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
Len Evans - Board Member

HELD AT:

Public Utilities Board
400, 330 Portage Avenue
Winnipeg, Manitoba
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Pages 2490 to 2692

APPEARANCES

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

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UNDERTAKINGS

--- Upon commencing at 9:52 a.m.

THE CHAIRPERSON: Good morning, everyone. Mr. Peters, do you want to bring us up to date?

MR. BOB PETERS: Yes, thank you. Good morning, Mr. Chairman. As a result of counsel meeting when we last met, we looked at our schedule and the available dates that the Board has made available to the parties, and Manitoba Hydro was pleased to organize and have before the Board today Mr. Judah Rose from ICF International, the intention being that we would use as much time as the Board had set aside this week, as needed, for the ICF International evidence, and then next week we would also turn to Manitoba Hydro's other external panel from KPMG and we would hear from them next week.

So at this point, I'm pleased to turn over to Ms. Ramage the microphone and allow her to introduce Mr. Rose formally. We'll ask that his evidence be taken as sworn evidence and his oath administered by Mr. Singh. So I'll turn it over to Ms. Ramage, if that suits the Board.

THE CHAIRPERSON: Ms. Ramage.

MS. PATTI RAMAGE: Thank you, and good morning, Mr. Chairman, Vice Chairman Mayer, Mr. Evans.

As Mr. Peters indicated this morning, Manitoba Hydro is presenting the evidence of ICF International. Mr. Judah Rose is here to testify with respect to the report. That report was filed, I believe, in Volume IV, Appendix 12.2, of Manitoba Hydro's General Rate Application. Mr. Rose has put together a presentation this morning to -- to walk the Board through with respect to the report.

And I'm not sure if this is the right time, but to get the housekeeping matters done, we have a package of undertakings that are being collated in the backroom that have exhibit numbers on them, so when this report goes in -- if I could just jump ahead. We are on Exhibit 43 but because those have exhibit numbers on them already we're going to propose that Mr. Rose's package be Exhibit 55, so.

THE CHAIRPERSON: That's fine.

MS. PATTI RAMAGE: And we'll get the -- we'll fill in the blanks as soon as all the other undertakings are collated so we can hand them out as a package.

THE CHAIRPERSON: Okay. That's fine, Ms. Ramage.

--- EXHIBIT NO. MH-55: Package of Mr. Judah Rose

THE CHAIRPERSON: Welcome, Mr. Rose. I hope you brought your parka with you.

Mr. Singh, do you want to swear in the witness.

ICF INTERNATIONAL PANEL:

JUDAH ROSE, Sworn

THE CHAIRPERSON: Ms. Ramage...?

EXAMINATION-IN-CHIEF BY MS. PATTI RAMAGE (Qual):

MS. PATTI RAMAGE: Thank you. Mr. Rose, could you -- could we begin by outlining your qualifications with respect to energy industry matters, in particular, with respect to your education, professional experience, and previous testimony before regulatory tribunals?

MR. JUDAH ROSE: Yes. First let me just say it's a pleasure to be here in Winnipeg. It brings back many fond memories of various different trips I've had in western Canada, so, again, it's a -- it's a pleasure. In terms of my experience and qualifications, my undergraduate degree is from the -- from MIT, and my -- in economics. My graduate degree is in public policy with a specialty in energy economics. And I've

specialized in energy issues since the late 1970s.

I currently work at, in terms of my professional experience, at ICF International. I'm from the DC -- Washington DC area office. ICF International is -- has around four thousand (4,000) employees approximately, revenues around $750 million a year. We're a publicly traded company on the NASDAQ and we have a large number of people that are involved in energy issues. We have about three (3) or four hundred (400) people working in supply and demand issues related to energy and -- and something in the order of five hundred (500) people involved in energy facility siting with an emphasis on the environment.

I've been with the Company since 1982, therefore, I'm at my twenty-ninth year at ICF, and I'm the managing director responsible for wholesale power issues, issues related to generation and transmission. The type of work that I do is to provide support to companies and other entities related to energy market conditions, the forecasting of future conditions, evaluation, and financial issues related to the power sector, issues related to generation and transmission and the regulation thereof, expert testimony, due diligence work in -- in the space, so it's a -- it covers issues, again, related to generation and transmission. I also

provide planning support.

The way the Company's organized I think is relevant to the work that I'm presenting here today. We have various different specialists working off a common set of modelling tools, including our own proprietary models, which I'll discuss, that have been used both in the states and in Canada. And so we have specialists in generation, transmission. We have specialists in the various fuel markets, including gas and coal.

We also have specialists that handle various different environmental regulations. We have two -- actual two separate environmental regulatory groups: one (1) that works exclusively with the federal government of the United States, and with the -- with Environment Canada, and another group that works more with private companies.

That organization is -- has specialists se -- and -- and associated materials. We're also located in a number of locations. We have offices in Ottawa, in Canada, Toronto, and a small office in Calgary. And in terms of our clientele, I think it's worth mentioning that we work with the Edison Electric Institute. Right now, it's the organization of US electric utilities that are privately owned, that is -- or publicly traded stock, and we're very much involved in the issues related to the

regulations that the US Environmental Protection Agency has and the dialogue between EPA and EEI.

I think it's worth notice -- noting that it's a pretty unique relationship. That is, we are representing and doing the analytical work for the 80 percent of the power in the United States, the Edison Electric Institute.

We've also worked for thirty (30) years continuously as the primary -- primary consultant on market implications of environmental regulations, air pollution regulations, for EPA, for the US Environmental Protection Agency.

And so we've been able to do that by virtue of our unparalleled modelling tools, particularly the model I'll refer to as -- later the integrated planing model, but we've been able to work both in the public and the private sector, and we've -- based on, I think, the contributions that we can make to -- to the public policy debates in those areas.

We also work with the people that run the power grids. I'm going to be talking about the Midwest independent system operator. We have worked for them in analyzing their own structure, and the advantages and disadvantages, cost and benefit, to various different market structures they have in the Midwest ISO,

independent system operator.

We're -- we're currently also working with people that run the power grid in the west, that includes British Columbia and Alberta, as well as the western part of the US, the WECC, the Western Electric Coordinating Council. So we work with the people that operate the power grids.

We also work with the individual utilities, so all the utilities in the Untied States at some point or another prob -- I believe have worked with ICF. Northern States Power. We've worked with Minnesota Power. We've worked with a number of the larger utilities throughout the Midwest and the United States. American Electric Power. FirstEnergy.

We've worked in all of the regions in the -- in the country, and in north -- in North America generally. The only province or state I have not personally been in is Prince Edward Island and New Brunswick. And we -- so we have a fairly broad geographic coverage related to the type of work that -- that we're doing.

We have a lot of Canadian clients, so the -- on the -- on the -- we work -- I mentioned Environment Canada, Natural Resources Canada. We've worked in -- I just testified recently in Quebec -- Quebec for Hydro

Quebec, for H -- HQT, for TransEnergy. In fact, I was in Montreal on Thursday.

And -- and so as you go across the country, I've been in Newfoundland working with NRCAN. We have done work in Nova Scotia, ongoing, with my -- that my colleagues are conducting. Work in -- for HQT, HydroQuebec. We have our office in Toronto that's leading up a lot of our work with the Ontario Power Authority and the various different entities, including the regulators in Ontario.

And as you go across the country -- across the country, we've worked in Manitoba -- with Manitoba. We've worked in TransAlta, ATCO, in Alberta -- Alberta Environment. We work with the environmental authorities in British Columbia.

So it's a -- we work with a very large number of gas utilities, as well as the power -- power utilities, as well as the regulators in Canada. So it's a pretty broad clientele.

This is my twenty-first jurisdiction. Not that I'm counting everything that I do, but this is my twenty-first state or province that I've testified in -- in North America.

I've also testified in -- in front of the Federal Energy Regulatory Commission in an international

arbitration. It covers a -- a broad range of geographic locations, and some of the things I've testified on include utility planning, or integrated resource planning, and the various different aspects related to -- to that, including some of the -- the issues related to fuel, and generation, transmissions.

I've testified in environmental regulations, both CO2 reg -- related -- proposed regulations as the -- as well as regulations related to what they call criteria pollutants.

I've testified as an expert on coal issues, just in the last few weeks, in coal contract disputes. My hundred and eight (108) items I've identified in my resume related to -- many of them relate to power purchase agreements.

I've testified on risk management issues. I've testified on -- in financial and evaluation issues, financial theory issues related to the power sector. I've testified on demand-side management and energy efficiency programs in the sector.

And it's a pretty broad list of items that I've testified. Checking my cheat sheet. I think that covers -- I've testified on renewables, as well.

So it's a fairly broad set of testimony experience. I have some publications that are listed on

my resume. I also -- I've spoken in -- at very -- a very large number of energy conferences. I plan to speak in San Diego in March, next month, on transmission issues.

So that's a -- a overview of my background and experience in the sector, and I hope that I can positively contribute to the Board's deliberations.

MS. PATTI RAMAGE: Thank you, Mr. Rose. And with that, Manitoba Hydro requests that the Board qualify Mr. Rose as an expert in the economics of power -- of the power sector in North America.

Mr. Rose gave a -- a fairly lengthy list of his past expert testimony, but it -- it would include power sector modelling, economics in regulation of the electric generation transmission centre, environmental issues, and energy finance issues.

THE CHAIRPERSON: Mr. Peters, do you have any questions?

MR. BOB PETERS: I don't of his qualifications, although my friends opposite may.

THE CHAIRPERSON: Do any of the Inter -- Intervenors have anything to ask Mr. Rose?

MR. ANTOINE HACAULT: I would, Mr. Chair, and it's just to perhaps gain a little bit more knowledge about this witness's ability to speak to some of the issues that we have here, apart from the broad

designation that has been given to this witness.

CROSS-EXAMINATION BY MR. ANTOINE HACAULT (Qual):

MR. ANTOINE HACAULT: Mr. Rose, in addition to Hydro Quebec, have you testified in other regulatory proceedings involving other Crown-owned entities, or in the case of the Untied States, state-owned utilities?

MR. JUDAH ROSE: I have testified, as I indicated, with respect -- on behalf of Hydro Quebec. I have testimony in -- that was filed in British Columbia that was related to a dispute between Powerex and Alcan. And those are the only testimony experiences related to Crown corporations that I have.

With respect to public power entities, I'll have to give that some thought. I have worked with public power entities. I wasn't the sworn witness, but I test -- I provided -- made a presentation to -- related to the munici -- one (1) of the municipal utilities in Florida.

And I -- I'd have to give some thought to the public power entities we've worked for. We've worked for Tennessee Valley Authority. I believe we've worked for -- I currently have a project ongoing with the Association of Rural Electric Cooperatives in the United

States related to smart grid and various different issues there. They represent the -- the cooperatives which are a large part of the public power sector in the United States.

(BRIEF PAUSE)

MR. JUDAH ROSE: If any -- anything comes more to mind, I'll -- I'll come back to it.

MR. ANTOINE HACAULT: Thank you. I wasn't trying to put you on the spot. Another theme that's coming up in this hearing, and you've indicated that you -- and your CV shows that you have knowledge with respect to financial matters and valuations.

Would you have any knowledge that you'd be able to share with us on the issue of financial ratings by rating agencies such as Moody's of hydro-electric utilities, and in particular, in the case of Manitoba it's Crown-owned.

MR. JUDAH ROSE: Well, I do have experience with the rating of power companies, and -- and I regularly look at sort of required rates of return for various different companies, but I -- I haven't test -- the testimony I've given on -- on rates of return is focussing on either the utility sector generally or

various different private companies.

MR. ANTOINE HACAULT: Okay. In that regard, do you have any knowledge with respect to the IFRS as it relates to Crown-owned utilities international financial reporting standards?

MR. JUDAH ROSE: No, I can't say that I do.

MR. ANTOINE HACAULT: Okay. You haven't specifically mentioned, but in your report, or in the report, there's dealt some commentary with respect to the organizational structure of Manitoba Hydro to deal with various risks. Do you have expertise to enlighten us in that particular area?

MR. JUDAH ROSE: Yes. You know, my staff and I have looked at -- at those issues and looked at various different risk-management arrangements and procedures. I've done that in the context of various different proceedings, including the Calpine bankruptcy, which was the -- it's an independent power producer. It's the largest -- it would have been the largest valuation in US history, and we were involved in risk management there.

MR. ANTOINE HACAULT: Thank you. I saw in your CV that you also had testified or written with respect to various valuation issues. Would you have any

expertise in helping us determine the value of capital assets for hydraulic electric generating corporations?

MR. JUDAH ROSE: I have done numerous studies on power plant valuation. I just testified in a US bankruptcy court in -- in New York City on thermal assets, but I have also done valuation studies of hydroelectric assets.

MR. ANTOINE HACAULT: Next, you list a number of matters in which you testified with respect to various contracts in the electric utility area. Would you be able to assist us in determining whether or not the contracts or proposed contracts which Hydro is going in -- going to enter into, and which it has already entered into, how those compare with respect to other utilities generally, without getting into specific details?

We're not going to ask you to breach any confidentiality, of course, or commercially sensitive information, but would you have the ability and expertise to give us some information in that area?

MR. JUDAH ROSE: Yes. I've -- I've testified on numerous energy-sector contracting issues. I've been involved in damage valuations and -- and various different assessments related to power contracts.

MR. ANTOINE HACAULT: And finally, could

you give us some explanation of which other hydro-electric regulatory matters you've dealt with? You've indicated, I think, BC -- British Columbia -- and Quebec, and I think some others in the east, but could -- could you enlighten me as to whether or not there are additional ones which you haven't already mentioned?

MR. JUDAH ROSE: Well, I would say -- you know, most of the work that I've done in the hydroelectric area has not been as focussed in on the expert testimony as in the various different analyses that we've conducted of those various different regions: the planning that goes on, market conditions there.

So, as I indicated, we've -- I worked for NRCan on issues related to the Churchill Falls power plant project. We're regularly modelling Quebec and Quebec's power system, which is -- is -- is hydro. We've -- are modelling all of North America, including the hydro systems there. We've done a lot of work in the pacific northwest and vis-a-vis TBA, which are one (1) of the few areas of high concentration of hydro power in the United States.

MR. ANTOINE HACAULT: Thank you. The last area which I wonder if you could explain is whether you have any expertise with respect to the transmission capacity in I'm going to call the northern states grid of

the United States of America?

MR. JUDAH ROSE: Yes. We've done very extensive studies of all of the power grids in the United States. That study is facilitated by our access to critical energy information info -- critical energy infrastructure information, various load flow models that we use, which are the engineering type of models that are used to assess transmission grids with respect to the market price conditions that prevail.

And as I -- for example, we did a very detailed study for the Midwest Independent System Operator, which runs the power grid and condu -- and runs the markets that are in the areas closest to you, including the northern states power area.

MR. ANTOINE HACAULT: Mr. Chair, this might seem as an unusual request, but I'd ask that this witness also be admitted as an expert with respect to these additional areas which he has identified expertise in.

THE CHAIRPERSON: Thank you. Mr. Williams, do you have any questions for the witness?

MR. BYRON WILLIAMS: No, we -- certainly our clients consider the witness well qualified within the ambit that Manitoba Hydro has sought to qualify him.

THE CHAIRPERSON: Mr. Gange...?

MR. BILL GANGE: No, Mr. Chair, we don't have any questions.

THE CHAIRPERSON: Mr. Wood...?

MR. GAVIN WOOD: No, we don't.

THE CHAIRPERSON: Ms. Ramage, do you accept MIPUG's counsel's addition to the areas that you canvassed?

(BRIEF PAUSE)

MS. PATTI RAMAGE: Mr. Chairman, we don't have any objections to the extent that it's within the scope of these proceedings. I -- my hesitation just comes from I don't want it to turn into a free for all of undertakings on matters that Mr. Rose or ICF wasn't retained by Manitoba Hydro to speak to, so -- so provided it's within the -- the scope of the Hearing there is no objection.

RULING (Qual):

THE CHAIRPERSON: Okay. We'll see how it all develops. So we look forward to Mr. Rose's testimony.

Do you want to begin?

EXAMINATION-IN-CHIEF BY MS. PATTI RAMAGE:

MS. PATTI RAMAGE: Thank you. Mr. Rose, Manitoba Hydro filed the ICF report, dated September 11th, 2009, as part of its GRA. I think I've referenced, it's Volume IV, Appendix 12.2.

Can you confirm this report was prepared by yourself or under your direction?

MR. JUDAH ROSE: Yes, ma'am.

MS. PATTI RAMAGE: And do you have any corrections you wish to make to the report?

MR. JUDAH ROSE: No, not at this time.

MS. PATTI RAMAGE: I -- I might add, we -- Manitoba Hydro notes that -- that there's a correction to the front cover page which we assisted Mr. Rose in producing. And apparently our computer thinks that you're the Public Utilities Board of Manitoba Hydro, which you are in fact, but it's not your formal title.

Mr. Rose, could you please review for the Board the scope analysis and conclusions contained in ICF September 11th, 2009 report?

MR. JUDAH ROSE: Yes, ma'am. Just I -- in the materials that I have here, I have seven (7) sections, and the first section is some introductory and bra -- background material related to the scope of the engagement that we have -- had with Manitoba Hydro. And

then I -- the next section discusses sort of market conditions and our views on Manitoba Hydro exports. There's a section on my -- on contracting, droughts, modelling, and what is called selected finance and risk issues, and some governance and risk issues.

So right now, I'm just going to focus in on the material on page 8, which is the terms of reference of our engagement, and there was six (6) terms of references -- reference.

So, again, on page 8, item number 1 is the -- looking at the business strategic and risk issues related to long-term, twenty (20) or thirty (30) year contracts.

The second term of reference was the price, whether it was adequate to be involved in export transactions both long-term and short-term.

The third was risks related to the transactions, that is selling long-term energy from dependable resources with emphasis on the potential implications of drought.

Item 4 is the merchant power energy trading trans -- transactions, as to whether the Company should be involved in that.

Item 5 was the reasonableness of the quantification of risk exposure, and this focuses on the

issue of the five (5) year drought as a quantification of the risk the Company faces.

And then the last item, item 6, is the adequacy of the drought risk-mitigation measures that the Corporation has.

So those were the things we were asked to look at, and that was the scope of our September 11th, 2009 report. And I think, with that, I can maybe begin to go into discussing the various different findings and conclusions that we have, and what I was hoping to do is, in section 2, talk about the power markets and the role of Manitoba Hydro exports and proceeding to page 10.

The main points about the power markets with respect to Manitoba Hydro is that the most important market is the MISO market. Winnipeg is close to the US border and it is adjacent to an extremely large regional system operator/power, market/collection of utilities, and when I say large, the latest measure of the size of the capacity in MISO is around 140,000 megawatts versus a peak demand for Manitoba Hydro of around 5,000 megawatts. So it's an extremely large system, and it extends from Cincinnati and Michigan all the way over to the Dakotas and Iowa.

So the -- it's a very large area, and it alone is in the position to really absorb Manitoba

Hydro's surplus. The reason we're focussing in on -- it's not that Manitoba Hydro only sells to -- to MISO entities, but that's -- you know, in terms of size, it's the only thing that can really absorb the fair amount of surplus energy that Manitoba Hydro has.

Another thing that is very much also related to the issue on drought, it's the only entity that's realistically able to, given the transmission system, supply your province in the event of an emerg -- a drought worse than the worst on record or an unusual circumstance. That is, if you need to draw a lot -- large amount of -- large amounts of power unexpectedly, that's the place to go and get it.

It's a summer peaking system, it's a thermal system. The percentage of hydro generation in the Dakotas and Minnesota is something on the order of 1 to 2 percent versus, you know, the high nineties that you have here. So it's complementary and it's large and it's available, provided that there's sufficient transmission capacity, to go get the power in the event that something happens, let's say, outside the historical record.

And I know that's a -- I think an issue that's I'm sure on the minds of all of the decision makers in -- in Manitoba in light of the fact that my trip previously to Winnipeg, not related, was on the way

to do some backpacking in -- on the Mackenzie River area. You're at the end of the North American system and the northernmost portion of -- of it, and so, therefore, being connected to a large portion of the United States power system is a -- an advantage, and that's why we're focussing in on MISO.

MISO's where you're going to sell most of your power, I think 80 percent, and so what goes on in spot markets, which I'm going to talk about in the next section, affects the prices that you can obtain for your short-term sales, opportunity sales. The extent of volatility or uncertainty in the prices affects your interest in long-term contracts and that of your counterparties. If there's no volatility or unexpectedness, there's -- there's less interest in long-term contracts.

There's a relationship between the long-term and the short-term prices, which I'd like to mention and discuss, and again it focuses on the relationship between the MISO prices in the -- the short-term and the long-term, and those are the main points that I wanted to make there with why I wanted to get into and discuss MISO.

With that, I'd like to turn to the graphic on page 11, and this is an historical time series of the

power markets in MISO, and you can see the reason we have different lines: We have on-peak, off-peak, and all hours. The graph extends from '97 to 2010, and that's pretty much the period of time in which it was legal and you actually had some price discovery in the wholesale markets.

The United States didn't really get markets going until around 1995, '96, '97. And they're -- and what you can see here is is that the spot prices averaged around fifty dollars ($50) a megawatt hour for the blue line, the on-peak hour where you'd like to sell most of your power, and given your storage capacity of 10 terawatt hours you do have some flexibility to do that. And with approximately 2,000 megawatts of export capability, that's where you would like to -- to put your power.

And but at the same time while it's averaged around fifty (50). And this is in 2010 dollars; we've corrected for inflation. So we've got everything in the same real dollar context. You can see that it's variable. We have provided an estimate. It's standard deviation to assess the variability.

The variability goes both ways. The variability is significant. You can see that the prices in the last two (2) years were half of the prices over

the previous five (5) years. Thirty-three (33) versus sixty-six (66) for the on-peak power.

And it goes both ways in the sense that that means that to -- there's interest in things that mitigate the variability of spot prices, and long-term contracts is the main mechanism for mitigating that by establishing, both for the buy and seller, both of whom are facing this uncertainty, both of whom are not -- would prefer that their ratepayers not be subject to significant swings in their rates, the main mechanism is the long-term arrangements for supply.

So again this goes for both parties. There's uncertainty and both parties are interested in mitigating that. Both the buyer and the seller.

Now, I think it's also worth noting that the most -- the recent current downturn in prices is related to the current recession.

I'm much more familiar with the recession conditions in the United States, and unfortunately they've been more severe, but it's a once in a seventy (70) year event, and I think it's -- we want to be careful that we don't extrapolate from a one (1) -- unnecessarily from a once in seventy (70) year event to -- that is -- that's -- that's going to be determinative of what we're going to see in the future.

And I think that there are positive things in the power markets that are occurring and negative things, but none of them change the fact that there's significant uncertainty and a history of cycles in the marketplace.

(BRIEF PAUSE)

MR. JUDAH ROSE: I'd like to turn to page 13, and there's a table on page 13 which shows prices that I alluded to. These are the historical prices, and the first row is the on-peak price in real dollars, and then I show a 2025 dollar, so that's what you would expect, assuming that you have general inflation of 2 1/2 percent a year, and you can see it's a -- that the second row is 45 percent higher than the first row.

And the reason we have columns is that I am showing the average over the record that's available, the '97, the 2010 on the left, and then I'm showing the high prices we had in the three (3) -- the 2003, 2008, and the lower prices that prevailed in '09 and '10.

The first point I wanted to make is when you're looking at the short-term spot prices, it's important to recognize that inflation is -- is likely, in our view, to cause pri -- prices to increase.

And so if you have a 2025 set of cost or figures you're looking at, you would want to increase today's dol -- dollars by 45 percent to make them comparable.

So an average of fifty dollars ($50) a megawatt hour for on-peak is really equal to seventy-two dollars ($72) a megawatt hour in 2025. Again, this is just general inflation related to the mysteries of central banking and the depreciation of the currencies. The 2 1/2 percent is a good estimate of what is likely to happen.

So the first thing is is if you're going to go out in a future period time you need to take into account inflation.

I think the second thing is is that these spot prices are for transactions typically that are done on a day-ahead basis. So people are on the phones. They're providing information to MISO of what their bids are for both demand and -- and demand that they need, and there's a market clearing engine that takes into account an extremely large amount of information, and in an extremely sophisticated way relative to other industries is creating a huge amount of price information.

But the spot prices are primarily related to - - to today's bids for tomorrow's supply. And in

that context, there is typically, relative to these prices, a premium that people would be willing to pay, knowing it enables them to avoid, in the future if it's a long-term arrangement, from having to build new power plants.

And that premium is not always reflected in the spot price, and that premium would be on a nominal 2025 dollar basis, something in the order of thirty dollars ($30) a megawatt hour.

It's a little bit hard to exactly figure that out, but the first thing -- the first thing is you need to take the real dollars and adjust them for inflation. And then you need to adjust for the fact that if you're offering a long-term product, it allows the buyer not to have to build new power plants. And there's some premium in the market that's required to justify new capacity construction.

There is also very much interest in what Manitoba Hydro has to sell. There are no major sources of hydro available in the United States. And so the only major sources of hydro that I'm aware of in North America are: in Manitoba there's the Churchill Fall -- Lower Churchill Falls in the Newfoundland/Labrador area; there's the resources that are available in Quebec for expanded hydro production; and there are one (1) or two

(2) major sources of hydro that British Columbia's identified.

And -- and with those exceptions, you're offering a product that is renewable and whose fuel price is very stable; it's always zero. And the reason that's important is because, as I indicated, the utilities do not like to have to change rates, something I'm sure that you don't need to be even told. When I went through customs I mentioned I was working for a Canadian utility. They asked me, Are you going to help them lower their rates? This was the police officer. So I'm sure that whatever feelings and emotions he was conveying to me you have experienced a hundred times.

So -- and how do you -- how do you do that? Well, the way it was done historically is is you went and built coal power plants. Coal power plants are easy to contract for the fuel, relatively speaking, in the sense that you can put it -- you can have -- stockpile it and there's no -- in the industry -- in the coal industry what's known as mark-to-market collateral requirements.

And by comparison, to understand what I'm saying, is if you buy natural gas and you try to -- to lock in a price for natural gas you're required to maintain a collateral account which requires a huge

amount of capital in order to -- and that's mark-to-market. On a daily basis, when the gas prices change, you're required to update that collateral requirement.

And I -- I alluded to the Calpine bankruptcy that I testified in as an expert on valuation and other issues, that was the precipitating thing that put them into bankruptcy, was the very high pressures they came under when that entity is only producing power from natural gas power plants and a -- and -- and a geothermal resource. So they're very exposed to natural gas.

So the issue here is is that people are willing to pay a premium: A) to avoid having the hassles and the concerns about the environmental regulations related to coal, recognizing that they can't really -- it's very, very difficult. In fact, there's a defacto prohibition on new coal power plants in the United States due to the current administration policies in that regard, and that their only other alternative is natural gas. And so you're offering something that's stable that doesn't require mark-to-market collateral requirements, and the associated working capital requirements, and that meets a need for price certainty.

And so, again, in that context, when you're looking at the prices, it's something that there's

a -- there may be a -- I would expect to be -- there be a premium for -- related to the lack of competition of -- and the interest in that particular resource.

On page 14 I have the historical time series for Henry Hub natural gas prices. And the reason I have there here is -- is to -- to highlight the fact that when you rely on natural gas you're exposed to uncertain and volatile natural gas prices. These are the annual average prices in Henry Hub, Louisiana, a market location. And in real dollars in 2005 they reached almost ten dollars ($10) a million BTU. And in my professional career they've been two dollars ($2) as well, as you can see from the ta -- table on page 14.

And so what's happening is is that, again, the alternative that your counterparties are facing is the uncertainty of exposure to natural gas prices, and it's also a significant correlation between the natural gas prices and the pa -- wholesale power prices that they're facing.

And so -- you know, and one of the -- as we go through now, think about what's happening in the MISO market pu -- plus and ma -- and pa -- plus and minus, you know, natural gas is clearly one (1) of the issues.

Page 15, it shows our most recent forecast

for a natural gas commodity in North America, vis-a-vis what we had previously. And you'll see that our forecast has come down. So one (1) issue facing the markets, as exemplified on page 15, is the fact that expectations about natural gas prices are lower.

Now, this forecast that we provide, you can see the October 10 ICF forecast, is a forecast not necessarily of what the volatility is going to be in each year, but what we expect the price on average to be is if we replayed the year over and over again. So there's an annual volatility on top of that, and there's uncertainty. And the uncertainty is these are coming from our -- our gas market modelling.

We have more access to information about gas production potential I think than any other entity because the NGA, the Natural Gas Association supply -- Gas Association of America, provided us -- all their members provided us information on their -- particularly their shale gas resources.

And so we do have good information, but it doesn't mean that there's not uncertainty. You have commodity cycles and you have just uncertainty as to both on an annual case with respect to the economy and weather. And so that doesn't go away, but our prices are lower.

So one (1) of the things that's occurring is is that the main alternative in the -- in a critical market dryer -- driver is lower prices. And the reason for that I alluded to is in page 16, where we show the unconventional gas supplies, including shale gas.

Now, the -- the whole development here is something that you guys are very much familiar with. One of the best economies in the United States is North Dakota, and the Bakken oil shale extends for sure into Sask -- Saskatchewan and has -- you know, has the potential for a million barrels a day of production in the next few years. That's using the same technology in -- that is being -- is significant in the gas base, and -- and it's called horizontal multi-fracking; it's something that's been going on since around 2003.

So that again is the reason why we lowered our forecast, but it doesn't change the fact that there is annual volatility and uncertainty and that both parties on the buy and the sell side are interested in -- in, if you will, preventing exposure to -- excessively to the spot market. And I don't think that that has fundamentally changed, but it is the case that the expectation of gas prices is lower.

The other thing that has happened in the last two (2) years, which everyone can read in the

newspapers is, on page 17, which the politics have changed, vis-a-vis, climate change. Now, one of the things that the -- the corporate's -- Manitoba Hydro's strategic plan is to pursue is Hydro the -- as an answer to global climate change. It's still an issue of significant uncertainty in the United States, but we have lowered our forecast, as you can see. The two (2) columns are the previous and current forecast, and we've pushed out the beginning of any Co2 program that manifests itself in a -- in the cap and trade or dollar per ton rel -- relationship.

So the EPA, the Environmental Protection Agency in the United States is still pursuing Co2, and -- but gas prices are low -- have become lower, in our view, and Co2 has become less likely, but there's still significant uncertainty in that.

On the other side of the coin, in terms of drivers, on page 18, this is a list of organizations that have forecasted, including us and us for the Edison Electric Institute, those are the first two (2) rows, expected retirements of legacy power plants or coal and oil and gas power plants due to proposed EPA regulations.

So on the one hand, there has been less likelihood that Co2 controls are going to be passed in the United States. The critical thing there was is that

additional legislation was sought in that area. But existing legislation in the United States is ex -- is expected by all these organizations to result in very large amounts of retirements of either coal or oil and gas steam capacity. And these regulations, again, are under existing authority, and, in some cases are being required under court order.

And as it turns out, this is a very large map, there's 325,000 megawatts of coal power plants in the United States. You can see that many of the forecasts are in the 50/60 gigawatt range, or 50 to 60,000 megawatt range for coal retirements, that's the first column, and that this is something that's facing all of the utilities in the United States, and in particular, the utilities in MISO.

And on page 19 there are three (3) regions on the United States as a focal point of this potential large scale retirement of capacity, MISO being one (1) of them. To be in this category, you have to have older coal-power plants that are not controlled for various different environment pollutants that are being regulated: SO2, NOx, mercury. There's a whole list of other hazardous air pollutants that are under sub -- subject to tightened regulations for coal ash and water use.

And so many of your counterparties are working with us as an electric institute, where we'll be subject to our client, EPA, the Environmental Protection Agency, and are very concerned about the loss of their legacy fleets. Many of these power plants are quite old. There are a lot of power plants that extend back to the 1950s, and since I was born in '58 I can tell you that it's old.

And so this is a positive trend in terms of marketing your assets. People are concerned about how they get access to something other than coal that's stable, and that if you had these retirements, lower supply leads to higher prices. And I think that that's one of the countervailing trends that we've observed.

There's a lot of uncertainty about these regulations. Congress on Saturday night at 4:00 in the morning, the US Congress, I think X'd out all of the money that would have been required to implement these regulations. However, as I understand the -- the situation, they had -- in order to 'X' it out they had to get the approval of Senate and the President, which is extremely unlikely.

So that -- those are some of the dynamics that are going on, but your counterparties are very nervous, and rightfully so, about the availability of

power supply.

So that's a little bit of a plus and minus of what's going on in the markets and what the trends have been historically, and sort of -- sort of where we are.

The only thing I would mention before I get into the discussion of the export business, is electricity demand has recovered very significantly in the United States. That is, the 2007 to 2009 recession resulted in the first time in the United States of electricity demand measured in megawatt hours going down in two (2) years consecutively since the Great Depression in the 1970s -- 1930s.

However, US electricity demand in megawatt hours went up in 2010 4.1 percent, and even faster in MISO at 5.1 percent. And so those numbers are a significant recovery, and then do augur for recovery in the energy space generally.

As I talk about switching topics to what's -- what we've found with respect to the power business, export -- export business for Manitoba Hydro -- and -- and I'm on page 21 -- the main thing that we found is -- is that, with respect to the terms of reference, the -- the question really was not whether you are involved in the hydro export or the power export business, but how

you'd be involved. And the reason why have to be involved is -- is there's no other market we discussed that can handle the amount of surplus that you currently have.

You already are committed in some sense to having a surplus in many years and -- and that it has -- that -- that -- even if you were -- were just going to be relying on short-term sales, you are going to be involved in exports necessarily. The market is not big enough. Your demand is 20 terawatt; your production is thirty (30) roughly. So that extra 10 terawatt hours has got to go somewhere, and it can't go to Saskatchewan and Ontario due to the lack of transmission or the smallness of those markets. It's got to go -- export and it's got to go, in -- in large measure, southward.

You have benefited greatly from the hydro surplus. You have the lowest electricity rates, so I -- I'm now able to testify the jurisdiction has the lowest electricity rates, not even only in Canada, but also throughout the entire United States. And we have graphics here that show that.

That remarkable achievement is driven from the subsidies for your domestic generation rates that accrue to your ratepayers via the exports, and so there's a lot of success that you've had in that area,

expectations of continued success, corporate strategy in -- in that direction, and the imperative of even just dealing with the surpluses you have.

And I have a figure here that your -- your domestic generation cost is approximately -- is under thirty dollars ($30) a megawatt hour; in the middle of page 27. And as we'll be discussing, the export prices on -- on page 21, if you look in the middle there, there's twenty-seven dollars ($27) a megawatt hour. That's an estimate from 2006 of the generation rates in Manitoba for your customers here in Manitoba. And as we'll be discussing, we're talking about term-sheet prices in excess of eighty-seven dollars ($87) a megawatt hour. So it gives you some sense of the -- the benefits that you get from having export sales.

Now, we're going to discuss that -- that's part of the -- a little bit of apples and oranges of -- of embedded versus future costs. But, you know, just looking at your embedded cost of twenty-seven (27), and you're being able to sell at an average of fifty (50) on-peak, you see the -- the large benefits that you have.

That -- in terms of -- another issue that I -- I wanted to talk about here, which I eluded to, is the exports have been the vehicle for the -- the historic progress of Manitoba in securing the grid against extreme

droughts; that is, is the vehicle by which you connect to the outside world.

And given that there's a possibility that you might have a drought worse than anything you've ever seen on the -- on record -- and in fact every four (4) pages in our report we mention once the term, "a drought worse than the worse on record" -- that the exports have been the vehicle by which you are bringing on hydro in a manner that doesn't create extreme rate shock, but is also facilitating and reso -- the construction of transmission ties to the United States by virtue that counterparties are building the transmission lines to the US border, which you have no control over, but only can induce through the exports, and in particular, the long-term contracts.

And so the -- it's very important that -- that people recognize that to protect Man -- Manitoba's ability to meet its customers needs in -- given how extensive the reliance is on hydro, and also the history of hydro availabil -- variability, which is the most pronounced in the province of Manitoba relative to other Canadian provinces, but also the fact that there has been a history of prolonged droughts, and that is a major concern for all of the decision makers I'm sure in Manitoba, and again the export business is getting you

the transmission grids, there's over -- there's approximately, you know, two (2) -- you know, roughly 1,500/2,000 megawatts of transfer capacity to MISO, and there's going to be more construction should the proposed term sheet arrangements go forward, being paid for by entities in the United States, and permitted by entities that are in the Untied States, and subject to that type of arrangement.

It would be very hard to get that transmission capacity built, or very expensive, that we have an estimate that the transmission capabil -- capability that's being added in order to facilitate the long-term contracts is on the order of $2 billion, so -- which is generally not included in the -- the calculations. Nor is it included in the calculations of what would happen if you had something very, very bad in Manitoba in terms of a drought worse than the worst on record and you didn't have access to the US thermal system.

So again the -- the -- it's a very important issue here, and one (1) of the other things that we're finding in terms of how, again it does make sense to have a mix of long and short-term contracts. And that relates to the fact that the long-term contracts are providing stability to -- to Manitoba ratepayers;

it's providing protection against budgetary problems, which mani -- could manifest themselves in rate issues; and it's getting the other parties willing to pay premium prices, because they get to -- knowing they have long-term contracts, they get to avoid having to build new power plants; they're -- knowing that they have these long-term arrangements, they're willing to build new transmission, and so that is important.

I think another issue is, is that since there's uncertainty in pricing, one (1) way to deal with that is to have short-term sales. And the Company is -- is -- proposes on average to have roughly 50/50 in terms of the megawatt hours, at least historically, to be in that -- on a typical year to be 50/50 roughly: short-term sales, opportunity sales, base on the surpluses and long-term contract sales.

And we think that makes sense for a lot of reasons, which we'll -- which I'd be discussing. So it's important that you be involved. It's necessary that you be involved. It's part of the history of building up the Manitoba system to be what it is, as strong as it is. There's more work that needs to be done in that regard. And that it is also necessary, and useful to have, in -- in my view, a combination of long and term -- long and short-term arrangements for sales because of various

different issues that I've already mentioned.

Page 23 has a -- has a history of Manitoba Hydro exports. The -- it's showing the relationship between the growing exports over time and that has accompanied -- been accompanied by -- by hydro expansion, also expansion of the transmission, and strengthening the reliability of -- of the system.

And so there is volatility being associated with hydro because of the fact that you have volatility in the -- or uncertainty in the amount of hydro you're going to have related to hydrological conditions, and uncertainty with respect to the prices. And so in some years it could be that it's -- you could have a drought and some problems. But you need to take a look at the overall effect of the -- of the export program in terms of on average having per -- significant value to the ratepayers in terms of lowering their rates, and also in getting the infrastructure necessary for these very long-lived hydro facilities.

On page 24 I -- I alluded to the fact that although you're a relatively small system, you're not producing as much hydro output as -- say as Quebec, the -- on 24 you see that by far you -- in terms of percentage of exports as a percentage of generation to the United States, you're at -- you're by far the largest exporter

in terms of percentage. That's the pink bar or the purple bar. Your percentage of exports when you include Sasa -- Saskatchewan and Ontario is closer to 32, 33, 34 percent. So you are way out there in terms of having exports in the sense of it being a significant part of your business, and it's worked out very much to your benefit, as shown on page 25.

And as the left most graph shows Manitoba having the lowest rates, as I put on my glasses here, you're at five point six (5.6), versus every other Canadian province having higher rates than you. And the one on the right, the graphic on the right, shows of the States -- in the United States you also have the lowest rates, and that's a testimony to the benefits of the hydro exports, which have been very successfully developed and managed.

And we even have for the Canadian provinces a minus point eight (.8) correlation coefficient. That means that the less hydro you have, the higher your rates. And so, again, it -- it has worked very much to your benefit to -- to have these -- this endowment of hydro resources and the programs that have been put into place over the many years to take advantage of that.

On page 26, I talk about the alternative

to -- to hydro development. And the main alternative for both you and for your customers is natural gas. And so, again, the reason for interest in your -- in your product is -- is everybody's alternative -- you know, main alternative is natural gas.

And the shale gas developments, notwithstanding, there's a lot of concern about how you get stable rates. And were Manitoba Hydro to go down a route of eschewing future development of hydro and pursuing a natural gas expansion program, what you would have is a -- you know, a sequence of natural gas power plant construction that would lead to fuel adjustment clauses. You would have to pass through your fuel charges. Your rates, therefore, would become more volatile and higher as you lose the advantage of the export subsidy, and you would end up having -- you know, facing the same dilemma that other companies have with respect to high and volatile rates which have been very difficult for customers given the volatility historically in -- in natural gas.

So it's a future that has lower capital costs, but it would very much change the structure of what Manitoba Hydro is, and it's business, and also its regulation and rates.

So that concludes our sort of background

on -- on what we found with respect to the market conditions and with respect to exports. And I now sort of would be going through some of which I've already mentioned, what we found vis-a-vis the export contracting strategy of the Company.

I can keep going.

THE CHAIRPERSON: How about we just give Mr. Rose a chance to -- we'll just have a ten (10) minute break.

--- Upon recessing at 10:54 a.m.
--- Upon resuming at 11:18 a.m.

THE CHAIRPERSON: Okay. Welcome back.

MR. JUDAH ROSE: Thank you. I was wondering, before I proceeded -- and I did want to say that a lot of the material that I'm planning to cover is -- has already been at least touched on in my introductory remarks, and I'm going to continue, but I was wondering if there's any questions that -- on the -- on what I've said. And if it turns out that it's related to material later, I'll -- I'll mention that and we can -- but I'd be encouraging questions.

MR. ROBERT MAYER: If I may, I -- I'm looking at the -- the page 19 and the graph. And it

appears to have highlighted four (4) particular units. I don't know what those numbers mean: twenty-six (26) one (1), twenty-two (22) zero, fifteen (15) zero, and twenty-six (26) one (1). Could you fill me in on that, please?

MR. JUDAH ROSE: Sure. The -- the units are gigawatts, which are thousands of megawatts. So Manitoba Hydro has a 5 gigawatt system. The -- to the left on the slash is the coal power plant retirements that are being projected. So the amount that's being projected, for example, in MISO, using -- using the Edison Electric Institute as an example, where it says "EEI Scenario 1 and 2," the third and fourth rows down, that's saying that there's fifteen (15) to 26,000 megawatts, three (3) to five (5) times the entire Manitoba Hydro system, that's expected to retire. The zero and the one (1) refer to oil and gas steam power plants, of which there's very little in the MISO area.

And one (1) thing I didn't mention is that -- that EPA is under court order in some of these cases to implement the regulations by 2014. So we're in 2011. So this is - this is referred to often as the train-wreck scenario: there are so many different EPA regulations that are coming down simultaneously that people are saying the grid -- grid reliability is threatened.

And it's not just people. The North

American Electric Reliability Council, which is now the Electric Reliability Organization of the United States under FERC regulation, under authority given in the 2005 Power Act, has said that these regulations are a threat to the reliability of the grid. That is, the US government has said that the other part -- the thing that the government -- the other side of the government is doing something that's threatening the grid reliability. So you can imagine how much interest there would be in securing resources that are not subject to these regulations -- i.e., non-coal resources -- and that's, I think, a positive for the hydro offering -- hydro-based offering of Manitoba Hydro.

MR. ROBERT MAYER: Okay. So I'm reading this graph again: fifteen (15) to twenty-six (26) are volumes.

MR. JUDAH ROSE: Right.

MR. ROBERT MAYER: And the top two (2), twenty-two (22) to twenty-six (26), that's ICF's range?

MR. JUDAH ROSE: Right. Those are the -- those are ICF studies that were done separate from the EEI. The fifth row is NERC, which is the North American Electric Reliability Council. They for -- seem to have lower retirements in the MISO area, but it's generally not the view that that analysis, with all respect to

NERC, is on the same par with the other analyses that are being conducted.

THE CHAIRPERSON: I would just continue on, Mr. Rose. We'll have, fear not, many, many questions when it's all done.

MR. JUDAH ROSE: Okay. I'm in Section 4 to -- I'm sorry, section 3, and this is the review of the -- the -- the strategy of Manitoba Hydro with respect to long and short-term contracts. And many of the points with respect to the utility inappropriateness of a mixed strategy, of a diversified, not put all your ba -- eggs in one (1) basket strategy, I've already made, with respect to the -- the risks that are involved on sort of the -- just relying solely on the short-term, and the advantages of the -- of the long-term contracts.

And I guess -- I think to me -- to me I think the thing that would be most helpful is to go to page 31. And this graphic shows the -- on the horizontal axis the years and the Y-axis the energy pro -- and it shows the -- the purple area, the first one (1) is the load of Manitoba Hydro. And the sort of greyish -- not greyish, but the greenish brownish net exports is for firm long-term exports, and the -- as -- as augmented by the green under the proposed exports, and the orange is is the short-term, as available, opportunity sales.

And I think the main thing I wanted to point out is is that -- one (1) is that the Company has about roughly 50/50 between the brownish and the orange, so it's -- it's not putting all of its eggs in one (1) or the other, but it is -- it has a mix of short -- short-term and long-term.

The other is the blue line shows that this is the energy available from its facilities under the worse hydro conditions on record, which extend back to 1912, and it shows that its not going to make a sale, or a commitment domestically, that can't be met even under the worst hydro conditions.

So part -- a main -- part of the risk strategy that they have to manage -- to manage the risks of hydro variability is to limit the firm exports, and I'll discuss some of the other elements that the Company has incorporated into its strategy.

And so it has a mix. The mix is useful because the long-term contracts are providing things that the short-term contracts don't. Not a surprise for people on long-term mortgages. And I'll just add is that these -- these long-term contracts allow amortization over many years of the cost of the -- the hydro.

I think another point I made is -- is related to the reliability issue, and to emphasize that,

I'll note that major advances in science occurred when there -- there was nomenclature and notation and mathematics -- nomenclature and notation that was adopted to describe things properly.

There is a term that has emerged in the last few years in the risk-management literature known as the Black Swan event. It turns out that my boyhood friend from college is the chief risk officer of the leading money manager in the world, and he has, outside his office, a Black Swan. Now, this is -- it's a -- it's one of those wooden things.

And he's done a lot of work on the mathe -- mathematical assessment of risk, but he has a lot of respect for the concept that when you examine what goes wrong in risk management, often it's things that were not quantifiable, and not addressable quantitatively.

And the Black Swan simply refers to the fact, What's the probability of seeing a Black Swan. Well, until they discovered one (1) in Australia all the swans were white, so the probability based on historical experience would have been zero.

Now, the Company is very sensitive to that Black Swan possibility. That sensitivity derives from the fact that, although the Company has more hy -- hydro data than most other entities, about -- about a hundred

years, there is a concern that, and I've been privy to -- not privy, but I've been fortunate to review the work of Drs. St. George and Drs. Leavitt on dendrochronology and lake sediment records on historical drought conditions.

I say I've been lucky because it was something that the Company allowed me to take a look at, and a dendrochronologist refers to the tree rings. I wanted to be able to testify once in my life on tree rings and I have achieved it. I'm not an expert but one (1) of the things in -- in speaking with them and reviewing their material is is that there is a concern, but there's not enough data to figure out exactly what the concern is, and so in that sense it looks like the Black Swan.

You don't have the sufficiently detailed historical record to eliminate the concern of seeing something that never has happened, or there's no ante -- historical antecedent for it, but you can't measure exactly what it -- how -- how likely is it.

And so again the ex -- I just want to drive home that the Company is sensitive to the existence of Black Swan events. It is appropriate that they do so, and they have built that into their strategy by reinforcing the transmission links, via the long-term export contracts, to link up Manitoba so that its ties

with the rest of North America are strengthened, and it's the logical way to do, almost. But an extremely large percentage of Canadian populations is within 90 miles of the border. Winnipeg is close to the border, the transmission ties and/or size of the adjacent markets make that difficult.

So I wanted to emphasize that, and I think the -- the term for -- term to do that, I think, is the Black Swan. Again, I -- I'm impressed with the Company's sensitivity to that and the work that they've done in that area. Now, the counter-example is in the -- is -- as you look at long-term contracting, that's what Hydro Quebec is -- this is not the counter-example, but Hydro Quebec is -- is building transmission to the United States. It's -- it's developing new hydro resources. It's -- wants long-term contracts. It's got authority from the Federal Energy Regulatory Commission to -- to negotiate long-term contracts.

The utilities. Most of the power plants that have been built are -- in most recent years are by utilities that implicitly have a long-term contract relationship with their relation -- with their customers, as adjudicated by the Public Utilities Commission, to -- to -- again to provide the support for the development in a contractual setting.

This is also the case with respect to many of the most recent independent power projects or the deregulated power projects. The counter-example is the IPP industry. Now, unfortunately, I've been working on inde -- independent power producer issues for many years, and I -- I've had to be at many bankruptcies. I -- I alluded to the fact that I testified in bankruptcy court in Manhattan very recently, November.

I've testified in the Calpine bankruptcy. Tt was one of the largest bankruptcies in US history, the NRG bankruptcy, the Mirant bankruptcy. These are names of independent power producers who because they had -- or inadequately contracted and they didn't have any -- any traditional utility rate setting capability, they ended up in bankruptcy. So excessive reliance on spo -- on spot transactions has been a formula for disaster and it's in -- in the US.

And I've provided some list of the companies that have gone through that. Again, these were companies that were inadequately contracted and/or were not involved in utilities. This is not the case here, just the opposite. The company has a structure where most of its sales are either to dome -- to domestic or to -- under long-term contracts with -- with credit-worthy counterparties. So I think, again, having long-term

contracts as part of the mix is -- is very beneficial.

If I could, I -- I'd like to -- to proceed to page 42, and 42 is the graphic that shows the contract prices -- or the -- in the term sheets. I think the Company has released the fact that they're looking at prices in excess of eighty-seven dollars ($87) a megawatt hour in 2010 dollars. And I've -- on page 41 I've expressed that in 2025 dollars.

So you see the hundred and twenty-six dollars ($126)? That's applying fifteen (15) years of inflation at 2 1/2 percent. So the Company is saying that we have a mix of contracts. We think that there's benefits for having both long and short-term contracts. It has limited itself to only having long-ter -- long-term quan -- contract quantities that can be done and under the worst -- can be delivered under the worst hydrological conditions on record.

But in our view, they've also gotten adequate prices. And, again, the eighty (80) -- greater than eighty-seven (87) or the greater than a hundred and twenty-six (126) we found were good prices, and what we have compared here is the -- on forty-two (42), the red bar is the greater than eighty-seven (87) term sheet price, and the -- we show the historical on-peak spot prices.

So we looked at se -- several metrics. The first metric was we took our own forecast which we have been providing to the Manitoba Hydro over a few years, and the forecast -- these prices are in excess of the forecast that we had at the time the Company was entering into them. So we found that not only was the strategy appropriate but the price was appropriate.

We did not have access to other forecasts. The company had accumulated I believe five (5) forecasts from four (4) other entities and ourselves. I didn't have direct access to those forecasts, but I had access to the average. And the price year was above the average forecast price, another metric indicating that the price was adequate.

When you look at prices above, it's above the historical spot prices. It's above the prices -- significantly above the prices achieved in the current -- or the previous sets of export contracts. And so when we looked at all the metrics that we had available, we found that the contract prices, or the term sheet prices, were better than the -- the metrics that we compare it against: historical spot prices, the existing contract prices, ICF forecasts, consensus forecasts, et cetera. So again, when we looked at the export situation, we found a good balanced strategy related to -- and a good

pricing set.

I've also included an excerpt of an article from The Wall Street Journal, which itself is describing some work some professors did. And this is on page 44, and this relates to the fact that the Company has established a policy to sell at -- at prices that are some percentage above the average of the forecasts that's available to it. And the issue here is that it makes sense to look at other forecasts, and, you know, we do forecasting, and we're one (1) of the entities that they've reached out to, and -- and we contributed to one (1) of the five (5). And there's literature indicating that taking the average reduces errors, and that it's a way to sort of try to take into account that various forecasters are looking at things with various different focus, and it's described here as a powerful tool.

So the Company has, in our view, established prices that are adequate in the long-term, established a good mix of contracting, it is responding to both what the Company needs in terms of stability and what the buyers are interested in, and has protected itself against seller's regret that you're selling at the wrong -- too low a price by taking a look at multiple forecasts and adding a premium to them. So our review of the -- again, the contracting of the Company has showed

that we're -- we believe that the Company is pursuing policies in an -- an appropriate manner.

Brings me to page 45. It doesn't have a page number, it's just the page break for section 4 of my presentation, which is the analysis of the drought risks. And I've already alluded to drought risks. There's -- there's two (2) types: There's the drought risk based on the historical record, and there are drought risks that reflect droughts that are outside the historical record, and that's the Black Swan issue.

And -- and so the first issue that we were asked to -- to look at is: What were the risks that the Company had with respect to -- to drought, and how was it addressing those risks?

And I think the thing that I wanted maybe to turn to was page 50. And page 50 of my presentation is labelled Contractual Risk Management Mechanisms, and -- and how the Company's trying to deal with the risks to the contracts, with drought being a very important risk -- a risk that we were focussed in on -- on -- on addressing.

I've already alluded to the fact that the Company does not enter into long-term contracts for hydro supply that would -- that would be in excess of their dependable energy, and that's based on the worst Hydro

experience in the ninety (90) -- so ninety-seven (97) year record of the Company. And so they are limiting themselves to be able to provide power in a -- in a drought situation.

Now, one (1) of the things that they're also doing is in two (2) of the contracts -- or the term sheets, excuse me, they are -- and I've indicated that's Wisconsin Public Service and Minnesota Power -- that they are limiting the obligation to provide power in the event that there's a drought worse than the worst on record, so the Company doesn't have to supply power if there's a drought from the hydro resources in -- in that type of context. And so it has emphasized the dependable hydro element, not only in -- in setting the quantities but also in terms of the amount.

It has also -- as -- has other elements here of their risk management strategy with respect to the contracts, some of which are -- are helpful in mitigating the market risks, and some of them that are helpful in mitigating the -- the drought risks. I'll just go through a little bit what those drought risks are.

The one (1) risk is -- is that your -- you -- as you enter into a drought, you are in a situation in which you are -- don't have enough hydro to supply, and

so you're having two (2) types of risks in that -- in that respect.

One (1) is sort of a financial risk and one (1) is a risk that you are in a situation in which you are not able to supply domestic load.

And so the Company has undertaken, in its contracting mechanisms, to -- in two (2) of the -- the MP and the WPS, to -- to transfer that risk over to the counterparties. In the event of a drought worse than the worst on record, it is in a position to transfer that over.

Now, there are -- there are -- so that protects against the -- the threat of not -- it's part of the ways you protect against the risk of not being able to deliver power to your domestic customers.

And the other is is that as you are entering into a drought you are in a situation, however, that you are wanting to further mitigate any potential risks that you have since you're not really sure when you enter in a rosk -- risk -- a drought, how long it's going to be or -- or the severity of the -- of the risk.

There's no way to forecast where you are in a given moment, particularly as you go into a -- a drought. That is, you have a sense of what the hydrology is but you don't know what the next year is going to

bring.

And so in that situation, you are in -- you are exposed to having to perhaps do power imports or use of thermal resources, and those -- those -- so you have the -- the risk of not getting as much power sales revenue, and you're having financial consequences, and -- and you're also trying to mitigate that by overprotecting yourself against a drought worse than the worst on record or other -- other types of contingencies that you might be facing.

And so again, the Company -- one (1) way it's doing it is through the contract, and the other is is vis-a-vis other things that I'll -- I'll be describing.

I do think it's worth mentioning here vis-a-vis the -- the contracts, the other risk management mechanisms that are here, and you'll notice that the Company has -- has different pricing terms and formulae. Again I'm on page 50.

That is, there -- there -- some of the contracts are escalated inflation, wholly or in part, or some are indexed to the market. There are diverse time periods in terms of when you have to re -- do the renegotiations. There are multiple buyers and all the buyers are creditworthy counterparties.

And so -- and it -- as I indicated, it's a -- it's a reasonable mix of short and long-term contracts, and there's -- there's good pricing.

And so the Company has, in its risk management strategy, attention not only to the re -- drought risk, but also to the -- to the market risk.

(BRIEF PAUSE)

MR. JUDAH ROSE: On page 51, in terms of the -- the contracting mechanisms, this -- this the -- the blue line shows the proposed contract volumes under the term sheets, and you see the -- that's the dark blue line, and you can see that we're talking about a -- a long-term period here, 2015 to 2035.

And the vertical axis is gigawatt hours or -- and so you can see that the -- this contracting is associated with bringing on the Keeyask and Conawapa hydro facilities, and other -- other facilities, the volume is increasing, and that the lower levels are associated with different ability to back off sup -- either provision of opportunity -- and the red line is indicating that if you have a drought worse than the worst drought the Company doesn't have to deliver the power, and that it has therefore transferred some of the

drought risk of the extreme Black Swan event over to the -- to the entities -- other -- other -- the counterparties. That's the -- the red line on page 51.

(BRIEF PAUSE)

MR. JUDAH ROSE: Now, on page 53 as this is sort of an overview of the Company's drought planning, which we reviewed, and while we indicated we thought that additional write-up of the drought planning would be useful, it does show that the Company is very much oriented to managing both the financial and the physical threats related to drought.

The financial being not have as much hydro revenues, and having to purchase the -- the -- the more extreme situations not being able to deliver to domestic load. So the Company is doing many different things, and I've already described some, including getting more transfer capability, et cetera.

And here we have identified some of the key documents, the oversight bodies, the implementation mechanism, the tools, the Corporate activities, all of which are related to the Company's -- the fact that the Company's -- all of its activities have some drought-planning elements to it, not all, but a very large

portion of it.

So, for example, while there isn't a written drought-planning document today, the Company does have experiences related to its system, or relevant documents, its system operation priorities. I described that the number one priority is to provide domestic generation that describes the -- there's the drought management control plan that was adopted in 2003. It describes some of the steps that the Company went through in terms of responding to the drought.

There are the oversight bodies that are involved. A number of them here I mention are the Company's Board, it's Executive Committee, it's Export Power Risk Management Committee, the Sales and Operations Market Committee, PSOMC, the drought financial management working group, which I'll -- I'll return to.

So the Company is not only looking at it from a contractual mechanism and using -- and trying to lever the trans -- export business via the transmission to protect itself, it also has the -- and has these various different elements related to how to go about implementing a drought.

Now -- now, some of the risks that you face here is what happens if, I think we already mentioned, the drought is worse than the worst on the

record. And I think in the past the Company has taken a conservative approach based on its system operation priorities to make sure that it's in a position to store enough energy or to -- to get -- to get enough energy available to meet that risk, that it would either buy power or -- or use its thermal power.

And it -- it can -- it is possible that you could run out of power, again, even if you don't have a drought worse than worst on record if your demand is unexpectedly high or there's some other contingencies. So the Company's experience does show that it will go and take the necessary steps, and that was I think indicated in the 2003 drought, to protect itself against unexpected events as it goes into a drought of un -- unknown duration.

It looks at its hydro record very carefully in developing its dependable energy using its various different tools. There's a set of communication procedures that it follows with its oversight bodies. All -- all of the different implementation, the front, the middle, and the back office and the risk-management team is aware of that this is a significant risk to the Company.

It has low probability, but potentially large out -- outcome for some -- for some aspects of the

drought, and that it's affected, as I describe, the contract design, the transmission planning design, and covers basically a lot of what the Company is doing. But, as I indicated, we felt that additional write-up would be -- be useful of that.

We were asked to take a look at the 2003 drought and review how the -- how the Company handled that. And what I wanted to do was to turn to page 58. And this is looking at what happens in a median or average hydro situation, and the rows are the generation of hydro, and you can sort of see the thirty-one thousand (31,000). That's really the 31 terawatt hours. Very limited thermal generation. Very little imports of power, less than 2 terawatt hours, less than 1,730 gigawatt hours.

You see the export sales of eighty (80) -- eight thousand four fifty (8,450) or eight (8) plus terawatt hours. And when there's a drought situation the Company's thermal generation is expanding greatly, the imports is expanding, the export sales are going down, and so the -- and the -- and the generation from the hydro facilities are going down.

So the -- so the Company is -- did adapt to what happened in 2003 in the sense of it -- it took the steps to make sure that -- say demand, they went to a

one (1) to ten (10) planning mode for demand. So they said, What would be the -- not the average demand during the winter, but what would be the 90th percentile of demand in the winter. Let's make sure we can meet that.

The Company went in and had some sales arrangements, and it did what they call book out. They sold out the sales. And they took other steps to sort of manage that drought.

And -- and on page 59 this is a slide that was prepared by Manitoba Hydro, and it's comparing the -- what happened in the 2003 drought, which we had reviewed, to the conditions that were occurring earlier last year when there was a -- low winter precipitation. And the green is referring to the fact that, in 2010, there are some things that facilitate the treatment of drought relative to 2003, and -- and so what I'd like to do is just compare sort of the treatment in 2003, which we thought was reasonable, but also some of the improvements that have occurred in the way the Company has that.

Now, one (1) of the improvements is that the previous set of contracts were not as explicit as the MP and WPS contract as -- in terms of not having to deliver if you are in a drought worse than the worst on record. So the Company has changed its contracting policy vis-a-vis what was -- it had going into that.

You'll notice that the Company has -- is now functioning in a market that previously was bilateral which is now centralized and -- so it's easier to -- to disengage transactions or engage transactions in terms of risk management, hedging. It's more a liquid market. There's a centrally operated MISO market that every hour has prices at every location and is producing a liquid, open market. The Company has greater access on -- onto transmission in terms of control of the transmission. It has larger retained earnings: they've doubled. The very bottom row there is the retained earnings: in 2000 -- early 2003, over 1.2 billion. They now are 2.2 billion.

And so there have been changes both contractual in terms of the ability to be in a liquid market that you can conduct either risk-management hedging transactions or settle transactions that you've already had, and in terms of access to the transmission, and the Company also has greater retained earnings. So its -- we think its capability has improved. We think that they handled the 2003 drought with the probity that you would expect from an entity that has such heavy responsibilities in the event of a drought.

Another issue that we were asked to review was how the Company quantifies the risk of a drought. Now, one (1) of the things that the Company is doing, and

I alluded to in terms of retained earnings, is it looks at a five (5) year drought in the historical record and uses that as the stress case for establishing what type of stresses might result from the drought. And the question is: Is that a reasonable stress case to review?

And what I'd like to do is -- is -- if we could just flip to page 66, 66 has a graphic that's got these green bars on it, and the biggest risk that the Company faces in terms of drought is the prolonged drought. And you can see here in the red ovals or ellipses, you see three (3) events: There's a five (5) year drought in the '80s, a five (5) year drought in the '20s, and a seven (7) year drought in the '30s. So given that the biggest risk that the Company has in terms of drought is this prolonged risk, the question is -- is: Given this record, what would be a reasonable level of stringency or stress to apply to the Company's, for example, financial situation?

And what the Company has chosen has been the second worst prolonged drought that occurred in the 1980s, a five (5) year drought, and has not chosen the seven (7) year drought or the less stringent five (5) year drought from the '20s. And it's used that as the basis for its planning, for example, in doing stresses -- stress tests on the financial performance of the Company

vis-a-vis the equity position of the Company.

Now, what we thought would be useful would be -- is to ask the question of (a) should there be -- how does this stringency compare to the stringency that is applied in stress tests in other industries? And we picked two (2) in the financial space where they are conducting these stress test exercises.

And what we're focussed on is: What is the probability of the event, how stressful should the event be, and I think the issue also is, How much should it be drawn from the historical record.

And what we found is is that the five (5) year drought that's chosen is quite stringent compared to the other tests that we looked at.

We looked at Standard & Poor's, there a question about rating agencies. They go to the power marketing entities, and they ask, How could you -- how would you respond to a downrating where your investment grade rate -- your rate -- rating, your bond rating goes from investment grade, to sub-investment grade, or junk, in combination with a 30 percent decrease in -- in power and -- and gas prices.

We found that that was roughly equivalent to around a 3 percent event. That is, these companies have had downratings in recessions. Recessions in the

United States occur every seven (7) or eight (8) years, something on that order, and when you look at the combined probability of that occurring it looked very similar to the Manitoba Hydro probability, which when you look at the historical record, we described as -- as basically akin to having a 3 percent -- 3 percent change of having -- or of having the five (5) year event or worse.

And so 3 percent -- I'm going to go through the 3 percent. It's sort of using the -- the probability theory, and the 3 percent if you just look at the -- on page 66, the graph, it's asking the question if I -- I -- I'm looking forward, I don't know what year I'm going to be in, let's pick some year 'X' in the future.

There's ninety-seven (97) of them in the historical record that were in the period of time that we looked at, what's the chance that one (1) of them would be the beginning of either a five (5) year or a seven (7) year drought, and there's three (3) of them.

That is that there's one (1) year each for the beginning of these prolonged droughts, and so there's a three (3) in ninety-seven (97) chance, or roughly a 3 percent chance, that you could be going into a prolonged drought.

Now in fact, we were conservative because

in fact the drought that the Company uses is the second worst. We sort of said, Look any of these prolonged -- three (3) prolonged droughts, what's the probability -- of 3 percent? It's actually 2 percent of having the drought that the Company uses or worse. They didn't pick the absolute worst. They picked the second worst event. They picked the five (5) year and not the seven (7) year drought.

And so again, the question is, Should they have picked the seven (7) year drought or could they have picked something even worse. So when we looked at the stress tests that they were conducting on power companies and banks, we found that -- that they're not going for the ninety-ninth (99th) percentile chance, or the -- you know, or -- you know, the one (1) in ten thousand (10,000) event.

What they're looking at is events that have probabilities of 2 or 3 percent. And that's sort of what the Company's doing, as well.

So we think that the -- what the -- the stress that they picked, they picked the second out of worst event in ninety-seven (97) years, and that's the stress test that they are applying in their financial IFF work and -- and of course when they do the dependable energy they pick the worst hydro event.

And they're also very sensitive to the fact that the hydro record is limited, and I think what they're doing is right. They should take advantage of the very long hydro record you have. Ninety-seven (97) years is a good long period of time. Be aware of the fact that things might be worse. Be aware of the fact that while the research is progressing, it doesn't provide an answer of -- of what the probability is of the worst of the worst on the records.

The tree rings, and the -- as I spoke to the scientists, they don't feel the tree ring knowledge, base knowledge or the -- the pond sediment knowledge is adequate to provide a probability and provide a sufficient set of information on the four (4) river streams that feed into your hydro system in the four (4) seasons. It's almost like you need sixteen (16) pieces of information.

What is the worst event when you look across the four (4) seasons and the four (4) rivers, and they don't feel that the science allows that to be provided. So it doesn't mean that you should ignore that.

You should use a reasonable stress test, and -- but you should also worry about what would happen if the worst, the Black Swan event, and that's what the

Company is doing.

I think it's the right way to go about it. And one (1) of the concerns I have about efforts to quantify the -- the record beyond the ninety-seven (97) year record is the fact that we just don't know.

We, the scientific -- speaking -- the "we" is really the scientific community. None of the experts. I've spoken to some of the experts who claim that they know more infor -- that there's more information out there. It's not true, as far as I understand, and I've been able to -- it doesn't mean again that you don't respect that. Just the opposite. But you -- you respect it by treating it as something that can't be quantified and you deal with it on a quali -- qualitative basis.

So again, I -- I have a table here that emphasizes the fact. And when we looked at other stress tests we felt that the Company was being adequately stressful and were reassured by the fact that the Company has looked at the Black Swan event. So I'm looking at page 63. And 63 is labelled, "Stress Test Comparison." It's showing Manitoba Hydro picked the second-worst event and that it -- it's a -- it's listed as a 3 percent probability. That's actually a little bit of an overstatement; it's 2 percent.

And I note in passing that the K and M study I believe has concluded that the probability of the -- the five (5) year '80s event is less than 2 percent. It's on the order of .14 percent. So if their numbers were true as opposed to the -- really the 2 percent I think the historical record indicates, they're saying that -- that using that is an even more stressful event.

And -- and it's true that they're only looking at one (1) variable, which is drought, as opposed to multiple variables, but it's because it's a very -- it pushes -- it pushed the envelope by taking a very unusual event. It's sort of almost as if you said to the banks, We want you to plan for the Great Depression. And so the Company, I think, is being adequately -- I don't think we need to ask US banks to plan for the Great Depression.

I don't -- I think that that is something we need to figure out how to avoid, and I think the Company has done the right thing of saying, We may not be able to avoid it, but we want to have a reasonable approach quantitatively, and back that up with qualitative work.

Now, the last thing I wanted to talk about was on page 68. Now, as I understand it, the Kubursi and Magee assessment of the probability of a drought and the severity of the drought are affected by the fact that

they have created a statistical assessment of the probability distribution, and in doing so, the -- they have made certain com -- come to certain conclusions.

For example, they -- I think, as best I read, they -- I think they feel like that what the Company has done is picked an event that has 1.4 percent chance or worse than happening. So they're saying that it's pretty -- compared to other stress tests, I think that they're -- I don't think they'd disagree on the probability, and this is just my understanding -- from reviewing their material.

Now, they made the interesting conjecture that by looking at the data they're able to look at the five (5) year event and create a synthetic five (5) year devent -- event. Synthetic refers to creating data that's beyond the data that's available, right.

We only have two (2) five (5) year events, they exhibit a certain relationship between each individual year. What the Kubursi and Magee -- Magee study says is that they have -- are able to simulate alternative five (5) years that don't necessarily exist in the historical record. By doing so, and having auto-correlation or a relationship between each of the individual years and the five (5) year, they come to the conclusion that the financial stress is greater.

My concern with that is is that we only have two (2) five (5) year events. I don't think we have enough information. I mean, it's an interesting conjecture, but I don't think we have enough information to create -- know exactly all the -- what the possibilities are for five (5) year events.

And I also feel like that if you -- if you -- we don't know -- they -- they actually sit there -- sit -- sit in their analysis. I think the conjecture is they can tell you any type of event what the probability event -- what the probability is -- a drought that's, you know, outside the historical record.

And I -- my concern is is that I think we just don't know. That is, the management of the Company, the regulators of the Company, the oversight enti -- entities all need to know that I don't believe that the -- you can answer the question of what the probability of a worse year -- worst drought than the worst record, and that the claim that you can is interesting conjecture but it's not based on sufficient information to know.

And I wanted to use a term which is more Greek than the Black Swan. I wanted to use the term, "leptokurtosis," and that's L-E-P-T-O; kurtosis is like K-U-R-T-O-S-I-S. It refers to the possibility that -- of fat tails. It's a fancy word for that.

And so it's referring to the possibility that you could end up having out -- outside the hundred year record or the ninety-seven (97) year record, it could be that the true distribution out there shows that, in terms of severity, there might be some very severe event that's out there, and what the K&M -- M study has said is, We'll take, extrapolating from the record that we have, which doesn't include anything worse than the worst on record, and estimate the probability of the worse than worst on record, which necessarily implies some assumptions about the tail of the probability distribution, extreme events, the probability, which I don't think is justified by the record.

I think it's an interesting conjecture, but until we have more historical data and/or there's a breakthrough in the scientific characterization of the paleo-climatic information, I don't believe we'll be in a situation to answer that.

And so the concern I have is it's actually better to have the event described qualitatively as a -- as a Black Swan event, to walk into the officer -- the chief risk officer and say, There's -- we've got to quantify as best we can, on the one (1) hand, but on the other hand, we have to live with the fact that wisdom is the combination of qualitative and quantitative analysis,

and that we need to know there's limitations on what we understand, and therefore we need to have a strategy built around the fact that -- that you're at the edge of North America and that, if you can strengthen your -- your transmission ties and if you can purs -- use your export options to reinforce that to -- and pursue a set of integrated mechanisms, that's what you want to do, and -- but just be aware there's just a limit to -- to what you can do in terms of quantification of the risks.

I'm in Section 5, and there's only six (6) sections. I'm -- again, if there's any questions before I go on, I'd be glad to, from the commissioners, take questions. Okay. I'm -- I'm at the disposal of --

MS. PATTI RAMAGE: I'm just wondering if this might be an appropriate time for lunch.

THE CHAIRPERSON: Okay. We'll take the lunch now and we'll be back at 1:15. Thank you.

--- Upon recessing at 12:05 p.m.

--- Upon resuming at 1:22 p.m.

THE CHAIRPERSON: So, Ms. Ramage, do you have some exhibits now or do you want to wait?

MS. PATTI RAMAGE: We were -- we were thinking we would wait until Mr. Rose was done just to

not interrupt the flow, if -- if that's okay with the Board. We do have some.

THE CHAIRPERSON: Yeah, that's fine. Mr. Rose, if you want to continue when you're ready.

MR. JUDAH ROSE: Okay, thank you very much, Chairman. I'm on page 69, Section 5, labelled, "Manitoba Hydro modelling, forecasting, and planning." I'll be discussing modelling on the part of Manitoba Hydro, so it'll be something of a somewhat complicated area. But I'd -- just before I start, I just want to check and see if there's any questions on anything I've said so far.

THE CHAIRPERSON: Again, fear not, sir, when you're done, I think the --

MR. JUDAH ROSE: Okay.

THE CHAIRPERSON: -- questions will probably come in a torrent.

MR. JUDAH ROSE: Okay. On page 70 there's a diagram that shows the suite of models that Manitoba Hydro uses. These are computer-based models to help guide operations and planning on the part of Manitoba Hydro, and you can see there's five (5) of them there: MOST, HERMES, SPLASH, PRISM, and then there's a load forecasting tool that they use.

And like most utilities, they have

multiple models. And so the question is is -- that we've been asked to review the performance of Manitoba Hydro's models. On page 71 I have the same models from the previous page listed as, "Rose," and various different features of the models. And one thing I wanted to mention is the first column is listed, Period, and what you see is that the models are for dari -- various different time periods.

You have MOST in the middle, which is a very short time period, 24 hours, a day or two (2) ahead. You have something that's called HERMES, which is zero to two (2) years, and it's typically the period of time in which you know what equipment you're going to have. And then you have SPLASH, which is a long-term modelling tool which is more planning related and more related to determining what your capital stock is going to be as opposed to what to do with the plans that you have.

There is a PRISM model, which is a model that covers a zero to five (5) year period of time. I'm going to talk about that. It overlaps some with the HERMES and the SPLASH but is a different type of model, and it's a load forecasting tool.

Now, I've also listed some various different features of the models. The first one is stochastic, which means probabilistic or statistical, and

deterministic means for a given set of inputs you have one (1) and only one (1) outcome, and your description is sort of a almost, if you will, one (1) for one (1), is the meaning of deterministic. And stochastic means that you are -- for your inputs are getting an ex -- an expected value and a probability distribution around that value.

And so you see the models. The first three (3) are either 'D', or -- or 'S' for stochastic, and they are -- there's various different footnotes indicating the ones that are deterministic models, and the ones that typically use sensitivity cases to -- you change the inputs and you get different -- different outputs, and it's not as stochastic or statistical as some -- some of the other approaches, like the PRISM and the load forecasting tool.

And one (1) of the issues that's comes up in this case is the issue of linear versus non-linear, and the first thing I wanted to say about linear versus non-linear is historical, the economics -- the economics profession didn't make major breakthroughs in the ability to solve complex problems until World War II when someone said, Let us describe the production function, or the supply curve, linearly, which I'll explain in a second, and they came up with a -- a closed-form solution.

The person didn't get a Nobel price. He's very famous -- his name is Dantzig -- professor, and they were doing this to -- to help out in the war effort, and it turns out that linear programming solution, the programming referred to the different ways you could do -- to produce things, was a huge mathematical breakthrough. And so we're going to talk about linear programming.

And non-linear refers to relationships that a lot -- a lot of it is if-then. If this -- if you chose this it necessarily means that, and that's difficult to incorporate, if not impossible, in a linear program. So there's a thing called non-linear, and most of the models here are using linear programming, and the issue has been sort of whether they should be using linear or non-linear.

So it's a very complex area, and -- and I'll -- so I'll be addressing that. And you can see here I've already described the focus. Some are system -- more operations, and operations means, What do I do with what I got, and the planning is, What should I have.

And I talk about the methodology here. There's a thing called Monte Carlo, and it's exactly like it sounds. It's related to probablistic analysis where you -- you spin the Monte Carlo wheel, and it comes up

with a uncer -- it's a random outcome, and that becomes you picking from these distributions, and you're going thousands and thousands of times, and you're creating a probability distribution by just brute force, going through and ex -- exploring all the different possible settings of all the different variables, which each setting is like the Monte Carlo spin of the -- of the wheel. And it talks a little bit about some of the origins of the models.

And I think overall we are not -- we did not find any deficiencies in the -- in the models, and we think that they're -- the modelling capabilities that they have are -- are good. I think we recommended continued development of the PRISM model, which I'll come back to, which is one (1) of the more stochastic or Monte Carlo tools.

And I'd like to respond to -- to some of the comments that K&M have made with respect to the integration of the models and the use of linear versus non-linear programming.

So I guess, turning to page 73 -- I think I'd like to step back. I mentioned that we do a lot of modelling at ICF, and most of that's done in the Washington, D.C., area office. And we have about a hundred (100) people that are operating these models.

These are computer models. Most of our models are in-house models, but we also license some models, so we have sort of people that are all working in -- in the modelling area.

So we have a fair amount of experience with it. It's not exactly the same, but I'm going -- as the experience and the requirements of entities that are inside the utilities, but I -- I did -- I do think it's relevant to understand sort of where -- where we're coming from in terms of our conclusions.

And the main concern that we have internally is that the model run time not be so long, and the complexity of the model not be too overwhelming, so we have what we call implementation failures.

And implementation failures are, we can't get the model to solve, its -- we don't understand the results, and we can't get it done in time. We have a deadline. We can't met the client's requirements. We have unexpected contingencies.

The biggest problem that you have is basically what I've called implementation failures. Now, some of these models, we're talking about -- one (1) of the models that we run, to run one (1) year could take twenty-four (24) to thirty-six (36) hours of clock time on a -- on a fairly advanced computer.

And -- and so what's happening is, is that once you get beyond four (4) to six (6) hours, it becomes very difficult to -- to -- then, if you've made a mistake in the computer program, to go back and fix it. And one (1) of the things that we -- that is one (1) of the big issues is the implement -- in terms of implementations, the input: someone screwed up the input file. You know, there's millions of inputs. One (1) of them's not right, you've got to redo it, and if it takes really long, that's how you get the implementation failures.

So what people tend to do is not integrate all the models into one (1) platform, and the reason for that, again, is, the bigger the model, the slower it runs and the more chance there is for implementation failures. And what they -- what they do instead is, they -- as you can see here on page 73, they align the modelling with the requirements. They fit the -- the structure to fit the -- the function, or the form to fit the function, and basically they align the models either in terms of the time frame of the decision or the type of decisions. There's the short-term, the long-term, and the -- and the difference again is what capital equipment you have, and they're -- and they're -- they're focussing on the difference between operations and planning.

And what's happening is the computer space

is growing all the time. I indicated I'm in my twenty-ninth year at ICF of continuous service, and so when I started, we didn't have even a PC. I was the last class at MIT to go in not requiring a slide rule because we had the hand calculators. And so I've seen that we've been able to now -- or we have one (1) model that covers all of North America. We used to only have three (3) regions at a time, now we have a hundred and twenty (120) regions.

And so we're able to handle a lot of different issues, but it's still the case that we maintain multiple models, not all on the same platform, and it's because as we -- as we -- as we inte -- well, as we get more computer time and space, we are using it to -- to basically elaborate on the treatment not necessarily to fully integrate the models.

The other thing I wanted to say is that we rely heavily on linear programming and -- but we're -- we don't only use linear programming. But as a general matter, we are -- we -- we are using linear programming very extensively, and I -- I find that is the case with the utilities that we work with. And so, you know, our overall finding is is that integration can be problematic, and not as -- not in every case, but just as a general, practical implementation issue, people or

entities maintain separate models for different problems and they also are very heavily reliant, although not exclusively, on linear programming.

Now, for -- linear programming guarantees a solution to a problem that's a global. It is a, Here's the input set, this is the result, and it is optimal. We have minimized costs, we have achieved optimality, and in a non-linear context you cannot guarantee that.

I refer to page 74, and on page 74 it shows ICF's own models. So the -- these -- it's a Venn diagram box. It shows the various different models, and in the middle is the -- is the IPM model. The IPM model refers to the integrated planning model. So it's not that we're against integration, just the opposite, we are trying to integrate, and we do think that that is a critical component of the work that we do, but I'm also reporting that the integration doesn't involve having a single platform, even for the power sector models.

And so the IPM, the red one in the middle, does address a fairly broad range of issues, but it's a planning model. It's focussed primarily on -- on longer periods of time.

The upper right-hand GE-MAPS model is a model we licence from General Electric, and it has similar elements to the IPM in the sense of the core.

We've got power plants, we have some characterization of the transmission, of the electricity demand, of the various different opportunities to -- to operate power plants, but it's a separate model. This is a model that can run twenty-four (24) to thirty-six (36) hours to solve one (1) year, and it's used, and it's very similar to the actual activities that are going on at MISO every day. They are solving a problem as to what is the optimal use of your power plants and your transmission lines. What are the prices that are the correct, optimal prices that each -- at each location?

And it is -- but it assumes that you know exactly what the equipment is, and so it's operationally oriented. And even though it -- it has the same power plants, we haven't integrated it because it would make the problem too -- too large. A detailed cut on the transmission generation interaction precludes a treatment of the issues that the other model is handling.

Now, we also use an AC transmission model, which has power plants and transmission lines, but it solves only one (1) hour at a time. It's a snapshot of the system, it's non-linear, but it's also separate. You can see the GE-PSLF for PowerWorld is separate from the GE-Mops -- MAPS ge -- separate from the IPM. And this -- this model's handling the actual engineering

specification of the transmission grid, which is a non-linear solution is required and -- but it only looks at an individual hour and you have to know exactly what the power plant settings in terms of injection are going to be, although you can vary -- and we'll get into some of the things you can vary.

GE-MAPS is handling hour by hour, so in a year it'll have eight thousand seven hundred and sixty (8,760) hours. IPM typically is analyzing a twenty (20) or thirty (30) year problem. So the -- I think the practicality is is that you would like integration, but I think the -- the reality is you end up having multiple models, and so that does very much characterize to -- well, characterizes it similar to what happens at the Utility.

They have short-term models, and then they have long-term models. So they have MOST and -- and HERMES. And then they have the longer term model, SPLASH, which corresponds to GE-MAPS and IPM respectively.

Now, the thing that we're inte -- integrating in the IPM models, we have a characterization of the coal and the gas markets, but it's not as detailed as G -- the -- the two (2) bottom circles. So, you know, we -- we feel like that maintaining multiple models with

different orientations and uses is the practical outcome of the tradeoffs between the increased computer modelling capability as well as the practical limitations of having a problem that's so large that it takes too long to -- to solve.

On the next slide there are -- it shows some of the models I showed earlier, but other models -- we do have a -- there is a -- there are models that are Monte Carlo or sta -- or use different -- different algorithms as opposed to the -- either linear or non-linear that I've described. The -- there's -- on the upper northwest corner -- northeast corner there's EAID, and it looks -- it's a -- it looks something like the PRISM model I am going to describe.

So -- so that -- again, the multiplicity models make sense. On page 76 I have a list of various different entities that have various different models in this space. There are -- they are primarily linear programming. And I think it's -- it's generally the case that the preponderance of the underlying methodologies or algorithms are linear programming and -- but there there are also some other tools that are used.

So I -- okay, and we're not surprised by the -- the fact that the Company maintains separate models, they're not fully integrated, and that they are

relying heavily on linear programming but not exclusively.

Now, one thing that the Company is doing, it has -- is in the process of developing the PRISM model. And I think we've recommended in our report that the Company continue to develop it. It is a Monte Carlo oriented tool where you're trying to capture and create the probability distribution as opposed to having the deterministic outcome and supplementing that with scenario work.

And it has a simplified treatment of the production description of the Company, and it's doing that so it can look at other issues stochastically or probabilistically or create distributions. And on page 79 the Company has -- it describes the -- the PRI -- the model, the PRISM model, the fact that it is able to simulate various different outcomes, like different gas and electricity prices, different water conditions, different transmission and wind conditions.

It's doing it on a probabilistic basis, so you're saying -- you're trying to create a probability distribution and, say, answer the question of what I do reduces the variance and the outcome of the budget of the Company over the next year, and you're do -- be able to sort of say, We have a 95 percent confidence interval

that our budget will be within 'X', 'Y', or 'Z', or we believe this -- this hedging strategy will help reduce the variance of the Company.

So we think that it is something that is useful. It is -- it does allow for some nonlinear relationships and some stochastic relationships in -- for in the PRISM model. We have recommended it continue to be developed. The Company's still in development of that, and I don't believe that will -- in our experience, that those type of models which are oriented towards risk management will ever be, you know, fully im -- integrated in a single modelling platform.

Now, in the hydro modelling area and on page 81, so this is looking in the details of how you handle the hydro power plant operation, and how it integrates with the hydrological circumstances of the Company.

There has been recommendations that the Company look at alternative formulations, and also that it -- that it use more synthetic data, which relates to this issue that we were talking about before, as if -- creating a synthetic probability distribution is is try to squeeze more juice out of the historical data and you create a probability distribution that allows you to extrapolate and create a description of things that

haven't occurred before, and so I'd like to respond to that.

On page 82, a couple things. One (1) is in the hydrological space there is a common theme that people use the historical data to create probability distributions.

And so there are -- we have -- the ones that I am most familiar with are the BC Hydro, and they are drawing from a distribution, and they sort of said, Look here's the historical record, and we're going to draw from that. And to the extent that they're -- they have fairly long hydro data sets, that is, experiences measured in years worth of data, you know, fifty (50), sixty (60), seventy (70), eighty (80), or maybe as clo -- much as a hundred in -- in the case of Manitoba, you're in a situation in which they do draw from that.

When they're very short on data, then they'll try to create synthetic or -- synthetic data sets or -- and where they try to extrapolate on the data they have. Our -- our recommendation is that they -- that the Company continue to base its analy -- quantitative analysis on the historical data sets, particularly because BC Hydro is endowed with a good data set -- a long data set.

And the other point is that each system is

unique in terms of the complexity and the design of the system: how much storage, how many rivers, how much hydro do they -- do you have, and what's the -- what are the flexibilities that you have, or lack of flexibilities.

So it is common for people to use customized hydro modelling, and -- but they're all -- but many of them are based on -- drawing from the historical record, running scenarios based on a situation in which you're trying to figure out what would happen if history repeated itself in the course of time.

And on page 83, I list some of the hydro utilities. Whether they're using historical data. They are all using it, to our knowledge. And -- and you can see that Manitoba Hydro has -- has as much data as almost anybody, which is not surprising, in that the power industry itself only goes back to Edison, which is like 1884, and they didn't start hydro. They started coal, and they went to hydro pretty quickly, but it's rare that people have the detailed data sets in any meteorological or hydrological phenomenon beyond a hundred years.

You guys are up there. You're doing -- doing what other people are doing. People do look at paleoclimatic information, but are generally using the actual historical records because the paleoclimatic information doesn't give you the detail typically that

you require.

Page 84 is another graphic showing that you guys have about as much hydro data as the companies that we're familiar with.

(BRIEF PAUSE)

MR. JUDAH ROSE: On eighty-six (86), we were asked to also address the issue of the -- of, Can you forecast -- what's the status of the forecasting profession with respect to meteorological or hydrological conditions.

And you know, there is some regularities that exist, and again I'm not a meteorologist, but it's my understanding is that there are some regularities. You hear about La Nina, or -- or El Nino, and there's a -- there's more technical terms. I think there's the Southern Pacific oscillation.

So there are some phenomena that do allow themselves to -- to get some elements of forecasting. But as a general matter, and -- and I have a quote here from a professor at MIT, once you get beyond ten (10) to thirty (30) days, somewhere in that window, you're as likely to be - - the best that you can do is to use the long-term average as a typical.

And so you'll notice if you go to weather.com that they may have the ten (10) day forecast. They may -- seven (7) day forecast, but the -- there -- it's just -- it is -- it's a huge problem trying to go significantly beyond that.

And -- and so I think it's very -- it's useful to take a look at what's available, but as -- realistically, as you're sitting there making decisions as to what should happen, the problem is is that once you start going into a drought situation, you don't know exactly where you're going to end up.

I don't think that there's any reliable predictor that this is a -- a one (1) year drought versus a five (5) year drought, and it's related to the problem that we've been discussing, which is, although you can sort of see the lead time for the hydro reservoirs, beyond that you can't really, I think, reliably gauge what's likely to happen, and so you have to sort of plan, if you will, for the worst case, frequently.

And this really -- there are some statistical regularities, and I think we showed that graph with the green bars before. Was it on sixty-six (66)?

On page 66, where you have the -- the hydro events of the last sort of almost a hundred years

laid out, the green bars, and you -- and you can sort of see, of the -- there's been, you know, something on the order of seven (7) to eight (8) bad hydro events in the history here as -- as represented on this graph, three (3) that were prolonged. Two (2) that were five (5) and one (1) that was seven (7) we talked about.

And -- and so once you go into a drought, you -- I think you do observe the fact that you're more likely to be in a prolonged drought than you would be for any given -- just any year, because the -- the droughts seem to be what they call serially correlated. They tend to -- if you have a bad year, things are likely to get worse -- more likely to get worse than they would be if you were just in any year.

But that doesn't mean that you have enough information a) to, I think, create the full distribution of -- describes what happens in the course of one of these events, nor are you in a position to -- really to forecast what's likely to happen. You -- really, you need to look at this at different possible outcomes and plan prudently using the -- the judgment that you have and recognition of the importance of the issue.

Now, I have referred to the Kubursi and Magee work, and talked about -- a little bit about some of the issues here, like -- and they have some

conjectures based on taking the -- making a statistical assessment and trying to elaborate on the history. I've expressed my concerns about going too far in that regard, and -- and sort of what are the limitations of -- of knowledge that we have with that.

I'd like to talk about an issue that they've raised here on page 87 that's in a different area, and it's related to the issue of whether or not -- sort of the issue of dependable energy. As I indicated, the Company has a concept that the dependable energy is measured as the energy output available from its resources in the worst -- assuming the worst drought or the -- the lowest hydrological conditions in its record.

And here you'll see, on the bottom of page 87, they've expressed the concern that wind should not be considered as its -- energy output of the wind plant shouldn't be available to meet dependable demand, or shouldn't contribute to that, and then it mentions that NERC is essentially not including wind in its reliability criteria. And I think that, you know, what's happening here is is that NERC, the North American Electric Reliability Council, is dealing with primarily thermal-based systems -- excuse me -- without much -- without anywhere near as much storage as Manitoba Hydro.

Manitoba Hydro is I think a special

circumstance. Energy -- electricity is generally not stored, but you have a demand of around 20 terawatt hours and a storage capability of 10 terawatt hours, and within that storage capability you have the ability to adapt to the -- the momentary fluctuations of the wind output by either storing more or less energy.

And so the primary problem that you face is not having enough megawatts or capacity or power, it's having enough megawatt hours or electrical energy, and you're not so much concerned about the peak demand and the capacity, but having enough electrical energy in the storage or in the -- or in the system. And the wind does contribute to that and it -- and its energy output should be considered.

Now, NERC takes a wind megawatt and will derate it because it's dealing with systems that don't generally have as -- anywhere near as much storage and are not -- they are -- they have a problem meeting their peak capacity, not having the right amount of energy. And so, again, what they -- what NERC is doing typically, or what the NERC regions and councils are doing, is not appropriate given the particular cir -- and special circumstances of the Manitoba Hydro system.

The other thing they say at the bottom of page 87 is is that the inclusion of the dependable energy

from thermal energy resources, and the Company has a few hundred megawatts of thermal power plants, is problematic because it's typically too expensive.

And I think that the issue here is is that there's -- there's dependability and reliability which is not directly economic. And what you do with the resources -- the thermal resources, if they're not -- if they have high variable costs you try not to use them, and you keep them as long as they are providing sort of beneficial service that's higher than their costs.

There's some economic issues that deal with the thermal issue both operationally and whether you keep them, but that is -- doesn't mean that their energy's not available once they're there to maintain reliability and making sure that the lights stay on, or more importantly, in the winter, that the heating is maintained.

And so I believe that there -- the expensiveness of the thermal energy resources is not a barrier to including them to the dependable energy and contribution to its reliability.

So there are some specific issues here related to -- to their assessment. And I did want to make -- make it clear that I think the Company's handling of the wind resource and the handling of the thermal

resources, while the situation is unusual in the sense of the amount of storage and the high degree of hydro-ness, if you will, of the system, I still think the Company is -- is handling that correctly.

I'm on the penultimate section of my prepared materials, Section 6, page 90. And I was asked to -- commented on -- on two (2) issues. The first issue is whether or not there should be an explicit drought fund or rate stabilization fund related to hy -- hydro conditions, and also issues related to floating and fixed-rate debt.

The first issue is -- is -- and my -- my experience leads me to conclude that a specialized fund for the hydro conditions is not recommended. And the reason for that is I think that corporations are generally having equity that is not constrained for specific purposes, and that that becomes the basis by which people that are looking at the Company's financial situation expect to sort of see.

And this -- the fact that you have the equity, if you will, to cushion the Company from perturbations in its revenue situation is related to the fact that you can't always anticipate what is going to be causing the perturbations and that the management should have flexibility.

Now, the exceptions that I see in that typically in the corporate area are related to project financing, where you have an individual power plant that's financed and they very restrictive debt covenants that are typical in that area. But I don't think that that applies to a situation like Manitoba Hydro, which has many different assets and in which if you had very restrictive covenants, which -- which a stabilization fund would involve, would be considered as a source of concern for people evaluating the financial wherewithal of the Company.

Now, there are non-corporate entities -- states that maintain rainy day funds, and we did look at them. And on page 92 there's a graphic, shows the -- shows the United States, and it shows that a lot of them do have rainy day funds. Of course, they don't have equity; they're not corporations.

And, typically, the rainy day funds are very, very small percentages of the expenses, whereas the equity of the Company is 130 percent of its expenses. The rainy day funds are typically 5 percent or less. And they do -- while they do have overrides, it does create -- would create, I believe, added complexities and difficulties if you started restricting the -- the application of the Company's equity related to, say, for

an explicit drought fund.

And as it is, we do have checks and balances, various different entities that are involved, and looking at what Hydro is doing, and to have additional covenants I think would be -- is not recommended, and I wouldn't use the state as a -- state experience and rainy day funds as a -- as a model for Hydro in light of the differences in the states, and the fact that they are very, very small fractions of the expenses, and it would complicate, I think, the financing of the Company.

The other issue that I looked at on page 93 is the amount of floating-rate debt versus fixed-rate debt. This is the corporate finance analogy to the housing situation in the United States, where the question was, Should you -- how much should your debt be?

Like a thirty (30) year fixed versus the one (1) year adjustable rate mortgage, and I think, you know, one (1) of the things that we -- we found out is is that the very short -- the heavy reliance on the floating rate creates unexpected outcomes, and I think it's mirrored if you take a look at the utility industry.

I looked at various different entities, and Manitoba Hydro's 21 percent floating debt share is, you know, is moderately on the high side. Not massively

on the high side. The -- there was one (1) entity that I think the -- BC Hydro has a higher level. If you take a look at the footnote there's some complexities there.

So I -- I don't see -- it is the case that interest rates are low today for short-term, you know, floating debt, but what happens is that thing moves very quickly, and it -- I think that it creates added risk to the -- to the Corporation that would be outside the experience of other comparable utilities, most of which have a fixed debt rate.

And -- and I noticed, for example, there's been some consideration on the part of the -- the federal US Treasury to extend -- extend out its fixed rate obligations to go for longer term and greater fixedness, if you will, in light of the fact that it's true, interest rates are very, very low right now in the short market, but it does expose, as we've seen in the debt crisis in the -- in the housing sector when a lot of your debt is not at a fixed rate.

And the Company seems to be well within the comparable spe -- set, if a little bit on the high side, and there's -- I don't think there's any reason that they should be pushing more the degree to which it's exposed to floating-rate debt.

The last section I have relates to our

review and conclusions related to governance and risk. And you know, in general I think that we found when we reviewed, and I'm on page 95, the controls and the governance structure with respect to power trading that -- we found that the, you know, reasonable and appropriate controls were in place.

And I've listed here some of the oversight bodies, some of the entities that are evolved in the front, the middle, and back office. The various different plans and specifications and -- but we did make some recommendations with respect to the -- the middle office and with respect to a clarification of some of the documentation and some of the -- some of the controls and risk management functions that are in place.

Now in that regard, we were asked to look, as one (1) of the terms of reference that I referred to earlier, one (1) of the -- the six (6) terms of reference as to whether the Company should be involved in merchant transactions, and I -- I hasten to -- to state that the management's not interested, and it doesn't really in -- involve -- it's not involved in what's call -- called non-arbitrage merchant transactions.

It's transactions are -- are acid-based, and they are -- the only exception would be what they call arbitrage, which is essentially a riskless

transaction where you're basically a buy and sell that is closed very quickly. They offset each other. And generally have very low risk, such as in transmission between two (2) regions if you happen to own the transmission capability and you're sort of buying and selling simultaneously so that you're taking advantage of a arbitrage potential, or a potential to -- to take advantage of price differences.

But that there's still some improvements that could be made in the documentation and structures, even in the event that the Company is -- is not going to, as we expect, to go more into the merchant trading function.

We're -- or the experience we -- we have with merchant trading is is that it is not something consistent with the structure of the Company being a public entity. It's not something that the management wants to do. It's very -- can be very injurious to the financial situation.

So I don't think there's any -- any doubt that that's not where it wants to go, but even in the context of what it's doing, since it does need to interact with the marketplace, it does have to have hedging that is related to assets, that there's some improvements, and there is a list here of improvements

that have been recently, as we -- as we understand, that have been made to the middle office to provide additional participation in the oversight function and the control function and the risk management function, which we think is in the right direction and consistent with our recommendations.

So that concludes my prepared remarks and covers the areas that the report addressed primarily, and I guess I'm available for my counsel.

THE CHAIRPERSON: And I'll turn to Mr. Peters.

MS. PATTI RAMAGE: Oh, I'm exhausted from all the talking I've had to do, so Mr. Peters can go.

CROSS-EXAMINATION BY MR. BOB PETERS:

MR. BOB PETERS: Thank you, Mr. Chairman, and good afternoon, Mr. Rose. Welcome again to Winnipeg.

MR. JUDAH ROSE: Thank you. Thank you, Mr. Peters.

MR. BOB PETERS: On behalf of the Public Utilities Board, I'll have some questions for you this afternoon, and possibly even tomorrow morning, depending on how -- how we go.

MR. JUDAH ROSE: Okay.

MR. BOB PETERS: You are aware, sir -- I

have a bad habit, and I'm confessing it right away. I often say "you," Y-O-U, and of course I'll be referring to ICF International when I say that. Are you comfortable with that?

MR. JUDAH ROSE: Yes. I'm an officer of the Company.

MR. BOB PETERS: Yes, I appreciate that. And ICF is aware that certain information is being considered confidential by Manitoba Hydro and has been redacted from the public record of these proceedings. You're aware of that?

MR. JUDAH ROSE: Yes, sir.

MR. BOB PETERS: And, in fact, Appendix 12.2, which we have called the ICF Report, there are redactions in that report, and you're aware of that as well?

MR. JUDAH ROSE: Yes, sir.

MR. BOB PETERS: Did you make those redactions, sir?

MR. JUDAH ROSE: I did in -- in part in consultation with the Company. There is ICF material in there as -- but there's also stuff that's proprietary and confidential to the -- to the Company.

MR. BOB PETERS: So ICF proposed the redactions it wanted to protect its confidential

information, and Manitoba Hydro indicated to you what it wanted redacted?

MR. JUDAH ROSE: Yes, sir.

MR. BOB PETERS: And in terms of producing the actual redacted report, did that come from ICF or did Manitoba Hydro do the physical redactions and the -- the preparation of the report?

MR. JUDAH ROSE: I believe that we provided a redacted and non-redacted version.

MR. BOB PETERS: None of my questions to ICF International and you, Mr. Rose, are seeking answers that will require you to disclose information that Manitoba Hydro or ICF has redacted from the public record. Is that understood and agreed?

MR. JUDAH ROSE: I've been so advised.

MR. BOB PETERS: All right. And if you are in doubt, you will no doubt want to clarify your answer off the record before you answer on the record, and you would clarify that with one of the Hydro lawyers, Ms. Ramage or Ms. Boyd or Ms. Fernandes, I guess. And as well, you also have the benefit of some Hydro employees in the back row, Mr. Cormie and Mr. Warden particularly, and Mr. Surminski.

MR. JUDAH ROSE: Yes, sir.

MR. BOB PETERS: All right. And in

addition to what's been redacted by Manitoba Hydro and ICF, none of my questions are seeking disclosure of information that this Board has ordered be redacted from the various reports including, in one (1) of its orders, 95 of '10 and the attached appendices. Would that also be understood and agreed?

MR. JUDAH ROSE: Yes, sir.

MR. BOB PETERS: All right. Thank you. You've had a chance to read Order 95/'10, have you, sir?

MR. JUDAH ROSE: I don't -- I don't believe so.

MR. BOB PETERS: And you wouldn't then have had an opportunity to -- you wouldn't have reviewed the -- the appendices to that Order as well, the various risk reports?

MR. JUDAH ROSE: I may have reviewed reports, but I don't remember the -- the -- those particular references.

MR. BOB PETERS: Would the Board be correct, Mr. Rose, in understanding that the ICF report, dated September 11th of 2009, is as a result of ICF being the successful bidder on a tender issued by Manitoba Hydro on February 3rd of 2009?

MR. JUDAH ROSE: Yes, that's my understanding.

MR. BOB PETERS: And in the tender on which ICF responded, and I guess we know -- we now know was ultimately successful, there's discussion about key personnel at ICF who would have a relationship with Manitoba Hydro.

(BRIEF PAUSE)

MS. PATTI RAMAGE: Mr. Peters, could you direct us to a page.

CONTINUED BY MR. BOB PETERS:

MR. BOB PETERS: Let me -- let me approach it this way, Mr. Rose, rather than -- and we can look through the document for the reference. But in terms of ICF's key personnel who have an ongoing relationship with Manitoba Hydro, who are those people? Can you identify them, sir?

MR. JUDAH ROSE: Yes, with respect to this engagement, I have a list of five (5) people. They are myself, Judah Rose, Shanthi Muthiah, Nanish Gupta, Sunita Surana, and George Katsigiannakis. Ms. Surana's here today. And all these -- and people were involved to some degree or another as were other more junior people in the preparation of the work and the assessment. And -

- and I, in particular, was very involved.

MR. BOB PETERS: Yes, thank you. I'll -- I'll come back to that thought. The sic -- the six (6) specific requirements of the tender were set out in the ICF report, and I'm looking at page 1 of the document. And you've highlighted those. And you also, I think, highlighted those in your oral presentation and your written presentation through Ms. Ramage today, correct?

MR. JUDAH ROSE: Yes.

MR. BOB PETERS: Now, on my reading of the -- the tender, the report was due May 29th of 2009; do you recall that?

MR. JUDAH ROSE: I don't recall that specific date, but...

MR. BOB PETERS: Do you recall being late?

MR. JUDAH ROSE: No, I wouldn't say that. I think there was some delays in engaging us, and I don't feel that we were late.

MR. BOB PETERS: Well, I was just wondering. Your re -- your report was dated September 11th, 2009, correct?

MR. JUDAH ROSE: Yes.

MR. BOB PETERS: All right. And -- and that -- and to my math, that was three and a half (3 1/2)

months after the stated date of the tender requiring the -- the deliverable, but you're indicating there was extensions of time given.

MR. JUDAH ROSE: That's right. That is -- there was -- I don't believe we were engaged contractually until the very end of April, and that I believe our visit -- first visit to Winnipeg was in May and that -- that there was a clear acknowledgement that -- that that engagement was inconsistent with the schedule we laid out that would have required a certain initiation date, and -- and I feel overall we performed in a timely manner given the complexity of the scope.

MR. BOB PETERS: Did ICF file any prior reports to this -- to the one that's been marked as Appendix 12.2?

MR. JUDAH ROSE: There were drafts, but this was the -- this is really the only report as such.

MR. BOB PETERS: Do you recall how many drafts were provided by ICF to Manitoba Hydro?

MR. JUDAH ROSE: No, I don't have a specific count, but there were drafts.

MR. BOB PETERS: And the purpose of the drafts were to allow Manitoba Hydro to suggest revisions to the ICF report?

MR. JUDAH ROSE: That was one (1) goal,

was to get feedback from the Company if there were any factual errors, whether perhaps there was better data available, and also to allow us to continue to refine our exposition.

MR. BOB PETERS: Did ICF make the revisions requested by Manitoba Hydro?

MR. JUDAH ROSE: If we felt that the revisions were appropriate, yes, we did.

MR. BOB PETERS: Was that by and large the case?

MR. JUDAH ROSE: Yes, I think that that's -- I -- I think that the comments were appropriate, and to the extent that we had an opinion I felt that it was understood and respected.

MR. BOB PETERS: You indicated that ICF came to Winnipeg, but I think I understood from your previous testimony this might be your first time in the city --

MR. JUDAH ROSE: No --

MR. BOB PETERS: -- other than stopping here on a hiking expedition.

MR. JUDAH ROSE: No, I was here in -- under more -- more, how shall I say, warmer weather, and so this is not my only visit here.

MR. BOB PETERS: All right. So you did

attend -- to -- to meet with Manitoba Hydro with respect to this project?

MR. JUDAH ROSE: Yes.

MR. BOB PETERS: And likewise, other members of your team also attended Manitoba Hydro?

MR. JUDAH ROSE: Yes. On my previous visit I was accompanied by Ms. Muthia, who was mentioned, and Mr. Katsigiannakis, who were also mentioned in the group of five (5). On the phone was Nanish Gupta in some of our conversations.

MR. BOB PETERS: And today you indicate Ms. Surana has joined you.

MR. JUDAH ROSE: Yes.

MR. BOB PETERS: All right. And I take it she's sitting in the back row behind you, and we welcome her here as well.

MR. JUDAH ROSE: Okay.

MR. BOB PETERS: And in terms of -- how many times were you here to meet with Manitoba Hydro?

MR. JUDAH ROSE: The only time I was here was the two (2) or three (3) day period I was here in the spring of '09. I would say that we've had many, many teleconference calls, and a lot of data and document exchange, and I've alluded to some of those in my comments.

MR. BOB PETERS: Do you know if other members of your team were in Winnipeg more often than you relative to this project?

MR. JUDAH ROSE: No, actually I've been here the -- as much as anybody. In fact, more.

MR. BOB PETERS: And I take it, as the managing director it was your role to oversee the entire work project. While individuals may have had specific duties, you oversaw the -- the larger -- the larger project?

MR. JUDAH ROSE: That's correct

MR. BOB PETERS: And can you tell the Board, who in the team of five (5) that you've mentioned was the primary researcher on the project?

MR. JUDAH ROSE: I think the person that spent the most time with the documents was Ms. Surana, who -- who we mentioned earlier. I would sort of say I was the principal author of the document. I spent a lot of time with the actual document.

And there were different sub-areas where we had different people be more involved, and -- and so that's generally how it's split out.

MR. BOB PETERS: When you attended in Winnipeg in the spring of '09, with whom from Manitoba Hydro did you meet with?

MR. JUDAH ROSE: I met with -- with Mr. Warden, Mr. Cormie, Ms. Hickson, various different members of the modelling team, the risk management group, counsel. We met with somewhere between ten (10) and twelve (12) people.

MR. BOB PETERS: And as I recall the tender documents, one (1) of the main evaluation criteria was the experience and work performed by ICF's key personnel at Manitoba Hydro, as well as any other hydro-based utilities.

Do you recall that being one (1) of the criteria?

MR. JUDAH ROSE: Do you have a specific reference in mind?

(BRIEF PAUSE)

MR. BOB PETERS: I think if you turn, I think you're counsel has an Information Request labelled PUB Manitoba Hydro Risk Question 89A, Attachment 1, page 7 of 14.

MR. JUDAH ROSE: Okay. I see something like that.

MR. BOB PETERS: And one (1) of the -- one (1) of the criteria was, in your case, ICF's

experience in working with Manitoba Hydro previously?

(BRIEF PAUSE)

MR. ROBERT MAYER: Okay. There we go. I'm getting confused as to which attachments we're referring to here. I -- I've seen Attachment 1. I -- looking Attachment 2 which seems to have some criteria, and Attachment 3 which has some numbers on it. Which one are we on?

MR. BOB PETERS: I was looking at Attachment 1, page 7 of 14.

MR. JUDAH ROSE: Okay. I -- I see Evaluation Criteria D.

CONTINUED BY MR. BOB PETERS:

MR. BOB PETERS: Yes. It's just -- Mr. Rose, one (1) of the -- one (1) of the points was prior experience. Can you tell this Board whether any of the five (5) on the team, including yourself, had prior experience with Manitoba Hydro?

MR. JUDAH ROSE: Well, as I indicated, we had been providing Manitoba Hydro with forecasts for several years. And as the managing director of the wholesale power group, one of my colleagues and staff

members, Maria Scheller, was involved in that forecasting work, which was focussed in on the Midwest Independent System Operator, MISO, power markets, and that was done in -- in collaboration with other people at ICF.

MR. BOB PETERS: So while nobody on the team of five (5) had specific involvement with Manitoba Hydro, other members of ICF did?

MR. JUDAH ROSE: Yes.

MR. BOB PETERS: And would it be correct to say that there's been at least a decade of business relationship between ICF and Manitoba Hydro?

MR. JUDAH ROSE: I don't know that it goes back that far, but it has predated our engagement and was focussed in on providing forecasts, in my experience, with respect to other -- in particular the work done out of -- out of the United States.

MR. BOB PETERS: Do you know, Mr. Rose, if ICF -- first of all, does ICF acquire other consulting companies? Is that part of the corporate strategy at ICF in the twenty-nine (29) years you've been there?

MR. JUDAH ROSE: It is. It's an element. We recently purchased a company in Ottawa that does demand-side management energy efficiency work. I alluded to that when I said we had an Ottawa office, and we have purchased other companies as well.

MR. BOB PETERS: The purpose of my asking that is, do you know if any of the companies you've acquired have also got experience with Manitoba Hydro?

MR. JUDAH ROSE: I know that we have worked with Manitoba Hydro, I believe, in other areas -- in the area of natural gas forecasting, or natural gas market assessments. That work I believe was done primarily by my colleagues in the States. And I was referring more to the power forecasting work, but there -- I think there are other work -- there was other work that we've done, too.

MR. BOB PETERS: All right. Are any of the itemized matters on your curriculum vitae that Ms. Ramage introduced -- are any of those matters listed as a direct result of your having worked for Manitoba Hydro?

MR. JUDAH ROSE: I'm not sure what -- what you're referring to, but I have not testified for Manitoba Hydro, and I have a list of testimony in my resume, a hundred and eight (108) of them, and then I have, I don't know, several score conference presentations. But if there's a particular reference, please let me know.

MR. BOB PETERS: No, I'm just asking if you can recall anything on your resume being expressly related to Manitoba Hydro, other than point number 109,

which will be the -- the newest and the latest testimony.

MR. JUDAH ROSE: I'm sorry, I can't --

MR. BOB PETERS: Nothing comes to mind?

MR. JUDAH ROSE: No.

MR. BOB PETERS: When we were talking about the prior work that ICF has done for Manitoba Hydro, you had mentioned your colleagues -- I think you said your colleagues in the States, they had done some work on the Centra Gas Manitoba Inc. side, which is the gas utility owned by Manitoba Hydro.

MR. JUDAH ROSE: Yes, I believe so.

MR. BOB PETERS: You haven't worked on that utility, have you?

MR. JUDAH ROSE: No.

MR. BOB PETERS: No. And I had suggested it was perhaps a decade long, and I, just for the ease of your counsel, might be able to pull up the Information Request, PUB/Manitoba Hydro Risk 91A. And --

MS. PATTI RAMAGE: We've got it.

CONTINUED BY MR. BOB PETERS:

MR. BOB PETERS: Thank you, Ms. Ramage. This document sets out in snapshot form some of the prior engagements that ICF has done for Manitoba Hydro. And I had perhaps incorrectly assumed that the consulting

services with respect to natural gas supply re-contracting options in preparation of RFPs would have been a decade ago, only because the next items in the schedule go back to 2002.

But do you know how -- how distant passed ICF was working with the gas side of the business?

MR. JUDAH ROSE: No. And as we're talking about it, you know, we did purchase EEA and it's a firm that specializes in natural gas work. And I think that some of that work was historically -- they were involved in that, so we had purchased them a few years ago. But it wasn't ten (10) years ago; it was something on the order of three (3) or four (4) years ago, maybe five (5).

It's possible that the work extends back, and maybe that's why it didn't seem to me that it went back a full ten (10) years.

MR. BOB PETERS: But what the Board is being told is that at least in 2002, in October, ICF did some work for Manitoba Hydro with respect to the audit and review of greenhouse gas measurement.

MR. JUDAH ROSE: Yes, I see that.

MR. BOB PETERS: You weren't aware of that. You had no involvement in that, I mean, like --

MR. JUDAH ROSE: I wasn't involved in

that. I -- now that you mention it, I mean, I -- I -- there is a part of our firm that does that type of work. Most of my short-term memory right now is focussed in on the power related work that we've been talking about and it may have skipped my mind.

MR. BOB PETERS: No, understood. And in addition to the work done in -- perhaps earlier than 2002, but certainly the work in 2002 and 2003, it next indicates that ICF's work is on providing electricity priced forecasts and fuel priced forecasts for Manitoba Hydro, correct?

MR. JUDAH ROSE: Yes.

MR. BOB PETERS: And that would be something you would be directly involved in, sir?

MR. JUDAH ROSE: Yes, in the sense that the staff that were involved, some of them report to me directly; other report to colleagues. As I recall, one (1) of the important issues there was environmental; and some of that staff I work with, but they don't report to me.

MR. BOB PETERS: Would the Board also be correct, Mr. Rose, in understanding that while ICF was responding to Manitoba Hydro's tender and preparing the ICF report of September 11th, 2009, marked as Appendix 12.2, ICF was also preparing a report for Manitoba Hydro

on the Midwest Independent System Operator region?

MR. JUDAH ROSE: Yes, that's the thing that I was referring to earlier, the price forecasting. The focus of that is in the MISO area.

MR. BOB PETERS: And since the 2009 price forecasting report, ICF did a similar report in 2010?

MR. JUDAH ROSE: Yes, and there may actually be work ongoing right now as well.

MR. BOB PETERS: All right. And do you know for how many years ICF has been providing Manitoba Hydro with electricity price forecasts?

MR. JUDAH ROSE: I can't say precisely. I -- I see the list here, but I -- I can't say precisely. I don't remember.

MR. BOB PETERS: Well, the list only shows two (2) years, correct?

MR. JUDAH ROSE: That's correct.

MR. BOB PETERS: Yeah. And, likewise, on the -- not only the electricity price forecast, but on the fuel price forecast it shows that ICF has been providing that information to Manitoba Hydro in 2009 and 2010?

MR. JUDAH ROSE: That's correct.

MR. BOB PETERS: And you're not aware if that's been provided to them earlier than that?

MR. JUDAH ROSE: I -- I would have to check. Generally whenever we provide an electricity price forecast we're also providing a fuel price forecast, and an environmental forecast since they're critical inputs into the fundamentals based modelling that we do.

MR. BOB PETERS: So these forecasts will -- will talk about the natural gas forecasts in Canada, as well as the United States?

MR. JUDAH ROSE: I think generally they'll talk more about the natural gas price forecasts in the -- in the US, but the natural gas modelling we do is for North America.

MR. BOB PETERS: And for coal, would the forecast be, again, American-based?

MR. JUDAH ROSE: Yes. Nearly all the coal in North America is produced and used in the United States. And of course MISO is -- the area that's most price determine (sic) is primarily coal based MISO subregions.

MR. BOB PETERS: And as you testified, are you aware of any other less significant assignments than those that have been listed in response to the PUB/Manitoba Hydro Risk Question 91 that your counsel has shown you?

(BRIEF PAUSE)

MR. JUDAH ROSE: I -- you know, I -- I don't -- I don't have any in mind, but I -- it can't be exhaustive given the multiplicity of different parts of the Company.

MR. BOB PETERS: Is there a quick and ready way that you can verify that or check that?

MR. JUDAH ROSE: It depends how you define quick. What it is, is I -- I could reach out to colleagues but it may take a while to find out. I mean, I can also reach out to our contracting group, but I -- I think because as -- as you mentioned, we have purchased some companies, and we do have international offices. It -- it may take some time to be comprehensive on the assignments that may be going on right now.

MR. BOB PETERS: I'll leave it at that, sir, and if it comes to your attention -- probably should say to -- more accurate I guess to Ms. Surana's attention, if she's going to be doing most of the work on that, if you could just let one (1) of Manitoba Hydro's counsel know, and they can certainly let the Board know. But I -- I won't ask you to take that away, sir. That's -- I appreciate your answers so far.

It would be fair to say, though, that Manitoba Hydro has been a relatively long time client, or customer, of ICF?

MR. JUDAH ROSE: I think particularly depending on how much work EEA did with the Company, so there -- you know, depending on how you define long-term. We have worked over -- as we've discussed over the years -- it doesn't go back to, as far as I can tell, under ICF aegis much beyond 20 -- 2002. But we are -- they are a client of ours, and we're --we're happy to have them. We find their issues very interesting. And we have other clients that are bigger, and others that are smaller, others that are longer, and others that are shorter.

MR. BOB PETERS: Fair enough. Mr. Rose, I'm not sure it's on the record of these proceedings, but do you know what the order of magnitude is of the cost charged by ICF through to Manitoba Hydro for Exhibit 12.2?

MR. JUDAH ROSE: I -- I don't have that number. You know, it's -- I'm thinking it's roughly in the 200 k range, but I would have to check to be -- to be sure. I just don't remember, sitting here.

MR. BOB PETERS: All right. Well, maybe that is one (1) undertaking that I could ask you to -- to check up on, and just get back through Manitoba Hydro's

counsel to the Board on.

--- UNDERTAKING NO. 52: Mr. Rose to indicate what the order of magnitude is of the cost charged by ICF through to Manitoba Hydro for Exhibit 12.2. Also, to indicate if the hourly rate was a fixed price contract with ICF

CONTINUED BY MR. BOB PETERS:

MR. BOB PETERS: In addition to -- would -- would the Board be understanding correct that while you disclose your hourly rate in your response to the RFP issued by Manitoba Hydro that this was a -- a fixed price contract with ICF?

MR. JUDAH ROSE: You know, I -- as I recall there was some work that was done under an expanded scope. I just -- and there was work that was done subsequently to the September 11th report, and I -- I would have to check. And so there may have been some change orders that occurred.

MR. BOB PETERS: Well, let's add that to that undertaking you were going to check on and get back

to the Board on. Would that be fair, Mr. Rose?

MR. JUDAH ROSE: Sure.

MR. BOB PETERS: When you say that there may have been some work subsequent to the September 11th report, what are you referring to, sir?

MR. JUDAH ROSE: Well, there was work I alluded to earlier, the work on the paleoclimatic information that's occurred, I believe, in the -- at the end of 2009. It was a relatively small assignment. And there's been preparation for the hearings, the preparation of the document, those are the things that are -- are -- most come to mind.

MR. BOB PETERS: And those -- those latter, subsequent events would have been invoiced to Manitoba Hydro based on the hourly charges of ICF employees that did the work?

MR. JUDAH ROSE: Yes.

MR. BOB PETERS: Maybe you can, in that undertaking, just bring the Board current in terms of the total charges to the time of your testimony.

Would that be possible, sir?

MR. JUDAH ROSE: Within an approximate amount, we'll -- I'll get that information.

MR. BOB PETERS: Thank you, sir. Looking to the future, am I correct that ICF has a current

assignment related to Manitoba Hydro's gas portfolio review for Centra Gas's customers under -- under hand right now?

MR. JUDAH ROSE: I don't know.

MR. BOB PETERS: All right. Maybe Ms. Ramage can show you PUB/Manitoba Hydro Risk 91B, in terms of ongoing or future assignments. And I'd understood that currently there is an assignment related to the gas portfolio review, but you're not aware of that?

MR. JUDAH ROSE: It just -- what it is -- is there a date on this? Is it -- is it -- when it says current -- I'm just not sure what it means by current. Is it -- there's a date on the bottom here, is that the way to interpret this?

MR. BOB PETERS: Well, I would suggest that the date on the bottom would be the date that Manitoba Hydro provided its answer. But let's just -- let's maybe just get your understanding as to whether ICF is working on a gas portfolio review for Manitoba Hydro's gas company currently, or whether you think that assignment is completed, or whether you have no knowledge of it?

MR. JUDAH ROSE: I -- I have no knowledge of it.

MR. BOB PETERS: All right. Thank you.

Would it be correct, in looking at that same written response to PUB/Manitoba Hydro Risk 91B, to indicate that ICF expects in the future to have assignments with Manitoba Hydro related to electricity price forecasting, fuel price forecasting, and the MISO market assessments?

MR. JUDAH ROSE: Yes, sir.

MR. BOB PETERS: Okay. I believe you had told Ms. Ramage in one of your earlier questions this morning, sir, that, in addition to Manitoba Hydro, you've also done work on the electricity side for MISO itself.

Did I hear that correctly?

MR. JUDAH ROSE: Yes, sir.

MR. BOB PETERS: And so your client was -- was MISO?

MR. JUDAH ROSE: Yes, sir.

MR. BOB PETERS: And are you at liberty to tell this Board what -- what was the nature of the work you've done for MISO?

MR. JUDAH ROSE: Yes. We did a cost-benefit study of two (2) issues, the creation of the hourly -- what is known as the Day 2 market. And that was a very detailed, engineeringly oriented economic study of the hourly locational marginal pricing market that they run now; and the related market, which is the insular service market for -- primarily for operating

reserves that they also run jointly with the electrical energy market.

MR. BOB PETERS: Those were the two (2) assignments you've done for them?

MR. JUDAH ROSE: Yes. It really -- it was really more one (1) assignment that had two (2) components.

MR. BOB PETERS: And -- and what year was that done, sir?

MR. JUDAH ROSE: I believe it was done in 2007, subject to check.

MR. BOB PETERS: And when you say you did a cost-benefit of the MISO Day 2 market or -- explain what the cost-benefit was.

MR. JUDAH ROSE: Well, the -- the benefits of the Day 2 market are determined using -- were determined using the GE-MAPS model that I referred to earlier, which is having a centralized market run by a centralized operator has access to all of the information, all the bids and the -- all the transmission data, all the generation bids, as to whether that operates more cost effectively than the bilateral market in which buyers and sellers are -- are reaching out without full access to all that information. And we concluded that there were benefits to having the

centralized activity.

The costs refer to the -- and we -- we focussed more on the benefits which requires looking at all of the power plant operations in the system. The costs referred to the cost of operating that market and setting up the organization to implement that.

MR. BOB PETERS: Would you have been able to determine Manitoba Hydro's potential involvement in that market when you were doing the study?

MR. JUDAH ROSE: We had proprietary access to the operational situation on the grid in historical periods of time so that all entities that were involved in the study, which was all the MISO members, provided us information. But I don't believe that included Manitoba Hydro because it doesn't participate; that is it -- the locational marginal pricing is -- it just prices at each node on the grid, and that's not the case in Manitoba.

So it -- it -- I don't believe -- I think we had information on imports or exports, but I don't believe we had information on their operation of their individual units like we had for the other thermal entities.

MR. BOB PETERS: And it was ICF's opinion and conclusion in their report from MISO that the -- the

Day 2 market would be beneficial?

MR. JUDAH ROSE: We estimated the benefits, and I believe that they were greater than the costs. And it's the case that, I believe, it's somewhere between two thirds (2/3) and three quarters (3/4) of the US population is under a similar system today, having been subsequently adopted by California and Texas, or parts of Texas. So it's generally a pretty broadly accepted idea that there are benefits to having a centralized operation.

MR. BOB PETERS: You had indicated that, in one of your answers to Ms. Ramage, that you also did and have done work -- or maybe you still are working for Minnesota Power; is that correct?

MR. JUDAH ROSE: I -- you know, they have been clients. At the time, I'm not at liberty to discuss at length that, but we have worked with most of the utilities in the United States, including those that are in MISO.

MR. BOB PETERS: You're not at liberty to indicate the nature of the assignment with Minnesota Power; is that what you're telling the Board?

MR. JUDAH ROSE: Yes.

MR. BOB PETERS: And that's pursuant to a confidentiality agreement you have with Minnesota Power?

MR. JUDAH ROSE: That's correct.
MR. BOB PETERS: I believe you also mentioned that Xcel Energy or Northern States Power has also been a client or is a client of ICF; would that be true?
MR. JUDAH ROSE: It has been a client of ours through the years. As I indicated, we were, I believe, hired by Xcel to be the market consultant during the NRG bankruptcy, and through the years we have done work for them. Of course, both Minnesota Power and Xcel are members of such organizations as the Edison Electric Institute, and it's public knowledge that we're actively working with them on these type of issues.
MR. BOB PETERS: You told the Board that the Edison Electric Institute is the -- is the institute representing non-government owned electric utilities?
MR. JUDAH ROSE: Essentially, yes. It's the -- they call it the public utilities because they own public -- have publically traded stock, so it's a little bit of a confusing -- but the mo -- mostly, the nonpublic utilities is defined by FERC or the government entities.
MR. BOB PETERS: And the nature of the work for NSP, is that also protected by way of confidentiality agreements between ICF and NSP?
MR. JUDAH ROSE: I -- I'd have to check

on that.

MR. BOB PETERS: So as you're here today, you're not at liberty to -- to indicate the nature of the assignments that ICF has undertaken for -- for Xcel or NSP?

MR. JUDAH ROSE: No. I mean, they are in the -- I'm -- I am able to say that they're in the electric space, but I haven't, for example, testified -- I've testified adverse, as you'll find in my resume, to Xcel, but -- in the FERC proceeding, but because it's not testimony I -- I -- I'm not able to say here exactly what we've done.

MR. BOB PETERS: All right. Quickly then, what about Wisconsin Public Service, is that another utility for whom ICF has been engaged?

MR. JUDAH ROSE: I believe so. I would have to -- to double-check.

MR. BOB PETERS: I won't test it further, but if you -- if -- if you have been engaged by Wisconsin Public Service, you're just not aware as you sit here today what -- what necessarily the assignment was?

MR. JUDAH ROSE: No, I -- you know, as you might imagine, you know, because we have almost four thousand (4,000) employees, and -- and the Company's been around since even before I started, and we do have a --

we have worked most utilities in the country on a broad range of topics, and I -- I believe so but I would have to -- to double-check.

MR. BOB PETERS: Are there any other utilities in the MISO region that you can recall ICF providing services for, without indicating the specifics of those services?

MR. JUDAH ROSE: Sure. I mean, I think again I -- a lot of the utilities we've worked with, as -- as we've worked with a lot of the states and the various different energy-related governmental entities in those states.

MR. BOB PETERS: Can I -- can the Board take from your answer, Mr. Rose, that a very high percentage of the MISO utilities in the electric industry are likely to be ICF customers?

MR. JUDAH ROSE: Yes, and -- and I think that applies also for the independent power producers as well.

MR. BOB PETERS: The inde --

MR. JUDAH ROSE: This again, not all of them at the same time, but over the course of the years.

MR. BOB PETERS: And those are the independent power producers also in the MISO region?

MR. JUDAH ROSE: Yes.

MR. BOB PETERS: When ICF was doing its assignment from Manitoba Hydro, do you recall having access to, for example, the integrated financial forecasts of Manitoba Hydro?

MR. JUDAH ROSE: Yes.

MR. BOB PETERS: Do you know what vintage or data set was provided to you, what -- what year that would have been?

MR. JUDAH ROSE: It was provided to us in mid 2009, and I believe it was the work that had been finished prior, you know, obvi -- obviously prior to that, but I -- and I think it's footnoted in the study...

MR. BOB PETERS: I did see a reference to IFF-08, and I'll find the page if that's helpful to you, sir.

MR. JUDAH ROSE: Yes, that would be helpful.

MR. BOB PETERS: I'm looking on page 57 of Appendix 12.2.

(BRIEF PAUSE)

MR. JUDAH ROSE: Yes, I -- I see that. We did have access to IFF-08.

MR. BOB PETERS: And did -- did ICF also secure the assumptions that underpinned IFF-08-1?

MR. JUDAH ROSE: Yes, we received information that, for example, I believe in here there's a table that describes the results of sensitivities that were done and we received other information as well.

MR. BOB PETERS: Would ICF also receive the capital expenditure's forecast from Manitoba Hydro, also circa 2008?

MR. JUDAH ROSE: We did receive some summary data on the -- some aspects of the capital plan. I think it was like a -- a number or two (2) that's included in the report.

MR. BOB PETERS: Did ICF review the cost of service study done by Manitoba Hydro?

MR. JUDAH ROSE: I don't remember that. And...

MR. BOB PETERS: What about the load forecast? Do you remember going through the load forecast?

MR. JUDAH ROSE: We did take a look at load forecast information. So I -- I do remember looking at load forecasts.

MR. BOB PETERS: As well as the power resource plan?

MR. JUDAH ROSE: Yes, I believe so.
MR. BOB PETERS: What about the annual reports of the -- of Manitoba Hydro?
MR. JUDAH ROSE: Yes, I believe we looked at those as well.
MR. BOB PETERS: Did ICF go through the actual export contract documents that Manitoba has with -- with its counterparties?
MR. JUDAH ROSE: I remember reviewing term sheets and some stuff that -- I can't remember whether it was contracts or not. They may also have been contract summaries and/or term sheet summaries. I did review that material.
MR. BOB PETERS: The term sheets that you recall reviewing, are you at liberty to indicate who the counterparties were?
MR. JUDAH ROSE: Yes. I mentioned two (2) of them in my material: Minnesota Power and WPS, Wisconsin Public Service. And the third one, that was NRG. Sorry, not NRG. Northern States Power, NSP.
MR. BOB PETERS: So you saw those three (3) term sheets is what you're saying?
MR. JUDAH ROSE: Either the term sheets or the summaries were provided.
MR. BOB PETERS: Okay. Would I be

understanding your evidence to be that you didn't necessarily take the -- the specific contract -- say, for example, the NSP contract -- and -- and go through it in detail?

MR. JUDAH ROSE: I'd have to double-check. I do remember seeing information, but I -- again, I can't remember it, except it was a summary, or how extensive it was, but we did receive information that was relevant to the terms and conditions.

MR. BOB PETERS: And that information may have come by way of a summary, which was I think provided in one of the information requests that Manitoba Hydro has provided.

MR. JUDAH ROSE: Yes, and there are some summary statistics of both existing and term -- proposed term sheet arrangements in the -- our report.

MR. BOB PETERS: Mr. Rose, did -- did ICF go over any drought and low-flow assessment reports from Manitoba Hydro?

MR. JUDAH ROSE: We did review information about drought and -- and low flows -- I'm sorry, hydro flows. I don't remember all the material that we received, but we did review material like that. In fact, I presented and discussed some of that today.

MR. BOB PETERS: Were you able to obtain

actual reports on the drought situation from Manitoba Hydro?

MR. JUDAH ROSE: We did review and receive reports related to the 2003 drought experience. That's something that I remember sitting here.

MR. BOB PETERS: Can you -- you wouldn't have those with you, or would you?

MR. JUDAH ROSE: You know, I don't know what I have in terms of my -- in my computer.

MR. BOB PETERS: All right, then. Maybe what I'll do is I'll ask Ms. Ramage to undertake to check with you on what specific drought reports were provided, and to the extent that they're on the record, we'll have them, and if they're not on the record, to -- to please provide them to the Board.

--- UNDERTAKING NO. 53: Mr. Rose to provide drought reports that are not on the record

CONTINUED BY MR. BOB PETERS:

MR. BOB PETERS: In addition, Mr. Rose -- and perhaps Ms. Ramage can be of assistance here -- is that marked as Exhibit 3(a), 3(b), and 3(c) in these proceedings are reports appended to a letter dated

February 26th of 2010. Now, I appreciate your report was prepared prior to that date, but some of the reports in the letter were predated February 26th of 2010. And I'm wondering if Ms. Ramage had given you a copy of the reports at Exhibit 3 in these proceedings?

MS. PATTI RAMAGE: Who's exhibit?

MR. BOB PETERS: Manitoba Hydro Exhibit 3.

(BRIEF PAUSE)

MR. BOB PETERS: There's a listing of some sixteen (16) reports, so I -- I was just going to ask whether or not that information was provided to Mr. Rose as well.

MS. PATTI RAMAGE: Mr. Peters, maybe it'd be of assistance -- this is -- to confirm, this is the letter dated February 26th of 2010. I believe it's from myself to the PUB.

MR. BOB PETERS: That's the one. And it appended -- or it referenced at least sixteen (16) reports, Ms. Ramage, that you'll have.

MS. PATTI RAMAGE: Correct.

CONTINUED BY MR. BOB PETERS:

MR. BOB PETERS: And -- and my question to Mr. Rose is whether or not he -- prior to his preparing his report of September 11th, whether he was provided with all or any of that information listed in the February 26, 2010 letter from Manitoba Hydro to the Public Utilities Board.

(BRIEF PAUSE)

MR. JUDAH ROSE: I -- I can't answer that sitting here. There -- it looks to be there's some stuff that we may have reviewed and some stuff that we did not review.

MR. BOB PETERS: Well, Ms. Ramage, perhaps then I can facilitate that by asking by way of an undertaking for Manitoba Hydro to advise the Board as to which of the reports in Manitoba Hydro Exhibit-3(a), (b), and (c) were provided to ICF in preparation of Appendix 12.2.

MS. PATTI RAMAGE: We can do that, Mr. Peters, but it might be simpler if we refer to the lever -- letter of February 26th because those -- the Exhibits A, B, and -- 'A', 'B', and 'C' I believe just con -- add additional materials or reference similar materials, and I think this is the document we're actually referring to.

Is that correct?

The -- the exhibit list refers to a letter of March 5th. And if my recollection is correct, that was a physical distribution of the documents that were referenced, and the earlier February 26th letter is just a listing, but I think it's the same thing.

MR. BOB PETERS: We probably are speaking of the same thing, Ms. Ramage. But just so the record is clear, and I've gone back to the exhibit list, and I could have been more precise, and apologize for not being so, the Exhibit MH-3-1(a), 3-1(b), and 3-1(c) all relate to letters dated February 26th and March 5, 2010, and they contain not only terms of reference but internal reports and external reports.

So the question in the undertaking is: Which, if any, of those documents were provided to ICF for their review as they were preparing Appendix 12.2. Would that be satisfactory?

MS. PATTI RAMAGE: Yes, it would.

--- UNDERTAKING NO. 54: Mr. Rose to indicate which, if any, of the documents, letters dated February 26th and March 5, 2010, terms of reference, internal reports,

and external reports, were provided to ICF for their review as they were preparing Appendix 12.2.

CONTINUED BY MR. BOB PETERS:

MR. BOB PETERS: Mr. Rose, sorry for all that lawyer talk, but let's get back to some specific questions with you, sir. Did ICF carry out an independent twenty (20) year net present value analysis of either Manitoba Hydro's preferred development plan or its alternative development plan?

MR. JUDAH ROSE: No, we reviewed material, but we did not conduct an independent analysis.

MR. BOB PETERS: And did ICF do any independent determinations of transmission shortfalls for Manitoba Hydro in 2003/'04?

MR. JUDAH ROSE: No, we did not conduct any independent assessment of transmission conditions. We did review material related to the '03/'04 drought but we did not conduct an independent assessment.

MR. BOB PETERS: And did ICF conclude that transmission was not a limiting factor back in 2003/'04?

MR. JUDAH ROSE: I don't remember making

a conclusion like that.

MR. BOB PETERS: Just while I'm on the subject of transmission, it may be helpful to the Board if you could explain how Manitoba Hydro would achieve firm imports from the counterparties to which it has term sheets when Manitoba Hydro doesn't actually own the rights to the new transmission and doesn't have firm import contracts?

MR. JUDAH ROSE: The -- I think the thing I was referring to was a situation in which if you had a drought worse than the worst on record, based on my earlier comments, the lines are not being used. You're not -- Manitoba Hydro is not obligated to -- to sell the power. Since the lines are open it's presumed that they can purchase power and that it can be done through purchases that would be facilitated either by counterparties or probably most likely by the MISO system operator itself.

It could purchase power at the border. And in that situation the -- right now the transmission's not controlled by anyone other than MISO. And so there are tra -- there are what they call firm transmission rights. And as I understand it, the Company has some transmission arrangements already in place which might facilitate further the -- the purchasing and the risk

management of those transactions.

MR. BOB PETERS: I just want to make sure the Board is clear in understanding your answer that -- let's go back to 2002 to 2004, in that drought. Is it ICF's conclusion that there was adequate transmission capabilities from the US to supply Manitoba's needs in that circumstance?

MR. JUDAH ROSE: As I -- I don't have a conclusion with respect to that, the adequacy. What I do -- what I do want to say is -- is that the institutional arrangements that existed in 2003 and 2004 no longer exist. That is, there is now a market, a market operator that's also operating the transmission grid, that's MISO itself. And so that's different than the previous situation.

It's -- it's a centrally run market that is more liquid. And there -- within MISO there's no firm transmission. There's a -- a financial arrangement that allows people to mitigate the basis difference or price differences that occur within MISO.

And I -- as I indicated earlier, I've been -- it's my understanding that the Company has more transmission capability or access or -- or financial control of transmission than it did in 2003/2004.

MR. BOB PETERS: Does Manitoba Hydro

still have access to physical transmission as it did back in '03/'04?

MR. JUDAH ROSE: It has, as I understand it, the ability to move power, say between MISO, itself, and Ontario, for example. And I -- I don't know how that specifically compares to what they had in '03/'04, except for to say that as I understand it there has been an improvement in greater access to transmission or the financial equivalent than they had previously.

MR. BOB PETERS: Can you confirm that in the absence of any new generation and transmission inside Manitoba with new firm contracts, if -- if -- let me rephrase the question. In the absence of any new generation and transmission, and in the absence of any new firm contracts, Manitoba Hydro wouldn't need any additional firm export transmission capability into the states, would it?

MR. JUDAH ROSE: I don't know if nee -- need is the right word. I -- I think there are circumstances in which it would prefer to sell power more on-peak than off-peak, and there are circumstances where having greater transmission would be useful in that regard.

So -- and I think as I indicated in my report, additional transmission would make the power

sales more firm. And one (1) of the concerns I've indicated is is that the ability to count the exports from the buyers perspective as firm is a function of the ex -- exact specific requirements, and that is established by NERC, the North American Electric Reliability Council, and FERC, the regulator, and MISO itself. And my concern is -- is those are tightening, that I think that the firmness of the transmission could become an issue if there's not additional lines.

So we haven't conducted a detailed needs study, but I think that there would be at least three (3) major benefits from upgraded transmission that I think should be considered, and I just mentioned two (2) of those: the greater firmness in export, the greater ability to do on-peak versus off-peak. And then we discussed earlier the Black Swan issue, which is having more transmission would be helpful to allow the Company to withstand a worse drought that the worst on record.

MR. BOB PETERS: In your -- in the ICF report, Mr. Rose, when ICF refers to fossil fuel plants, should the Board interpret that to include all thermal plants, whether gas or coal?

MR. JUDAH ROSE: If there's a specific reference. There's no doubt that both natural gas, oil, and coal, or all three (3), are fossil fuels, but if

there's a specific reference, you know. Coal's a result of a coalification process which is very similar, or at least somewhat similar, to fossilization, for example.

MR. BOB PETERS: Mr. Chairman, if it suits the Board for an afternoon break, this might be an appropriate time before I change into another area.

THE CHAIRPERSON: Very good.

MR. ROBERT MAYER: Just before we go -- I've been pushing this thing all day, and it's not working properly. It's working now. I've been wanting to ask this question ever since I read the report, and, sir, Mr. Peters asked you about what part you had in redacting some of the material. Can we go to page 86 of your report? This really is more on the subject of humour than anything else. Paragraph 6.4.6.

MR. JUDAH ROSE: Yes, I see that.

MR. ROBERT MAYER: Last word -- the last item redacted on the first sentence under that heading. Now, I don't have to be real bright to realize that underneath that black mark is ICF, and especially when I go to page 88 where we discussed the ICF forecasts. What would ever possess anybody to redact it in one (1) place and not in another? Page 88, first paragraph.

MR. JUDAH ROSE: You know, in my version, the ICF is -- I see what you're saying.

MR. ROBERT MAYER: I'm assuming you didn't do that, sir.

MS. PATTI RAMAGE: I believe this was a Manitoba Hydro redaction, Mr. Mayer, and it's -- if you -- at the break, we can look at it. I'm a little concerned if there is an error, that -- you know, in terms of what we're disclosing here, but -- but we'll look at it and -- and get back to you. But I believe it had to do with the disclosure of the forecasts -- forecasters.

MR. JUDAH ROSE: Right. I mean, it could just -- you could see here that there's some reference to the extent to which the negotiated prices are a percentage higher than the ICF forecast. The percentages are redacted. Then there's a reference to six (6) eleven (11) itself, which is redacted. So I think the goal is to -- to -- to hide the -- if you knew the ICF forecast, then you could figure out what the prices were that are being referred to in the second line of eighty-eight (88).

THE CHAIRPERSON: Okay. We'll take the break now.

--- Upon recessing at 3:05 p.m.

--- Upon resuming at 3:29 p.m.

THE CHAIRPERSON: Okay, Mr. Peters. Oh, Ms. Ramage, we have all your exhibits now.

MS. PATTI RAMAGE: Yes, I'll -- I'll run through them quickly. The -- the undertakings that have been distributed, the first is Undertaking number 12, which --

THE CHAIRPERSON: Hold on just one (1) second. I want to make sure everybody's got them. Okay, it appears we have them.

MS. PATTI RAMAGE: Okay, the first being Undertaking number 12, which we've given Manitoba Hydro Exhibit 43, was refiling the schedule of PUB/Manitoba Hydro 135(e) using actual information for the first test year and updating any relevant information in the second test year.

--- EXHIBIT NO. MH-43: Response to Undertaking 12

MS. PATTI RAMAGE: The next is Manitoba Hydro Undertaking number 13, which we've assigned Exhibit Manitoba Hydro 44, which was revising the tables on the PUB book of documents pages 139 to 142 showing actuals in IFF-10 compared to what was forecast, and also showing the forecast for fiscal years 2011 and 2012.

--- EXHIBIT NO. MH-44: Response to Undertaking 13

MS. PATTI RAMAGE: Next we have the response to Manitoba Hydro Undertaking number 21, providing a schedule of long-term debt which Manitoba Hydro assumes was related to the Wuskwatim project and a list of any other assumptions, and that we've assigned Manitoba Hydro Exhibit 45.

--- EXHIBIT NO. MH-45: Response to Undertaking 21

MS. PATTI RAMAGE: The next is Undertaking number 31, which is graphs from the 2006 and two (2) thou -- for 2006 and 2007 from the Winnipeg River at Seven Sisters, the Red at Lockport, and the Saskatchewan River at the Pas. And Manitoba Hydro was also to file graphs from Lake of the Woods and indicate its water levels and inflows. And that we've given Manitoba Hydro Exhibit 46; that's the thick one.

--- EXHIBIT NO. MH-46: Response to Undertaking 31

MS. PATTI RAMAGE: Page 7 is very pretty, you're correct. The next is Manitoba Hydro number 33, and in that the Corporation was to quantify the effects

of energy and storage depletion attributable to the actions of reservoirs not under the control of Manitoba Hydro. And that has been given Exhibit Manitoba Hydro 47.

--- EXHIBIT NO. MH-47: Response to Undertaking 33

MS. PATTI RAMAGE: Manitoba Hydro Undertaking 34, which was providing a chart comparable to that at Tab 43, page 106, I believe, of the Board counsel's book of documents setting out the April 1, November 1, and peak day levels of energy and storage for the three (3) reservoirs. And that we've given Manitoba Hydro Exhibit 48.

--- EXHIBIT NO. MH-48: Response to Undertaking 34

MS. PATTI RAMAGE: Manitoba Hydro Undertaking 42 involves Manitoba Hydro comparing the average revenue per kilowatt hour received by Manitoba Hydro from domestic customers, as opposed to extra-provincial customers, net of water rentals and fuel and power purchased allocated to both classes of those customers. And that has been assigned Exhibit Manitoba Hydro 50.

--- EXHIBIT NO. MH-50: Response to Undertaking 42

MS. PATTI RAMAGE: I'm making up for lost time this morning. Next is Manitoba Hydro Undertaking number 3, and this is an addition, and that's quantifying the transmission and ancillary -- ancillary service cost that Manitoba Hydro put in forecast year 2020 as well as the two (2) test years, and providing the same information for actuals in 2010.

There -- also here is Manitoba Hydro Undertaking number 48, which Manitoba Hydro was to refile the table provided by PUB counsel with respect to Manitoba Hydro Exhibit 21, setting out the unit prices, quantity of energy, and total dollar amounts for fiscal 2009 and 2010. And Manitoba Hydro was to correct any numbers on the table that were incorrect. And those two (2) undertakings have been combined, and that's Exhibit Manitoba Hydro 51.

--- EXHIBIT NO. MH-51: Responses to Undertakings 3 and 48

MS. PATTI RAMAGE: Next is Manitoba Hydro Undertaking number 50, where Manitoba Hydro was to confirm what assumptions are included in calcula --

calculating the OM&A costs for planning purposes, and that's Exhibit MH-52.

--- EXHIBIT NO. MH-52: Response to Undertaking 50

MS. PATTI RAMAGE: Manitoba Hydro Undertaking number 35 is a copy of the risk management review of power sales and operations by risk advisory, the April 2003 report. And that, for the record, has been filed as Exhibit Manitoba Hydro 53.

--- EXHIBIT NO. MH-53: Response to Undertaking 35

MS. PATTI RAMAGE: Next, we have Manitoba Hydro Undertaking number 37, where Manitoba Hydro was to determine the origin of the opportunity sales that are shown on Tab 35, page 78, of the Board counsel book of documents for the 2003/'04 year. And that has been assigned Manitoba Hydro Exhibit 54.

--- EXHIBIT NO. MH-54: Response to Undertaking 37

MS. PATTI RAMAGE: And if you recall, Mr. Rose's testimony was assigned Manitoba Hydro Exhibit 55. So the last Undertaking is number 23, which Manitoba

Hydro was to provide the internal rate of return that was used at the CEC hearing. Manitoba Hydro's response provided to the PUB at the last GRA and the rerun internal rate of return calculation using the now revised forecast of export prices. And that is, for the record, Manitoba Hydro Exhibit 56. So that -- that is our undertakings to be filed today.

--- EXHIBIT NO. MH-56: Response to Undertaking 23

THE CHAIRPERSON: Thank you, Ms. Ramage. Mr. Peters...?

MR. BOB PETERS: Yes, thank you.

CONTINUED BY MR. BOB PETERS:

MR. BOB PETERS: And before the afternoon recess, Mr. Rose, I was asking on behalf of the Board for the reports that you had seen in preparation of your report and that's coming by way of an undertaking.

I now want to ask a similar question, but wanted to know, since the preparation of your September 2009 report, that's the ICF report, marked as Appendix 12.2, I would like you to provide the Board with the information as to what reports you have reviewed since your report was prepared.

And I'm not sure if you're able to answer that currently, or whether that's a matter that would be best undertaken and provided in writing through Manitoba Hydro's counsel, sir?

MR. JUDAH ROSE: There are some that I can remember sitting here, but to be comprehensive, and I think my concern earlier was to be as comprehensive since the list was -- was long, I would have to go back, but I did review, as I mentioned in my direct summary, some of the K&M material, and I also did review some KPG material. And -- but to be more comprehensive I'd have to go back and check all the material that I reviewed.

MR. BOB PETERS: Then I'll ask, sir, that you undertake to do that, as to provide a list of all of the reports that you have reviewed subsequent to the preparation of the ICF report of September 2009, marked as Appendix 12.2, and provide that information through Manitoba Hydro's counsel as an undertaking.

MR. JUDAH ROSE: So advised by counsel, I'll be glad to comply.

MR. BOB PETERS: All right. Thank you, sir.

--- UNDERTAKING NO. 55: Mr. Rose to provide a list of all of the reports that have

been reviewed subsequent to the preparation of the ICF report of September 2009, marked as Appendix 12.2

CONTINUED BY MR. BOB PETERS:

MR. BOB PETERS: I want to turn with you, Mr. Rose, to the discussion about the appropriateness of Manitoba Hydro's long-term contracts. That was one (1) of the terms of reference and you talked about it in your Appendix 12.2 report, and you also talked about that in your -- in your presentation to the Board today, correct?

MR. JUDAH ROSE: Yes, sir.

MR. BOB PETERS: And what does ICF understand to be Manitoba Hydro's stakeholder's expectations with respect to Manitoba Hydro entering into long-term contracts?

MR. JUDAH ROSE: That it be consistent with the strategic plan and the other different documents that describe the Company's strategy and controls, and that it be done in a manner that is, as I understand it, prudent and consistent with the history of the Company, which has been to provide low-cost power if possible, taking advantage of the ability to subsidize the domestic rates.

MR. BOB PETERS: And where do you get an understanding for what those expectations are, sir?

MR. JUDAH ROSE: Well, the -- I have reviewed some documents related to the Company's strategic plan. There's an Act I think that legislatively controls their various different management control plans, drought priority plans, system operation priorities, those documents that I have reviewed.

And it's my experience that people's expectations are affected by history. So, you know, it just -- it -- it's my sense that the -- having the lowest electricity rates in North America is something that has affected people's expectations.

MR. BOB PETERS: Would you agree that those low electricity rates in Manitoba are largely attributed to the vintage of the generating assets of Manitoba Hydro?

MR. JUDAH ROSE: It's related. I wouldn't say largely. It's -- the Hydro assets are the longest-lived assets. And in my experience the -- the more hydro you have, the lower the rates that you have, but it's also a consequence of being able to deploy those assets in a -- an attractive market setting where you can achieve good revenues, as we've discussed.

MR. BOB PETERS: Did ICF do a study on

whether Manitoba Hydro would have the lowest rates, even without the long-term export contracts?

MR. JUDAH ROSE: No, we did not do a but-for analysis, but I don't think there's any doubt that the rates are lowered by the export contracts since they're -- they're lucrative, and, as I indicated in my direct, we did look at the fact that the more hydro you have, the lower the rates you have. And so that is a -- there was a correlation coefficient that I discussed of minus point eight (-.8), which is a statistical description of that relationship.

MR. BOB PETERS: Does that correlation hold true if Manitoba Hydro has to build new merchant plants?

MR. JUDAH ROSE: What do you mean by merchant plants? I'm not 100 percent sure what you're asking.

MR. BOB PETERS: You'd given the Board an answer that, in essence, the more hydro translates into lower rates. Did I understand that correctly?

MR. JUDAH ROSE: Yes, that's a statistically observed phenomenon.

MR. BOB PETERS: And that is based on Manitoba Hydro's existing resources?

MR. JUDAH ROSE: It's based on historical

data that I reviewed, and it's -- therefore reflects the historical facts of all the utilities, including all aspects of their operations as manifest in their rates.

MR. BOB PETERS: It doesn't include the costs of Wuskwatim, Keeyask or Conawapa as generating stations, does it?

MR. JUDAH ROSE: Not to the extent that they are future and haven't been reflected in the rates of the Utility, nor have the earnings from those sales been reflected in the rates.

MR. BOB PETERS: So your answer was qualified with respect to the more hydro, the lower the rates with Manitoba Hydro's existing generating assets?

MR. JUDAH ROSE: Yes, that's what I was referring to. You know, we did review but did not conduct our own studies, and those studies indicated that there was a lot of attractive elements to the future export contracts, but we did not conduct those studies.

MR. BOB PETERS: And when you talk about the stakeholders of Manitoba Hydro, who specifically are you talking about in your report?

MR. JUDAH ROSE: Well, the -- the ratepayers and I've -- there are various different regulators, and those were the -- the main stakeholders. I -- I think about the regulators as, you know,

representatives of the -- Manitoba and the -- and the ratepayers. So there's some overlap, but those were the entities I had in mind.

MR. BOB PETERS: And in terms of the stakeholders who are -- who you call regulators, can you be more specific as to who you were referring to?

MR. JUDAH ROSE: I'm not expert in all of the complexities of the regulatory structure here, and so I can't be, you know, specific with -- with respect to that, but as I understand it, there are a number of entities that have various different responsibilities and authorities, and -- and, as I understand it, it's diffuse -- not diffuse, but there's multiple entities with that responsibility.

MR. BOB PETERS: And do you expect that the expectations of -- of the stakeholders' group that you've now defined have some divergences?

MR. JUDAH ROSE: Well, for sure. You know, if we take the ratepayers as a whole, there's different classes of ratepayers. There's -- I know that one (1) of the issues that I've become familiar with is there's an industrial tariff issue, and, of course, you know, if you take -- there's half a million customers on the electric side, as I understand it, for Manitoba Hydro, so -- and my experience is that a half a million

people are going to have a lot of opinions, so -- but I do think -- so I think -- the trivial answer is of course they're going to have different opinions.

But I do think that the main thing that I've been focussing on -- the fact is that people have experienced low rates here in Manitoba, and I think that that's something that, were they not informed that that was changing, that that would be their expectations, and that's partly related to my experience with electric customers in general in North America.

MR. BOB PETERS: If Manitoba Hydro's rates have to increase over the next decade to support future exports, do you think the stakeholders might be opposed to that?

MR. JUDAH ROSE: You know, I -- I think it depends. I think the expectation is is that, you know, rates may be increasing, but they still may be relatively low compared to others. And, you know, there is general inflation and other factors that affect rates, so I think just generally the -- the ra -- the ratepayers have been expecting -- have experienced low and fairly steady rates, although not perfectly steady. And I think a sudden, you know, change in policy is something that they would need to be -- they're not expecting.

MR. BOB PETERS: And those rates have

gone up approximately 20 percent in the last five (5) years?

MR. JUDAH ROSE: I don't have that specific numbers. I do know there were rate increases that have occurred, but as I recall, they were in a handful of percent, and as I indicated, they -- the rates are the lowest not only in all the provinces I reviewed, but also in comparison to all the US states.

MR. BOB PETERS: When you say "the rate increases in the last five (5) years have been in the handful of percent," what does that mean?

MR. JUDAH ROSE: I reviewed the rate increase, I believe, in 2008 that occurred. And as I recall, it was something on the order of 2 to 5 percent, but that's just from my memory of re -- reviewing the decision of the commission.

MR. BOB PETERS: And if the rates have to increase in similar fashion over the next decade, as they have in the last five (5) years, is that something the stakeholders expect and support in ICF's estimation?

MR. JUDAH ROSE: I -- I don't have that level of specificity with respect to the expectation. It was more just with respect to the general condition of having low and steady rates or relatively steady compared to the rest of North America.

MR. BOB PETERS: ICF didn't research specifically then the expectations of shareholders and do any kind of an analysis of -- of individual stakeholders?

MR. JUDAH ROSE: No, but again, we did review the -- for example, the strategic plan of the Company, and, you know, there are -- there is oversight and -- of Manitoba Hydro, and they would be aware of the strategic plan. And if they had problems with that, I -- that would be one (1) thing that we did look at.

MR. BOB PETERS: What does ICF understand to be Manitoba Hydro's mandate with respect to long-term exports? Is it to maximize sales? Is it to maximize revenues? Or is to maximize net export revenues?

MR. JUDAH ROSE: The -- you know, as I -- I reviewed the strategic plan of the Company and sort of the history of the -- of the business. I think, you know, there -- there's the expectation of prudent operations, but there's an expectation of an effort to lower the rates. And I've also observed in some of the various different documents a distinction without a difference, as far as I can tell, because the minimizing of costs is achie -- can be achieved through sort of maximizing the rates, but all of this needs to be done subject to prudent operation and taking into account other factors such as reliability.

MR. BOB PETERS: Does it follow then from your understanding and your review that if the rates are going to have to be increased significantly for future exports, that's not consistent with stakeholder expectations?

MR. JUDAH ROSE: My expectation is that exports lower rates. So are you asking about a hypothetical situation in which you're exporting it's on net increasing rates but you're achieving higher rely -- reliability? I'm -- I'm not sure what you're asking.

MR. BOB PETERS: Well, I'm asking you then to -- to -- you're aware of Manitoba Hydro's future plans in the next decade, are you?

MR. JUDAH ROSE: Yes, I have some understanding.

MR. BOB PETERS: And do you consider that hypothetical then going forward?

MR. JUDAH ROSE: I consider it hypothetical that on net the exports won't lower -- lower costs overall.

MR. BOB PETERS: So you're telling the Board that the costs of the new exports will be fully recovered from the export customers?

MR. JUDAH ROSE: No, I -- I've reviewed studies that indicated that having the plan that the

Company has, which involves the acceleration of some of the hydro construction and the sales of -- of hydro, on net reduce the overall net present value of the costs. And so while we did not conduct an independent investigation, we did review that material and that's identified in my report.

MR. BOB PETERS: So should it be Manitoba Hydro's priority, according to ICF, to maximize net export revenues?

MR. JUDAH ROSE: It should have that as a cons -- an important consideration if they -- as long as it's consistent with prudent management and operation to take advantage of the opportunities that it has to it. Certainly, given a fleet of -- of existing assets to the -- the way to sort of minimize the cost on the ratepayers is just to take advantage of the export opportunities, again, subject to the prudent obligations and priorities of the Company, which is it's primary -- the first priority is domestic service.

MR. BOB PETERS: Is it ICF's view that exports are a free byproduct of building for or investing for future domestic load?

(BRIEF PAUSE)

MR. JUDAH ROSE: I wouldn't say free, but if -- if I could have that question read back to me or rephrased.

MR. BOB PETERS: In your direct evidence through Ms. Ramage you suggested to the Board that one (1) of the advantages that ICF saw with hydro-electricity is the fuel was free.

Did you say something to that effect?

MR. JUDAH ROSE: Right, the -- the payment for -- there's no payment for hydro like there is for coal or natural gas. I -- I wasn't referring to any -- there -- there may be -- in fact, maybe I was saying that too strongly. There may be some water licence or royalties that you have to pay, but as a general matter it's -- it's usually contracted in advance, and it's not subject to the perturbations of the coal or gas markets.

MR. BOB PETERS: No, and I appreciate you may not be intimately familiar with some of the -- some of those costs, but in that context, and the qualification you've made, is it ICF's view that the exports are a free byproduct of building for or investing in future domestic load?

MR. JUDAH ROSE: No, I -- I would phrase it more that it's net beneficial to the -- to the ratepayers and -- on many different levels, some of which

are easy to quantify and others which are not as easy to quantify. But that -- for example, the acceleration of the construction of hydro requires an acceleration, but it is -- as a general matter it has been helpful to have the export revenue help pay for the construction of new hydro, and the rates are significantly lower because of the overall export policy.

MR. BOB PETERS: What value does ICF say would be appropriate to be assigned to the surplus energy that Manitoba Hydro currently has?

(BRIEF PAUSE)

MR. JUDAH ROSE: I mean, you can do a calculation of what would be the increase in rates if tomorrow there was no surplus. So for example, we knew for -- depending on how you define the surplus, but if we knew tomorrow there was going to be a cessation of precipitation, we could -- you could calculate how much higher the rates would have to go on average in the absence of precipitation.

I'm not sure if that's what you're asking, but it's -- as I under -- there was some discussion about a cost of service study. When I remember it it was in 2006 and it indicated that the domestic rate of twenty-

seven dollars ($27) a megawatt hour had reflected something on the order of subsidies of 20 percent or so from the effect of the exports. The export -- exports have been very beneficial in that they're -- at least in terms of embedded costs, the revenues greatly exceed the incremental costs.

MR. BOB PETERS: Did you look at more recent cost of service studies other than the 2006 one?

MR. JUDAH ROSE: I remember the 2006 one. That was where the twenty-seven dollars ($27) came from. I think if I flip through the document, I -- there's the September 11th, 2009 document. I think there's another reference in there, and it may be -- I think it may be that -- to that same 2006 study, but I haven't -- I don't remember looking at one more -- a recent one.

MR. BOB PETERS: Does ICF suggest to the Board that existing generation and transmission has the same value on export as does future Manitoba Hydro construction?

MR. JUDAH ROSE: One (1) of the main differences is the -- you do -- to the extent that you have to accelerate your construction profile, you have to accelerate some costs. I wouldn't -- I'm not here to suggest that embedded and -- and future are the same, but I'm here -- I am here to suggest that there has been a

history of success and benefits from the hydro-based exports. And the analyses I -- I've reviewed have indicated that future exports will continue to provide very significant benefits, ranging from lower cost and, in addition, to augmented transmission, the avoidance of those transmission costs, et cetera, and of course the greater reliability on the system, which is hard to value but I think is potentially very -- is -- is very valuable as well.

MR. BOB PETERS: I'll come back to this point, but on page 42 of the Manitoba Hydro Exhibit 55, which was your written presentation today, you had a chart on page 42.

MR. JUDAH ROSE: Yes, sir, Exhibit 215.

MR. BOB PETERS: We might be at cross-purposes here, sir, and I apologize. I was looking at a different document than you have in your hand. I'm looking at the presentation you'd given today, Manitoba Hydro Exhibit 55.

MR. JUDAH ROSE: Okay.

MR. BOB PETERS: And, Mr. Chairman and Board members, I'm looking at page 42 of the presentation that was handed out and referred to by Mr. Rose starting this morning at 9:30. I think it's been marked as Exhibit 55, Manitoba Hydro.

MR. JUDAH ROSE: Yes, sir, I'm -- I'm on that page right now.

MR. BOB PETERS: All right. While we're on that page, you're showing the MISO power on-peak average prices in 2009 as three (3) cents a kilowatt hour?

MR. JUDAH ROSE: Yes.

MR. BOB PETERS: And three and a half (3 1/2) cents in 2010?

MR. JUDAH ROSE: Yes.

MR. BOB PETERS: How do sales at those peak prices lead to lower domestic rates, Mr. Rose?

MR. JUDAH ROSE: I think the study that I saw said that the incremental or variable costs for doing the -- for providing the exports was something on the order of two-thirds -- one-third of the -- they accounted for 10 to 15 percent of the variable costs and 32 percent of the revenue, so that -- and, given the average rates, I -- I would still think that -- that you're in the money, but, you know, obviously it's -- it's a -- a low point in the market, so there would be less revenues there -- than there would be if -- in the previous five (5) years, which were double that price.

MR. BOB PETERS: Just so the Board is clear, Mr. Rose, the costs that you were talking about,

whether they were three (3) or three and a half (3 1/2) cents, those were the variable costs? Is that how -- how you're classifying them?

MR. JUDAH ROSE: Right. I think what I was trying to answer was, if you look at 2009/2010, should you have -- should you have performed exports or should you have just sat on your hands and not done it? And the answer is, yes, you should have done it because the variable costs were -- were low. And, of course, the main point of the graph is -- is that the -- the contract prices are, you know, multiples of -- of this -- of this price.

MR. BOB PETERS: And can you tell the Board, in -- in your example, if the variable prices are -- are covered by the export revenues, who then is going to pay for the fixed costs related to making those exports happen?

MR. JUDAH ROSE: Well, there are embedded or historical costs, and these are -- these are the spot prices. So one (1) entity that would be providing a contribution towards the fixed costs would be the -- the revenues you get from the spot sales, or the short-term sales. Then you're getting con --

MR. BOB PETERS: Well --

MR. JUDAH ROSE: Please, let me finish.

MR. BOB PETERS: I'm sorry. I didn't mean to interrupt. Go ahead.

MR. JUDAH ROSE: Okay. And then you're getting contributions from the long-term contract prices, which are -- in the existing contracts in this period were above this level, and about half the sales are under these long-term contracts and half are under spot. So you're making money on these sales, albeit a contribution that maybe is less than you'd like, and -- but you're also making money from the contribution that you're getting from the contract sales. And then lastly, you are getting contribution also from your -- your ratepayers.

And so one (1) of the virtues of having long-term contracts is is that you avoid having all your sales at thirty-three dollars ($33) a megawatt hour, which is the average for '09 and '10. Of course, if you go a hundred percent long-term contract, then you miss the sixty-six dollars ($66) a megawatt hour that was the average in the previous five (5) years.

So I think the -- you know, that there's benefits to having short-term sales, recognizing that it sometimes works to your advantage and sometimes it doesn't.

MR. BOB PETERS: Thank you, sir. Looking

at your chart still on page 42 of Manitoba Hydro Exhibit 55, and let's stay with 2009/2010, what's shown on the graph under those years -- or above those years is the on-peak average prices in MISO, correct?

MR. JUDAH ROSE: Yes.

MR. BOB PETERS: And so when you talked about the embedded costs or historical costs could be picked up by the spot sales, there would be spot sales off peak, correct?

MR. JUDAH ROSE: Yes. If you can't -- yes, there would be some.

MR. BOB PETERS: And the off-peak sales will be less than half of the three (3) cents or three and a half (3 1/2) cents that you get on-peak, correct?

MR. JUDAH ROSE: Yes.

MR. BOB PETERS: And so that would mean, would it necessarily, that what isn't being picked up by the spot prices or the long-term contracts would fall then to the ratepayers to -- to pick up?

MR. JUDAH ROSE: Yes, or to the equity holders --

MR. BOB PETERS: Who are rate -- I'm sorry.

MR. JUDAH ROSE: The -- the eq -- the equity could be also affected, so it's not only

necessarily to the ratepayers. Look, I -- there's not doubt that if you take the worst economic recession in seventy (70) years, people are going to be getting things less than they -- than they normally do.

I think the question that -- I think it's important to emphasize is that a once in a seventy (70) year event doesn't happen every year. And -- and the reason that you see a situation in which you have the possibility of having sales greater than eighty seven (87) are the reasons I mentioned before, which is is that people don't expect this to continue and they're not willing to live with the uncertainty of having, well, maybe two (2) good years in terms of low prices, but may be be exposed to the potential for very high prices as well.

MR. BOB PETERS: While you say a one (1) in seventy (70) year event doesn't -- doesn't happen every year. It could happen every year.

MR. JUDAH ROSE: Right, but let's just -- let's just go do a little math. If we do the probability of -- one (1) second. The probability of having a ten (10) year one (1) in seventy (70) event in every year for the next ten (10) years is three point five (3.5) times ten (10) to the minus nineteen (19), which is a -- which would -- which may well be akin to having all the

molecules in this room ending up in that corner and asphyx -- phyx -- asphyxiating, so it's a very unlikely event.

And I think that the -- again, this gets into -- all facetiousness aside, and perhaps maybe if I did have more of lunch I wouldn't have done that, but you know, the -- the -- you know, I think that you can't -- I -- I don't think -- and I think this -- it's -- it's not only my opinion. It's obviously, I think, the opinion of the potential counterparties that they be entertaining contract sales at eighty-seven dollars ($87) a megawatt hour and -- or above.

And -- and furthermore, as I indicated, a lot of the fleet is under threat from environmental regulations. So, again, electricity demand has recovered. 2009 was a very, very bad year. And I think there are reasons to expect that you don't have to rely on these low prices. And I -- I don't think it's reasonable to expect that this would continue for ten (10) years.

THE CHAIRPERSON: Mr. Rose, I think everybody would probably agree with you just logically that the global economic credit crisis and recession that followed the credit crisis was a rare event, and there's not too many people in this room that will remember the

last time it happened, if any. But other things happened at the same time, did it not, like, for example, we had the disconnect between oil and natural gas prices that have seemingly continued to persist?

MR. JUDAH ROSE: Well, I mean, let's -- let's assume that we all agree, just hypothetically, that things are going to be bad for a long time. Then I think one (1) view of it is is that you would try to solve -- I mean, try to sign more long-term contracts. You would deviate from the historical 50/50 mix that has guided the Company.

And where we sit today that looks, you know, fairly attractive, but -- but I think it's reasonable to conclude that a -- a mix of the short-term and the long-term makes sense. Again, I -- it's true that maybe it's not ten (10) to the minus nineteenth (19th) probability. And I -- but I think, you know, one (1) thing that you would observe here is that there had been cycles in the industry.

And that -- the cycles that are most prominent in this historical times here is in -- in page 42 are two (2). One (1) is is that you have the high-price cycle that I've -- I've referred to, the '03 to '08 cycle, where we had very high prices. You have the current cycle where it's down. Before that we had, you

can see a -- sort of a downward trend in '01, which was the last US recession.

We had the upswing in -- that we had in '99/2000. I remember where I was on June 24th, 1999, when prices exploded in the midwest in the United States. It was during a hot event, and in that particular case it wasn't so much natural gas prices and fuel prices as it was just a shortage of supply.

And that, in turn, was related to the -- the high-tech boom of the -- of the 1990s. So you have these cycles, and so one (1) would expect that the cycles would continue, although the -- the nature of the cycles, what's actually driving them would be in exact timing, and duration, frequency, or amplitude, is something we can't really know.

So -- and, you know, one (1) view of it would be is that this is exactly the time not to go all long-term because people are taking a -- a perhaps an overly negative view. The stock market's doubled in -- since March of '09 to where it is today. There are -- electricity demand grew in MISO at 5 percent. That's a very strong rate. That means it's doubling every twelve (12) -- at a rate of seven (7) -- 5 percent, it doubles every fourteen (14) years, the demand.

So that means that there would be a -- a

real need for a new capacity. So, I mean, I think there are mixed signs and I -- I -- I like the idea of not having all your eggs in one (1) basket because I don't want to have to come back in five (5) years when you have a 100 percent long-term contracts, the prices are exploding because we're in a different cycle, and -- and -- and I didn't -- you know, and maybe you can say it's a little bit contrarian in the sense of, you know, being anti-cyclical in your view is the essence of being contrarian.

You're essentially buying low today by maintaining some access to the spot market as opposed to going all long-term contract. It's an, effectively, a contrarian view of the future. And -- and it highlights the fact that the -- the enterprise of Manitoba Hydro in its export does have a commercial ele -- element that requires some canny -- not canniness but some sophistication as to what's the nature of commodity cycles.

And my recommendation is is that it -- you should not act as if you expect this is always going to be negative and low, the prices, but I would also sort of then recommend if you really believe that, then you -- then you would try to seek more long-term contract arrangements because other people are taking the opposite

view to the extent that you can -- can arrange these type of contract prices.

CONTINUED BY MR. BOB PETERS:

MR. BOB PETERS: Mr. Rose, thank you for that. Would it also then follow, looking at that chart on page 42 of Manitoba Hydro Exhibit 55, that the '97 to '02 cycle may be the cycle that we're in right now and about to repeat. There's a -- that's equally as possible as us being in a repeat of the '03 to '08 cycle? Do you accept that?

MR. JUDAH ROSE: Yeah. I think that it's a -- it's a very interesting point that you're raising, Mr. Peters. You know, one (1) of the things that I have when I go to meet with people on Wall Street to do due diligence or -- we've been involved in some of the recent transactions that have occurred, a lot of times all people talk about is the '03 to '07 cycle, and that's because it was related to high gas prices and it's something that's easy for them to get their arms around, whereas the cycle in '97 to, you know, 2000/2001, you know, there were -- I'm sorry, when I said June of '99, it was June of '98 -- that's harder for them to get their arms around because it's related to the shortage of capacity that occurred in the United States, in the

eastern interconnect, where MISO's located, in '98/'99, and in the west in 2000 and 2001.

And so that cycle's further back in their minds, and the idea that there would be a premium for having capacity is harder for them to understand. And I -- my concern is actually that, like you said, we might be more in a cycle like that because of this potential forced retirement of coal plants, and so that it may be more driven by scarcity of capacity than necessarily higher gas prices. But, you know, one (1) thing that would also happen is that you'd have more hours in which -- that if you got rid of a chunk of the coal plants, you'd have more hours in which gas was the marginal fuel source, and even if gas prices didn't go up, your average price would go up, particularly your off-peak and average price.

MR. BOB PETERS: Mr. Rose, did ICF study the actual impact of Manitoba Hydro's Limestone generating station on domestic consumer rates during the 1992 to 2000 period?

MR. JUDAH ROSE: No. We're simply, in that particular graphic, observing that there is -- the bringing on of the hydro was related to the exports and the ability to cushion the blow onto domestic customers by allocating a -- a significant portion of the costs to

the export sales, but I -- we did not do a historical analysis of Limestone, nor, for that matter, of the other facilities mentioned on page 23.

MR. BOB PETERS: When in your report -- and in ICF's report, more accurately -- there's an indication that export prices have greatly exceeded Manitoba Hydro's embedded generation costs, the number you're referring to is the two point seven (2.7) cents a kilowatt hour?

MR. JUDAH ROSE: Yes. The -- the number I had in mind -- and, again, this was done in 2000 -- our report was done in 2009, but it was based on data primarily from '08, and the -- again, the twenty-seven dollars ($27) I believe is from the 2006 cost of service study, taking into account like a 20 percent subsidy rate, as I understand it. So I was comparing vis-a-vis the twenty-seven (27).

MR. BOB PETERS: That wasn't necessarily the case that export prices greatly exceeded embedded generation costs prior to 2000, was it?

MR. JUDAH ROSE: Well, you know, I have on page 99 of the handout that we went through today actually the actual prices, so I do go back to '97, '98, '99, 2000. You do -- you do see pretty strong prices in '99, 2000, 2001 in real dollars. It's -- they're

averaging about forty-nine dollars ($49) a megawatt hour on-peak, and that's very close to the -- to the long-term average. So there were periods of time in which prices were lower, but our time series only goes back to '97.

MR. BOB PETERS: When we talk conceptually about the embedded generation costs, I just want to make sure the Board is clear, sir, that -- is that the average of the generating costs of all of Manitoba Hydro's generating stations?

MR. JUDAH ROSE: My understanding of the embedded costs would be the allocation in a particular year of the net non-depreciated capital plus other variable charges that are related to generation, less subsidies from the exports.

So, for example, if you had a rate base of capital investment of a hundred, you had depreciated fifty (50), a portion of that fifty (50), maybe five (5) would be allocated to a year's rates. And you would have on top of that -- you would add the other variable costs, like operation and maintenance costs, and you'd subtract out the net profits from the exports.

MR. BOB PETERS: Why wouldn't ICF measure the costs for export to be covered based on the last generating station that Manitoba Hydro brings on stream?

MR. JUDAH ROSE: I mean, we did look at a

number of different measures. I -- the -- the -- on forty-two (42) they -- and I -- I thought it was a nice graphic, was, say we had observed that historical spot prices, which, as I indicated, may not be the best measure -- say these numbers were ten (10) times as high and I saw that you had a price that was one tenth (1/10) of that. Then I would -- that would want be some -- that would be worrisome to the -- to me, to the Board.

So one thing we did look at is -- is one (1) of the measures we looked at. In fact, I listed all the measures, or at least most of them, on page 41. So I did look at historical spot prices just to -- and I found that even the highest spot price was less than the contract or the term sheet, the potential contract price, which I had thought was encouraging.

But we then also looked at whether or not the net present value of the system costs were less if you had the export contracts relative and the export profile that the Company has relative to not having it. And we found that there was a savings that are de -- is described in our report, and that savings didn't include the $2 million of transmission that you didn't have to pay for because your counterparties were building those transmission lines, and it didn't account the benefits that you were decreasing your exposure to the Black Swan

event.

So we did look at the future going costs, forward going costs, with and without the contracts, albeit we relied on analysis that had been done; we didn't do our own analysis. And so this is just one (1) of the -- I have here a list of six (6) metrics that we looked at, and one (1) of which we just talked about, the last one, was the issue of market timing and trends, which is a -- which is a tough issue in the sense of not knowing the future, but I think reassurance -- some reassurance in the past and the nature of the strategy that's being pursued.

MR. BOB PETERS: What do you understand to be the lowest price for which Manitoba Hydro has sold its energy in the last couple of years?

MR. JUDAH ROSE: Are you referring to -- well, I don't have -- the best record I have is -- is the historical prices. I -- I can't -- you know, I don't have all of the short-term sales transactions. I'm sure that they're occurring all the time. But I do know that the contract prices historically going into the period of time when we were doing our report were above the -- above the numbers that we've been talking about, significantly above the thirty-three dollars ($33) a megawatt hour on-peak.

I -- I'm looking at the off-peak prices. I'm sure that there were some sales that were done at off-peak because the lines were filled up and there was no room on the -- to make on-peak sales, but I -- I don't have a detailed knowledge of all of the individual transactions.

(BRIEF PAUSE)

MR. BOB PETERS: Before I leave the -- the first item on the terms of reference, would the Board be correct in understanding that ICF's conclusion is that the MISO market price for on-peak energy is set by the price of natural gas generated electricity?

MR. JUDAH ROSE: In some hours it is, that the -- that the spot price is a function of the natural gas price. Now, there's going to be variation within that because you have more or less thermal efficient units. It depends where you're located on the grid. There's -- there's prices -- the power industry actually creates more prices than all other industries combined looking at it generally.

It's the most price inte -- prolific industry in the world by a wide margin. So it depends on where you're locating and look -- looking in MISO. So

there are hours of -- primarily on-peak where that you do have gas in the margin.

Now there has also been some correlation between gas and coal prices. It's a -- it's not a perfect correlation, but there has been some correlation there, but it is a factor.

MR. BOB PETERS: Well, looking at page 42 of Exhibit 55, the MISO on-peak power prices for which you give the average from '97 through to 2010, those would be predominately set by natural gas. Isn't that correct?

MR. JUDAH ROSE: You know, I think on average, you know, there'll be hours, I think, in on-peak which it'll be coal, and hours in which it's gas. But on average -- for example, in 2007 -- well, let's do -- let's do 2005, the average price for gas delivered in -- was something on the order of, in real dollars, maybe nine (9) to ten dollars ($10).

So to get a -- a price of seventy-two (72) you would have a -- you would expect there to be a substantial number of hours in which -- that results in a price typically in the order of eighty (80), ninety dollars ($90) a megawatt hour. Your coal price delivered would probably be something on the order of a buck fifty (1.50), which results in a price of fifteen (15), sixteen

(16), seventeen (17), eighteen (18), something in that order.

So it -- I -- I would expect that there were a fair number of hours on-peak where gas was on a margin.

MR. BOB PETERS: So I think you're agreeing with me that what we're -- what the Board is seeing on page 42 is largely a representation of natural gas being the on-peak price setter?

MR. JUDAH ROSE: Well, I -- I'm -- you know, I'm not trying to di -- to dispute that gas is not an important determinative of on-peak prices, I'm just -- it's a -- it's not the only thing that's going on. It -- but it is an important phenomenon.

MR. BOB PETERS: But we see the average on-peak here -- you picked the year, I guess you picked '05, seven cents (.07) a kilowatt hour. If it was -- if it was coal setting that price it would be down around the -- the two cents (.02) a kilowatt hour?

MR. JUDAH ROSE: For most -- for most coal plants. Some coal plants, you know, in MISO have relatively expensive costs, but I think that that's fair. Well, all I'm saying is that there are hours on-peak which coal's in the margin, and there -- even if the majority or a good chu -- chunk of them are natural gas

driven, and that the prices reflecting the differences in the thermal efficiency of the different gas units.

And also, I -- you know, in some of these years the allowance prices were pretty significant for some of the plants. So you can have coal price -- prices reach forty (40), fifty dollars ($50) a megawatt hour for the more expensive coal units, which are more likely to be the price setting units.

But again, I think you -- there is a clear pattern here that -- that there is a correlation with -- with gas, and gas is important.

MR. BOB PETERS: And does it follow then that the off-peak opportunity sales into MISO compete against coal as the electric fuel source?

MR. JUDAH ROSE: Yes, it's primarily coal, and it's -- and because it's off-peak and the demand is low, it's often the lower cost coal plants.

MR. BOB PETERS: In your second last answer to me, sir, you said the allowance prices could be significant for coal plants. Do you recall saying that?

MR. JUDAH ROSE: Yes.

MR. BOB PETERS: What are you referring to when you say "allowance prices"?

MR. JUDAH ROSE: The variable cost of operating the coal plant are usually just primarily fuel,

and there's a small amount of non fuel variable low end that's assigned. But there were periods of time in which there -- the allowance price -- and this is the cost of a permit to admit, say for example a tonne of SO2 -- the allowance price was say fifteen hundred dollars ($1,500) a tonne for SO2, and because MISO includes areas that traditionally use high sulfur coal and there are some plants that are not scrubbed, it wouldn't be uncommon to have a plant that has an emission rate of 5 pounds and a million BTU, which is pretty high level. That's -- that's pounds of SO2 per million BTU.

So -- one (1) second. Just -- you know, I -- I believe that you could end up having in -- in addition of -- something on the order of twenty dollars ($20) a -- a megawatt hour or two cents (.02) a kilowatt hour just from the allowance prices in those circumstances. I just need a second to...

(BRIEF PAUSE)

MR. JUDAH ROSE: Yeah, so that it wouldn't be -- it would be certainly possible in some of these years that the -- the coal price could have an adder that's bigger than the fuel cost delivered to the plant.

MR. BOB PETERS: All right, and -- and so the allowance price is really an adder, or a penalty, as a result of the emissions from the coal plant?

MR. JUDAH ROSE: Right. It's the cost of a permit that you have to purchase, or the opportunity cost of a permit that you can't sell. And in some of these years, particularly in the '05 to '08 period, the allowance prices for SO2 and NOx did reach fairly high levels.

MR. BOB PETERS: Who sets the allowance price?

MR. JUDAH ROSE: The allowance price is the result of supply and demand. The government is creating a set of permits, and the prices in the case of SO2 is resulting sort of -- sort of -- it's a -- it's a free-market price. So the supply is set based on the permits that the government is creating, and the demand is a function of how much usage, economic usage, there is of the SO2-producing coal power plants in particular. So it's a free market outcome.

MR. BOB PETERS: Would this board be correct in concluding that the volatility between on-peak and off-peak pricing is due to the difference between natural gas to generate electricity on-peak and the coal-generated electricity off-peak?

MR. JUDAH ROSE: Again, that's a -- a significant portion of it, but it is -- I think also in some hours, you -- you have to rely on the most expensive coal plants and/or the most expensive gas plants, so it's -- but the difference between coal and gas is a significant portion, and it is something that we -- we have had to tease apart and -- so there is some complexity to it, but I think it's okay to sort of, with the caveat, to say gas is more on-peak than -- and coal is more off-peak. That -- that's fine, but there are some caveats to it related to the fact that it's -- there's some more complicated phenomenon.

(BRIEF PAUSE)

MR. BOB PETERS: Before we leave page 42, Mr. Rose, the prices you've given on your chart of the MISO on-peak, those are average prices over the course of the full year, correct?

MR. JUDAH ROSE: Yes, sir.

MR. BOB PETERS: And can we conclude that off-peak prices are always lower than on-peak prices?

MR. JUDAH ROSE: No, but, on average -- you know, again, if you refer to page 99, I think you'll see that, in every year, the off-peak price is lower than

the on-peak price, which is what you'd expect. All I'm saying is is that, for example, it might be on -- there are some off-peak hours in which the price is higher than the on-peak hour, but that --

MR. BOB PETERS: That's rare.

MR. JUDAH ROSE: -- would be -- you know, on the weekends sometimes, if -- it depends how -- also how you define on-peak. If you define it five (5) by sixteen (16) is on-peak, that means the two (2) is the Saturday and Sunday.

So, for example, you could have a situation in which your off-peak during, say, the afternoon on Saturdays -- the prices could be higher than the -- some of the on-peak hours, but as you can see here -- and I -- and I don't mean to belabour the point, but you can see that, on an average basis in every year, the off-peak price is lower.

MR. BOB PETERS: And, in fact, ICF has concluded in its report that the off-peak prices are only 43 percent of on-peak prices for the 1997 to 2009 period?

MS. PATTI RAMAGE: Do you have a reference, Mr. Peters, just to move things a little faster?

MR. BOB PETERS: Yeah, I'm sorry.

CONTINUED BY MR. BOB PETERS:

MR. BOB PETERS: Page 70 of the pre-filed evidence, Appendix 12.2, I believe.

MR. JUDAH ROSE: You know, I've -- I've looked at page 99, and 42 percent looks like a -- a pretty good number for the average 1997 to 2010.

MR. BOB PETERS: And so that average, Mr. Rose, is that the off-peak prices are 42 or 43 percent of what the on-peak prices are over that time period?

MR. JUDAH ROSE: Yes, on -- on average. I think that's a fair characterization of the historical evidence.

MR. BOB PETERS: Mr. Chairman, with that answer, and in light of the hour, this might be an appropriate place to adjourn for the day.

THE CHAIRPERSON: Very good, Mr. Peters. We'll look forward to everybody being back tomorrow at 9:30. And thanks to Mr. Rose for his patience today, and hope he has a -- a good rest overnight.

MR. JUDAH ROSE: You're welcome.

THE CHAIRPERSON: Don't wander around outside too much.

MR. JUDAH ROSE: It's cold, huh? Okay.

(WITNESS RETIRES)

--- Upon adjourning at 4:28 p.m.

Certified Correct

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Cheryl Lavigne, Ms.