty-five

(35).

THE CHAIRPERSON: Perhaps, Dr. Kubursi, if you were to provide the details of your calculation to Mr. Hacault --

DR. ATIF KUBURSI: Yeah, yeah.

THE CHAIRPERSON: -- it might facilitate moving ahead.

DR. ATIF KUBURSI: Yeah, but -- but just -- let's very quickly summarize. I have the average generation, 2001-2007, I have the average flow, 2001-2007. I have the minimum flow that comes from the random things. I divide the minimum by that average and then I adjust by the ratio the generation.

CONTINUED BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: So that ignores storage. So when in 2003/2004 Manitoba Hydro intentionally kept more in storage, excuse your number because your number has no idea what's in storage, it assumes that there wasn't human intervention in the storage, that it was just a natural flow and your calculations assumed that Hydro did not interfere in the usual flow?

DR. ATIF KUBURSI: Yeah. That -- that would be correct if I'm talking about a very par -- one

(1) particular year. If I'm looking at over a period of time I must have taken all these variations of relationship between the flow to generation with storage. If you take one (1) year and say that year is the only year I'm going to use, then I may be liable to some of the issues.

But if I'm looking over an entire period, then one (1) time I kept the flow, the -- the storage high, one (1) time even lower, it averages out. That's -- that's -- that's the logic. I mean, it averages out.

MR. ANTOINE HACAULT: Well, perhaps you can give me those calculations, sir, because --

DR. ATIF KUBURSI: Oh, I can do that, no problem.

MR. ANTOINE HACAULT: -- that would be the easiest way.

DR. ATIF KUBURSI: Yeah. Yeah.

MR. ANTOINE HACAULT: Now -- undertaking to provide the calculations of the relationship between flow and generation assumed in the model done by Dr. Kubursi and, who is this assistant, Steve? What are --

DR. ATIF KUBURSI: Steve Spencer, yep.

--- UNDERTAKING NO. 152: Doctors Kubursi and Magee to provide the calculations of

the relationship between flow and generation assumed in the model

DR. ATIF KUBURSI: He's the one running around to get you the numbers for the other one (1).

CONTINUED BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: Now are all these numbers on Exhibit 10 independent, or -- for example, let me ask you a question, there's a heading under operating expenses. It's entitled "Royalty Expenses." Do you see that?

DR. ATIF KUBURSI: Yeah.

MR. ANTOINE HACAULT: What's Royalty Expenses? Is it the water rentals?

DR. ATIF KUBURSI: Okay. I mean why don't you go to that Table 6.1, page 227.

(BRIEF PAUSE)

DR. ATIF KUBURSI: It certainly must be the water rental.

MR. ANTOINE HACAULT: Do you know whether it is?

DR. ATIF KUBURSI: I -- I think it's a good guess it is.

MR. ANTOINE HACAULT: My next question then, is it randomized independently?

DR. ATIF KUBURSI: Every one is randomized independently.

MR. ANTOINE HACAULT: Does that mean, sir, then that you could have in your distribution, when your computer does its run, a high royalty based on the sampling that you've given here?

DR. ATIF KUBURSI: M-hm.

MR. ANTOINE HACAULT: So that would mean high water rentals in a low generation year.

DR. ATIF KUBURSI: I mean, it's a randomized process and each one (1) of them follows with this. But, I didn't just get -- you know --

MR. ANTOINE HACAULT: But -- but is the answer, yes, sir? Could you have --

DR. ATIF KUBURSI: No, it's -- it's never, yes or no because you're dealing with economists. Okay.

As -- it's -- it's really a little bit more complicated, I tell you why. I mean, I didn't get this -- I did not create a random distribution here out of nowhere. I looked at the distribution that fit the

actual number over seven (7) years that you have here and I felt what is the best distribution that these numbers could have come from. So it couldn't possibly be just a random process this way.

No, this is a probability distribution that was particularly chosen, carefully chosen, where I could really say with some confidence that the numbers that you see here must have come from that random distribution.

MR. ANTOINE HACAULT: But, you'll agree with me, sir, that in your random distributions there are extremes, correct? So if you are attributing random distribution for royalty expenses, the computer could choose either a low number for water rentals or a high number for water rentals --

DR. ATIF KUBURSI: No, no --

MR. ANTOINE HACAULT: -- within the distribution that you've chosen, correct?

DR. ATIF KUBURSI: Not correct. You see, I'm -- I'm -- let me say it again -- I mean, you're talking about it as if I am some sort -- pulling from a probability urn. I'm not.

All I'm really saying, I am picking numbers from a distribution that I'm so confident that the seven (7) numbers that I began with must and are best

-- best characterized by this distribution, all right?

MR. ANTOINE HACAULT: Could you go to -- could you go to your Table 6.38, which is your random distribution as I understand it for royalties.

DR. ATIF KUBURSI: Six point three eight (6.38)?

MR. ANTOINE HACAULT: Yeah. It's on page 257, I believe.

DR. ATIF KUBURSI: Two five seven (257) yeah. Correct.

MR. ANTOINE HACAULT: So I'm asking the same question, sir. This is the distribution you told the computer to consider, correct?

DR. ATIF KUBURSI: Correct.

MR. ANTOINE HACAULT: And the computer will randomly consider, within that distribution, a combination, each independent, giving you an answer, correct?

DR. ATIF KUBURSI: Correct.

MR. ANTOINE HACAULT: So the computer could chose something at the cost of royalties a little bit over a hundred and twenty thousand (120,000). It could chose that in its random sampling, correct?

DR. ATIF KUBURSI: Correct.

MR. ANTOINE HACAULT: And it could chose

something a little bit less than twenty (20) in its ramble --

DR. ATIF KUBURSI: Yes.

MR. ANTOINE HACAULT: -- random selection.

DR. ATIF KUBURSI: But -- but you have to read this distribution also too, that the largest number of things that you could possibly expect to pick are going to be bounded by one (1) standard deviation add on the mean.

MR. ANTOINE HACAULT: So it's most likely to pick --

DR. ATIF KUBURSI: It would be the mean--

MR. ANTOINE HACAULT: -- plus seventy (70) -- seventy-six (76), I think it says the mean --

DR. ATIF KUBURSI: Yeah, yeah. Seventy-six (76), three-o-one (301).

MR. ANTOINE HACAULT: Okay.

DR. ATIF KUBURSI: Plus a standard deviation around the mean of one (1), which is thirty-three (33). So I am going to pick most of my numbers to be between forty (40) something and a hundred.

MR. ANTOINE HACAULT: Okay. But, sir, I don't want to -- is it your understanding then that water rentals have no relation to the -- the generation? In

other words, you can have low generation but high water rentals.

DR. ATIF KUBURSI: Yeah.

MR. ANTOINE HACAULT: So...

DR. ATIF KUBURSI: I mean, you have -- you have a point in the following sense. I did not impose any correlation among these different components of cost. Mr. Hacault is right in the sense that I could pick a lower royalty and a high, you know, different number from this course. It is possible.

I mean, it would be nice if I were able to really say that I would weed out all these that would suggest a low royalty with a high flow. I -- I can't -- I can't do this.

All I'm really saying here, I am looking at a broad distribution of possibilities, and I'm looking at the risk factors that could come. There could be situations in which there would be a possibility of the variations you're talking about, but that probability could be extremely low, and I'm going to look at all the possibilities and then concentrate on the average. And when I'm talking about the average, it will not be far-fetched to suggest that this average would only emerge if I'm using all these average values of the different things.

MR. ANTOINE HACAULT: But, you see, that that's one (1) of my points, sir, is that if you go to page 228, which is your Table 6.1 --

DR. ATIF KUBURSI: Yes.

MR. ANTOINE HACAULT: -- when you allow these variables, such as a high water-rental rate when you would have low generation, which just can't happen in real life, those little probability or not-likely situations would appear in the tails of this diagram because the computer is thinking, well, it might happen.

DR. ATIF KUBURSI: Absolutely, and that's what we would like to know. I mean, one (1) of the most important lessons we learn from risk analysis is that you can't look everything to be along the average. You ought to look also at these situations which have very little likelihood, the head, the tail, but if they still have a chance of occurring, and they would im -- have implications that you have to be aware of and be prepared to deal with.

MR. ANTOINE HACAULT: So the computer is assuming that the province is going to increase its water rental rates in a drought year. That's one (1) of the scenarios, and it shows up in the tail end of your probability distribution.

DR. ATIF KUBURSI: I mean, it -- it could

-- it could easily be that the tail end is exactly the opposite in the sense that they would reduce it. All I'm really talking about here is the combinations that would come, and the one we're talking about that the most likely would be the average, and when you're looking at the average, you're possibly looking at the average of all these variables.

But if you want to be in a situation where you know all the possibilities, it's there, but it has such a low probability of occurrence, and you want to know what will be the one that is most likely to happen, then you don't look at the tail, you look at the average.

You see, the trouble is that if you don't do this then you weed out an incredible number of events, and you won't have as rich a menu to be looking at. I mean, one (1) of the greatest advantages of risk analysis is you look at all possible combinations that are likely to happen and you put a probability distribution and confidence levels.

And we're saying, you see, I have a confidence level that this kind of situation you're talking about has less than 5 percent of occurrence, or maybe 1 percent. But if I want to look at situations where there is a very high probability of occurrence, which is really at the mean, then that situation you're

talking about is most likely not going to happen.

MR. ANTOINE HACAULT: And, on average, then, your testimony is that Manitoba Hydro, based on your Stats Can analysis and this small sample, should be making $445 million a year, minus -- or you -- you may have to add some interest costs on that.

DR. ATIF KUBURSI: Yeah.

MR. ANTOINE HACAULT: I -- I do have one (1) -- just a question of clarification, then. On this table that you've produced as Exhibit 10, is it -- firstly, is it Steve that produced this table?

DR. ATIF KUBURSI: Oh, yes.

MR. ANTOINE HACAULT: Yes. Okay. Do you know -- did you instruct Steve that every time there was a random number in the six point one (6.1), that he should indicate the word "random" beside?

DR. ATIF KUBURSI: Yes.

MR. ANTOINE HACAULT: So am I correct in looking at this table, then, if I don't see "random," the base case includes the number that is actually shown on the sheet?

DR. ATIF KUBURSI: No, I -- I mean, for example, I -- I told you, in this table everything is random. He -- he probably didn't put random next to generation. He just put the 2007. And, in some sense,

maybe he's reflecting my instructions. I wanted you to see, if I give you this number and say, Everything random, I don't put a number here, you say, What -- what did you give me.

I want to tell you that these are numbers that could come, exactly 2007 table, so you could see them. But when we run that system we don't run it with thirty-five-o-eight-o (35080). We run it with the random distribution that is basically -- best characterizes the generation.

MR. ANTOINE HACAULT: Now, let's just look at generation -- but page 260 of your report.

DR. ATIF KUBURSI: yes.

MR. ANTOINE HACAULT: There's the triangular probability of distribution of generation --

DR. ATIF KUBURSI: Which is --

MR. ANTOINE HACAULT: -- which shows --

DR. ATIF KUBURSI: Yeah. Yeah, it's a triangular --

MR. ANTOINE HACAULT: Okay, have you located?

DR. ATIF KUBURSI: Yeah.

MR. ANTOINE HACAULT: Okay. Now, what I'm having trouble understanding is that you say that the thirty-five zero eight zero (35080) in Exhibit 10, as I

understand your answer, I should be able to find it somewhere on this table, six point four four (6.44), and I don't see it. It goes down to, in the tail end, a little bit under nineteen (19), and at the top end a little bit over twenty-two thousand (22,000).

DR. ATIF KUBURSI: Let -- let me check Table 6.1.

(BRIEF PAUSE)

DR. ATIF KUBURSI: I think it's titled wrongly. This looks more -- in -- in my view, more -- this is a representation of load. Because if it was really generation, these numbers that you have should have really been there.

MR. ANTOINE HACAULT: But you have a Table 6.19 as load, sir.

DR. ATIF KUBURSI: I'm just checking it just to see it.

MR. ANTOINE HACAULT: And if I look at that probability distribution I don't have your number from this Exhibit 10 anywhere on that sheet either. Six point one nine (6.19) is at page 247 of your report, sir.

DR. ATIF KUBURSI: Yes. And, you know, these numbers that are in parentheses, they're the

average and the standard deviation. In triangle, at one (1) I should have the min, the -- the max, and the average. None of these things seem to be -- I -- I'll have to check on this one. It -- it doesn't look at all to be the representation of generation.

If it was generation, I should have the minimum generation, which I -- Table 6.1 is two two seven (227). I mean, these numbers should have really been there, and that's why -- let's see. I have the min -- the minimum, eighteen seven six (1876). Is there any one -- eighteen seventy six (1876).

THE CHAIRPERSON: Perhaps you could take your time over lunch.

DR. ATIF KUBURSI: Yeah. Yeah, let me check this one because --

THE CHAIRPERSON: Yeah. Mr. Hacault --

DR. ATIF KUBURSI: -- it doesn't look like the generation to me.

THE CHAIRPERSON: Yeah, it's best you take your time and determine that. Mr. Hacault, I'm not trying to hurry you. I'm just wondering, do you know how much longer you'll require the panel before we can move on to the next Intervenor?

MR. ANTOINE HACAULT: I had expected, quite frankly, to finish my questions, but every time I'm

getting an answer it seems to be confusing me more about what his calculations are and what his base case is. I will say, at -- at the outside, half an hour. I -- I would hope that I can finish in ten (10), fifteen (15) minutes, but...

THE CHAIRPERSON: Okay. Well, hopefully over the break Dr. Kubursi will find a way to address some of your issues.

DR. ATIF KUBURSI: Yeah.

THE CHAIRPERSON: So we'll -- we'll come back at one o'clock to try and make up a bit of time.

MR. BYRON WILLIAMS: Mr. Chairman, could you hold just one (1) second before you break.

(BRIEF PAUSE)

MR. ANTOINE HACAULT: I guess just to clarify over lunch, in the event that six point four four (6.44) on page 260 is not the probability distribution used in the base case. Could we have what in fact is that probability distribution? Thank you. Do -- do I have that undertaking?

You have to indicate yes or no, sir.

DR. ATIF KUBURSI: Yes, sir.

MR. ANTOINE HACAULT: Thank you.

--- UNDERTAKING NO. 153: Doctors Kubursi and Magee to provide, in the event that six point four four (6.44) on page 260 is not the probability distribution used in the base case, what in fact is that probability distribution

THE CHAIRPERSON: Thanks. Okay. We'll be back at 1:00.

--- Upon recessing at 12:01 p.m.
--- Upon resuming at 1:17 p.m.

THE CHAIRPERSON: Okay. Welcome back, everyone. As a matter of time, we had a bit of a discussion amongst ourselves, and -- and given the timetable and the expectations for different witnesses appearing in a -- in a row, basically, following the -- the doctors' testimony today, after Mr. Hacault is finished with his cross, we'll be going to Mr. Gange. We're aware that Mr. Williams was reserving the right to ask some additional questions, and then we -- we know we have Manitoba Hydro's cross.

Based on our indications through counsel of the timing, we'll see how it goes, whether or not we can completely finish with the doctors today, subject to whatever may come up. So we may go past our normal closing hour to be able to accomplish this. It'll all depend on the -- the length of time it takes to finish the cross-examinations of the various Intervenors, and a short break to allow Manitoba Hydro to catch its breath and -- and then begin its examinations of the doctors.

So, with that note, we'll return to Mr. Hacault, unless Mr. Wood has something from Mr. -- Dr. Kubursi.

MR. GAVIN WOOD: We -- we do, sir, and I think this may in fact shorten at least the one (1) cross. There's several documents that we'd like to enter. Dr. Kubursi, would you go through them for me, please?

DR. ATIF KUBURSI: Yeah. We have three (3) documents. One (1) was something outstanding from last time, which is the distribution for the US import price. And this is the first graph. If you can see, it's titled "Price of US Imports."

MR. GAVIN WOOD: And that really is the second sheet to KM Exhibit number 9, and I'd ask that it be marked now as KM Exhibit number 11. That completes

that undertaking answer.

--- EXHIBIT NO. KM-11: Graph entitled "Price of US Imports"

DR. ATIF KUBURSI: The -- the second one is the generation distribution with the one that we have in our report on page 260, unfortunately, is load, and was labelled wrongly as generation. The new generation and the correct one that was also used in the model is now submitted as a separate document.

MR. GAVIN WOOD: That is, Mr. Chair, then Figure 6.44 at page 260, should be replaced with the document that's been distributed, and we'd ask that it be marked as KM Exhibit number 12, please.

THE CHAIRPERSON: That should prove helpful. Thank you.

--- EXHIBIT NO. KM-12: Replacement document to Figure 6.44

DR. ATIF KUBURSI: And there is also one (1) more, and this is the response to Mr. Hacault regarding the way we translated flow into generation. The formula that we used is also submitted. And this is

literally a shorter method for the formula that we have in our report on page 178 under footnote 27.

MR. GAVIN WOOD: So that's page 178 of the KM report, footnote 27.

DR. ATIF KUBURSI: Twenty-seven (27).

MR. GAVIN WOOD: And the document itself is a hand-written; it's -- it's titled "Flow/Generation," and that's KM Exhibit number 12, please.

THE CHAIRPERSON: Thirteen (13).

--- EXHIBIT NO. KM-13: Document entitled "Flow/Generation"

MR. GAVIN WOOD: And then there -- there's also -- Dr. Kubursi was hoping he could just clarify, sir, the exchange that took place. I think we were concerned, no fault, of course, of Mr. Hacault. We just felt it got a little ragged the last half hour or so, and if you would, I -- we think we -- it might save time if he just clarified, if that would be okay.

THE CHAIRPERSON: Yes, for sure.

DR. ATIF KUBURSI: Thank you, Mr. Chairman. There are three (3) important overriding commitments we made and I'd like to reiterate them, and they will explain things.

First, we haven't done anything that we did not document. We probably, as now, we have seen that in Figure 6.44 it was mislabelled. This was -- we ran one (1) more time load under the triangular distribution and was mislabelled as a "generation"; we have now the new generation.

2. The base case that we have -- and we made it very clear right at the beginning that this was a case in which we allowed all the variables to come from probability distributions. We did not use a single fixed number. We wanted to see what, if this period, 2001 and 2007, and we fit probability distributions that we considered to be the best fit, where they give you some level of confidence that the numbers that were in Table 6.1 are coming from these distributions.

And then one (1) we wanted to share with you something. I mean, we could have easily said, These are the variables and everyone of them came from a random distribution, and we gave the probability distribution. It would have been absolutely in -- you couldn't read it because, I mean, all that we really say, They're all distributions.

To make things clearer we wanted to show numbers that correspond to the table from which they came, and we used the last year to do so. I misspoke

myself by saying the average. Because if we used the average it would have never been show, because the average would be a number that is not necessarily one (1) of the observations. So we wanted to show you and give some level of comfort that what we've used here are numbers coming from this table in our report and each one of which is a probability distribution.

And to make and underscore this, we present it; we didn't have to, actually. I mean, one (1) of the things people were a bit objecting to it is that, Why do you want to put all this distribution at the end with all these colours? We wanted to give a level of comfort to everybody that we want to present something that could be replicated, and that every single variable that we are putting in this Exhibit 10 is coming from a particular well documented situation.

The other thing that we want to -- I mean, there was a bit of a -- an exchange with Mr. Hacault and necessarily -- probably I did not clarify. There is no one to one (1) to one (1) correspondence between flow and generation; nobody's claiming that. There is a formula, and this is the one we said in page 178, footnote 27, Exhibit 30, that shows the strict formula that engineers use and I see it -- and I saw it in SPLASH and in HERMES. We paraphrased it by saying --- and I -- I mean, I

haven't done this, but I'm -- will be more than happy to do this as undertaking at no charge. I want a correlation between flow and generation and I will bet my sweet life it will be higher than 95 percent, and could use the coefficient to adjust.

But what we did, we made it a bit of a heuristic, but because we're literally interested in the big picture here, and the story is: Look, this are the generation that correspond to a particular flow. What if this flow is a drought flow? And what would really happen if we were to stress the system?

And remember, all what we were doing is stressing the system. And we put that generation that corresponded to that lowest flow over that period of 2001-2007, yes.

THE CHAIRPERSON: Thank you, sir. Mr. Hacault...?

CONTINUED BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: Thank you, Dr. Kubursi. Bringing you then to Exhibit 13. Where did you take the numbers for the first item in the formula Average Generation? Is that from the table that -- of Statistics Canada?

DR. ATIF KUBURSI: Correct. This is

Table 6.1, page 227.

MR. ANTOINE HACAULT: Okay. So that if we want to do the calculation we would take the total generation numbers on page 227.

Is that correct?

DR. ATIF KUBURSI: Correct.

MR. ANTOINE HACAULT: And add all -- all of those and divide it by -- by the number of years and we would get the average?

DR. ATIF KUBURSI: And you'd get the average.

MR. ANTOINE HACAULT: Okay. Now with respect to average water flows, where did you get that data?

DR. ATIF KUBURSI: The same data that you have. This was supplied by Manitoba Hydro to us. It was at the end of one of our chapters, but for some reason, because we had a little bit richer data, it was redacted. But it's exactly the same way. And our average is 113 kcfs; the one you have.

MR. ANTOINE HACAULT: That's -- that's from the seven (7) years? Because my table doesn't go up to 2007, the one that --

DR. ATIF KUBURSI: Well --

MR. ANTOINE HACAULT: -- I've marked, so.

DR. ATIF KUBURSI: -- the -- the one we have I think goes to 2006 probably. This is it.

MR. ANTOINE HACAULT: So did you just --

DR. ATIF KUBURSI: So it would be -- it would be on 2006 -- 2001-2006.

MR. ANTOINE HACAULT: Could -- could you just --

DR. ATIF KUBURSI: But I will check this, yeah.

MR. ANTOINE HACAULT: -- verify where you got that information, because it --

DR. ATIF KUBURSI: Yeah.

MR. ANTOINE HACAULT: -- it makes a difference in the -- that a -- because, you know, when I asked my secretary; I said, How did you get that number. She says, Well, I pressed this and this. And I said, It it gave you that number?

DR. ATIF KUBURSI: Well, there was --

MR. ANTOINE HACAULT: And said, Oh, wrong numbers in, wrong numbers out.

DR. ATIF KUBURSI: No, no, no. I mean, we got this exactly from probably where you got yours from: Manitoba Hydro. We had the flows that were from 1912 all the way to 2000. The last things I got, 2006.

MR. ANTOINE HACAULT: So can you tell us

then what number you put your 2007?

DR. ATIF KUBURSI: I -- I could give you these numbers.

MR. ANTOINE HACAULT: Where did you get that number?

DR. ATIF KUBURSI: No, this is something I -- I would -- you see, it's redacted. I don't have it with me, but I can share these numbers --

MR. ANTOINE HACAULT: Okay.

DR. ATIF KUBURSI: -- with you.

MR. ANTOINE HACAULT: Where is the redacted form of that?

DR. ATIF KUBURSI: It's -- what was it? Table -- it's -- it was the last page in chapter 5. I'll give you the page number.

(BRIEF PAUSE)

DR. ATIF KUBURSI: Sorry, chapter 4. Chapter 4.

(BRIEF PAUSE)

DR. ATIF KUBURSI: It's page 311.

MR. ANTOINE HACAULT: It's completely

black.

DR. ATIF KUBURSI: Well, I mean, this was requested of us. I know --

MR. ANTOINE HACAULT: No, that's okay. I'm not criticizing you, Dr. Kubursi, at all.

THE CHAIRPERSON: You must be getting used to that, aren't you, Mr. Hacault?

MR. ANTOINE HACAULT: Completely in the black. Okay, so you'll give us those numbers. Presumably, those aren't confidential.

DR. ATIF KUBURSI: The -- the unredacted...

(BRIEF PAUSE)

MR. ANTOINE HACAULT: Ms. Ramage has a comment.

MS. PATTI RAMAGE: Now -- yeah, I'm just raising the concern. If that's been redacted information, that's numbers that Dr. Kubursi can supply. And I'd have to look at exactly what we're speaking of, but as a -- as certainly an interim measure, perhaps if you could supply them to us, to Manitoba Hydro, and we can confirm that they are the numbers that were behind the redaction, if that would assist Mr. Hacault.

THE CHAIRPERSON: He's nodding. Sounds okay.

MR. ANTOINE HACAULT: Correct, Mr. Chairman. I just want to know what numbers he used in his formula.

--- UNDERTAKING NO. 154: Doctors Kubursi and Magee to indicate where they got the data, with respect to average water flows

CONTINUED BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: Now, number 3, in the series of formula on KM Exhibit 13, indicates ratio of minimum flow. So minimum flow, is that the fifty-four thousand (54,000), or is it the minimum flow between the years 2001 and 2007?

DR. ATIF KUBURSI: Now, we -- we used two (2) numbers. In one (1) case, we used the actual minimum, which was the lowest minimum, which is the fifty-four (54). And the second one was the distribution that Lonnie gave me, which is an average of the minimum at the 2.5 percent interval level.

MR. ANTOINE HACAULT: And what's that number then?

(BRIEF PAUSE)

DR. ATIF KUBURSI: Sorry. This is a situation where we tried to stretch the system at the minimum that has not been observed but is possible. And this is the average of the minimum at the two point five (2.5) level, and it's in page -- Table 4.5, and at what page?

Sorry, page 151, and the number thirty-eight point five seven (38.57).

(BRIEF PAUSE)

MR. ANTOINE HACAULT: Okay. So the kcfs is -- the flow is thirty-eight point five seven (38.57)?

DR. ATIF KUBURSI: Six (6), yeah.

MR. ANTOINE HACAULT: Five six (56)?

DR. ATIF KUBURSI: Five (5) -- point five seven six (.576).

MR. ANTOINE HACAULT: Five (5) --

DR. ATIF KUBURSI: Thirty (30) -- three eight point five seven six (38.576).

MR. ANTOINE HACAULT: Okay. Now, I did a quick calculation while you were looking at your computer

and we came to an average, between 2001 and 2007, in the range of thirty-three thousand one seventy-four (33,174). And then what we did is we divided that by what you indicated was the -- you thought was the average at one hundred and thirteen (113).

DR. ATIF KUBURSI: The hundred and thirteen (113) is the total average of the entire one, but for that period you have to calculate it.

MR. ANTOINE HACAULT: And that's the number we don't have yet. Okay.

Because doing that calculation, are -- are you able to tell me at the fifty-four (54) level, firstly, what the computer assumed as a generation number? Is it like around fourteen (14) or fifteen thousand (15,000)?

DR. ATIF KUBURSI: I -- I can't unless I have the numbers in front of me.

MR. ANTOINE HACAULT: Okay.

DR. ATIF KUBURSI: But I -- I can supply these, yes, no problem.

MR. ANTOINE HACAULT: Is that an undertaking? We need to -- to have that understanding.

MR. GAVIN WOOD: Could you set it out in detail, one (1) of your, please --

MR. ANTOINE HACAULT: Well, I'd like --

I'd like the formula which is shown on KM-13 applied to the two (2) scenarios that Dr. Kubursi identified, the first one is the 54 kcfs flow, and the second one is thirty-eight point five seven six (38.576) flow, and what the computer then assumed was the generation resulting from that flow.

DR. ATIF KUBURSI: Is it correct, Mr. Hacault, you want me to put the numbers that are on this sheet, which is Exhibit -- what number is it?

MR. GAVIN WOOD: Thirteen (13).

DR. ATIF KUBURSI: Thirteen (13). And I will just put the numbers that we used here?

MR. ANTOINE HACAULT: Correct.

DR. ATIF KUBURSI: Fill it in.

MR. ANTOINE HACAULT: For the two (2) scenarios, because we know that the actual generation was around nineteen thousand (19,000) something, and our calculations based on your formula, seem to -- to think that the computer would probably be thinking that it's fourteen (14) or fifteen thousand (15,000) instead of the actual nineteen (19), so we want to know how much the computer's off.

THE CHAIRPERSON: So -- okay, so Dr. Kubursi is taking that as an undertaking, just for the record. Thank you.

DR. ATIF KUBURSI: Yes. Yes, sir.

--- UNDERTAKING NO. 155: Doctors Kubursi and Magee to provide the formula which is shown on KM-13 applied to the two (2) scenarios identified, the first one is the 54 kcfs flow, and the second one is thirty-eight point five seven six (38.576) flow, and what the computer then assumed was the generation resulting from that flow

CONTINUED BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: Now, just a point of clarification, when we've been talking about generation and water flows, although your table shows a number of components leading to the generation, including wind and coal, is your average the average of the water generated, or the power generated by wind and coal? Because the table that you've now provided shows the maximum and minimum for generation as the total of all forms of generation, not just the water.

DR. ATIF KUBURSI: Yeah. We use only

water, the hydro generation.

MR. ANTOINE HACAULT: So going to your Table 6.1 on page 227, I believe. What number are you taking as the water generation number?

DR. ATIF KUBURSI: We take the total generation minus the two (2) that we have, which is the wind and the thermal.

MR. ANTOINE HACAULT: Where is wind and termal -- thermal in this table?

DR. ATIF KUBURSI: I -- I don't see them here, but we have -- we have this information.

MR. ANTOINE HACAULT: The only way we can do the calculation is by having those additional numbers, then.

DR. ATIF KUBURSI: You -- you'll get them for you it.

MR. ANTOINE HACAULT: Could you undertake to provide those to us, please?

DR. ATIF KUBURSI: Yes.

MR. ANTOINE HACAULT: Thank you.

--- UNDERTAKING NO. 156: Doctors Kubursi and Magee to provide numbers, in regards to Table 6.1 on page 227, for wind and thermal generation

CONTINUED BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: Just one (1) question on a different subject. Sir, we had talked about earlier on about depreciation; do you have any definition of depreciation, just like how do -- how do we define depreciation?

DR. ATIF KUBURSI: As we discussed it, there are several ways of -- of doing it. There is declining balance, double declining balance, some of the year digits, linear. Here, we did not make our own calculations; we took the actual numbers, as reported by Statistics Canada, to reflect depreciation.

MR. ANTOINE HACAULT: Would I be correct in suggesting to you, sir, that in asset valuation, depreciation could either be one (1) of those two (2) methods, either the straight line or the -- the curve method, but starting with the cost of reproducing or replacing the asset?

DR. ATIF KUBURSI: I mean, depends what the actual accounting system that's used. We just took the numbers.

MR. ANTOINE HACAULT: But my question to you was: In the context of asset valuation, am I correct in understanding that your start number is either the

cost of reproduction or the cost of replacement of the asset, to which then is applied the depreciation?

DR. ATIF KUBURSI: Yeah. I mean, the -- the standard -- even the Canadian Revenue Agency, it tells you, if you use one (1) method, you stick to it. You have to be consistent.

MR. ANTOINE HACAULT: I'm not so sure I have my answer yet.

DR. ATIF KUBURSI: Yeah. I -- I really don't know.

MR. ANTOINE HACAULT: Is -- is it an accepted definition, that for asset valuation you start with the cost of reproducing or replacing the asset, then you apply depreciation?

DR. ATIF KUBURSI: But -- but you could easily start with the cost of the actual asset and you use it. But whatever is the method that you use, you cannot flip through another one in the middle, or use a different one.

Typically, there are two (2) ways, and you already outlined them. I'm not so sure which one is being used here. My -- if -- if you ask me which one I would recommend, which one I feel more comfortable with, it would be the cost of replacement.

MR. ANTOINE HACAULT: Thank you. Those

are all my questions, subject to my initial qualifications at the outset, that I hadn't received answers to the undertakings that I had asked before we broke last time. And so I'm not in a position, obviously, to ask questions with respect to those or other answers that Hydro had posed, and that we cooperated with in not asking again.

THE CHAIRPERSON: Okay. Thank you, Mr. Hacault. We'll see how we make out.

We're moving now onto Mr. Gange for RCM/TREE. Mr. Gange, are you ready to begin?

MR. WILLIAM GANGE: Yes, I am, sir.

THE CHAIRPERSON: Thank you.

CROSS-EXAMINATION BY MR. WILLIAM GANGE:

MR. WILLIAM GANGE: Professors, during --

MR. GAVIN WOOD: Mr. Gange, could I bother you just to move that chair out of the way. Thank you.

CONTINUED BY MR. WILLIAM GANGE:

MR. WILLIAM GANGE: Professors, during the course of your review, did you have unrestricted access to the ICF report, the KPMG report, and the New York Consultant reports, and the Manitoba Hydro

responses, in terms of that -- that you saw the entire reports prior to any redactions?

DR. ATIF KUBURSI: We have seen the unredacted reports of ICF, KPMG, Manitoba Hydro responses. We only saw the public document of the NYC.

MR. WILLIAM GANGE: Okay. Thank you. And during the course of your review, did you have access to the Manitoba Hydro model inputs, algorithms, and outputs, without -- without any redaction? Did you have full disclosure of those?

DR. ATIF KUBURSI: We have what you might comfortably call full disclosure, in the sense that we have seen these models run, we saw the numbers, we saw different simulations. We feel comfortable that we've seen unredacted versions of them.

MR. WILLIAM GANGE: Thank you. And -- and so -- and in particular, the -- the PRISM and the SPLASH models, you had basically unrestricted access to them in being able to ask Hydro employees questions that might arise as you were reviewing them.

Is that correct, sir?

DR. ATIF KUBURSI: That's correct.

MR. WILLIAM GANGE: Would you agree with me, sir, that if -- if you did not have access to all of that information, it would have been extremely difficult

for you to have conducted your review?

DR. ATIF KUBURSI: We certainly feel comfortable and feel enabled, you know, by looking at these models and seeing the runs. We certainly would have been in a more difficult position, particularly in regards to the forecasting, to the simulation, to the antecedent forecast, to the long-term plans, the models and the way they run, and the unfettered access we had to the people who ran them. And the -- we -- we still came up with recommendations that we would like to see more formal documentation of the system. But we felt quite comfortable with what we saw.

MR. WILLIAM GANGE: That's not quite the -- the focus that I'm putting on this. I understand that because of the -- the significant access that you did have that you would, in fact, feel quite comfortable.

I'm putting to you the -- the hypothetical, that if you had only been able to see the redacted versions of all of those reports would you have been comfortable in coming before this panel and saying, We can give you an appropriate assessment of the risk of Manitoba Hydro?

DR. ATIF KUBURSI: I mean, this is quite hypothetical. With hindsight, now that I've seen them, I would really say that we were in a position where we

found ourselves confident in our evaluation and judgment. I -- I -- it would be extremely hard to believe that if these redactions were kept and we were denied the full access whether we would have been able to conduct our work in the way we did.

MR. WILLIAM GANGE: Yes. It would have been extremely difficult for you to have conducted your work in the way that you did.

That's -- that's a fair statement?

MR. GAVIN WOOD: Yeah, appreciating it depends what's taken out.

CONTINUED BY MR. WILLIAM GANGE:

MR. WILLIAM GANGE: It's -- but, Dr. Kubursi, you've seen the redacted reports, haven't you?

DR. ATIF KUBURSI: Yes.

MR. WILLIAM GANGE: And -- and you're aware of -- you, better than anyone, except perhaps the Hydro people, understand the extent of -- of the redactions. And ex -- and do understand better than anyone, other than Hydro, the importance of -- of the information that was in the redactions?

That would be fair, wouldn't it, sir?

DR. ATIF KUBURSI: Yes, and no. I -- I hate to always be in this position where I can't give you

yes or no, but I'll tell you why I am saying yes and no.

The number of redactions were not very large, but they were very critical, all right? So in some sense the redactions made a difference. If I were to look, for example, at KPMG and I did not have the full access to the sale/no-sale calculations, I wouldn't have been able to understand and grasp fully what their conclusions and recommendations mean.

MR. WILLIAM GANGE: Thank you. I'm going to move on, sir, that one (1) of the issues that -- that KPMG raised was that -- and -- and I'll quote for you from -- from the KPMG report. It -- just for the record, it's found at page 113 of the KPMG Report. It says:

> "KPMG has a concern that the assumption of perfect foresight will tend to understate operating costs when the model is used to generate forecasts of future financial results."

Were you able to follow me on that, sir?

DR. ATIF KUBURSI: Yes, and we came to the same conclusion ourselves.

MR. WILLIAM GANGE: Yes. I was going -- that was going to be my next. That was a conclusion that you came to, that -- that the use of perfect for -- perfect foresight has the probability that costs will be

understated, especially at times of adverse water conditions. Is that correct, sir?

DR. ATIF KUBURSI: That's correct. The -- the assumption would allow you to know with complete foresight the amount of water needed in the next period. And if you run a situation where you have a bit of uncertainty you might have kept more water and, therefore, you would have got less revenue and, therefore, you understate the cost of the drought.

MR. WILLIAM GANGE: Mr. Wallach has suggested -- and you -- you've reviewed Mr. Wallach's report and his testimony, sir?

DR. ATIF KUBURSI: Yes, sir.

MR. WILLIAM GANGE: And he suggests that the Company should study the issue of perfect foresight and the effect that it may have on the costs and the risks and -- and that -- that the company should attempt to determine the effect of the underestimate. Would you agree with him on that, sir?

DR. ATIF KUBURSI: Yes. And we -- we -- I mean, I agree. My -- it's my understanding, and the way we saw the way HERMES run is that it doesn't assume foresight and, therefore, it's in a better position to estimate these costs.

MR. WILLIAM GANGE: Thank you, sir. One

(1) of the points that you raised is that -- you stated that one (1) method of reducing risk related to drought would be the development of -- of diversification. Is that correct, sir?

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

MR. WILLIAM GANGE: And -- and one (1) of the comments that you made was the -- the development of other power sources. And -- and do I have this, sir, that -- that in a period of stress, in a period of -- of extreme water conditions, the fact that Hydro had alternate power sources would, to some degree, lessen the risk with -- that arises out of the drought scenario? Is that correct, sir?

DR. ATIF KUBURSI: It's correct if you're talking about the physical one, the physical possibility of not having enough energy and that -- blackouts, but the issue is also financial. And, yes, you may have alternates, such as, say, thermal, but it may be out of the money and may be quite expensive.

MR. WILLIAM GANGE: Yes. However, that -- that question of quite expensive would -- would obviously have to be weighed at the market in which the drought would occur. Tha -- that's fair, sir?

DR. ATIF KUBURSI: It's fair. And you have to also see to what extent you could import power

instead of -- at a cheaper price rather than firing your own expensive thermal.

MR. WILLIAM GANGE: Yes. Although we know that in the 2003/2004 drought scenario one (1) of the stresses on the system was that the import price was, to use my word, not Hydro's word, but I'll use my word, perhaps exorbitant, and -- and that that -- that the -- that the exorbitant import price added to the stress level of -- of the -- of the drought?

DR. ATIF KUBURSI: Yeah, we -- we agree. And one (1) of the stressors that we use is we look at a situation where you have a drought in the -- captured by low flow, the minimum flow, and we added to it a very high -- we didn't use the word "exorbitant," but very high import prices.

MR. WILLIAM GANGE: Yes, thank you. And -- and you've used thermal as your example of other power sources. You also looked at -- at wind as -- as a potential alternative source. Is that correct, sir?

DR. ATIF KUBURSI: Yes, but we also recognize that -- two (2) issues with wind. One (1), there isn't much. You're talking at maybe 300 megawatts. At most times, you know, it's even less than that. And there's this issue of you cannot dispatch wind when you like it, when you need it.

I mean, you don't push a button and let's say, Let it be windy and you get the wind.

MR. WILLIAM GANGE: Sir, when you were being examined by -- by Ms. Southall, you were referred to the Dependable Resources 2009 Base Load Forecast. And the number that you used for wind in that, at page 6,360. 6,360, Mr. Wood.

(BRIEF PAUSE)

MR. GAVIN WOOD: He has it now, thanks.

CONTINUED BY MR. WILLIAM GANGE:

MR. WILLIAM GANGE: At -- at Line 19, sir, I think the -- the -- the value that you used was twelve fifty-four (1,254), not three hundred (300).

DR. ATIF KUBURSI: These are different units. We're talk -- I'm talking megawatt, and here you're talking about gigawatt hours. They're not the same units.

(BRIEF PAUSE)

MR. WILLIAM GANGE: But in -- in that -- that statement, sir, about it not -- it not being

dispatchable, one (1) of the -- one (1) of the elements that is at play in drought is the reserve -- the reservoir capacity. You'd agree with me on that?

DR. ATIF KUBURSI: Oh, I agree.

MR. WILLIAM GANGE: So that anytime that the wind power -- so when the wind is blowing and the wind power is available, Hydro would be able to store more reservoir water. Is that correct, sir?

DR. ATIF KUBURSI: Correct.

MR. WILLIAM GANGE: So that although it may not be dispatchable, wind power has the capacity in -- in a drought situation of being a firming capacity at any particular time when it is -- when it is operative. Would you agree with that, sir?

DR. ATIF KUBURSI: I agree with everything except the word "firming."

MR. WILLIAM GANGE: And -- and can you tell me what -- what you disagree with in terms of the word "firming"?

DR. ATIF KUBURSI: You see, because it's not dispatchable, I can't consider it to be firm.

MR. WILLIAM GANGE: Oh, I see. Okay. But you would agree with me that -- that -- that although it's not dispatchable, it has the ability to -- to allow Hydro to save more hydro power, water power for when the

wind is not blowing. Is that right?

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

MR. WILLIAM GANGE: Thank you. And would you also agree with me, sir --

MR. ROBERT MAYER: Excuse me, Mr. Gange.

MR. WILLIAM GANGE: Yes, sir.

MR. ROBERT MAYER: Is that what you call shaping?

DR. ATIF KUBURSI: I'm not so familiar with that word, but from what I know it -- it's close.

MR. ROBERT MAYER: Mr. Cormie seems to think that that's what you call shaping. Okay.

CONTINUED BY MR. WILLIAM GANGE:

MR. WILLIAM GANGE: If Mr. Cormie says it it's good enough for me, Mr. Mayer. The -- the other point that you -- that we talked -- or that you mentioned in terms of diversification would be the -- the -- the demand-side management programs?

DR. ATIF KUBURSI: I -- I agree.

MR. WILLIAM GANGE: And would you agree with me, sir, that -- that at any time it makes significant sense to invest as much as you can from -- from the Company's perspective in the demand-side

management program because that operates as -- as a -- as -- as a reduction of -- of the requirements on the system?

DR. ATIF KUBURSI: I agree with the spirit, but economists would -- would like to add a couple of provisos to it. One (1), that the marginal costs, the additional costs of an -- of a program should at least be balanced by an equal to additional benefit you get from it. I mean, to say that I will invest all the amount of money may not really be an appropriate way of looking at it because some of this investment may not be justified because there is no net benefit that's positive from it.

MR. WILLIAM GANGE: Yes, thank you. Thank you, Doctors. Those are -- thank you, Dr. Magee, especially. Thank you for -- for your assistance. Thank you.

THE CHAIRPERSON: Thank you, Dr. Gange --

MR. GAVIN WOOD: I could tell --

THE CHAIRPERSON: -- Mr. Gange.

MR. GAVIN WOOD: Doctor -- professor is -- is fine, too, if you want to go there, but that's fine. We -- we've had several fights over that, Professor Hacault and I, so.

THE CHAIRPERSON: Yeah. We won't have to

ask: Is there doctor in the house? That's for sure. Mr. Williams...?

MR. BYRON WILLIAMS: Mr. Chairman, I wonder if I might have a few minutes to confer with my friend, Mr. Wood, and I may be able to -- I've got Dr. Simpson away scrambling to produce an exhibit, but I -- we may be able to do it via undertaking, which might expedite things.

THE CHAIRPERSON: Very good. We're quite interested in that.

(BRIEF PAUSE)

THE CHAIRPERSON: How did you make out?

MR. BYRON WILLIAMS: We're optimistic, Mr. Chairman.

THE CHAIRPERSON: That's good.

RE-CROSS-EXAMINATION BY MR. BYRON WILLIAMS:

MR. BYRON WILLIAMS: And good afternoon, and good afternoon Professors Kubursi and Magee.

Professor Kubursi, first of all, if I could get you to -- to turn to Exhibit KM-13, which is the handwritten formula --

DR. ATIF KUBURSI: I have it.

MR. BYRON WILLIAMS: -- relating to the relationship between flow and generation. You have that, sir?

DR. ATIF KUBURSI: Yes, I do.

MR. BYRON WILLIAMS: And, sir, in looking at this formula, would I be correct in suggesting to you that your calculation of generation corresponding to minimum water flow, set out in point number four (4), is obtained by fitting, F-I-T-T-I-N-G, a line through the data using an intercept of zero and a slope equal to the ratio of average generation to average water flow from 2001 to 2007, sir?

DR. ATIF KUBURSI: That's correct.

MR. BYRON WILLIAMS: Now, sir, I'm going to ask you for two (2) undertakings and, Mr. Wood, just because Professor Simpson's out of the room trying to perform the same task, I -- I'll ask these undertakings, and if he corrects me, we'll -- we'll -- we might have to go back on the record. Is that understood, sir?

MR. GAVIN WOOD: You've only got one (1) shot at it.

THE CHAIRPERSON: Good for you, Mr. Wood.

MR. BYRON WILLIAMS: Well, then, I'd want to stand down, sir. But I -- I think my friend will be accommodating.

CONTINUED BY MR. BYRON WILLIAMS:

MR. BYRON WILLIAMS: Mr. -- Professor Kubursi, excuse me for that. I'm asking, first of all, if you could undertake to plot the -- your formula set out in KM-13 against the data relating to water flow -- excuse -- Manitoba Hydro hydraulic energy and annal -- annual system inflows as for the period between 1912 and 2005 as set out in Manitoba Hydro's response to PUB-1-81.

Are you prepared to undertake to do so?

DR. ATIF KUBURSI: This is something that I would very much like to share it with Professor Magee too. So I -- I'm taking this to be undertaking for both of us.

MR. BYRON WILLIAMS: Yeah, we would appreciate that as well, of course.

--- UNDERTAKING NO. 157: Doctors Kubursi and Magee to plot the formula set out in KM-13 against data relating to Manitoba Hydro hydraulic energy and annual system inflows for the period 1912-2005, as set out in Manitoba

Hydro's response to PUB-1-81

CONTINUED BY MR. BYRON WILLIAMS:

MR. BYRON WILLIAMS: And the second undertaking would be to perform a similar exercise, again using the information from PUB Manitoba Hydro-1-81, but examining how a simple regression with zero intercept would fit through that data.

Would you undertake to do so?

DR. LONNIE MAGEE: Sorry, just want to be sure, do you mean zero intercept, or non-zero intercept?

MR. BYRON WILLIAMS: We're meaning zero intercept.

DR. LONNIE MAGEE: Zero, okay. 'Cause the ration one in Undertaking 1 is effectively --

MR. BYRON WILLIAMS: Zero.

DR. LONNIE MAGEE: -- a zero intercept.

MR. BYRON WILLIAMS: Yes. And what we're effectively looking for is a comparison between the fit--

DR. LONNIE MAGEE: M-hm.

MR. BYRON WILLIAMS: -- using the simple regression analysis and -- and the -- the formula --

DR. LONNIE MAGEE: Right.

MR. BYRON WILLIAMS: -- employed by Professor Kubursi.

DR. LONNIE MAGEE: So the simple regression analysis is with an intercept?

MR. BYRON WILLIAMS: With zero intercept. We might have to clarify that with Professor Simpson.

DR. LONNIE MAGEE: Yeah, okay.

THE CHAIRPERSON: Perhaps -- it sounds like Dr. Magee has a take-up on this that might be useful to hear from, it might help you.

Did the -- Dr. Magee, you had difficulty with Mr. Williams question?

DR. LONNIE MAGEE: Well, the -- it -- it looked like what -- what he was interested in is how two (2) different formulas fit the data.

And the first formula is based on a ratio as like a straight line that goes through the origin, which is another way of saying it doesn't have an intercept. So that's why I expected that the second way would have an intercept, or would have a non-zero intercept.

So that's why I was puzzled that the second method was described as having a zero intercept because that would be quite similar to the first method.

MR. BYRON WILLIAMS: And, Mr. Chairman, I'll check on that and I'll reserve the right to -- to come back on for that simple point.

THE CHAIRPERSON: Yes, just in case if -- if Dr. Simpson meant something different.

MR. BYRON WILLIAMS: I -- I think we'll clarify the undertaking -- the second undertaking on the record, so I wouldn't note it as of yet.

MR. GAVIN WOOD: And then I would -- would remind Mr. Williams he had gone over a figure with the doctors at the break, the -- the graph that you showed them. And if we could get that for them because you were -- you were showing that it had already been grafted -- graphed

MR. BYRON WILLIAMS: Absolutely.

MR. GAVIN WOOD: -- graphed by you -- by Dr. Simpson. And they --

MR. BYRON WILLIAMS: Yes.

MR. GAVIN WOOD: -- that would help them.

CONTINUED BY MR. BYRON WILLIAMS:

MR. BYRON WILLIAMS: Okay. And we'll provide that to Mr. Wood.

And then I have one (1) other question for Professor Kubursi, which you may have already undertaken to do so in your response to My Friend, Mr. Hacault, but I just want to make sure that if -- if you haven't, that I ensure you have.

And if you could -- I don't know if you have the -- the yellow book of CAC/MSOS nearby, but if you could turn to page 31 of that yellow book in the top right-hand corner. You will see -- you'll see before you Figure 6.2, sir. Do you see that?

DR. ATIF KUBURSI: Yes.

MR. BYRON WILLIAMS: And just to remind us all, if you look to the paragraph of -- above, you'll see on the -- the second and third line that the next scenario involves construct -- let me back up. I wonder if you could indicate what specific value was chosen for generation to represent 1940 water flows.

DR. ATIF KUBURSI: We -- the generation, I have to give it to you, but what we use is the lowest water flow, which was the fifty-four (54).

MR. BYRON WILLIAMS: To be correct though, sir, you used generation as a proxy for water flow, correct?

DR. ATIF KUBURSI: Yes.

MR. BYRON WILLIAMS: And what I'm asking for is the actual figure --

DR. ATIF KUBURSI: Yeah, yeah, and --

MR. BYRON WILLIAMS: -- that was used for generation for the 1940 year, sir.

DR. ATIF KUBURSI: Yeah, and this is what

Mr. Hacault has asked us.

MR. BYRON WILLIAMS: Okay. And so you've already undertaken to provide that?

DR. ATIF KUBURSI: Yes.

MR. BYRON WILLIAMS: Okay. And thank you, Mr. Chairman. Subject to clarifying my inelegant question --undertaking, those are my questions.

THE CHAIRPERSON: Thank you, Mr. Williams. You're going to be remaining on-site? Very good. Ms. Ramage, I think it's finally reached Manitoba Hydro.

MS. PATTI RAMAGE: You know, interestingly, I think this is exactly what I was doing in 1996 when the Jets were going down. We were in a GRA, and this is what I was doing, so.

THE CHAIRPERSON: But they probably weren't cheering on the outside.

MS. PATTI RAMAGE: Exactly.

CROSS-EXAMINATION BY MS. PATTI RAMAGE:

MS. PATTI RAMAGE: Dr. Kubursi, Dr. Magee, you've made a number of suggestions for improving Manitoba Hydro's risk-management programs. I'd like to put some context around those suggestions. First off, would you confirm that Manitoba Hydro would be

categorized as a fairly large company with complex issues associated with its operations?

DR. ATIF KUBURSI: Yes, we can.

MS. PATTI RAMAGE: And during the course of your review did you note a distinction between the operations of Manitoba Hydro and those of other organizations in -- engaged in power-trading operations, for example, private organizations or -- did -- did you recognize that difference between Manitoba Hydro and a -- as a Crown and -- and those type of power-trading operations?

DR. ATIF KUBURSI: Yes.

MS. PATTI RAMAGE: Would I be -- if you could maybe elaborate on what that difference is maybe?

DR. ATIF KUBURSI: Well, in -- in -- there are a number of difference -- differences. One (1), the objective of a private corporation is to maximize profits for -- and value for its shareholders, which are basically private investors.

The -- the other one, they probably have a different governance structure that would be different in terms of its accountability and its reward and penalties than a public corporation. And there are also different limitations, and oversight would be exercised over a public corporation that may not exist for a private

corporation.

MS. PATTI RAMAGE: Would you also agree that, in Manitoba Hydro's case, we're looking at physically backed assets wi -- as compared to many -- a power-trading operation where they may be premised on betting on spreads?

DR. ATIF KUBURSI: That is a possibility, yes.

MS. PATTI RAMAGE: Would I be correct in my understanding of your evidence that risk management, and here I'm not focussing on Manitoba Hydro, but risk management throughout the business industry, is developing a new prominence over the last decade or so? Risk is being managed not only by line management, but now the risk management is a function in -- into itself, and that's a relatively new development?

DR. ATIF KUBURSI: That's correct.

MS. PATTI RAMAGE: And you begin your discussion of Manitoba Hydro risk governance at page 191 of your report. That's Tab 1 if you'd like to turn to it. And if I could just read into the record to give our discussion some context. You say:

> "Manitoba Hydro has made major progress in streamlining its risk-management governance architecture and is

continuing to make strides towards best practice. The middle office is functional and is entrusted with increasing risk-management policy formulation, oversight responsibilities, identification of risk, and some risk measurement. A large set of committees and procedures have been instituted to ground governance of risk into that full spectrum of the organization."

Have I read that correctly?

DR. ATIF KUBURSI: Yes, you did.

MS. PATTI RAMAGE: Now, KPMG had concluded that:

"The governance structure at Manitoba Hydro was -- is evolving and is converging towards best practice at other utilities and is consistent with the recommendations of the committee of chief risk officers."

Can I take it based on the passage that I just quoted to you, that you agree with that assessment?

DR. ATIF KUBURSI: We agree, but as you know we made also some recommendations to further move

the evolving process into the direction that we think is the best practice one.

MS. PATTI RAMAGE: And when you say that, would that -- is it your impression that, generally speaking, yourselves, ICF, Dr. Bhattacharyya, and Risk Advisory, that -- that you're all in agreement that Manitoba Hydro's middle office is evolving, that major progress has been made?

DR. ATIF KUBURSI: Yes, and -- and there's still things to be done.

MS. PATTI RAMAGE: And your report outlines a number of those suggestions for improvement of the middle office and risk management at Manitoba Hydro. Parties have focussed on those recommendations and improvements they're intended to address.

But to put those recommendations in context, would you agree that given the size and complexity of Manitoba Hydro, combined with the time frame in which risk management is taking prominence, that it's entirely expected that Manitoba Hydro's middle-office function would be evolving and -- and that it is in fact evolving appropriately?

DR. ATIF KUBURSI: It's absolutely evolving and there are a number of achievements that have been made, but we wanted to emphasize also the gaps

because we wanted to move into a situation to measure it with three (3) things that you already outlined.

1. This is a public concern and the shareholders are the people of Manitoba. And that there are certain architectures and incentive regimes governing this operation that may make it deviate from these things. Remember, we mentioned the principal agent problem, the moral hazard, the asymmetry of information, all these things. We wanted to streamline these recommendations in a way that the regime, the governing regime, is moving towards the best practice.

MS. PATTI RAMAGE: And -- and that's exactly what the -- the middle office and those sort of things are intended to address. Is that not correct?

DR. ATIF KUBURSI: Absolutely, but we wanted some more prominence. We wanted more staff. We wanted to be at the higher position. We wanted to be directly in the officer of the senior vice-president, certain of the things that we considered to be not just optics, but certainly optics in the sense that if you keep a certain middle office function at the lowest part of the organogram of the organization chart, you're literally signalling or communicating, inadvertently perhaps, that you are not considering this function to be at the level of importance that it should be.

MS. PATTI RAMAGE: But you're not -- if we move that in the organization chart, the middle office reports to the senior vice-president and you're satisfied with that. It's where it's -- where it's situated on the organization chart. You're not suggesting a change of reporting relationship from the -- to the senior vice-president of finance. Is that correct?

DR. ATIF KUBURSI: That's correct. But it's not just only reporting. We wanted to situate it at the position where if it asks, or vets, or reviews the, you know, front-office operations, it does it with some authority. It's not just a matter of looking over people's shoulders, but that it has that responsibility and is vested with the authority to do so.

MS. PATTI RAMAGE: Okay. Now at page 37 of your report, and here I'm at Tab 2, and I don't think there's a need to turn to it, really, but you confirm that -- or you describe the three (3) main bodies providing oversight of Manitoba Hydro's activities as being the Manitoba Hydro-Electric Board, the extra -- Export Power Risk-Management Committee and the Power, Sales, and Operations Management Committee.

And you've confirmed that those three (3) have executive authority and obligations, correct?

DR. ATIF KUBURSI: Yes. We -- we showed

that others that are involved, but they don't have the executive authority.

MS. PATTI RAMAGE: And one (1) that you described as the Corporate Risk Management Committee, or CRMC, I think in your evidence you say:

> "It's a forum for guiding processes where Manitoba Hydro's principal risks are identified, assigned, assessed, managed, and communicated with membership of senior managers of the Corporation."

And here I just want to pick up on a point of potential confusion. At page 194 of your report, which is at Tab 2, and again during your discussion -- discussion with Ms. Southall at transcript page 6,330, which is also at Tab 2, you comment that the CRMC is an advisory body without any executive powers.

You are aware that the CRMC is chaired by the senior vice-president of finance and administration, and has two (2) additional members of the executive, that being the vice-president of corporate planning and strategic analysis, as well as the general counsel? You're aware of that?

DR. ATIF KUBURSI: Yes, we are.

MS. PATTI RAMAGE: And the manager of the

corporate risk management department is also a member of the CRMC, is that correct?

DR. ATIF KUBURSI: That's correct.

MS. PATTI RAMAGE: And to clarify, the corporate risk management department might also be known as the middle office, correct?

DR. ATIF KUBURSI: Correct.

MS. PATTI RAMAGE: So it's actually the corporate risk management department that you're concerned about lacking executive powers --

DR. ATIF KUBURSI: Yeah.

MS. PATTI RAMAGE: -- as opposed to the committee. It's just those two (2) words get, I think, confused.

DR. ATIF KUBURSI: Right, and -- and the emphasis here, I want the CRMC, the middle office to be with these executive powers, not that it reports to an executive power, that it has it.

MS. PATTI RAMAGE: But this -- the -- the manager of the middle office is part of the CR -- CMRC, which does have those three (3) members of the executive that I have discussed.

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

MS. PATTI RAMAGE: Now, if I could deal

with some of your specific recommendations. At page 595 -- 5,961 of the transcript, you indicate that you tried to see if risk management best practices were being applied by Manitoba Hydro on a piece-by-piece basis, and you were happy with what Manitoba Hydro was doing, but you'd be happier if you -- if -- to see it assign a responsibility matrix.

Now, on May 6th, I provided your counsel with a responsibility matrix. Can you confirm you've seen that now?

DR. ATIF KUBURSI: I've seen it.

MS. PATTI RAMAGE: You've also now seen Manitoba Hydro's long-form risk profiles, which identifies individual responsibilities, is that correct?

DR. ATIF KUBURSI: I've seen it.

MS. PATTI RAMAGE: You've now also had the opportunity to meet with Manitoba Hydro's emergency response coordinator and been provided to access -- with access to a number of Manitoba Hydro's risk-preparedness manuals, is that correct?

DR. ATIF KUBURSI: That's correct.

MS. PATTI RAMAGE: And were they dusty and on a shelf?

DR. ATIF KUBURSI: Well, I -- I -- they were dusty, but they were not on a shelf, okay, no, no.

MS. PATTI RAMAGE: No. I was just trying to make a joke because I recall you saying that the ones from the university were dusty and on a shelf.

DR. ATIF KUBURSI: No, no. I -- I got it, I got it.

MS. PATTI RAMAGE: You hadn't seen these manuals prior to completion of your report, is that correct?

DR. ATIF KUBURSI: I -- I haven't seen some of these prior to completion of the report, no.

MS. PATTI RAMAGE: And -- and I'm hoping you recall this because I -- I showed you this. You saw a list of training and simulations that have taken place at Manitoba Hydro over the years?

DR. ATIF KUBURSI: Yes.

MS. PATTI RAMAGE: And you weren't aware of those either at the time you wrote your report, correct?

DR. ATIF KUBURSI: No, we were not.

MS. PATTI RAMAGE: A large portion of your review was devoting -- devoted to reviewing Manitoba Hydro's models, is that correct?

DR. ATIF KUBURSI: That's correct.

MS. PATTI RAMAGE: That focus would be natural, given your own background in optimizing models

and the timing of your retainer vis-a-vis the allegations of the New York consultant, would you agree?

DR. ATIF KUBURSI: I would.

MS. PATTI RAMAGE: You've made a number of what I would characterize as positive statements about Manitoba Hydro's models, and if I could get you to turn to Tab 4, I'd like to briefly read them into the record to provide context for our discussion. At page 123 of the KM report, you say:

> "First, and by any standard, HERMES is an impressive system."

At page 100 -- or page 36 of your in direct, you say:

> "SPLASH is a critical component of the model family."

And two (2) down -- two (2) lines down from that:

> "We're happy with the simulation structure of the system and the insights this can add to the Utility."

And if you turn the page in that tab, I've got -- I've copied transcript page 5,952, where you told us:

> "The models are serving their purposes and can be relied upon for operational

planning and long-term planning."

And, finally, at page 5,982 in that tab, you've told us:

"All what we're asking them is, basically and fundamentally, to experiment, to entertain, to move a little bit forward on these things. We are quite satisfied with our systems. We are quite happy with what we've seen, we are quite happy and recognize the capacities, the skills, and the dedication of the people, but we wanted a little bit more."

Have I read those correctly?

DR. ATIF KUBURSI: You read it correctly, but it's the little bit more that we have to talk about.

MS. PATTI RAMAGE: Yeah, but I'm -- but, given those positive statements, would it be fair to characterize your commentary, and the recommendations that follow, as an attempt to help and to offer up issues for consideration, as opposed to a con -- condemnation of Manitoba Hydro's models?

DR. ATIF KUBURSI: I -- I agree.

MR. ROBERT MAYER: Ms. Ramage, if I -- I'm -- I'm finally caught up. The Chair pointed out

where you are. All those comments on page 59, 62, and 59 -- well, 59, 62 are attributed Dr. Magee.

MS. PATTI RAMAGE: Yeah.

MR. ROBERT MAYER: Are they not?

MS. PATTI RAMAGE: I'm assuming -- I'm assuming that one speaks for both.

DR. LONNIE MAGEE: That's right.

CONTINUED BY MS. PATTI RAMAGE:

MS. PATTI RAMAGE: Yeah. And being helpful is providing ideas to be explored and to make sure Manitoba Hydro's looked at all the angles.

Would that be fair?

DR. ATIF KUBURSI: That would be fair.

MS. PATTI RAMAGE: You also indicated you'd observed Manitoba Hydro's modelling community and saw the relationships and how well they were working.

Would I be correct that your focus of that recommendation and that's -- I've reproduced at Tab 5, or what I'm referring to, but would that be -- you want to see structure with respect to that relationship? It's not a fundamental problem with the relationship; it's -- it's a documentation issue?

DR. ATIF KUBURSI: I mean, there are three (3) things that we wanted to -- to see here:

1. We wanted some documentation, all right, standard documentation, the one you find sometimes with commercial software. This -- these systems are in-house developed, home-grown, and people are very comfortable with them as long as they're here. But there is institutional memory and therefore it would be nice to commit some of this experience and this expertise to a formal documentation.

2. We wanted to formalize the communication among the people in the different modelling applications and see to what extent that this could develop into a modelling community committee that -- that they seem to know each other informally and many have crossed from one (1) model to the other. But this is something that probably you would capitalize upon by formalizing that exchange and that development and that -- the training.

And we -- we called for a number of things that we are still investigating that we were tasked with from the Chair as -- in terms of putting these models into a seamless interface on a common platform, that they could be used by all, and that this itself creates economies of scale and scope. And we were talking primarily on some of the upgrades; they may be costly, they take time. But you -- you characterized it

correctly, we wanted them to explore these things.

If -- if other utilities have used them, Manitoba Hydro is a leading public utility, and it would be nice to see it on the forefront of these developments. We want stochastic programming, non-linear programming, dynamic programming; these have become buzz words, but have become also applicable systems and we seem to have, in Canada, some of the best minds on these things. I mean, in -- in just our neighbouring Saskatchewan -- and I know Manitoba Hydro is aware and -- and familiar with these people -- Dr. Roy Billinton and -- and others who have done incredible work.

We wanted outside oversight. We want outside vetting. We want outside confirmation. These are important things that will give you comfort within Manitoba Hydro; they may cost you a little bit of money, but it's money well spent.

MS. PATTI RAMAGE: Okay. Thank you for that. I probably should have asked these questions earlier, but you indicated on your direct evidence on May 4th that you met with a number of Intervenors prior to completion of your report. I think it was around the time of Manitoba Hydro's workshop. Did any of the Intervenors provide you with any specific requests for areas that wanted to -- you wanted to explore or

investigate that you specifically addressed in your report as a result of that?

DR. ATIF KUBURSI: We -- we've had a number of meetings. And certainly we met with TREE/RCM. We met with MIPUG. There's no question about it, some of the -- CAC -- and CAC too -- certainly, certain questions, certain ideas must have influenced us. I mean, the -- the -- we were -- part -- part of our term of reference is to be resource people, to seek relationships with Intervenors, and -- and we try to live up to this.

MS. PATTI RAMAGE: Were you provided with any data or background information regarding Manitoba Hydro by any of the Intervenors?

(BRIEF PAUSE)

DR. ATIF KUBURSI: Yeah, a number of Intervenors had asked us to cover certain areas, or inquired the extent to which we would cover areas of concern, and these have really been important to us. And we have also -- we have also reviewed, as you know, quite a bit of the reports that were prepared for the Intervenors, in -- in the case of TREE and RCM. We looked at Dr. Wallach. We looked at the different

reports that were prepared for the different Intervenors, and -- and these have become part of our responses and our focus.

MS. PATTI RAMAGE: Was there any data that's not on the record of the proceedings that you were provided by the Intervenors?

DR. ATIF KUBURSI: Not that we know of.

MS. PATTI RAMAGE: You also indicated you spent some productive time with Mr. Larry Buhr and Mr. Roger Cathcart and reviewed data calculations of water levels and water storage. Were you provided any data there that -- that isn't on the record?

DR. ATIF KUBURSI: We went through ideas and through numbers. And I recall, at -- at best, we probably got two (2) pages, or something like this. But they were generous in terms of going with us through some of their ideas and some of their concerns, yes.

(BRIEF PAUSE)

MS. PATTI RAMAGE: Are you able to share the data that you were provided?

DR. ATIF KUBURSI: I'll -- I'll have to dig deep into it, but I'm sure we haven't displaced anything. I think we can -- we can dig for it, yes.

MS. PATTI RAMAGE: Okay. Can we have an undertaking? If there -- if there's any data that you've been provided by any party that is not included on the record, if we could get copies, please. Thank you.

DR. ATIF KUBURSI: Yes.

--- UNDERTAKING NO. 158: Doctors Kubursi and Magee to provide any data that was provided by any party that is not included on the record

CONTINUED BY MS. PATTI RAMAGE:

MS. PATTI RAMAGE: Now, one (1) of the primary recommendations you've made was with respect -- or that seems to have garnered a fair bit of focus, is Manitoba Hydro's models being placed on a common platform. As I understand it, your basis for the recommendation is resource efficiency; it's not a model accuracy issue.

Is that correct?

DR. ATIF KUBURSI: No, they're -- they're basically in terms of efficiency, utility, saving money, creating a common pool, and trying to see that you have a common solver, that you would save yourself sometimes questions raised about using different coefficients in --

in the different models.

MS. PATTI RAMAGE: Yeah, I'd like to -- if you could turn to Tab 6, and we'll -- we'll follow through here. And I think we're beginning -- I'd like to just clarify an exchange you had with the Chairman beginning at page 6,262. And here the Chairman asked whether:

> "If Manitoba Hydro accepted your recommendation regarding moving to a common platform, would it provide more support for the preferred development plan?"

And at the bottom of page 6,262 and the top of 6,263 you clarified that:

> "The common platform recommendation was not an accuracy issue."

Do you see that there? It says:

> "But in terms of accuracy, in dealing with the kind issue you're talking about, Mr. Chairman, I feel that the non-linear system's, the dynamic programming, the stochastic, would have a bearing on it."

That --

DR. ATIF KUBURSI: Yes. It --

MS. PATTI RAMAGE: Do you see that exchange?

DR. ATIF KUBURSI: It's because -- yeah, we -- we mentioned that it does not have any major bearing on issues of accuracy.

MS. PATTI RAMAGE: Right.

DR. ATIF KUBURSI: It -- it would, in -- in many respects, be able to deal with some of the questions and scenarios that people might wish to -- to explore and consider.

MS. PATTI RAMAGE: And if you see, beginning at line 5, the Chairman probed it a little further regarding the implementation of your recommendations, and that was the -- that was non-linear dynamic stochastic programming, not the common platform; that we were kind of back and forth between topics, I believe.

And -- but he asked what impact -- what the impact would be:

> "On the degree of support, or non-support, for the development plan."

Do you see that, beginning at line 5?

DR. ATIF KUBURSI: Yes, I see it.

MS. PATTI RAMAGE: And here is where my confusion begins. Your answer, beginning at line 14, is

-- or was:

> "There's so many variables on these things, but as far as the models used in order to choose the preferred sequence, if you use exactly the same set of data on both sides, the later are likely to give you a marginal improvement over the former."

Have I read that correctly?

DR. ATIF KUBURSI: Yes, you did.

MS. PATTI RAMAGE: Now, I take that as meaning if we assume the same input data, a model adopting your recommendations will result in a degree of improvement, but not a drastic improvement. That's how I interpreted it, but it appears the Chairman interpreted it differently, because at line 21 he says:

> "You're suggesting it's a significant improvement in their approach."

So I guess my question is, can you clarify, absent differences in the quality of input data, will it change to non-linear dynamic or stochastic programming, result in marginal or significant improvements in model accuracy?

DR. ATIF KUBURSI: All right. I mean, let -- let's consider at least three (3) areas where

there may be, you know, some discussion and where I think there is an improvement. You see, when you look at data over time and you don't include in this data discount rates, and you treat a dollar twenty (20) years from now to have the same value as today, you tend to exaggerate the future at the expense of -- of the present.

You really need to use the proper discount rate. And these need to be done within a framework of a dynamic system that treats time as every period is a different dollar value, and you need to bring some discounting. So this is one (1) issue.

The second one is that you cannot always assume a steady state all over the years, because some of these systems that treat time as if each piece of time is similar to another one, they tend to somehow gloss over the issues of how time and how accumulation starts to build up. Because, you see, if you have capital and you invest this year, next year is going to be a bigger amount capital minus depreciation. Then the initial year becomes the second year, not the first year, and you continue building up.

These can be more accurately represented in a dynamic system than in one that takes different years, but does not build these accumulation structures.

The -- the third one is the issue of

stochastic. You want to be in a position where you would like to look at probabilistic configuration of the future. You're talking about something five (5) years from now, ten (10), fifteen (15), twenty (20) years. Nobody is in a position to think that they know what this future is and to assume perfect foresight, or any foresight. It would make much more sense if we were to treat these future outcomes as if they're coming from some uncertainty systems.

And this is exactly the kind of stories we're talking about when we said, All right, we assume this probable distribution, we put this probable distribution here, we put this probable distribution. We're not saying that they're coming from some sort of random zonky (phonetic) system that anything could go. No, I mean, they're a little bit governed by the historical basis upon which these probable distribution were put.

So, we're thinking that if you were to treat time and take discount rates, build in the accumulation and how the periods relate to one another, and discard that steady state, but build on the different accumulation paths, and if you were to put probability to handle the future as if it's uncertain and not as something that you know with perfect foresight, that --

that definitely would be helpful.

MS. PATTI RAMAGE: I hear that it would be -- it would be helpful and that you'd like Manitoba Hydro to explore it, but I'm wondering is there any guarantee of improvement, either marginal or significant, or is it something we need to explore?

DR. ATIF KUBURSI: I mean, if I judge from my own experience, and I have handled before systems that were just purely static and deterministic, and when we used the more sophisticated systems, the future menu of choices is richer. But if you tell me, would you hang your representation and livelihood on saying it's going to be definitely, I would be a little bit hesitant.

MS. PATTI RAMAGE: And there hasn't been any work done to substantiate a difference? It's --

DR. ATIF KUBURSI: No. I -- and this is something, an undertaking, that I'm still working on it, and I will report very quickly on what are some of the improvements, and some of the rationale, and some of the reasons, and some of the utilities that had come from people who have used dynamic programming in the energy system versus those that use static ones.

MS. PATTI RAMAGE: Earlier in the section I quoted to you, you referenced maintaining data consistent between the two (2) models, and I'm interested

in exploring sort of the data-end of it.

Would you agree that the predictive accuracy of a model is a -- is a function of the quality of the input data?

DR. ATIF KUBURSI: Of course.

MS. PATTI RAMAGE: And the predictive accuracy is also impacted by the calibration of the model, and the calibration has to be logical.

Is that correct?

DR. ATIF KUBURSI: Logical, but also consistent with the -- with the observed, underlying reality that it purports to represent.

MS. PATTI RAMAGE: You jumped to my next question.

So the calibration also would require some professional judgment, correct?

DR. ATIF KUBURSI: Absolutely.

MS. PATTI RAMAGE: So, to experiment with this, that would involve resources, skills, and knowledge of system requirements, correct?

DR. ATIF KUBURSI: Absolutely.

MS. PATTI RAMAGE: And am I correct in -- in recollecting you -- you have an undertaking in terms of the cost of that?

Is that right? You're --

DR. ATIF KUBURSI: Yeah, I'm looking into that, too.

MS. PATTI RAMAGE: Okay. But that wasn't something that was reviewed at the time the report was written, correct?

DR. ATIF KUBURSI: No, but as -- as you know, I mean, we're familiar with these systems, and we've had opportunities to work with them and to see the kind of expertise, experience, resources, skills that would be required.

MS. PATTI RAMAGE: You -- you've also said -- and here I'm referring to transcript page 6,253. I'm saying that for the record. I know -- it's at Tab 7, but you don't need to turn to it.

You said that some compromises will be necessary if Manitoba Hydro were to move towards your recommendations. Have you identified or quantified any of those compromises?

DR. ATIF KUBURSI: We haven't, but, I mean, this is part of the undertaking: What would it take to move from the present status quo into the kind of preferred state that we had recommended? I mean, we -- I -- I'm hoping that we would come with some concrete identification of the type of skills or personality -- personnel that would be required, and what would it cost,

how much would it really mean in terms of getting a different solver than the one you have. These are part of the things that we're looking into.

MS. PATTI RAMAGE: And I think you've also stated that you wouldn't presume to tell Manitoba Hydro what priorities they should put, in terms of which direction they should go when it's making choices.

Would it be fair to say that, ultimately, it's the people responsible for operation of the models and who rely on them to inform their decisions on a day-to-day basis. And that -- by that, I mean management? They're in the best position, probably, to determine priorities in terms of which direc -- whether they want to experiment with stochastic -- if they have to make a choice, which one would bring them the -- the best bang for their buck?

DR. ATIF KUBURSI: Absolutely. I mean, all what we're trying to do is to explore ourselves on your behalf, and hopefully come up with some objective recommendations. But we cannot make decisions for you. We can provide advice and give you a -- a bit of a roadmap: What would it cost to go into this? Why have some utilities used it and what were their experience?

MS. PATTI RAMAGE: Would you agree that the Utility itself has started to go down this path with

the development of PRISM? That's a positive development, from your perspective?

DR. ATIF KUBURSI: Yeah, it's a -- it's a positive development, and it really signifies that you're moving into the stochastic thing. What we recommended here is to see to what extent that this PRISM is not a separate system, but integrated into the work of other -- other systems. I mean, as you know, PRISM uses HERMES and SPLASH. I'm really thinking of the reverse; I want HERMES and SPLASH to use PRISM.

MR. ROBERT MAYER: Could somebody give me a definition of the word "stochastic," please?

DR. LONNIE MAGEE: It's, I think, a fancy way of saying "random." So in a -- in a model like this, it would -- it makes it easier to incorporate the fact that you might not know what some particular number is in the calculation. So instead of saying it -- it's going to be five (5), like, maybe half the time it will be three (3), half the time it'll be seven (7), or something fancier than that. Then you -- and then you let the computer work out what the average result would be, or the distribution of results.

So it just -- it lets -- it lets you off the hook. You don't have to -- in a way -- in the sense that you don't have to pin down exact values for every

number that feeds into the calculation; you can waffle a bit. And then you get a waffly (phonetic) output, but it's -- it reflects the fact that there are things you don't know.

MR. ROBERT MAYER: So the definition is: Sort of like random that waffles a bit?

DR. LONNIE MAGEE: Yeah.

MR. ROBERT MAYER: Or permits you to waffle a bit? No wonder I hadn't figured that out until now. Thank you, sir.

DR. LONNIE MAGEE: Okay.

CONTINUED BY MS. PATTI RAMAGE:

MS. PATTI RAMAGE: You have to like plain English definitions.

One (1) of the -- or, the examples you've pointed to -- or, you've pointed to two (2) I should say: BC Hydro and Quebec Hydro, as utilities who use dynamic programming in their models.

Have you seen those models actually in action like you saw Manitoba Hydro's models?

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

MS. PATTI RAMAGE: Your information is based on papers published by engineers in those companies.

Is that correct?

DR. ATIF KUBURSI: Yes, and -- and conversation with some of these people who have developed these systems. But one (1) of the thing I'm hoping to do and if -- if things work the way I'm trying is we will see a demonstration of these.

MS. PATTI RAMAGE: It would be helpful, can you tell us which engineers at those organizations?

DR. ATIF KUBURSI: I can supply the names of these.

MS. PATTI RAMAGE: That -- that's by undertaking or...?

DR. ATIF KUBURSI: Yeah, yeah.

--- UNDERTAKING NO. 159: Doctors Kubursi and Magee to produce names of engineers involved in developing models at BC Hydro and Quebec Hydro

CONTINUED BY MS. PATTI RAMAGE:

MS. PATTI RAMAGE: I notice there's one (1) paper referenced in your report and it's written by Doug Smith of BC Hydro. It was presented at a two (2) day conference that was called "Water Management Decision Support Software: The Challenge of Knowledgeable and

Valued Decisions."

Do you recall that?

DR. ATIF KUBURSI: Yes, I do.

MS. PATTI RAMAGE: And did you see any of the other papers or presentations from that conference?

DR. ATIF KUBURSI: Yeah, I -- I looked at the program, yes.

MS. PATTI RAMAGE: And if I could get you to turn to page -- or, Tab 9, that is the program. And on the -- the second and third pages in, you -- you see the program.

You were aware that Manitoba Hydro was asked and made three (3) presentations at that same conference?

DR. ATIF KUBURSI: Yeah, I see it.

MS. PATTI RAMAGE: And would you agree that, generally speaking, conferences invite leaders in a given field to make presentations?

DR. ATIF KUBURSI: No, that -- that's stretching it out. Yeah, I mean, quite a bit some of these things you're either invited or you submit, you know. But quite -- quite a number of these conferences people have to be screened and they would not be invited to speak, or would be -- would accept a proposal without the organizing committees feeling that these people have

something to offer.

MS. PATTI RAMAGE: And in your discussions with Manitoba Hydro, were you made aware that the Corp -- employees of the Corporation meet with the World Wide community on hydro-system modelling every two (2) to three (3) years, and Manitoba Hydro is also an invited speaker at that event?

DR. ATIF KUBURSI: Yes.

MS. PATTI RAMAGE: And would this be the type of information exchange as between industry professionals that you would encourage?

DR. ATIF KUBURSI: I would very much encourage, yes.

MS. PATTI RAMAGE: Would you also agree that every utility has unique characteristics and modelling issues; their models must reflect that uniqueness? It must be appropriate for the problems they face?

DR. ATIF KUBURSI: Absolutely. But this is exactly, you know, looking at the flipside; there must be something in common between these that you could learn from each other.

MS. PATTI RAMAGE: Exactly. But -- but these conferences aren't an attempt to sell each other your models. They're to -- they're exactly what you say,

they're for learning purposes, to exchange ideas.

DR. ATIF KUBURSI: The -- they'll exchange venues, of course. But it would be nice to know if some utility is using a different system, the reasons, and the experience that these people have with these.

MS. PATTI RAMAGE: So, for example, one (1) of the comments you made about the Quebec and BC models is that they are stochastic, which is a strength, but they're also difficult to manage, present results that are more difficult to interpret, and don't include the complexities that HERMES encompasses. That would be a result of differences in the utilities, correct?

DR. ATIF KUBURSI: Yeah, correct, because you have to make compromises. I mean, you have a limited capacity to -- to run some -- some of the system, reasonable time at reasonable costs with reasonable results. And the issue here is that if you want to go into more sophistication you might have to sacrifice size or you might have to give up some solutions of -- including variables that are considered to be important for you.

So we wanted to draw -- the attention here is that we're not talking in a vacuum and that there are going to be compromises, there are going to be choices, but it would be worth looking at it to see what choices

one ought to make and -- and one should make and one would make.

You cannot just say, Well, oh, it's so hard. Its dynamic programming is so more difficult than static and, therefore, we -- we stay with static. I mean, you have to explore. You have to bring these things to bear, see what are the net advantages, what are the costs.

But -- and this you cannot do on paper. You have to be -- basically be involved into looking at these systems and seeing the utility, we -- whether at your own level or what other people have made. The fact that they have chosen it, in some sense, expresses a revealed preference that these people must have seen some utility in it. Why have they seen this utility that you might not wish to see if you can derive this?

MS. PATTI RAMAGE: So it's important to explore it. It -- it may not be that you choose it, but it's important to explore it?

DR. ATIF KUBURSI: yeah, I -- I've said, you know, the choices are yours. I mean, I -- I don't know what your budget constraint is. I mean, if I don't know your budget constraint, I mean, I -- as I said, always I'd like to have a helicopter, but I can't afford it.

MR. ROBERT MAYER: Which one?

DR. ATIF KUBURSI: Well, if you -- if you have one (1) to sell, I -- I would consider.

CONTINUED BY MS. PATTI RAMAGE:

MS. PATTI RAMAGE: My preference is a Harrier Jump Jet, but that's just me. I'm going to change -- change directions here a little, and I want to talk about the long-term contracts and your review of those contracts.

Am I correct in my understanding that you support Manitoba Hydro's strategy of maintaining a mixed portfolio as between the opportunity market and firm long-term contracts? Is that correct?

DR. ATIF KUBURSI: Several of the reports that we considered, have recommended, particularly ICF. And -- and we felt happy with that argument, that part of the risk management is to be in a position where you have many options, many alternatives, and that you don't put all your eggs in one (1) basket, that you have a diversified way of looking at things.

There is no question about it. If you put everything in a long-term contract, then you might be exposed to what we call the seller's regret in the sense that you fix a price, and then all of the sudden the

market would find a much higher price.

At the other hand, you know, if you were to put everything into the opportunity market, you may really get to a position where these opportunity prices have, you know, declined or -- declined or become very, very low and you get what we call the buyer's really regret.

So the issue here is to balance. And the best way to balance is to diversify. And -- and that's -- that's the argument that we have accepted and we -- we think is reasonable.

MS. PATTI RAMAGE: And from my reading of the report, you've accepted a number of the positions of ICF and KPMG, and I just want to review a few of those. One (1) of those is that participation in the export market generates incremental revenue for Manitoba Hydro, and that incremental revenue has resulted in lower rates than what they otherwise might be.

Do you agree with that?

DR. ATIF KUBURSI: On this one we have the number of provisos. You see, the issue here is how much of the cost have you allocated to exports. You see, exports represent 31 percent of the total revenue of Manitoba Hydro, but they only represent the 13 percent of its costs, if I recall well.

And -- and this, it's automatically raised a bit of a flag for us. Why is it that exports are reflected with lower cost than domestic generation and distribution? This, to some extent, raised a question, and the question is: What would be the best and most acceptable way of allocating cost of service between these two (2).

I -- I recognize that these are what we call joint costs. And this is the same thing, to say how much mutton, how much wool. And I remember one (1) time a colleague of ours was asked, as a professor, how much time do you devote to research and how much time do you devote to teaching, and how much more do you contribute to teaching, to compared to research.

And he said, Well, the only answer I have is Baa-baa (phonetic). And people would say, What the heck is, Baa-baa. He says, Well, if you ask a sheep, How much mutton, how much wool, that's the answer you get. But what -- but the -- but the story is more serious than this.

The -- the story is more serious than this. There must be a way in which we can verify what is the distribution of joint costs between domestic production and generation and distribution and how much would it really be to exports.

(BRIEF PAUSE)

THE CHAIRPERSON: Dr. Kubursi, isn't the -- the -- the potential answer to that question depending where you are before you build as opposed to after when you build?

DR. ATIF KUBURSI: It definitely has a lot to do with the initial state, but it is far deeper than this. We need to know exactly what are the -- the -- the reasons and the procedures used in allocating the joint costs between exports and domestic production.

And, you know, I can -- I can write everything to domestic production and then domestic production and revenue will become -- net revenue becomes very low, and then I only put the variable costs to exports, and then everything I get above variable cost is all profits. But the story is a little bit more complicated than this.

How are you allocating all these joint costs between domestic production and exports, so we really get a good metric of the net revenue generated. As you know, I mean, NYC was arguing in a very strong way that what you really have is a situation in which Manitobans are literally subsidizing Minnesotans.

I don't want to go that far, but I would

like to really see a proper run documented case where the cost of service, especially joint costs, are allocated appropriately and reasonably between dom -- domestic load and exports.

THE CHAIRPERSON: Ms. Ramage, if you don't mind maybe we'll take a break now. Thank you.

MR. BYRON WILLIAMS: And, Mr. Chairman, if I could, just for efficiency purposes, so I can get onto MPI matters for the rest of the afternoon, if -- if I could -- I think the undertaking's going to sound a lot like I phrased it originally, but the undertaking we would be suggesting would be using the data from PUB 1-81, in terms of annual system inflow and Manitoba hydraulic energy tested using a simple regression, and by simple regression, I mean ordinary least-square regression of water flow on generation with zero intercept and -- as to how that would fit the data.

Is that a satisfactory undertaking?

DR. ATIF KUBURSI: That's -- that's -- that's -- we'll -- you know, this is the thing that we understood and that's the way we took it.

--- UNDERTAKING NO. 160: Doctors Kubursi and Magee to use the data from PUB 1-81, in terms of annual system

inflow and Manitoba hydraulic energy tested using a simple regression, and by simple regression, ordinary least-square regression of water flow on generation with zero intercept, and as to how that would fit the data

MR. BYRON WILLIAMS: And, Mr. Chairman, Mr. Wood had asked me for an example of what we were asking him to do, which I provided offline. I -- I don't think it needs to be marked as an exhibit, but I -- I've got copies here if anyone wishes to -- to view it, just to see what I'm -- I'm -- I'm proposing.

THE CHAIRPERSON: Mr. Singh, perhaps you could help Mr. Williams. I think it should be distributed.

MR. BYRON WILLIAMS: Okay. I wouldn't say it's -- it's -- I would just for identification because I don't think it is -- it's not been confirmed by the other witnesses. It's just an example of what we're asking them to do.

THE CHAIRPERSON: Okay.

MR. GAVIN WOOD: And -- and can I -- do I

understand then, it's one (1) undertaking then rather than -- it's still the two (2)?

MR. BYRON WILLIAMS: There's still the two (2). And Mr. -- Mr. Wood, are you okay with sharing this document just as for identification, just -

MR. GAVIN WOOD: Whatever the chair wishes.

MR. BYRON WILLIAMS: Okay.

THE CHAIRPERSON: Okay. We'll see you back after the break.

--- Upon recessing at 2:57 p.m.

--- Upon resuming at 3:19 p.m.

THE CHAIRPERSON: Okay. Welcome back, everyone. Mr. Williams, I don't think he's here right now. We'll just introduce his exhibit: Exhibit CAC/MSOS-28. It's entitled "Water Flows and Manitoba Hydro Generation 1912 to 2005."

--- EXHIBIT NO. CAC/MSOS-28:

Water flows and Manitoba Hydro generation 1912-2005

THE CHAIRPERSON: Whenever you're ready,

Ms. Ramage.

CONTINUED BY MS. PATTI RAMAGE:

MS. PATTI RAMAGE: Thank you. If we could just maybe go back to the long-term contract discussion, would you agree that, even without additional investment, Manitoba Hydro will have surplus power for sale, and that long-term contracts are a means of maximizing value and disposing of the surplus energy for value?

DR. ATIF KUBURSI: Yes.

MS. PATTI RAMAGE: And you would agree that Manitoba Hydro's current and continuing involvement in the export market is a natural consequence of the Corporation's early involvement in the acquisition of knowledge and expertise it -- it acqui -- it developed over those years?

DR. ATIF KUBURSI: Yes.

MS. PATTI RAMAGE: And you don't take issue with the statement that long-term contracts serve to preempt excess capacity by competitors?

DR. ATIF KUBURSI: I mean, there's no question about it. The -- the fact that you are in the market, you, yourself, preempt competitors from being in that market.

MS. PATTI RAMAGE: Thank you. You agree with the statement that US-dollar denominated export proceeds act as a good hedge for currency fluctuations?

DR. ATIF KUBURSI: This is the extent to which there is a good match between the obligations to pay interest and principal on the debt into US bondholders versus what you earn on -- on your exports. The -- the problem is that you -- you -- this may not really be one-to-one.

MS. PATTI RAMAGE: You also recognize the benefit of long-term contracts, that they bring in providing greater access to firm imports?

DR. ATIF KUBURSI: Absolutely. I mean, with these diversity contracts, and you have transmission rights, they work both ways.

MS. PATTI RAMAGE: And would you agree with Mr. Rose of ICF's view that -- that a benefit of building for export is that Manitoba Hydro gets an energy guarantee for free by virtue of the bidirectional transmission associated with Manitoba Hydro's export strategy?

DR. ATIF KUBURSI: The extent to which you -- you're able to -- to get that correspondence between your export and your counterparties building the transmission, yes.

MS. PATTI RAMAGE: And you had an opportunity to review the terms of a number of Manitoba Hydro's existing and proposed export contracts. That's correct?

DR. ATIF KUBURSI: We looked at NSP, we looked at term sheets of others.

MS. PATTI RAMAGE: Now, one of the repor -- comments in your report that struck me regarding the assessment of these contracts is that -- and here I'm quoting:

> "It would be wrong to see the price in isolation of these additional values, that a lower price may have been necessary to acquire these attributes."

And there I'm reading from page 211/212 of your report. But does this mean that, in assessing the value of a long-term contract, you do not look to -- look at price in isolation? Rather you must also consider other benefits achieved, such as new interconnections, increased reliability, and improved market access?

DR. ATIF KUBURSI: The argument here is that the exports represent a bundle of things, so price is only one (1) of -- of these bundles. The fact that you will be able to get transmission, the fact that you can use it both ways to satisfy excess demand in the

winter, all these things must be taken into account.

MS. PATTI RAMAGE: And your assessment of the curtailment provisions, for example, in the new NSP contract and the term sheets, is that they're better than the old contracts and that they constitute a major achievement for Manitoba Hydro, is that correct?

DR. ATIF KUBURSI: You see, there's no question about it here. Two (2) things: One (1) of the real problems that were faced during the 2003/2004 drought is that you were, in many respects, obligated to meet your commitments, and the back -- the -- the bookout -- backouts were extremely costly.

The fact that you have now curtailment gives you a -- a way, a safety valve, so to speak, all right? They're still not really substantially large. They involve a certain amount that I cannot divulge at -- at the particular period of time I cannot divulge, but they definitely have a real advantage over the old contracts.

MS. PATTI RAMAGE: And -- and I think, as already been discussed, there's no liquidated damage clauses in the new contract or term sheets that you saw?

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

MS. PATTI RAMAGE: So there isn't a

financial risk associated with the curtailment, is that correct?

DR. ATIF KUBURSI: That's correct.

MS. PATTI RAMAGE: In addition, the new contract and term sheets include another provision, I think you've described as innovative, in that Manitoba Hydro has the right to put energy to customers, and that customers must take.

You agree that's a positive development for Manitoba Hydro?

DR. ATIF KUBURSI: Yes. I mean, this obligation that they must really accept. And -- and it -- it doesn't work in the reverse, which is also good.

MS. PATTI RAMAGE: And we've also discussed an upset heat rate based import prices. And would the benefit of that provision -- it places a limit on what counterparties can charge Manitoba Hydro on imports.

Is that correct?

DR. ATIF KUBURSI: This -- this is only in one (1) of the arrangements.

MR. ROBERT MAYER: Could somebody explain to me what an upset heat rate is? Dr. -- Dr. Kubursi, you're the one, I guess, who's on the stand. Can you tell me what an upset heat -- heat rate is?

DR. ATIF KUBURSI: Yes. This -- the heat rate is basically the amount of gas you take in order to produce one (1) extra kilowatt hour of electricity. And there is a price at which this would be a -- a ceiling price, so to speak. And this ceiling price puts a -- sort of a upper limit on how much these prices -- I mean, the -- the real problem was in the old contracts is that in the 2003/2004 drought the prices of some of these imports that we had to pay for and to replace energy that we were committed to deliver to our counterparties were in a -- I didn't want to use the word exorbitant, but they certainly were extremely high, and there is now a bit of a -- of a ceiling in one (1) of these contracts that limits this one.

MR. ROBERT MAYER: I was also led to believe though that the danger, or the problem we faced with the earlier drought was that we were, sort of, stuck with purchasing from the very people we were supposed to be supplying to and that that would have changed significantly, in any event, if you're buying into the MISO market.

DR. ATIF KUBURSI: There is no question about it, there are really two (2) issues here and you put your hand on it, Mr. Mayer. One (1) is that there is this business relationship that you want to maintain and

you want to make sure that your reliability comfort level or reputation is at stake.

The other one is the situation where you want to be also sure that you are able to access whatever energy you need to meet your obligation at the cheapest price. So in the -- in the past when MISO wasn't there you were literally stuck from where you're buying this, and you tended to buy those you have relationship with and that -- that hope that they would be as kind as you are to them did not materialize.

Now at least the MISO market will give you a chance to acquire this extra amount that you are obligated to deliver, that you are unable to deliver, from a broader market where the chances of getting a cheaper replacement is that much higher.

CONTINUED BY MS. PATTI RAMAGE:

MS. PATTI RAMAGE: Going back to the contracts, another term referred to in your report is the escalator clause. This is positive because it protects the contracts real prices in the future.

Is that correct?

DR. ATIF KUBURSI: Partially, because -- sorry -- partially because you don't -- I can't give you the exact numbers, but you -- there is a formula where

they increase in the implicit price deflator, which is a measure of inflation, a partial amount of this can be offset by raising the price by this amount.

MS. PATTI RAMAGE: You've also commented that the price under the new contracts has been carefully constructed by Manitoba Hydro using weighted long-term forecasts. Is that correct?

DR. ATIF KUBURSI: Yes, because what -- what happens here is that there are really two (2) methods that -- that should really be used. You always want to extract from your partner what is the avoided cost of them getting this extra unit. I mean, if they can get this extra unit at six (6) cents, you -- you cannot expect that you would charge them nine (9) cents and get it.

There -- there is a way where you would like to know what would really cause these people to acquire this extra amount and see what is the maximum upset price that you could extract from them given their avoided cost or long-term marginal cost.

I would prefer this really, and -- and I know that Manitoba Hydro has tried, attempted to do that. There has been some discussion in the KPMG Report that they have been able to see the -- a sheet that Manitoba Hydro shared with them about calculation of long-term

contracts. We did not see this.

There is a general declaration that this is the attempt to do. It would be nice if this is really something that we could really see and that there is a definite targeting, that you would like to negotiate a price with your counterparties subject to other limitations and -- and what the traffic would bear, but that you really know what is the replacement value for them so that you are able to extract from them whatever consumer surplus you can have, I mean, and the language becomes, I mean, the maximum price you could really get for it.

(BRIEF PAUSE)

MS. PATTI RAMAGE: Your report also characterized the price under these contracts as relatively high, and that was compared to MISO prices past and present. Is that correct?

DR. ATIF KUBURSI: Tha -- that's correct, and that's something you -- you ought to do. And, you see, the last thing you really want to be into a position where you have fixed a price and then the MISO market prices are higher. If you look historically, these prices tend to be at the higher end of the MISO market.

(BRIEF PAUSE)

MS. PATTI RAMAGE: Okay. You reviewed with Ms. Southall your recommendation that Manitoba Hydro consider a hydrological model to complement antecedent forecasting. Do you recall that discussion?

DR. ATIF KUBURSI: Yes, I do.

MS. PATTI RAMAGE: And, again, if I understand that correctly, you want to see Manitoba Hydro probe into this and experiment with it. Is that correct?

DR. ATIF KUBURSI: That's correct.

MS. PATTI RAMAGE: And I note in your evidence you reference Manitoba Hydro participating with the University of Manitoba, you -- participating with the University of Manitoba in matters related to hydrological modelling.

And I -- I can't quite put my finger on that reference, but are you aware that Manitoba Hydro has expended significant effort in climate change studies over the past five (5) years as part of a Canadian effort? This includes the cooperation from a group from Quebec called Ouranos and a Que -- and a Quebec university called Ecole de Technologie, as well as the University of Manitoba. Was that something that was

covered off with you?

DR. ATIF KUBURSI: Yeah, I -- I'm aware of that, yes, and -- and some of which I just became more aware of it now than I -- I was before. But the story is here is -- is -- is quite important. I mean, we look -- I mean, the issue for Manitoba Hydro with these models is to see what is the next period flow and what would be the best way to predict this next period flow.

And they've run quite a bit of regression using last year's flow as a possible predictor of next year's flow. And we said, This is great. I mean, you -- you really need a statistical system to do that. And we suggested looking at the data that we looked at, that maybe three (3) months should really be -- three (3) periods back because, as I know my colleague, Lonnie, did, was to show that many different auto-regressive systems and let him describe it were used.

And we found that the AR3, like if you take three (3) black periods, it gave us the best statistical robust results. And this really let us maybe -- what you should do in these antecedent forecasts is -- is -- enrich this by getting a longer period of lags as you predicted.

We also suggested, and -- and -- and we still think it's quite important, you're -- you're

dealing with precipitation. I mean the real key variable here, again you predict precipitation. I remember I have discussed this with the -- the Vice-Chair, and we were talking, Look, you know, they only give us fifteen (15) days weather. I mean, even Environment Canada is not giving real good indicators.

But maybe this is --

MR. ROBERT MAYER: Not very accurate either.

DR. ATIF KUBURSI: Yeah, more accurate than economists. But the -- the point that is crucial here is the -- is the fact that you're -- you're talking about hydrology. You're talking about water. I mean, it would make sense to invest time resources the way, you know, Manitoba Hydro is doing now, and maybe more encouraged to experiment.

I know a model in Turkey where they're trying to predict the drought and this, where they really went and developed a full hydrological model trying to predict precipitation. So I mean, some countries are doing it and they're not known for their sophistication. It would be worth experimenting and exploring in here.

CONTINUED BY MS. PATTI RAMAGE:

MS. PATTI RAMAGE: Could I get you to

turn to Tab 14. And if you could go -- I think it's five (5) pages into that tab. The first five (5) pages is your discussion with Ms. South -- Southall.

(BRIEF PAUSE)

MS. PATTI RAMAGE: And -- and this an -- an overhead. And I'm -- I'm wondering if you were aware of this study. It's a -- the Canadian Precipitation Analysis. It's a joint study of Manitoba Hydro, University of Manitoba, and Environment Canada. And it -- it's looking at -- at going out fifteen (15) days, and a) I -- or, first, was this something that you'd seen while you were at Manitoba Hydro?

DR. ATIF KUBURSI: No, it's first time I've seen it.

MS. PATTI RAMAGE: Okay. This is the type of study you're talking about? This is a fifteen (15) day, but this is a -- a joint study between Environment Canada and the University of Manitoba Hydro looking to -- to go forward. And I should put the caveat when I'm doing this, there's a number of slides here, this is what I -- I'm going to -- I found on our research and development manager's desk, so I grabbed it. I -- I don't know it's the entire presentation, but it gives you

a -- a taste for what Manitoba Hydro's doing. And this -- and is this what you're looking for?

DR. ATIF KUBURSI: Precisely. I mean, I know it's fifteen (15) days, and I know that Environment Canada has been very reticent to go beyond fifteen (15) days. I mean, this is something I had been aware of, yeah.

(BRIEF PAUSE)

MS. PATTI RAMAGE: Okay. Next if I can get you to turn to Tab 15. And -- oh, are we going to -- do we have extra...? I have one (1) additional page that Ms. Boyd is going to hand out just to run through. We wanted to run through the -- discuss some of the materials from chapter 6.

And -- and while I'm at it, I -- I realized I was -- I rushed into this a little too quick and the book of documents was not made an exhibit. If we could perhaps assign it an exhibit number, which I think is Manitoba Hydro 150.

THE CHAIRPERSON: It sounds like a good round number.

--- EXHIBIT NO. MH-150: Book of Documents

MS. PATTI RAMAGE: And then the additional handout, Manitoba Hydro 151.

--- EXHIBIT NO. MH-151: Additional Handout

THE CHAIRPERSON: The booklet is actually 151.

MS. PATTI RAMAGE: It would make the more -- more sense to mark the book of documents 150 and the single handout 151.

THE CHAIRPERSON: Okay. I accept that. Do you have that single piece of paper, Mr. Singh? Oh, okay. Sorry, it was mixed up with my other stuff. Thank you.

(BRIEF PAUSE)

CONTINUED BY MS. PATTI RAMAGE:

MS. PATTI RAMAGE: If -- if we set aside data and correlation issues for a moment, your approach in chapter 6 is intended to demonstrate a potential use of the software @RISK and a Monte Carlo simulation model, is that correct?

DR. ATIF KUBURSI: Counsel, can you repeat, please?

MS. PATTI RAMAGE: Oh, I was just going to say chapter 6 is intended to demonstrate a potential use of the software @RISK and a Monte Carlo simulation, correct?

DR. ATIF KUBURSI: Correct.

MS. PATTI RAMAGE: And I want to look at some of the data you've used, and there I would have you -- if you could look at page 227 from your report, which is in Tab 15, the first page.

DR. ATIF KUBURSI: Yes, I have it.

MS. PATTI RAMAGE: And if I look under the column "Exports," and go to the -- under 2007, do you see the figure of 12,845 gigawatt hours?

DR. ATIF KUBURSI: Yes, I do.

MS. PATTI RAMAGE: Now -- and that's under exports. For the purpose of your model, when you're looking at exports, that 12,845 gigawatt hours in -- is intended to represent Manitoba Hydro's export activities, correct?

DR. ATIF KUBURSI: Total, yes.

MS. PATTI RAMAGE: Now, you're aware Manitoba Hydro has an open access transmission tariff which allows other parties to access its transmission lines?

DR. ATIF KUBURSI: Now I'm aware of it,

yes.

MS. PATTI RAMAGE: And by virtue of Manitoba Hydro's open access transmission tariff, third-party power can travel through Manitoba. It doesn't necessarily originate in Manitoba, nor does it serve Manitoba load. Is that your understanding?

DR. ATIF KUBURSI: It's my understanding.

MS. PATTI RAMAGE: And you would agree that if Stats Canada calculated their Manitoba Hydro export number using metered exports, measuring all flows travelling through Manitoba, not just Manitoba Hydro's flows, you'd agree that the 12,845 gigawatt hours would not be the data that you intended to use for the purpose of your model, is that correct?

DR. ATIF KUBURSI: Maybe not. I mean, let's -- let's talk a little bit about here. I mean, there may be questions. You see, I had to -- I will check with -- with Statistics Canada because this is definitely total exports from Manitoba, and maybe they're metered as if they're the total exports of Manitoba. But they need not be the total exports of Manitoba Hydro. That's the presumption.

I'm not so sure about this. I want to -- I want to really explore this a little bit further. Why would they consider this to be the export of Manitoba,

when they must have -- considered it to be the export of another utility, you know, like Ontario, going through or somebody else? I want to check on these things, but on the face of it, I agree with you, that this number here, if it's metered for total Manitoba, it may or may not include exports from Manitoba Hydro.

MS. PATTI RAMAGE: If I could get you to turn the page in Tab 15, Manitoba Hydro has provided evidence that its total exports were 10,543 gigawatt hours. Do you see that number? It is --

DR. ATIF KUBURSI: Okay. I'm sorry, Counsel. I'm just going through it.

MS. PATTI RAMAGE: It's the --

DR. ATIF KUBURSI: Yeah --

MS. PATTI RAMAGE: -- four (4) lines down --

DR. ATIF KUBURSI: -- I -- I see it. Yeah, I see it.

MS. PATTI RAMAGE: -- the last column.

DR. ATIF KUBURSI: Then five four three (543), yes.

MS. PATTI RAMAGE: Now, if you were to accept this number, at least for the purpose of our discussion, would you agree that represents a 22 percent variance for the number utilized in your model? That's

the twelve thousand (12,000) number we just discussed?

DR. ATIF KUBURSI: All right, yes. I'd like to really see how -- how this number came about, I mean, because Stats Can are a careful bunch of people. I mean, they're not in the business of generating numbers without testing their accuracy. I would like to really see how on earth would they report a -- a number -- okay. Now, remember, I want to ask you: Is it only -- has this been adjusted to the calendar year? I presume it has. Is it -- is it calendar year --

MS. PATTI RAMAGE: Yeah, that's --

DR. ATIF KUBURSI: -- versus fiscal?

MS. PATTI RAMAGE: That's what the rebuttal evidence says, yes.

DR. ATIF KUBURSI: Yeah. Okay. So what I would really like to do is to maybe check on this with -- with Stat Can to see how would they explain a difference of this sort, now that you have come to a common definition in terms of the period because most of the IFF that we were looking at was on a fiscal year basis, and the data from Stat Can was on a calendar. But now I understand that this is the calendar-year adjustment.

MS. PATTI RAMAGE: And when you do that, if I could maybe direct your attention -- and I won't put

the -- the document on the record, but you'll be reviewing, to look at that, the Electric Power Generation, Transmission, and Distribution Stats Canada report of 2007 that you report -- that you reference in your report. And if I could maybe ask you to confirm that on page 14 of that report it refers to the supply and disposition of electric energy -- electric utilities and industry 2007.

And I -- I'm just putting my emphasis on the plural of utilities and industry 2007 by province. And that -- that might help us get to the bottom of this issue. If -- if you want to look at that page.

DR. ATIF KUBURSI: I see the title, this is Table 8.2 -- 8-2.

MS. PATTI RAMAGE: Table 3 is what I'm looking at.

DR. ATIF KUBURSI: Table 3.

MS. PATTI RAMAGE: You -- oh, I'm sorry. You don't -- you don't have that right now. I'm saying, when you go back --

DR. ATIF KUBURSI: Oh.

MS. PATTI RAMAGE: -- you said you were gonna go back and look. I'm just --

DR. ATIF KUBURSI: You're giving me the --

MS. PATTI RAMAGE: -- I'm giving you a little direction.

DR. ATIF KUBURSI: All right. Sorry.

MS. PATTI RAMAGE: Dr. --

MR. GAVIN WOOD: That's an undertaking then?

CONTINUED BY MS. PATTI RAMAGE:

MS. PATTI RAMAGE: Dr. Kubursi, can we get an undertaking that you'll -- you'll look at that table and come back to us with your comments?

DR. ATIF KUBURSI: I will.

--- UNDERTAKING NO. 161: Doctors Kubursi and Magee to examine Table 3 and comment on its contents

CONTINUED BY MS. PATTI RAMAGE:

MS. PATTI RAMAGE: Similarly, I'd like you to look, if -- if -- let's go back to -- to your table -- your page 227 of your report, that's the first page in Tab 15.

And there do you see, under 2007, load of 22,235 gigawatt hours.

Do you see that figure?

DR. ATIF KUBURSI: Yes, I see.

MS. PATTI RAMAGE: And would you confirm that when you use that figure that's intended to include Manitoba Hydro generation only? For the purpose of your model you're not -- you want Manitoba Hydro generation -- or Manitoba Hydro load, I'm sorry.

DR. ATIF KUBURSI: Yeah. I -- I was confused about load versus generation. Yes, this is Manitoba load.

MS. PATTI RAMAGE: And if you were to understand that when Stats Canada reports on Manitoba load it includes all Manitoba load at customer meters, including both Manitoba Hydro customers and self-generation by industry, wind -- wind generation and diesel generation not available to grid customers. Would you agree that that -- the number produced by -- by including all of those factors would not be the number you would intend to use in your model?

DR. ATIF KUBURSI: Can you explain why -- why would this be the case?

MS. PATTI RAMAGE: Well, if -- if a number include -- if you were looking for a Manitoba Hydro number and the number that you have includes Manitoba Hydro generation plus industry's generation that are self-generating for themselves --

DR. ATIF KUBURSI: Okay, yeah.
MS. PATTI RAMAGE: -- plus wind generation, plus diesel generation at sites that are not available to Manitobans on the grid.
DR. ATIF KUBURSI: No. Okay. I --
MS. PATTI RAMAGE: That number wouldn't be the number you're looking to -- to put into your model.
DR. ATIF KUBURSI: No, I mean, I -- you know, the only difference here is the -- the one (1) that you pointed out, if there is any coal gen and they're supplying these things. The other ones, we're taking care of that.
MS. PATTI RAMAGE: And would I be correct -- the next line down on page 227, "Unallocated Energy." Are you referring to transmission losses when you call that unallocated energy.
DR. ATIF KUBURSI: The definition that I saw from Stat Can refers to this as if it's losses.
MS. PATTI RAMAGE: And again, when -- when you're calculating Manitoba generation you would want the generation at -- at the generators, not after -- at metered load there would be losses, correct? So you're looking the -- for the at-generation number.
DR. ATIF KUBURSI: I presume so, yes.

This is at -- at source.

MS. PATTI RAMAGE: And so you would add the losses to the -- the metered load, correct, in order to get the at-source number?

DR. ATIF KUBURSI: Yes, because you see this is the delivered losses, yeah.

MS. PATTI RAMAGE: It appears to me, Dr. Kubursi -- and maybe you could help me, that you have net load, and you've actually subtracted the generation losses instead of adding them.

Can you confirm that? The 22,235 gigawatt hours, the difference between that and nineteen thousand nine hundred and nine (19,909) is the --

DR. ATIF KUBURSI: Yeah.

MS. PATTI RAMAGE: -- value attributed for losses.

DR. ATIF KUBURSI: I -- I would like to check on this because, you see, I've remembered I had problems with this with Stat Can, trying to explain what do they mean by the unallocated energy. I had presumed myself that it is losses, but it could be something that they could not explain in terms of the load.

I don't know. Maybe they were talking about this is the amount that is required by the station to generate, and this included by load rather than

subtracted. Stat Can deducts this. And that -- that's why I presume it is a loss.

MS. PATTI RAMAGE: Another -- an issue Mr. Hacault raised this morning was with respect to the correlation between generation and water rentals. And, at that time, you reviewed the distribution at page 257 of your report. And I don't have it included here, but I was wondering if you could turn to that.

(BRIEF PAUSE)

DR. ATIF KUBURSI: We have it.

MS. PATTI RAMAGE: Something that struck me about this distribution is that the minimum is -- and that's the left tail, is actually a negative number. And I don't think there's any dispute that -- that there's no circumstance in which the province pays Manitoba Hydro water rentals. And I should have started by -- Figure 6.38 is a distribution cost of royalties, and tha -- that's with respect to water rentals.

But can you confirm the -- why -- or can you explain why that would be a negative number?

DR. ATIF KUBURSI: Yeah, you -- you know, this -- this is the -- the -- you know, part of the Wiebull distribution. But, you see, what we do is we

truncate the distribution to only accept the positive numbers.

MS. PATTI RAMAGE: If I can get you to look -- because I think I may have figured it out. If I can get you to look back to two hun -- page 227 of your report, which is the Tab --

DR. ATIF KUBURSI: Yeah, I have -- I have it.

MS. PATTI RAMAGE: -- 15.

DR. ATIF KUBURSI: Yes, I have it.

MS. PATTI RAMAGE: And I have to admit, this is something that struck me this morning when we were going through this. If I could get you to look at royalty expenses for 2007.

DR. ATIF KUBURSI: Yeah.

(BRIEF PAUSE)

MS. PATTI RAMAGE: Yeah, that's Table 6.1. It's in the book of documents, the first page.

DR. ATIF KUBURSI: Yes.

MS. PATTI RAMAGE: And if I could get you to look down at -- down the 2007 column acro -- and royalty expenses. The number of thirteen million seven hundred and sixty-seven thousand (13,767,000) appears.

Do you see that there?

DR. ATIF KUBURSI: Ye -- yes, I see.

MS. PATTI RAMAGE: And if I could get you to look at Manitoba Hydro Exhibit number 151, which is Table 8.2 of the Stats Canada data.

DR. ATIF KUBURSI: Yeah, I -- I could see there is a missing number. There's a transcription error. It's not the one in the data that we use because you can see from the distribution it includes it, it's just in the typo. There is a seven (7) missing. You see, it's -- it's one two (12) -- sorry, it's a two (2) missing. It should be one two three seven six seven (123,767). The way we have it is thirteen (13). It's a transcription, but it's not outside the distribution, which means we have used the right number in distribution, it's just in the -- in the table, yeah.

MS. PATTI RAMAGE: I want to ask you about that because that's -- that number of 13 million is exactly what I thought made the distribution go to the left because it is outside of what I would call the normal water rental amounts that Manitoba Hydro would pay.

And would it not be true that in -- in order to get the -- the distribution to fit that 13 million, that is exactly what would have caused that

left-hand -- le -- that left-side skew?

DR. ATIF KUBURSI: I -- I'm sure, you know, it -- if it was used, a thirteen (13), it was skewed more to the left but not to the negative numbers.

MS. PATTI RAMAGE: Wouldn't it -- the 13 million as -- as a much lower number, and then carrying on, because that 13 million would be in the actual -- the -- the actual realm of experience in terms of the distribution, so wouldn't the left be carrying it further out that it -- it would take the negative number?

And maybe -- perhaps if I could just get an undertaking from you to review that and see --

DR. ATIF KUBURSI: Yeah.

MS. PATTI RAMAGE: -- what numbers were used.

DR. ATIF KUBURSI: Yeah, I -- I want to make sure, at this moment, looking at distribution myself, I'm not so sure that this has done that skewing. But what there is here is definitely a transcription error. I want to make sure that we did not use it in the generation of the distribution. Because, as you can see, all the numbers are the same numbers, only this number is missing it too.

MS. PATTI RAMAGE: If I look at the -- at

the minimum indicated on Figure 6.38, it indica -- indicates a number of negative two hundred and eighty-seven million nine hundred and ninety-four thousand (287,994,000). I think that -- or, no, it's two hundred and eighty-seven thousand nine hundred and ninety-four (287,994).

Where would that number come from?

DR. ATIF KUBURSI: Yeah, I mean, this is definitely a -- you see, the Weibull has a very long left tail, all right, but we definitely don't use this. We truncate it at the -- at the positive levels.

MS. PATTI RAMAGE: A negative number though would mean the province at that point pays Manitoba Hydro water rentals?

DR. ATIF KUBURSI: No, no, I mean, don't worry about it. I mean, we don't use these things.

MR. ROBERT MAYER: I think they're trying to collect some money back.

DR. ATIF KUBURSI: No. No, but what -- what I would do as an undertaking, Counsel, is that we check to see that this number is not just -- I hope it's only a transcription error, but we'll make sure whether when we fitted the distribution this number was part of it or not.

CONTINUED BY MS. PATTI RAMAGE:

MS. PATTI RAMAGE: It would be included in the mean or the average there though, wouldn't it?

DR. ATIF KUBURSI: If -- if we used -- if we used the wrong number, yes, it would be. Yeah, if we use -- if we used it, it would be definitely in the average.

MS. PATTI RAMAGE: Mr. --

DR. ATIF KUBURSI: But the average is seventy-six (76). And I can tell you, just looking quickly on the things, sixty-eight (68), forty-seven (47), seven (7) -- yeah, I mean... Yeah, yeah, so we'll -- we'll check this, yeah.

MS. PATTI RAMAGE: Mr. Surminski tells me he's confirmed that the mean is seventy-six (76).

DR. ATIF KUBURSI: Is the mean in -- with thirteen (13)?

MS. PATTI RAMAGE: Using -- using that low number.

DR. ATIF KUBURSI: Using that low number. Then -- then we made a mistake. We'll -- we'll go and check it and review it.

MS. PATTI RAMAGE: Okay, thank you. And then if I can get an undertaking, I'm not sure if we did, for you to come back and confirm what the -- what the

correct number should be.

DR. ATIF KUBURSI: Yes.

MR. ROBERT MAYER: I trust you don't mean physically come back.

DR. ATIF KUBURSI: Yeah, that would be good too.

MS. PATTI RAMAGE: No, we're not looking for Dr. Kubursi to physically come back. But if he could give us that correction and the impact on the analysis that would have.

DR. ATIF KUBURSI: I will.

--- UNDERTAKING NO. 162: Doctors Kubursi and Magee to check Figure 6.38 to determine where the negative number comes from

CONTINUED BY MS. PATTI RAMAGE:

MS. PATTI RAMAGE: And if I could have you turn to your Table 6.2 in the Kubursi/Magee report.

DR. ATIF KUBURSI: I have it.

(BRIEF PAUSE)

MS. PATTI RAMAGE: Could you advise what

the source of the import cost of a hundred and twenty dollars ($120) per megawatt hour that you use for the sensitivity of the low flow combined with high import prices?

DR. ATIF KUBURSI: Yeah, this was our estimate of the heat rate adjustment, that it would be about a hundred twenty dollars ($120) per megawatt.

MS. PATTI RAMAGE: Would that apply to all import energy?

DR. ATIF KUBURSI: We -- we used it in this case to be the upset price on all import energy.

(BRIEF PAUSE)

MS. PATTI RAMAGE: Dr. Kubursi, I -- I don't think I've heard a change in your evidence, but can you confirm that you're of the view the actual cost of a drought would be seriously understated as a result of the -- of SPLASH using perfect foresight or the impact of perfect foresight on SPLASH?

DR. ATIF KUBURSI: Yes, I mean, it -- it would understate the cost of the drought, yes.

MS. PATTI RAMAGE: When you said "seriously understated," are you talking 10 percent, 50 percent, a hundred percent?

DR. ATIF KUBURSI: Well, I mean, it depends about the amount of water that you need between one (1) period and the other and what would be the -- the cost of this water, the cost being the opportunity of having generated electricity and you sold it at that.

MS. PATTI RAMAGE: On page 62 to 64 of its rebuttal evidence Manitoba Hydro expor -- approximated the magnitude by which a drought may be understated by SPLASH. Have you read the rebuttal evidence related to this issue? That's at Tab 16.

DR. ATIF KUBURSI: What line, madam?

MS. PATTI RAMAGE: It's actually several pages. Maybe we'll walk through it.

DR. ATIF KUBURSI: Okay.

MS. PATTI RAMAGE: Would you agree that, in actual operations during drought, Manitoba Hydro will utilize non-firm import energy if it's available rather than emptying the reservoirs?

DR. ATIF KUBURSI: Yes.

MS. PATTI RAMAGE: And given that actual operations would utilize more import energy than is assumed in planning, would you agree that one (1) reason Manitoba Hydro might understate the cost of a five (5) year drought is that perfect site draws reservoir storage to minimum levels without incurring import costs, because

SPLASH knows the flows will recover the next year?

DR. ATIF KUBURSI: Correct.

MS. PATTI RAMAGE: Manitoba Hydro's evidence indicates that preserving storage through the purchase of non-firm import energy may cost in the order of $100 million for a five (5) year drought. Do you have any reason to dispute that number?

DR. ATIF KUBURSI: I'd like to know exactly at what period, at what price. Okay.

MS. PATTI RAMAGE: If we assume 2,000 gigawatt hours of non-firm energy is purchased at a price of fifty dollars ($50) a megawatt hour --

DR. ATIF KUBURSI: Yeah.

MS. PATTI RAMAGE: -- to -- and that maintains one (1) extra foot of storage on Lake Winnipeg, that's where that figure comes from. Does that seem reasonable?

DR. ATIF KUBURSI: Well, reasonable if you assume average conditions. If you assume that you're basically importing at the highest price during a drought, then it would really be a larger number. Instead of fifty (50), it would be one twenty (120) times the five (5) -- you know, or twelve (12) times the 5,000 gigawatt hours.

(BRIEF PAUSE)

MS. PATTI RAMAGE: If we could just -- we're going to work with my -- my numbers, and we'll, at the end, come back to your -- your issue of -- of whether the price is doubled, if -- if you can go with me on that.

If Manitoba Hydro were able to import non-firm energy during that five (5) year drought for a cost of an additional 100 million, as we've discussed, is it more likely that this water or energy would be carried forward in storage into the period after the drought, and that most of the 100 million can be recouped in the subsequent time period, or would you expect that that would be spilled?

DR. ATIF KUBURSI: What one ought to do here is to build exactly the set of assumptions that you would talk about. I mean, I could build a set of assumptions where I would say that this water really ends up, in a period after the drought, with -- that is completely spilled because there is excess water. I mean, I can build it.

I mean, you don't want to build the strong case to be the one that -- that best, you know, serves your interests. I mean, I -- I -- in a risk analysis, I

would really take it exactly the opposite way. I would build the situation to be the worst case condition, where I really, you know, took this water, stored it, went into the period, and then all of a sudden it spilled.

MS. PATTI RAMAGE: But -- but most of the time -- and if we -- we could look at historic water flows, we wouldn't be moving from drought to spilling. So we can expect that most of the time, that would not occur.

DR. ATIF KUBURSI: Yeah.

MS. PATTI RAMAGE: I see Dr. Magee nodding. I'm going to get him on the mic eventually.

DR. ATIF KUBURSI: Okay. He could nod as much as he wants, but -- but the -- the point -- the point that we raise here is -- is really crucial is: What assumptions do you make about the water conditions that would follow a drought? And we could go and look at the actual situation and see.

You tend to always go and say that it's a mean reverting system. Let's go to the mean reverting system and see what it is.

MS. PATTI RAMAGE: You wouldn't expect a spill in the mean, correct?

DR. ATIF KUBURSI: No, but that's -- that's what I'm saying, you know, because you -- you

build it in as a mean reverting, but it could easy -- if you look at the drought and see the period that went after it, I would like to see that -- is it a mean reverting one, or is it really a -- a different situation.

MS. PATTI RAMAGE: If we assume a mean reverting one that would be a case of undertaking an expent -- an expenditure earlier and then recouping it later, correct?

DR. ATIF KUBURSI: It -- it could easily be that case, yeah.

MS. PATTI RAMAGE: And when Manitoba Hydro estimates its cost of a drought, it -- it -- you would agree that it considers its natural gas, its coal-fired and firm import energy as dependable energy, correct?

DR. ATIF KUBURSI: Correct.

MS. PATTI RAMAGE: And if lower-priced non-firm import energy is available, Manitoba Hydro would, in -- in actual operations, substitute that lower-cost energy instead of running its out-of-the-money combustion turbines that were assumed in planning, correct?

DR. ATIF KUBURSI: If it's available.

MS. PATTI RAMAGE: And that substitution

would reduce Manitoba Hydro's actual cost of drought compared to the SPLASH estimate, correct?

DR. ATIF KUBURSI: Correct.

MS. PATTI RAMAGE: And -- and here, Manitoba Hydro has estimated, and you'll see in its rebuttal evidence, that the cost of the five (5) year drought -- that this factor could reduce the cost of a five (5) year drought by $90 million due to not having to run combustrine -- combustion turbines.

Do you have any reason to dispute that estimate?

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

MS. PATTI RAMAGE: And if I could just walk that through, the 90 million is derived from importing, for example, three thousand (3,000) gigawatt hours at a saving of thirty dollars ($30). And -- and when I say the thirty dollars ($30), the higher priced eighty dollar ($80) megawatt hour power versus the fifty (50).

DR. ATIF KUBURSI: I -- I mean, I -- I hope you'd agree with me that it all depends on how you are arranging the -- the system to reflect the level of cost.

I -- okay. Suppose I say, Okay, I -- I want to build a situation in which the drought happens

and I don't have any chance of importing cheap energy and I have to fire my thermal energy. I need to know what are the worst case scenario that we should be prepared for. If -- if I build everything on a rosy average situation I might get surprised. And the -- the issue here is to avoid any shocks or surprises.

MS. PATTI RAMAGE: You'd agree that the heat rate of Manitoba Hydro's combustion turbines are 50 percent higher than the market heat rate?

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

MS. PATTI RAMAGE: So that would put our cost at fifty (50) -- the cost that SPLASH estimates at 50 percent higher than -- than the market typically?

DR. ATIF KUBURSI: If the market is available at that year-old price and if you have the capacity to import it and the transmission is available, I mean, too many ifs.

MS. PATTI RAMAGE: Comments have been made regarding the '03/'04 drought. Can you tell us what specifically you did review in terms of Manitoba Hydro's operations during the '03/'04 drought?

DR. ATIF KUBURSI: We -- we looked exactly at a number of variables. We looked at the level of load. We looked at the generation, generation that came from hydro, from the thermal. We also look at

imports, and we looked at committed exports that you had to meet. We looked at these numbers to the extent that they reflected performance.

MS. PATTI RAMAGE: And what was the source of that information, can you tell us?

DR. ATIF KUBURSI: I mean, we looked at it really in two (2) ways, but the one we concentrated on is the one that came from Statistics Canada in 2003/2004. But we had also a chance to look at IFF and you -- and your estimates, you know, the Manitoba Hydro estimates.

MS. PATTI RAMAGE: If I could take you back to our -- our book of documents, I think it's Tab 15, and the second page in that, which is Manitoba Hydro's rebuttal evidence.

DR. ATIF KUBURSI: Yes, I see.

MS. PATTI RAMAGE: If we could look under the 2003 year --

DR. ATIF KUBURSI: Yes.

MS. PATTI RAMAGE: -- next to Generation, which is midway through the page --

DR. ATIF KUBURSI: Yeah, I see it.

MS. PATTI RAMAGE: -- you'll see Manitoba Hydro's generation is twenty-one thousand, two hundred and twenty-five (21,225). That's Manitoba Hydro's --

DR. ATIF KUBURSI: Yeah --

MS. PATTI RAMAGE: -- provided calendar year --

DR. ATIF KUBURSI: Yeah --

MS. PATTI RAMAGE: -- for generation.

Do you see that number?

DR. ATIF KUBURSI: Yes. Yes.

MS. PATTI RAMAGE: And you see that Stats Canada has used twenty-seven thousand, three hundred and sixty-two (27,362)?

DR. ATIF KUBURSI: Yes.

MS. PATTI RAMAGE: And that's a difference of six thousand, one hundred and thirty-seven (6,137)?

DR. ATIF KUBURSI: Yes.

MS. PATTI RAMAGE: And we would be dealing with the same generation issues we've discussed in terms of the accuracy of those numbers?

DR. ATIF KUBURSI: I mean, there is no question about it, an issue here to see how these numbers have really come out from Stat Can compared to the numbers that you've created.

If you give a chance and this is the undertaking, we're going to look and check and vet with Statistics Canada what was the basis that would have really given rise to a six thousand (6,000) difference.

No question the six thousand (6,000) is large.

(BRIEF PAUSE)

MS. PATTI RAMAGE: In reviewing the '03/'04 drought, did you review any of the ma -- the master and purchase sales agreements that were in place during that time?

DR. ATIF KUBURSI: We looked at it but...

MS. PATTI RAMAGE: When you say you looked at it, which ones did you look at of the -- the master sale and purchase agreements for the '03/'04 drought?

DR. ATIF KUBURSI: I mean, we -- we looked at quite a bit of documentation. At the moment, the only thing I remember is we looked at the master.

MS. PATTI RAMAGE: Did you look at the actual electricity transaction confirmations?

DR. ATIF KUBURSI: No.

MS. PATTI RAMAGE: Or the natural gas transaction confirmations?

DR. ATIF KUBURSI: No. I mean, the -- the only thing we looked at is the different amount of gas, the contracts that were brought in and, you know, what was stored in the US and stored here and what were

the different costs. But we looked at all these numbers as they came. And remember, I mean, we -- we wrote this in November, this -- what, a period back.

MS. PATTI RAMAGE: Did you -- you didn't see the storage in -- injection and withdrawal schedules for 2003/'04, did you?

DR. ATIF KUBURSI: We -- we looked at the withdrawals and injection. No, we looked at these things, yeah.

MS. PATTI RAMAGE: Dr. Kubursi, I'm wondering if you could tell us where you got that information from. It's not information from Manitoba Hydro, so I'm concerned where this is coming from.

DR. ATIF KUBURSI: No. I mean -- no, no. I mean, remember, the story was, is that, you know, right at the beginning you bought quite a bit of gas, and some of this gas was stored in Saskatchewan or some -- or Ontario, actually, right, and then some of which were kept into the US. I guess we didn't make up this information.

I mean, it has come from Manitoba Hydro, and maybe one (1) of the discussions, but there's no question about it. We knew about the amount of gas that you bought and some of which that you had to really sell on the market. There was a bit of a difference.

MS. PATTI RAMAGE: Was the source of your information the Risk Advisory Report? Does that...

DR. ATIF KUBURSI: I -- I have to check on this one. But I -- I recall very well that we knew exactly when you bought the gas, where you stored it, how you much you bought for it, when you put a put for it, and then what -- what the amount of money you realized.

Where exactly I got this, at the moment I'm not so sure, but I can -- we can verify it. I have notes that we can go back to.

MS. PATTI RAMAGE: Okay. Maybe if I could get an undertaking from you, sir, to provide us with the source of data. And I'm going to gi -- if I could give a list of a few things that Risk Advisory reviewed in its report in order to come to its conclusions on the '03/'04 drought. And maybe if you could tell me --

DR. ATIF KUBURSI: Maybe -- maybe --

MS. PATTI RAMAGE: -- in the undertaking whether you've seen it. And if you have, if you could tell us the actual documentation.

DR. ATIF KUBURSI: Right.

MS. PATTI RAMAGE: And for the court reporter, I'll -- I'll ask for the undertaking with respect to which master purchase and sale agreements, the

electricity transaction confirmations, the natural gas transaction confirmations, the storage injection and withdrawal schedules, the option transaction confirmations, the corporate import/export policies and procedures, if you saw those, any export strategy documentation. And I think that -- that completes the undertaking.

And with my last question to you, were the analytics behind the decisions discussed with Manitoba that it made at the time of the '03/'04 drought.

DR. ATIF KUBURSI: Okay. I mean, we took note of it, yes.

--- UNDERTAKING NO. 163: Doctors Kubursi and Magee to advise if they have seen any of the following documentation: master purchase and sale agreements, the electricity transaction confirmations, the natural gas transaction confirmations, the storage injection and withdrawal schedules, the option transaction confirmations,

the corporate import/export policies and procedures, and any export strategy documentation

MS. PATTI RAMAGE: Thank you, Dr. Kubursi, Dr. Magee. The best I got out of Dr. Magee was a nod, but I tried. But with --

MR. GAVIN WOOD: I was going tease that Mr. Cormie was nodding as well at times in some of these answers, but...

MS. PATTI RAMAGE: Mr. Chairman, with -- subject to the answers to any of the undertakings and the outstanding pre-asks that are coming, that concludes any questions we would have. I -- I suspect, based on what we've heard, that if we do have any followup it would have to be written in any event.

THE CHAIRPERSON: Thank you, Ms. Ramage.

MR. ROBERT MAYER: I'm not so sure how -- I'm not all that sure of that anymore. We appear to be developing time that we haven't filled in yet.

THE CHAIRPERSON: I'm sure we'll find a way. So I want to thank you, Dr. Kubursi and Dr. Magee, as well as Mr. Wood. I should -- I shouldn't -- I'm being remiss.

Mr. Wood, do you have any re-direct of the witnesses?

MR. GAVIN WOOD: No, I don't, sir.

THE CHAIRPERSON: Okay. And in your taking on and exercising the task and responsibilities of an independent expert, independent of all parties and interests, you have acted promptly, civilly, and professionally. You've responded to Intervenors, and also engaged in discussions, as we take it, from -- with Manitoba Hydro, Board advisors, and the NYC.

The issues before Manitoba Hydro, as we understand it, before the -- either customers and with -- before Manitoba overall are important. They're very material and they're quite complex, with implications not only for the near years out, but into the somewhat distant future.

Thank you for your review, your evidence, and your awareness, and also your capacity and obvious listening skills. You said many times through the Hearing that you sought to be helpful, and you have lived up to your objective. The Board's understanding of issues have been assisted by your contributions.

We look forward to your final undertakings, which, as Ms. Ramage alluded to, presumably be written submissions. And I wish you a good trip back

to Ontario.

So, we stand adjourned, and we'll starting back again tomorrow morning at 9:30 with RCM/TREE's engaged witness, Mr. Colton. So with that, we stand adjourned. Thank you.

DR. ATIF KUBURSI: Thank you.

(PANEL STANDS DOWN)

--- Upon adjourning at 4:16 p.m.

Certified Correct

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Cheryl Lavigne, Ms.