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MANITOBA PUBLIC UTILITIES BOARD

Re: MANITOBA HYDRO
NEEDS FOR AND ALTERNATIVES TO
REVIEW OF MANITOBA HYDRO'S
PREFERRED DEVELOPMENT PLAN

Regis Gosselin - Chairperson
Marilyn Kapitany - Board Member
Larry Soldier - Board Member
Richard Bel - Board Member
Hugh Grant - Board Member

HELD AT:

Public Utilities Board
400, 330 Portage Avenue
Winnipeg, Manitoba
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Pages 1255 to 1591

APPEARANCES

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--- Upon commencing at 9:01 a.m.

THE CHAIRPERSON: Good morning, everyone. I hope everyone had a good weekend. I will ask Mr. Peters whether he has any administrative matters before we begin, or any of the other counsels, if they have anything that they would like to address before we start the formal part of the proceedings.

MR. BOB PETERS: Yes, thank you. Good morning, Mr. Chairman. Administratively and, as we call it, housekeeping-wise, we have nothing at this side of the room, and I'm not aware of any other matters from counsel opposite. But if they do, they can certainly grab the microphone. I see Ms. Menzies is -- is the first to reach it.

MS. MEGHAN MENZIES: We just want to submit CAC Exhibit 26-1, which is a revision of Dr. Gotham's evidence. It was distributed on Friday, but a hard co -- I have hard copies here if anyone would like any. Yes. Kurt says, "Yes."

(BRIEF PAUSE)

MR. BYRON WILLIAMS: I -- I think that ends our administrative matters.

THE CHAIRPERSON: Good morning, Ms. Ramage. You'll be pleased to know that the panel members have been canvassed and they have done their homework.

MS. PATTI RAMAGE: I'm very pleased to hear that. We have a little more. This morning, Manitoba Hydro has distributed some light reading for you. It is the brief presentation you're going to hear this morning. 'Brief' is a relative term. This is brief given the topics we're going to cover this morning, but that's been -- I think, hard copies distributed in the room and should be, if our count is correct, Manitoba Hydro Exhibit 95.

This morning and for the next week, Manitoba Hydro is going to be presenting its Needs For and Alternatives To Panel. This panel is a -- a very large panel, the largest I've ever had to deal with in this hearing room. We are taking up the front and back row of the hearing room.

In discussions with Board counsel, next week, to make this a little more breathable from this end, we will do our direct this morning and members of the panel will give their directs. And with Mr. Peters's assistance and counsel's assistance, what we're going to try to do is put the panel members who

are dealing with particular topics into the front row, let the other panel members even go to the gallery or -- or listen from upstairs, but they'll be close by if they're needed, but it will allow our panel members to have their usual support wi -- support people in the back row. So if you see some movement, don't be alarmed. No one will be leaving and -- and escape from cross-examination.

I hadn't intended to introduce the panel just in the interest of time. We were going to jump straight into cvs. But given its size and the confusion we've already seen this morning with getting everyone seated, I thought it would be worthwhile.

To my immediate left, you are all now familiar with Ed Wojczynski. Following down the panel is Joanne Flynn, who's our division manager of Power Planning and co-lead in the NFAT with Mr. Wojczynski. Next is Terry Miles, who's the manager of Resource Planning and Market Analysis.

Next to Terry is Dr. Adam Borison, who is with Navigant Consulting. And at the end is David Cormie, who's the division manager of Power Sales and Operations.

Now, if we go to our back row, we have Dr. David Jacobson, who is responsible for

interconnections at Manitoba Hydro. He's the sect -- section head in transmission responsible for that area. Ian Page has already testified, our division manager of Corporate Planning and Strategic Review.

Next to Mr. Page is Bill Hamlind. He's our manager of Energy Policy and Analysis. And then we have Mr. David Bowen, who's the manager of Project Servicer -- Project Services in New Generation construction. Kelly Hunter is the senior market and planning engineer. Kelly -- Mr. Hunter is providing witness support.

Next to Mr. Hunter is Dr. Dean Murphy, who is with the Brattle Group. And then finally, behind me is Ms. Natalie Sever, who's the senior business analysis (sic) of Resource Planning.

So with that, I would suggest that the panel be sworn. And we will walk through the cvs of all of the panel members, following which they will launch into a presentation.

MANITOBA HYDRO PANEL 4:

ADAM BORISON, Sworn

DAVE BOWEN, Sworn

DAVID CORMIE, Sworn

JOANNE FLYNN, Sworn

BILL HAMLIN, Sworn

TERRY MILES, Sworn

DAVID JACOBSON, Sworn

DEAN MURPHY, Sworn

IAN PAGE, Previously Sworn

ED WOJCZYNSKI, Previously Sworn

MS. PATTI RAMAGE: Thank you, Mr. Simonsen. And with that, we will lead into our direct, first reviewing the qualifications of the panel.

Ms. Flynn, could you please outline your experience and qualifications, as well as your role in the -- in Manitoba Hydro's NFAT filing?

MS. JOANNE FLYNN: I am a certified general accountant, and have completed the executive management program from Queen's University. I have been with Manitoba Hydro since 1982, and have been the division manager of Power Planning since 2007, responsible for providing direction oversight to the generation planning function at Manitoba Hydro.

Prior to that, I was manager of Export Power Marketing in Power Sales and Operations for six (6) years, where I gained knowledge in Manitoba Hydro's export markets. I was also a board member on the Wuskwatim General Partnership for six (6) years, and

I'm currently the alternative member for Manitoba Hydro for the generation council of the Canadian Electricity Association.

With respect to the NFATs, together with Mr. Wojczynski, I am responsible for leading the NFAT team, providing direction and oversight to the preparation of the NFAT business case with specific emphasis on the economic analysis.

MS. PATTI RAMAGE: Thank you, Ms. Flynn. And, Mr. Miles, can you outline your experience and qualifications, as well as your role in the NFAT?

MR. TERRY MILES: Okay. I am a -- currently registered as a professional engineer in the Province of Manitoba, and I'm the manger of Resource Planning and Market Analysis. As manager of Resource Planning and Market Analysis, I oversaw the review and screening of resource options and the integration of corporate assumptions and forecasts into the formulation and evaluation of development plans.

Prior to my role as manager of Resource Planning and Market Analysis, I served fifteen (15) years in the Hydraulic Engineering and Operations Department at Manitoba Hydro serving various capacities, from hydraulic studies engineer, to Water

Resource Section head, to manager of the department for the remaining five (5) years. In total, I've been at Manitoba Hydro twenty-one (21) years.

MS. PATTI RAMAGE: Thank you. And I'm going to skip over Dr. Borison for a moment and deal with our external witnesses separately.

So, Mr. Cormie, can you outline your experience and qualifications as well as your role in Manitoba Hydro's NFAT?

MR. DAVID CORMIE: Yes. My position at Manitoba Hydro is division manager of Power Sales and Operations. I've held this position for almost fourteen (14) years. Prior to that, I was manager of Energy Supply and Sales, which position I assumed when Manitoba Hydro functionally separated into business units in response to deregulation of the electricity industry in the mid-1990s. In total I have been employed at Manitoba Hydro for thirty-four (34) years. I have a bachelor of science degree in civil engineering, and am a registered professional engineer in Manitoba.

I'm responsible for directing Manitoba Hydro's activities in the wholesale export market, from the sale of electricity in real time to all long-term sale agreements, all marketing and regulatory

activities, and the management of Manitoba Hydro's transmission reservation portfolio. The export term sheets, contracts, and business relationships that form part of Man -- of the NFAT filing were all negotiated under my direction. In addition, I am responsible for directing the day-to-day operation of Manitoba Hydro's system of reservoirs in energy planning and the operational time frame.

MS. PATTI RAMAGE: Thank you, Mr. Cormie. And going to the back row, Dr. Jacobson.

Can you please outline your experience and qualifications as well as your role in the NFAT filing?

DR. DAVID JACOBSON: Yes. I am a professional engineer registered in the Province of Manitoba. I've got a bachelor's degree, master's degree, and a doctorate degree from the University of Manitoba. I'm currently an adjunct professor at the University of Manitoba in the Department of Electrical and Computer Engineering.

I have almost twenty-five (25) years of experience in transmission planning. I started at Manitoba Hydro in 1990. I took a one (1) year sabbatical leave from Manitoba Hydro and worked with Siemens in Germany in their System Planning Department,

working on HVDC transmission in South Africa.

Currently, I'm a section head in the System Planning Department. I'm in charge of planning generator interconnections, and planning interconnections to neighbouring utilities. My section is also responsible for probabilistic planning, NERC standards relating to planning authority in the transmission planner, as well as many other specialized studies.

I currently represent Canada on the NERC planning committee. I'm a technical review committee member on the Minnesota Renewable Integration Study that's currently underway, examining up to 50 percent solar and wind up by 2030. I'm also a steering committee member of the Pan-Canadian Wind Integration Study Group that's examining 25 percent wind in -- across Canada by 2025.

I have been called to be an independent expert witness in Newfoundland, looking at the Muskrat Falls and the Maritime HVAC Projects. I've published roughly twenty-five (25), or co-authored -- authored roughly twenty-five (25) international journal papers. I'm a senior member of the IEEE, the Institute of Electrical and Electronic Engineers. I'm a distinguished member of CIGRE, which is a similar group

to IEEE, but it's European or more world -- word fo -- world focussed. It's a council on large high-voltage apparatus.

My role in NFAT has been all things transmission. I've assisted with integrated planning of generation and transmission alternatives, determined planning-level cost estimates. I've liaised with independent experts, power engineers in La Capra, to help them understand the transition plan. Thank you.

MS. PATTI RAMAGE: Thank you. And now we will go to Mr. Hamlin. Mr. Hamlin, can you please outline your experience and qualifications, as well as your role in the NFAT filing?

MR. BILL HAMLIN: Hello. I'm a registered professional engineer in the Province of Manitoba. I'm a manager of Energy Policy and Analysis in Manitoba Hydro. I've worked for Manitoba Hydro since 1989. I am chair of the Canadian Hydro Power Association's Clean Energy Work Group.

I've done several things in the past related to carbon policy. I was on the work group that set up the rules for the Chicago Climate Exchange, and I chaired the Chicago Climate Exchange offset committee for several years.

My responsibility and roles related to

NFAT are energy policy, carbon policy, renewable policies, and carbon pricing.

MS. PATTI RAMAGE: Thank you, Mr. Hamlin. Mr. Bowen, could you please outline your experience and qualifications as well as your role in the NFAT filing?

MR. DAVE BOWEN: Good morning. I'm a professional engineer registered in the Province of Manitoba. I have a bachelor degree in civil engineering from the University of Manitoba, and also a master's degree in structural engineering.

I've been in Hydro for the last eight (8) years. I started basically at the start Wuskwatim construction in the summer of 2006 in the role as the Project Services Section head responsible for the cost schedule components of the project.

I also worked two (2) years as the civil engineer for the Pointe du Bois project when we were looking at the different redevelopment options. For the past three (3) years, I've been the manager of the Project Services Department, responsible to support our new gener -- New Generation Construction Division and aspects of schedule, cost, risk management, project accounting, document management, and project liaison.

Prior to coming to Manitoba Hydro, I

worked for a local engineering consulting firm in -- in Manitoba, focussed on large infrastructure projects in the province.

In terms of the NFAT, I'm responsible for all things dealing with the Keeyask and Conawapa capital cost estimates and execution.

MS. PATTI RAMAGE: There. I'd now like to turn our attention to our external expert witnesses that Manitoba Hydro is presenting this week. First to Dr. Borison.

Dr. Borison, you are a director of Navigant Consulting Inc., practising in the power systems marketing -- markets and pricing group.

Is that correct?

DR. ADAM BORISON: That is correct.

MS. PATTI RAMAGE: And you were retained by Manitoba Hydro to assist in analysis undertaking and evaluation of Manitoba Hydro's development plans, and to provide assistance in the preparation and examination of Manitoba Hydro's NFAT submission?

DR. ADAM BORISON: Yes, I was.

MS. PATTI RAMAGE: And you've also prepared a report titled 'Economic Uncertainty Analysis: Overview and Concerns', which has been filed

as Schedule 3 to Manitoba Hydro's rebuttal evidence --

DR. ADAM BORISON: Yes, it --

MS. PATTI RAMAGE: -- which is Exhibit 85?

DR. ADAM BORISON: Yes.

MS. PATTI RAMAGE: Can you please describe for the Board the primary areas of focus in your work for Manitoba Hydro?

DR. ADAM BORISON: Sure. My background is very much in uncertainty analysis. And what we were asked to do was to support and assist Manitoba Hydro in the incorporation of uncertainty in their economic evaluation. And that's something I've done for many years.

MS. PATTI RAMAGE: Dr. Borison, your CV has been filed with the Board as part of Manitoba Hydro's Exhibit 92, I believe it is.

Can you describe your qualifications and experience related to the work undertaken for Manitoba Hydro?

DR. ADAM BORISON: Sure. Thank you. Well, let me go way back. I started in science and policy. I have an undergraduate degree in biochemistry from Yale and a -- a public policy degree from Harvard a long time ago, and then turned my attention more to

planning and analysis.

And so I got a PhD at Stanford in utility planning, of all things, and generation planning under uncertainty many years ago and began roughly a thirty (30) year career in the application of analytical tools, decision theory, finance theory, economics, optimization to energy, other fields as well, but primarily to utility planning.

So I've spent, again, probably twenty-five (25) or thirty (30) years trying to apply those tools, this kind of analytical work, to energy decisions, in particular, power decisions, in a variety of context. And that's -- and I've done that again now for about thirty (30) years.

MS. PATTI RAMAGE: Could you generally describe the -- the type of clientele you work for?

DR. ADAM BORISON: Sure. In my career, I've worked for a variety of many utilities, many of them in North America, but also around the world, to some extent. I've also worked for government agencies, various kinds, and some international work for mining companies, including some in Canada and Australia.

A pretty varied career in terms of typically corporate clients or organizations that are power generators, let's say. I've done a modest amount

of government work for development banks or for the EPA in -- in the US. But primarily my clients would be companies or organizations that have a decision to make about some kind of -- typically, a major investment; could be a power plant, could be a transmission line, could be a pipeline. In ca -- some cases, I've done water, dams of various kinds.

Sometimes this issue -- issues are operational. I did a lot -- a lot of work, for example, for TVA on their fuel buying policy, so. But generally, these are companies or organizations that have a presence in the energy industry and largely power.

MS. PATTI RAMAGE: Thank you. With that, Mr. Chair, I would ask that Dr. Borison be accepted by the Board as an expert for the purpose of giving evidence on the identification, representation, and -- and incorporation of uncertainties in economic eva -- in the economic evaluation of development alternatives for -- that is, in Manitoba Hydro's case, resource options, resource plans, and resource pathways.

THE CHAIRPERSON: Thank you, Ms. Ramage. And I call on Mr. Williams. Do you have any concerns or objections about...?

MR. BYRON WILLIAMS: We have no objections to the -- the characterization of the wi -- witness's expertise, and we accept him as qualified.

MR. WILLIAM GANGE: Green Action Centre. The same. We have no objections.

THE CHAIRPERSON: Maitre Hacault...?

MR. ANTOINE HACAULT: I just have three (3) or four (4) questions with respect to the CV.

Dr. Borison, one (1) of your publications was entitled 'Forecasting Long-run Energy' -- 'Electricity Prices', published in 2006.

Did you write any similar articles or analysis since then?

DR. ADAM BORISON: Not on that topic, as far as I remember.

MR. ANTOINE HACAULT: You've shown on your CV having done work for East Coast Utility environmental compliance strategy, correct?

DR. ADAM BORISON: Yes.

MR. ANTOINE HACAULT: With respect to that work, was it the subject of hearing or any articles with respect to the issue of declining demand and volatile fuel prices inter alia?

DR. ADAM BORISON: No, that particular project, I -- I can tell you who it was for. It was

presented to the board, I believe. I presented it to the management, but I -- I wasn't party to any particular hearing on that.

MR. ANTOINE HACAULT: And there's no published articles with respect to that work?

DR. ADAM BORISON: Not that I'm aware of.

MR. ANTOINE HACAULT: Thank you. Those are all my questions. No objection to the expertise as stated.

THE CHAIRPERSON: Mr. Orle...?

MR. GEORGE ORLE: No objection to qualification as an expert. Thank you.

THE CHAIRPERSON: Mr. Shefman...?

MR. COREY SHEFMAN: We have no objection to the qualification of the witness as an expert.

THE CHAIRPERSON: Okay. M. Monnin...?

MR. MICHAEL WEINSTEIN: No objections either. Thank you.

THE CHAIRPERSON: Yes, the panel will accept this as -- Mr. Borison as an expert witness.

MS. PATTI RAMAGE: Thank you. And then we'll -- our -- our last witness of this group -- and I should say of this group today. We will be bringing in

two (2) additional expert witnesses on Wednesday. That the plan is to have them in and out in a day. They're -- they're -- Dr. Borison and Dr. Murphy intend to be with us all week.

But if I could turn your -- my attention to Dr. Murphy. This is a little odd, speaking behind me.

But could you please outline your qualifications with respect to developing long-term electricity price forecasts and experience with the MISO market? In particular, your education, professional experience, and previous testimony before regulatory tribunals?

DR. DEAN MURPHY: Yes, I'll start with my education. I have a bachelor's degree from the Johns Hopkins University in material science and engineering. I have a master's degree and also a PhD from Stanford University. The master's degree is engineering economic systems. The PhD was in industrial engineering and engineering management.

I have been an energy economist for almost twenty (20) years, and virtually all of my work during that time has been in the electric power industry. Some related work in fuels, fuels that are important for the electric industry.

I have worked for electric utilities, both public utilities and investor-owned utilities. I've done work for merchant power producers and investors, and bond holders for merchant and merchant power producers. I've worked for industry groups and state agencies. All of this related to the electric power industry.

My work has been concentrated in North America, the US and Canada. Among other things, I have done power price forecasting. Most of my forecasting work has actually been done in a larger context; for example, as a part of an integrated resource plan or in evaluation where a forecast power price is a necessary component to perform evaluation for a particular asset or a contract.

I have done climate policy analysis for utilities, for fuel suppliers, for -- for several different utilities. I have worked on industry structure and market behaviour with attention to market power issues. I have done a little bit of work on cost allocation. Frequently, finance issues come up in the context of the work that I have done.

My testimonial experience, I appeared several times before the Connecticut Department of Public Utility Control in support of the Connecticut

Integrated Resource Plan, which I was involved in developing I -- over -- over several different versions of that plan over time.

I provided testimony in the US Court of Federal Claims regarding the -- the claims for the cost of storage of spent nuclear fuel from utilities that -- that have filed claims against the US government. There have been a couple of other cases where I have provided expert witness reports or affidavits, but those cases settled prior to going to trial or arbitration.

MS. PATTI RAMAGE: Dr. Murphy, and you may have covered some of this, but can you describe your position at the Brattle Group?

DR. DEAN MURPHY: I'm a principal with the Brattle Group. I joined Brattle in 1995 as an associate, was promoted to a senior associate, and then in 2006 was promoted to principal. During that time there, I have -- as I have said, I have done -- virtually all my work has been with the electric utility or with the electric industry, and/or industries that are closely related such as fuels industries.

MS. PATTI RAMAGE: The Brattle Group has provided -- has been providing electricity and

fuel-price forecasts for Manitoba Hydro for a number of years. And that forecast is included in Manitoba Hydro's consensus electricity price forecast.

Are you aware of that, and what's your role?

DR. DEAN MURPHY: Yes, that's -- that's my understanding, that the 2013 price forecast that I developed is included in the NFAT filing.

MS. PATTI RAMAGE: And had you done previous forecasts for Manitoba Hydro?

DR. DEAN MURPHY: Yes, I've been doing forecasts for Manitoba Hydro for several years. Approximately five (5) years.

MS. PATTI RAMAGE: The Brattle Group also prepared a report titled 'Long-term Price Forecast for Manitoba Hydro's Export Market in MISO', and that is filed as Appendix 3.1 of the NFAT filing.

Were you involved in that?

DR. DEAN MURPHY: Yes, I led the development of that report which was completed last summer, and included in Manitoba Hydro's filing. That is a -- more of a qualitative, descriptive report, talking about the -- the factors and the major primary drivers of electric power prices. It did not include a quantitative forecast, but you can think of that as a -

- a complement to the forecast work that I've done.

MS. PATTI RAMAGE: And, to clarify, in addition to the long-term price forecast, the Brattle Group also has provided a -- a report titled 'Electricity Market Overview for Manitoba Hydro's Export Market in MISO', which is filed as Appendix 5.3 in the NFAT filing.

Were you involved in the preparation of that report?

DR. DEAN MURPHY: Yes, and my apologies. I may have confused the two (2) reports. Yes, I -- I was -- I did develop that.

MS. PATTI RAMAGE: Thank you, Dr. Murphy. Manitoba Hydro is requesting that the Board qualify Dr. Murphy as an expert for the purposes of giving evidence in the long-term power and fuel pra -- in long-term power and fuel price forecasting, including new generation entrant analysis, market drivers and behaviour, and market rules and mechanics as they relate to the MISO region.

THE CHAIRPERSON: So, Dr. Murphy, could you -- could you focus your -- your description of experience in the MISO market? Could you -- could you -- I mean, you've -- you've -- you have a wide range of experience in the US and Canada and so on, but I'd like

to know specifically your experience with the -- the MISO region.

DR. DEAN MURPHY: Yes, in addition to the work that I've done for Manitoba Hydro over time, I've also worked for several other clients. I believe that they have all been merchant generators located in the -- in the MISO footprint, and those have been mostly issues of valuations of a particular asset or contract that those merchant generators either -- either possessed or were interested in acquiring. And -- and those would typically involve a five (5) to fifteen (15) year forecast, not quite as long as the forecasts that I've done for Manitoba Hydro.

THE CHAIRPERSON: So what I understand is you have done an examination of the factors that impact on prices in the MISO region. Did I correct --

DR. DEAN MURPHY: Yes.

THE CHAIRPERSON: -- did I--

DR. DEAN MURPHY: Yes.

THE CHAIRPERSON: -- I'm saying that correctly?

DR. DEAN MURPHY: That's true.

THE CHAIRPERSON: So have you done that just for the one (1) time period, or you've done it for an extensive period of time, or...

DR. DEAN MURPHY: I -- I've done it in a couple of instances for different -- for different assets in -- in different locations within MISO.

THE CHAIRPERSON: Mr. Williams, do you have any concerns or objections about this witness?

MR. BYRON WILLIAMS: I don't think I have any concerns, but I do have some questions for this wis -- witness, if I might, Mr. -- Mr. Chair.

Dr. Murphy, in -- in your work for Manitoba Hydro or other merchant industry -- utilities in the US marketplace, and -- and -- would your work involve an assessment of the evolution, or -- or revolution in the -- the US marketplace, including resource planning choices amidst uncertainty?

DR. DEAN MURPHY: Yes, that's certainly a fair characterization. My work for Manitoba Hydro is explicitly -- involved characterizing a number of different potential futures and what would occur in those, and in the other engagements that I've done, both inside MISO and outside, I have -- I can't say in all cases, perhaps, but in -- certainly in the majority of cases, we look at uncertainty on the primary driving factors.

MR. BYRON WILLIAMS: And way back when you were the author of 'US Should Price Carbon

Directly', back in 2007, does that ring a bell, sir?

DR. DEAN MURPHY: That was some time ago, yes.

MR. BYRON WILLIAMS: Yes. And you would also be the author -- co-author of 'Reviving Integrated Resource Planning for Electric Utilities: New Challenges and Innovative Approaches'.

Would that be fair, sir?

DR. DEAN MURPHY: Yes.

MR. BYRON WILLIAMS: And you played a significant role in the development of integrated resource planning in the state of Connecticut, both in 2009 and 2010?

DR. DEAN MURPHY: Starting in 2008, again in 2009, and again in 2010, yes. The Brattle Group has also been involved in the Connecticut Resource Plan subsequent to 2010, but I have been much less involved in those -- in those predictions.

MR. BYRON WILLIAMS: And -- and just, Mr. Chair, certainly in terms of the characterization of Dr. Murphy's expertise, our client has no objections. We understand that implicit within that is expertise in integrated resource planning, and that's -- I just wanted to confirm our understanding of that.

MS. PATTI RAMAGE: If Mr. Williams

accepts that that is -- it -- it appears it would be accurate. This is not part of the witness's report for Manitoba Hydro or part of his services, per se. He was retained as -- to provide the export price forecast, but if it's factually correct, it's factually correct.

MR. BYRON WILLIAMS: Okay. So we certainly would seek to just have an acknowledgement of his expertise in integrated resource planning.

MS. PATTI RAMAGE: I don't have a problem with it, but my concern is his report is what his report is, and -- and the purpose of coming to testify is to speak to the materials in his report, not to -- to start trailing off into new areas for which he was not retained.

MR. BYRON WILLIAMS: We will -- as long as his expertise is qualified, we're quite confident our cross-examination will be relevant.

MS. PATTI RAMAGE: And as long as it's part of Dr. Murphy's report, we have no issue either, so I think we just move forward from here.

THE CHAIRPERSON: Mr. -- Mr. Gange?

MR. WILLIAM GANGE: I think I'll be a little bit shorter, yes.

THE CHAIRPERSON: M. Hacault...?

MR. ANTOINE HACAULT: One (1) or two

(2) questions again. In your CV, Dr. Murphy, the second page, you list working for an electric company considering large additions of hydroelectric capacity for off-system sales, and it continues.

Was this a -- a investor-owned utility or a -- a Crown utility?

DR. DEAN MURPHY: I -- I don't have a copy of my CV in front of me, but I suspect that refers to Manitoba Hydro.

MR. ANTOINE HACAULT: Okay. In that description, it indicates the assignment was repeated several times with respect to possible evolution of several key market drivers, forecast long-term market prices.

Do you recall how many times that assignment was, in fact, completed, sir?

DR. DEAN MURPHY: I -- I've be -- I've been providing forecasts to Manitoba Hydro for about the last five (5) years.

MR. ANTOINE HACAULT: Okay, but this seems to go a little bit further than just forecast. It says -- talks about the evolution of several key market drivers and looking at a set of future scenarios, and my question to you was, With respect to that part, how many times would you have performed

that?

DR. DEAN MURPHY: Well, the -- the investigation of the key market drivers and the development of the scenarios is all part -- is all a part of the developing the forecast that I provide to Manitoba Hydro. You'll see in -- in my report, Manitoba Hydro requested a -- a base, a high, and a low electricity price forecast, but I developed a larger number of scenarios, in part because, a priori, prior to doing the analysis, it's not clear which are the sets of drivers that will give the high electricity prices or low.

And so that consideration of the -- of the driving factors in development scenarios, in my view, was a -- was part and parcel of developing the forecasts.

MR. ANTOINE HACAULT: But I note that prior to working in -- at the Brattle Group, that you worked as an associate as Applied Decision Analysis Inc., correct?

DR. DEAN MURPHY: That's correct.

MR. ANTOINE HACAULT: And at that time, you were working with Dr. Borison. Would that be correct?

DR. DEAN MURPHY: That's true. I did

work with Dr. Borison at that time.

MR. ANTOINE HACAULT: Okay. How many years had you worked at Applied Decision Analysis prior to joining Brattle Group, sir?

DR. DEAN MURPHY: I joined Applied Decision Analysis in 1985, and I was there until 1989 when I went back to Stanford to pursue my doctoral work, so about four (4) years.

MR. ANTOINE HACAULT: Okay. Thank you. No other questions.

THE CHAIRPERSON: Merci, M. Hacault. Mr. Orle?

MR. GEORGE ORLE: No questions and no objection to qualification.

THE CHAIRPERSON: Mr. Shefman, please.

MR. COREY SHEFMAN: No -- no objection to qualification.

THE CHAIRPERSON: M. Monnin -- or M. Weinstein?

MR. MICHAEL WEINSTEIN: No objections, Mr. Chair.

THE CHAIRPERSON: Thank you. The panel will accept this -- Dr. Murphy as an expert witness.

(BRIEF PAUSE)

EXAMINATION-IN-CHIEF BY MS. PATTI RAMAGE:

MS. PATTI RAMAGE: Thank you, Mr. Chair. With that, Manitoba Hydro would like to begin its presentation for the Needs For And Alternatives To panel. Ms. Flynn will lead that presentation. And we are going to be relying on the technology to bring this up on the screen. And it is working, apparently.

So I will turn the mic over to Ms. Flynn.

MS. JOANNE FLYNN: Good morning, Mr. Chair, Board members, and all present. I will start the presentation for Manitoba Hydro's direct evidence for this panel, need alternatives and economic evaluation panel.

The need alternatives and economic evaluation panel covers a broad range of topics, including the assumptions used in the economic, financial, and multiple account analyses provided by Manitoba Hydro. For example, the assumptions related to energy price forecasts, the economic indicators, and capital costs fall under this panel and will be discussed, along with the economic results and reliability and security of power.

I went the wrong way. Okay. to first of all, the need for new resources. At the time of the

preparation of the NFAT business case, new resources were required for Manitoba load to meet a dependable energy shortfall in 2022, with the need for winter peak capacity identified as 2025. With the 2013 update that was included in the NFAT submission this resulted in a change in the dates and the need for new resources one (1) year later, in 2023 and in 2026 for capacity.

The table also shows the dates with no new generation and no new exports. All the dates on the table are with no new generation and no new exports. And the table also shows the impact of the level of DSM, three (3) levels of DSM, on the dates for the need for new resources. The dates that are shown on the table also are used in the evaluation for DSM.

In the overview on March the 3rd, Mr. Wojczynski described the impact of DSM and load on the dates for needing new resources as a result of the pipeline load and the likelihood that not all of DSM Level 2 would be implemented and that DSM Level 3 is a higher level of DSM than is likely to occur.

As shown on the slide, the Keeyask advancement would likely be from six (6) to nine (9) years, depending on the amount of DSM savings and the changes in load due to the pipeline.

Determining the need for new resources

considers three (3) things: the demand, which consists of forecasted Manitoba load net of forecasted DSM shown as total demand, including exports, on the slide; the -- - the Manitoba Hydro system resources, shown as base supply on the si -- slide; and the generation planning criteria, which provides the definition of 'supply'.

The need for new resources is determined by comparing annual supply and demand values for each year of the study period before considering the addition of new resources.

The need for and timing of major new resources to address a deficit in either winter peak capacity or in dependable energy is established when persistent deficits occur, while intermittent or short-term deficits are -- would be met with purchases which would be arranged closer to but in advance of the need.

With respect to Manitoba Hydro's generation planning criteria, Manitoba Hydro has technical criteria for ensuring that the lights stay on, that our homes are warm, and industry continues to hum in the province. This is a responsibility that Manitoba Hydro takes very seriously and that generation planners and systems operators lose sleep over.

We cannot underestimate the responsibility that Manitoba has -- Manitoba Hydro has

for reliability and dependability of supply to Manitobans.

This technical criteria is the means by which Manitoba Hydro ensures the continuance of a supply of power adequate for the needs of the province, as mandated in the Manitoba Hydro Act. The generation planning criteria is used to determine when new supply is needed, and how much. It does not define what type of new supply is chosen. That is the subject of extensive analysis, including economic, financial, and multiple-count analysis.

Manitoba Hydro's generation planning criteria consists of two (2) separate criterion, both of which must be met to ensure adequate supply. The first requirement shown is the capacity criterion. This type is used in all power systems. The capacity criterion requires a reserve of generation capacity above the forecast peak load to account for weather-related load forecast uncertainty and outages or breakdowns of generation equipment.

This criterion is designed to ensure that the load can be served under system peak conditions; that is, the minus 35 or minus 40 degree winter day, conditions which are experienced a small number of hours per year. Such a criterion is

consistent with industry practice and the expectations of NERC, the North American Electric Reliability Corporation. Manitoba Hydro's capacity criterion is expressed as a percentage of the forecast peak load, and that percentage is 12 percent.

The second requirement is the energy criterion. Energy criterion are used only in predominantly hydro systems or other systems where running out of energy due to an extreme drought or due to fuel supply limitations is a real possibility. The energy criterion ensures sufficient energy will be available to serve the load during a critical energy event; in the case of Hydro, the worst drought in record, something we refer to as the 'dependable flow year'.

The energy criteria is applied on an annual basis to ensure there is sufficient energy over the course of the entire year during the dependable flow year. The energy criterion is in place to ensure that we don't run out of energy in a severe drought, and includes imports from neighbouring utilities.

The implications of a shortage in energy in an energy-limited hydro system such as ours are more -- are a more serious situation than a capacity shortage in a non-energy-limited system such as a

thermal system, where a capacity shortage would likely appear as power alerts during periods -- periods of extreme demand, such as those caused by extreme hot or cold weather, and might result in rotating blackouts for a period of hours or possibly for several consecutive days.

Energy is not a short-term -- energy is not a short-term event and would be a real concern in Manitoba. Potentially, there could be a need -- an appeal for energy conservation, but not just for a period of hours or for several consecutive days, but for an entire winter, with the threat of rotating blackouts due to a lack of energy at any time during the winter and that which will last until it starts to rain.

I would like to remind you of a couple of examples with regard to the reliability of power. The first is one that occurred just in January of this year, where there were issues in Newfoundland and where, after four (4) days of rolling blackouts and a transformer fire and a power plant malfunction that left residents in the cold. That -- with that power failure there were a hundred and ninety thousand (190,000) of five hundred and twenty thousand (520,000) customers in the province affected by the event.

Another event in July of 2012. Rolling blackouts hit Alberta as power generating stations failed in a heat wave. In this case, six (6) power generating stations failed, causing rolling blackouts and an appeal for energy conservation.

So these events are real events, and they happen -- and they happen.

THE CHAIRPERSON: On that point, though, just -- I don't want to be objecting to anything, but those examples are not related to capacity or energy though. I mean, they're related to the ability to deliver service, right? I mean, the examples we're talking about, capacity and energy, related to the entire system as opposed to individual events that are not related to capacity or criter -- or energy.

MR. ED WOJCZYNSKI: The -- the examples -- and I was going to talk about this later on, but I'll -- we can discuss it briefly now -- is the outages in -- in the examples that were given, and there are other examples, some cases, outages are due to transmission outages. Other cases, they're due to generation outages. And sometimes it's a combination of the two (2).

If you look at the situation in

Newfoundland, it's a shortage of generation. If you're looking at the -- the situation in Alberta, there was a shortage of generation. For a number of years, Alberta was having trouble keeping up with having sufficient reserves, capacity reserves. And one (1) of the consequences was the -- were the outages they had a few years ago.

So in some cases, though, when there were the ice storms in Eastern Canada, that -- that was a transmission issue, not a generation issue. And when you -- later on when we get into the last part of the panel, when we look at the reliability of the system, that is the integrated reliability of the bulk system; meaning, for instance, the DC and the north-south AC, as well as the generation itself.

But -- but you're right, the capacity reserve is a generation issue, and there are load curtailments or blackouts in Canada that have occurred in recent times with shortages of generation.

And in Manitoba ourself, we've had -- until the mid-'70s, we had a number of localized or provincial blackouts and load curtailments. It wasn't due to a shortage of generation. That was a shortage of -- of the transmission.

But that was rectified for a number of

years with the addition of the major interconnection to Minneapolis, the 500 kV interconnection. And that's a demonstration of the benefit of having the -- the interconnections from the US. They can reinforce not just shortages of generation, but also transmission problems.

MS. JOANNE FLYNN: One (1) of the areas of interest in the NFAT is Manitoba Hydro's reliance on imports. Within the energy criterion, there are requirements which limit, for the purposes of planning the system, the degree of reliance on imports.

This limitation impacts the year in which new supply resources would be required. The limitation on imports that Manitoba Hydro has in place is the quantity of energy equivalent to that which can be imported during off-peak hours, and is not to exceed 10 percent of the Manitoba load plus exports.

The degree of reliance is limited for a number of reasons, including the potential for energy contingencies. And I'll give you some examples. A determination of need is based on the expected load forecast. This means that weather which is colder than the expected load forecast, which would be based on a normal winter, will result in an energy demand higher than normal 50 percent of the time.

The potential for extended outages of thermal generation or transmission capability for imports, or import limitations due to transmission restrictions with -- within the US, is another example.

And another one is water flow uncertainty where there is uncertainty as to when the precipitation will occur during a severe drought, which makes optimal water man -- energy management more challenging. In addition, we plan for a repeat of the historic drought of record, but we could experience a drought worse than the drought of record.

Limiting imports is common in power system planning. If we use BC Hydro as an example in the year 2016, they allow 33 percent, or one-third (1/3) more imports than Manitoba Hydro. However, they have or projected load that is over two (2) times larger than Manitoba Hydro's and an import capability about four (4) times larger than Manitoba Hydro's.

Another example is the US Pacific Northwest region, which have similar restrictions on imports from California.

In the end, it comes back to ensuring an adequate supply of energy for the Province of Manitoba. The capacity and energy criteria are reasonable and necessary measures in establishing this assurance.

MR. RICHARD BEL: I have a question. Who decides the maximum level of imports? Is that legislated, or is that a decision within Hydro or a Board decision? Who sets that number?

MS. JOANNE FLYNN: It is a decision set -- it -- it is a -- a limit set by Manitoba Hydro through policy.

MR. RICHARD BEL: And that number could be changed?

MS. JOANNE FLYNN: Yes, it could be changed.

MR. RICHARD BEL: Okay. Thank you.

MS. JOANNE FLYNN: Okay. Now -- we'll now move on to the screening of resource options. Chapter 7 of the NFAT submission covers the screening of resource technologies and resource options. Manitoba Hydro maintains an inventory of resource options capable of meeting future Manitoba needs.

The first step in the screening process is the identification of technologies. For the purposes of the NFAT, sixteen (16) utility scale technologies were considered in the resource screening process. For the purposes of the screening, both quantitative metrics and qualitative aspects of the technologies were considered. These characteristics

were categorized into the four (4) groupings shown on the slide: technical, environmental, social and policy, and economic.

This next slide itemizes the characteristics under each one (1) of the groupings. A high-level screening was then done of each of the technologies, and that is represented in Table 7.1 of Chapter 7. A number of technologies were screened out, so of the ten (10) resource technology categories, five (5) were screened out, and those are the categories of coal, nuclear, enhanced geothermal, biomass, and solar.

Now, I'll just speak for a -- a minute about the solar generation, and what -- what we screened out for solar was the utility scale generation, and it was screened out on the basis of the characteristics of cost, intermittency, and the fact that the Manitoba peak load occurs in winter when there is reduced sunlight.

There are global and regional aspects to the cost of utility scale solar generation. The cost of the components, in particular the solar module, can be si -- considered the type of costs that would be similar on a global basis, and a plant built in Manitoba would be exposed to that global trend.

The balance of plant costs, which

include civil and electrical works and related labour will vary by region. Manitoba -- Manitoba is considered a higher cost region related to general construction costs, overall high-skilled labour costs, and a shorter construction season due to the cold climate. So these are the reasons that utility-scale generation -- solar generation was -- were screened out.

The remainder of the options were selected for further study. So where -- where the technologies were selected, specific resources are identified. So, for example, in the case of hydro generation, the Keeyask and Conawapa projects were identified, and for natural gas-fired generation, specific heavy duty units were identified.

At this point, we have established need and identified resource options that can meet the need. I will now turn it over to Mr. Cormie to discuss exports and the window of opportunity. We'll just need a minute to -- the slide. Okay.

THE CHAIRPERSON: Before you go there, I just -- I just want to ask a question. I -- I just noticed that the -- and as a resource option you've -- you have indicated a level of imports. I just want to make sure that -- to follow-up on the question from

Board member Bel.

Is there a set percentage for the import limit that's imposed when you select your resource options?

MS. JOANNE FLYNN: The --

THE CHAIRPERSON: Or is it a soft target? Is it that just -- a principle?

MS. JOANNE FLYNN: No, it's a calculated -- it's a calculated limit. So the factors included in -- in calculating that would be the size of the import line. So you would have a -- an absolute physical restriction on how much you can -- can import.

In addition to that, the criterion is around the percentage of Manitoba load, but as long as we have export sales, the -- the quantity of exports would be added to that. So those numbers are actually calculated and can be found in the supply/demand tables.

THE CHAIRPERSON: And I guess the -- the follow-up question is, you know, if -- if power -- wind power is selling in the US at minus two (2) cents, wouldn't you want to load up? I mean, you -- taxpayers will pay for it in the US.

Well, let's load up on wind power from the US while it's available.

MS. JOANNE FLYNN: So the limit that we're talking about is related to planning for the system, so what this means is that there is a limit to how much we are willing to rely on as dependable energy. In the operating time horizon, the -- the system characteristics are there for the operators to use, so they have the choice in the operating time horizon.

If they see wind at minus two dollars ($-2) per megawatt hour, they can import. There's no restrictan -- restriction in the operation -- operating time horizon as to when they can import, but it will be affected by whether we have export obligations.

So in the on-peak hours, we tend to have export obligations, and you can't import and export at the same time, so we tend to -- to int -- we tend to import in the off-peak hours, which also tend to be the lower cost hours.

(BRIEF PAUSE)

CONTINUED BY MS. PATTIE RAMAGE:

MS. PATTI RAMAGE: I forgot to mention, Mr. Chair, we'll be passing the computer down as we go between witnesses.

(BRIEF PAUSE)

MR. DAVID CORMIE: Good morning, pa -- panel. I'm not used to sitting at this corner of the table. I feel like a lawyer today. And I'm not used to addressing Mr. Peters on the right and Mr. Williams on the left. I'm -- I'm a little bit confused. It's good to be back.

As Ms. Flynn has described and as we've indicated in our filing, Manitoba Hydro's planning involves a combination of activities: new generation, new transmission, additional imports and export sales, and a commitment to expanded DSM.

The purpose of my evidence this morning is discuss the critical roles that exports hold at Manitoba Hydro, how interconnections have been and will be key in the future.

As well, I -- as well, I will provide updated information on the recently signed sales agreements with Wisconsin Public Service, potential new agreements, progress on the new 500 kV interconnection, and an update on the Great River Diversity Exchange Agreement that was signed last fall.

Exports and the revenues that they generate are very -- a very high-profile activity. We

account hour by hour for the revenues that are generated, and report continually on the value of that activity, at times at much -- in much detail. This isn't surprising, given that they can make up 40 percent of the Company's revenues.

What is less obvious and much more lower-profile are the other values that our export activities create. There is no ongoing accounting of the cost saved or of the emergencies avoided because Manitoba has chosen to be interconnected to its neighbours, but our Preferred Development Plan that we are proposing does that. It is a combination of increased exports, increased imports, and increased reliability and these revenues and the reduced and avoided costs have been included in the economic analysises (sic) in all the comparisons.

Our plan is a plan that recognizes that through continued coordinated efforts with our neighbours, that more can be achieved by working together than by proceeding alone.

What are the shared benefits from working with our neighbouring utilities? Firstly, there's the efficient use of capital. Hydro was built in large blocks. Surplus capacity that's available can be sold. In-service dates can be adjusted. Capacity

can be shared when there is a lo -- is load diversity. Generation reserves can be minimized through pooling of reserve capacity.

From a production costing savings, fuel costs can be min -- minimized through economic dispatch. Why run an expensive generator when your neighbour has a lower-cost generator that can be run instead?

Why should Manitoba run an expensive, inefficient combustion turbine when a neighbour has a more efficient combustion turbine that can be run as an alternative? And for a hydro utility like Manitoba Hydro, surplus water can be used rather than being spilled and wasted by exporting the electricity.

In emergencies, we can help each other out. When the transmission system is damaged, power flows change direction instantly. Exports become imports, and the lights stay on, and maximizing the use of renewable resources that don't harm the environment.

But the key to all that -- the key to being able to achieve these benefits is the interconnecting transmission lines, and so to -- and so it should be no surprise that in Manitoba Hydro's Preferred Development Plan, the one plan that has the maximum benefits is the one that involves new export

transmission, increased export sales, increased energy imports, additional seasonal diversity arrangements, and improved reliability.

The practice of building interconnections in conjunction with new hydro plants is not new. This chart indicates Manitoba Hy -- Hydro's history of export volumes for the past fifty (50) years. As the system was expanded, export volumes grew to where they are today, to approximately 10 million megawatt hours in an average water year.

Development of Grand Rapids, Kettle, Long Spruce, and Limestone all involved associated increases in -- in interconnection capacity. Each new plant generates surplus energy, and -- and the power planners of those days chose to increase market access to capture the value of that surplus.

The obvious benefit of the existing interconnections has been the $10.3 billion in export revenues that have been generated from these sales since 1960. The benefit is most dramatically shown as the value of surplus energy from Limestone alone has been in excess of $6 billion for a plant that cost $1.6 billion to construct.

So as we've now ponder the future with the development of Keeyask/Conawapa the amount of

surplus energy will increase again, doubling under favourable water conditions. Expanded transmission to the United States will allow Manitoba Hydro to capture and maximize the value of that surplus energy.

However, there are other unaccounted for benefits of the existing interconnections. There have been no blackouts in Manitoba since the large 500 kV interconnection came into service in the late '70s. Drought costs have been significantly reduced because lower cost purchase power was available during the droughts of 1982 to 1992 -- I'm sorry, 1988 to 1992 -- and again in 2003/2004.

And required generation reserves in Manitoba are 80 percent less because Manitoba Hydro has generation reserve-sharing arrangements with the neighbouring region. These avoided costs have benefited consumers through lower rates than would otherwise be necessary, and an expanded interconnection will bring similar benefits.

These include increased reliability, the existing 500 kV interconnection will have a back-up, they will reduce our exposure in droughts, and it will increase reliability to the region should this line be lost, in addition, increased ability to buy power at lower -- low-cost off-peak energy rather than have to

import more expensive on-peak energy or burn natural gas during energy-short periods.

In the NFAT filing, Manitoba Hydro has identified this period as a window of opportunity. So what is that window of opportunity? It's a window of opportunity to work with our neighbours in a manner that maximizes the benefit for all parties.

It's a limited opportunity, because there are also ma -- because they are also making strategic decisions now. It's a limited opportunity because we've convinced them over the past several years to expand their set of planning options to include significant long-term reliance on Manitoba Hydro.

Minnesota Power and Wisconsin Public Service, Northern States Power, Saskatchewan Power all face daunting challenges, too. And the uncertainty associated with planning for load growth is not new, but today these highly coal-dependent utilities are wrestling with additional uncertainty in decisions regarding the future of aging generating fleets, with their traditional fuels being outlawed, with new fears about nuclear, with gas price volatility, and with emerging resources like wind and natural gas generation that are only partial solutions.

A purchase from Manitoba Hydro is an attractive option to them. We have indicated to them, firstly, that we are prepared to make long-term commitments for renewable, dependable hydraulic energy, that we can offer stable, predictable pricing, that we can offer them resource diversity, and that investing in new transmission will give them long-term access to our surplus hydro energy.

These companies have seen values in these offers, and have seen the value of having increased certainty. On the basis of our long-standing reputation with them, they have agreed that this is an opportunity for them too, in facing the future with Manitoba Hydro as a partner. This opportunity won't come again soon.

Since 2008, Manitoba Hydro and its US customers have agreed to several power sale agreements at very attractive rates that are dependent on the construction of new hydro generation and transmission. The first agreement is the NSP 125 -- 125 megawatt system power sale that goes from 2021 to 2025, and this agreement is subject to the construction of Keeyask.

The second agreement is a hundred megawatt power sale from 2021 to 2027. It's also subject to Keeyask.

The third agreement is the agreement with Minnesota Power for 250 megawatts from 2020 to 2035, subject to Keeyask and the construction of a new interconnection.

And, most lately, with Wisconsin Public Service, a 308 megawatt system power sale from the in-service of Conawapa to 2036, again subject to Keeyask/Conawapa, and the new interconnection.

With these contracts, these utilities are choosing not to build alternate supply resources, but to rely on Manitoba Hydro as the supplier. Without these contracts, these utilities will invest in other long-term supply options to meet their needs. The opportunity for Manitoba Hydro to displace these other options will not return. They will be lost.

The contracts that have been signed to date for hydraulic energy effectively use up most of the surplus power -- hydro power available from Keeyask. However, export discussions with Wisconsin Public Service, Great River Energy, and Saskatchewan Power and others continue, mainly for the power from Conawapa.

With Wisconsin Public Service, under the 500 megawatt term sheet, discussions continue on up to another 200 megawatts in addition to the 308 megawatts

that's already been sold. These would be subject to Keeyask/Conawapa and the new interconnection.

With Great River, we've just agreed to begin discussions on up to 600 megawatts of power and additional seasonal diversity power to meet their needs post-2025. These sales would be subject to Keeyask/Conawapa and the new interconnection.

With Saskatchewan, we intend to finalize the 25 megawatt term sheet shortly, and are working quickly on several stage long-term sales that would require Keeyask and Conawapa. A major sale from Conawapa will require major new transmission to Saskatchewan. Saskatchewan is aware of Manitoba Hydro's timeline with regard to an investment decision in Conawapa.

In addition, we are in discussions with other ser -- with several other utilities for another 250 megawatts.

As part of the Minnesota Power 250 megawatt sale, Minnesota Power needs to construct new transmission in the United States from Manitoba, which the Minnesota Public Utilities Commission recognized when it approved that sale agreement.

However, just building a 250 megawatt line was not consistent with Manitoba Hydro's Preferred

Development Plan, which considers a 750 megawatt line necessary with any plan that involves the development of Conawapa and a major sale to Wisconsin Public Service. Minnesota Power has agreed to build the large line, subject to, firstly, a pro rata sharing of costs, compensation for additional costs, and additional considerations. They have named the US portion of the new interconnection the Great Northern Transmission Line. It will have at least 750 megawatts of export capacity from Canada, and it will have 750 megawatts of import capability.

Sharing in the costs of a larger line provides significant cost savings for Minnesota Power versus building a smaller line. On the assumptions that a large interconnection would be built and in keeping with the 2008 500 megawatt term sheet with Wisconsin Public Service, Minnesota Power, Manitoba Hydro, and Wisconsin Public Service put requests in for two hundred and fifty (250) and seven hundred (700) -- or 500 megawatts respectively of transmission into the MISO transmission service queue in 2008. The equivalent reservations remain in place today.

This is a map showing the location of the Great Northern Transmission Line. It connects Winnipeg to Duluth. A specific route has yet to be

chosen, although a hundred percent of the Great Northern Transmission Line will be in Minnesota.

And you'll note that no transmission line construction is required in Wisconsin, because the transmission request placed in 2008 by Wisconsin Public Service, Manitoba Hydro, and Minnesota Power included 500 megawatts of export access into Wisconsin.

Dr. Jacobson will explain in more detail later why this is possible in his presentation, why we can gain access to Wisconsin by -- but only building transmission in Minnesota.

However, what is important to know is that the -- that the 500 megawatts of transmission service request into Wisconsin were made at an optimum time to take advantage of other transmission investments being planned between Minnesota and Wisconsin at that time. So those 500 megawatts of requests are in place today to Wisconsin.

If the larger line is built and all approvals are received, MISO will grant the transmission service reservations to Minne -- to Manitoba Hydro and Wisconsin Public Service, and these reservations will be used to deliver the power to Wisconsin Public Service.

Should the 308 megawatt transaction with

Wisconsin fall through, all the associated transmission request for access into Wisconsin will be lost. This, no be... This opportunity to expand into Ma -- expand Manitoba Hydro's marketplace into Ma -- Wisconsin will be lost.

So now I just want to turn to the Wisconsin sale agreements that were announced two (2) weeks ago, and I'm showing here a supply chart that compares Manitoba Hydro's firm energy forecast and signed export commitments to our dependable energy supply forecast from the current year out to 2036.

Similar to the graph that Ms. Flynn showed earlier, the graph is in -- in terms of dependable energy. Dependable energy is measured in gigawatt hours. The vertical axis is in thousands of gigawatt hours. And just for reference, the current energy demand for the -- Manitoba Hydro's customers in Manitoba this year is around 25,000 gigawatt hours, and you can see that by looking at the extreme left-hand side of the graph where the grey area intersects the axis.

On top -- on the -- on -- on the graph is -- on the top black line, this shows Manitoba Hydro's forecast of dependable energy supply. Today it is over -- just over 29,000 gigawatt hours, and you can

see it increases significantly when Keeyask is built. The line jumps up around 2019, 2020, and then again it jumps up with the in-service of Conawapa around 2026, '27.

So the black line is the dependable supply line. That's the dependable capability from an energy perspective of the power system. Also shown on the -- on the chart is the energy demands. Manitoba firm energy demand is shown as the -- as the grey area, and this demand is expected to grow over time, based upon the load forecast, subject to modification because of DSM.

Shown in blue above the Manitoba firm energy demand is the energy required to serve the signed export agreements. So the signed ones are the ones shown in -- in dark blue.

Today, these include those to NSP and Minnesota Power and others. With the in-service of Keeyask, these sale obligations grow as a result of the Wisconsin Public Service and the Minnesota Power sale agreements.

The drop-off that's shown around 2025 is when the existing NSP sale, or the -- the sale extension expires in 2025. Manitoba Hydro and NSP expect to extend that sale for ten (10) years, but that

extension is not shown here. After 2027, the only signed sale shown -- the only signed sale shown is the Minnesota Power 250 megawatt sale going out to 2035.

Above the signed sales are the two (2) major WPS sales that were announced last week. They're shown in yellow. And in a minute I will discuss the details of each sale, but what is significant here is that the first sale can be served from existing resources, so we don't need to build Keeyask in order to enter into the 108 megawatt sale.

However, what al -- can also be seen is that the larger 308 megawatt sale can't be served from existing resources. It requires that both Keeyask and Conawapa dependable energy supplies be available.

Of note, there remains a gap between the dependable energy supply line and the firm energy commitments after 2020. This unsold dependable energy is mainly a result of the increase in dependable energy associated with the increase in import capability as -- as a result of up-sizing the line of a -- as a -- as a result of building a new interconnection with increased import capability.

So there is a -- a gap shown between the -- the signed sales and the -- and the supply, and Manitoba Hydro is actively marketing this additional

dependent energy, both in the short and long-term in Canada and the United States.

Two (2) weeks ago, Manitoba Hydro and Wisconsin Public Service announced that they had approved and signed two (2) major power sale agreements. The first one (1) is the 108 megawatt sale -- power sale from 2016 to '21. The sale is for fixed-price energy, five (5) days a week, Monday to Friday, sixteen (16) hours a day. And the -- as I mentioned, this sale is served from existing generation and transmission resources.

The second and more significant sale is the 308 megawatt system power sale. This sale is for fixed-price energy, seven (7) days a week, sixteen (16) hours a day.

And I note, Mr. Chairman, on -- on -- during Mr. Thomson's presentation on the first day, you asked him about the type of energy. The sale to Wisconsin is not only dependable energy, but it's fixed-price surplus energy. So it's a combination of -- - of the two (2) products, and I will talk about that later.

The length of the sale is for up to ten (10) years. The up to ten (10) years is dependent on when the fourth unit of Conawapa comes into service.

So if Conawapa is delayed -- or if Conawapa comes in as scheduled now, the sale will be nine and a half (9 1/2) years. If it is advanced, it could be ten (10) years. It can't be longer than ten (10) years, but it can be ten (10) years.

And if the Conawapa in-service is -- is delayed a year, then it would be eight and a half (8 1/2) years, seven and a half (7 1/2) years, but there's a point in the contract at which the delay results in the contract being terminated. The end date of the agreement is May the 31st, 2036, and this sale requires both Keeyask/Conawapa and the new five hundred (500) interconnection to the United States so that we can make delivery into Wisconsin.

In signing the agreement, Manitoba Hydro has incurred no obligation --

MS. MARILYN KAPITANY: Just -- just a question before you go on.

MR. DAVID CORMIE: Go ahead.

MS. MARILYN KAPITANY: So you say there's no obligation to build here?

MR. DAVID CORMIE: Yes.

MS. MARILYN KAPITANY: So could you just explain that a bit more?

MR. DAVID CORMIE: Well, perfect, I was

just going to get to that. In signing the agreement, Manitoba Hydro has incurred no obligation to build. There is enough optionality in there that we can delay it. We can -- we can decide, even after we've started the -- the generating station, to -- to stop.

With Keeyask, the obligation to sell power to Minnesota Power triggers on the day we put the first rock in the river at Keeyask. With Conawapa, the -- the obligation to fulfill the sale starts the date that the fourth unit comes into commercial service. So any time prior to that, we can walk away from the decision to build Conawapa.

Our obligation, though, is if we do build Conawapa, their agreement -- the agreement requires Manitoba Hydro fulfill its supply obligation to Wisconsin, and they have an obligation, then, to fulfill their purchase obligation. Does that answer your question?

In order to be able to deliver the 308 megawatts to Wisconsin, 200 megawatts of new firm transmission service on the new US tie-line must be established. So we already have 108 megawatts of transfer capability to them. They're taking another two hundred and eight (208), and that's how it comes up with the total of 308 megawatts. If -- we'd always

talked about a 300 megawatt sale, but we -- they wanted the last 8 megawatts, and so that's how the -- the size of the sale was determined.

Manitoba Hydro is recovering the cost of providing transmission service on the new interface in the price in -- in the -- in the power purchase agreement. To put the size of the sale in context, the energy quantities associated with this sale are significant, relative to Conawapa. It's 33 percent of its generation under dependable flow conditions, and under average flow conditions it's 29 percent of Conawapa generation.

In addition to the two (2) sales that were announced, Manitoba Hydro and Wisconsin also signed two (2) other sale agreements. The first is the 200 megawatt energy purchase agreement, which is possible because of the new interconnection, and this agreement secures annually a 1,600 gigawatt hour energy supply from Wisconsin from 2020 to 2036. The new import -- the new line has 750 megawatts of import capability. This agreements allows us to draw on 1,600 gigawatt hours of energy out of the Wisconsin market to serve Manitoba load if required.

This energy will flow north over the new large interconnection. There's a minimum -- a minimal

annual commitment for Manitoba Hydro to bid for energy under this agreement. We have an obligation to bid. We have no obligation to purchase, and the difference between that is that you can say, I'm willing to pay five dollars ($5) for the energy -- or I mean fifty dollars ($50) for the energy. If the market clears at twenty dollars ($20), the energy won't flow.

So we have an obligation to ask for the energy. We have no obligation to purchase. I'm sorry, I had that -- I had it around. It's the opposite. If we don't want to actually take physical delivery, we'll bid less than the -- than the market price of the energy, so why would they sell it to us? So we can...

Now, the last agreement is a --

MR. WILLIAM GANGE: Mr. Cormie, could -- I'm -- I'm sorry, Mr. Chair. It's Bill Gange over here, Mr. Chair. Could you -- could you resay -- state that because I got lost in that -- in -- in that explanation. So I -- I apologize, Mr. Chair, but --

MR. DAVID CORMIE: Sure.

MR. WILLIAM GANGE: -- I knew that Mr. Cormie was going to move on. But -- but --

MR. DAVID CORMIE: I'll -- I'll try one (1) more time.

MR. WILLIAM GANGE: Thank you.

MR. DAVID CORMIE: Manitoba Hydro has an obligation to bid for the energy, a -- a minimal amount, in order to be able to -- to be eligible for the transmission service, but we don't have to bid at a price that makes sense to the market, and if we bid so that they won't sell the energy to us, we've fulfilled our obligation.

Does that help, Mr. Gange?

MR. WILLIAM GANGE: You -- you used numbers. Could -- could you redo it with the numbers? Because I -- I thought that the numbers were -- I -- I thought you said that they were backwards. So if I could hear it, that -- that would help me.

MR. DAVID CORMIE: Mr. Gange, if I were to offer you a house -- if your house is up for sale for a hundred thousand (100,000), and I offered you ten thousand dollars ($10,000) I would be bidding for your house. You would say, No, thank you, Mr. Cormie. Thanks for the bid.

And that's what we would do. We have an obligation to bid, not to buy, but that gives us the option when we do need the energy to bid appropriately so that the energy will flow on the transmission that has been reserved in -- in -- the firm transmission has been -- will be used.

MS. MARILYN KAPITANY: So Mr. Cormie, just before you move on, is -- is it correct to say, then, that there are no signed contracts beyond 2036?

MR. DAVID CORMIE: That's correct.

MS. MARILYN KAPITANY: Okay. And I don't know if you can say this in -- in this open forum, but are there any statements in the contracts that would give us the -- the possibility of extending those contracts under certain conditions?

MR. DAVID CORMIE: No, there are no -- there are no continuing obligations beyond 2036.

MS. MARILYN KAPITANY: Thank you.

MR. DAVID CORMIE: The smaller 8 megawatt surplus energy agreement is necessary to secure the full 108 megawatts of firm transmission service for the period of the previously signed 100 megawatt sale. So several years ago, Manitoba Hydro and Wisconsin Public Service agreed on a 100 megawatt sale. There's a 108 megawatts of transmission. This 8 megawatts sale is for surplus energy so that we can encumber that last 8 megawatts of transmission.

In addition, Manitoba Hydro and Wisconsin have agreed to extend the term sheet once again. I'm not sure how many times we've extended it, but there continues to be interest to fully explore up

to the 500 megawatts that the term sheet originally envisioned, and those discussions are ongoing.

There are -- ha -- have been and continues to be a lot of questions regarding Manitoba Hydro's involvement in the US portion of the proposed new interconnection, and now I will try to bring some clarity to that issue.

Firstly, who will build it? Minnesota Power's going to build it. This line connects to their substation near Duluth, and they have the right to build, and this is the -- this line is the line that they will call the Great Northern Transmission Line.

Secondly, who will invest in the line and who will own it? Manitoba Hydro and Minnesota Power will jointly invest and own in the line, with Manitoba Hydro being the minority owner.

Ideally, given Manitoba Hydro's lower cost of capital, the least expensive way to build the line would be for Manitoba Hydro to own and invest in the entire line. However, under Minnesota statute, Minnesota Power has the right to own and earn up to 100 percent on the line.

Minnesota Power has agreed to split ownership with Manitoba Hydro. However, Manitoba Hydro recognizes that owning assets in the United States

exposes it to US taxes and to regulatory risk. As a result, Manitoba Hydro's ownership is only as a last resort, but it is necessary to ensure that the large line is built and can be put into service by 2020.

Manitoba Hydro is in ongoing discussions with other US transmission owners at this time who are interested in assuming Manitoba Hydro's 49 percent investment and ownership position. We need to give Minnesota Power the assurance that the path that they're following will result in having the line costs paid for.

Manitoba Hydro has made that assurance, but we expect that we will be able to transfer that responsibility to another US transmission owner. In the meantime, the line can proceed. So we are there as an owner of last resort. Minnesota Power and Manitoba Hydro continue to develop the business relationship regarding the ownership.

So with regard to the question of who will pay, Minnesota Power intends to rate-base the cost of their 250 megawatt share of the large interconnection. That means their customers, through their rate-recovery mechanisms with their customers, will recover the cost of their investment.

Their customers will pay the revenue

requirements. Man -- that leaves Manitoba Hydro with the obligation to pay for the balance of 66 percent, including the cost of providing the transmission services to Wisconsin Public Service.

The detailed cost-sharing arrangements are being negotiated under the interconnection term sheet which was signed last September, and that term sheet has been filed.

Discussions on the business relationship and the cost sharing are proceeding well, and resolution will occur in the next several months. However, as we intend to be an owner only of last resort, we are making provisions in these discussions on the business relationship so that a third party can step in and participate.

Lastly, the question is: Who can use the line? Who has the rights, the firm rights, that are created by the construction of this line, not only on the transmission line, but into Wisconsin?

Under the contracts dependent on the line, Manitoba Hydro's energy gets shipped first. Whether it's dependable or surplus fixed-priced energy or additional energy that Manitoba Hydro intends for the spot market, we own the transmission rights in Canada.

They may own the transmission rights on the US side associated with their ownership position, but it's always Manitoba Hydro's energy that will flow on that -- on -- under those firm rights.

Energy ownership may transfer at the border to Minnesota Power or Wisconsin Public Service or to MISO, but it is the Manitoba Hydro-sourced energy that will flow south.

MS. MARILYN KAPITANY: Mr. Cormie, can I just clarify again? You said that Manitoba Hydro will invest and own 49 percent --

MR. DAVID CORMIE: Yes.

MS. MARILYN KAPITANY: -- but that we're going to pay for 66 percent.

MR. DAVID CORMIE: That's correct.

MS. MARILYN KAPITANY: That doesn't make sense to me.

MR. DAVID CORMIE: It's economic for Manitoba Hydro. The -- the most economic way to build the line is for Manitoba Hydro to build and own the entire line. The benefits of developing Conawapa are maximized under that scenario.

To the extent that we have others come in and -- and if we pay -- if we -- if -- if we make that investment, that is -- that is the best possible

outcome for Manitoba Hydro.

A better outcome is if somebody else comes along and says, We will bear some of the costs of the line. That makes the benefits associated with the Preferred Developed Plan increase, because somebody else is now bearing some of the costs. And that unloads Manitoba Hydro, but it's a good deal even if we -- if we had to pay the whole cost of the line.

So Minnesota -- Minnesota Power is going to pay for 33 percent of the line. They're going to pay 33 percent of the cost. That improves the economics of building the line, which was already economic if we owned the hall -- all. Minnesota Power won't be -- their customers aren't prepared to pay more than what they need, so that leaves Manitoba Hydro who wants the line as part of the Preferred Development Plan left funding the balance of the cost of the line, making that additional expenditure.

Twenty (20) percent of those costs will be recovered by the Power Purchase Agreement with Wisconsin Public Service, so that even makes the Preferred Development Plan even better because the PPA has additional revenues in it that -- in the price that reduces the -- the actual cost -- actual cost of the transmission, oth -- 'cause others are now paying for

that line.

So in that context, Manitoba Hydro is better off paying sixty-six (66) than -- rather than a hundred percent, because others are sharing in the cost of the line. That line by itself in conjunction with building Conawapa is -- is an -- an economic thing, if we -- even if we had to pay for the whole thing. Does -- does that help?

MS. MARILYN KAPITANY: Some.

MR. DAVID CORMIE: To -- I'll -- I'll put it another way. To the extent that you have decided to build a house and pay for the whole cost of the house, to the extent that you have somebody come along and rent the house from you, you get additional income, it makes your investment in the house even better. That's -- that's the case here.

Manitoba Hydro has decided that as part of it's Preferred Development Plan, to -- and which includes Conawapa, a 750 megawatt line is the -- an economic thing, even if we have to pay for the whole thing. That's -- that -- that is an economic outcome.

MS. MARILYN KAPITANY: But in your example, I'd own 100 percent of the house. In this example, we're only going to own 49 percent of the line.

MR. DAVID CORMIE: Right. Minnesota Power wants -- needs to own something in -- to get a return on their investment. They need part of -- they -- they need an incentive to up-size the line above what they need for their own load. So the 250 megawatts is what they need for their own load. They are not going to bear the cost -- the additional cost of -- of building a bigger line than what they need, so Manitoba Hydro has to pay for that. So instead of paying 100 percent of the line, we're paying sixty-six (66), and some of that we will get through -- recover through the -- through the power purchase arrangement -

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MS. MARILYN KAPITANY: Thank you.

MR. DAVID CORMIE: -- with Wisconsin.

THE CHAIRPERSON: Mr. Cormie, I would normally have called for a break at this time. Do you need -- how much more time do you think you need to get to the end, please?

MR. DAVID CORMIE: I'm going to need fifteen (15) minutes, sir.

THE CHAIRPERSON: Okay. Well, I think we should break, then. Let's take a -- a fifteen (15) minute break, so back -- back in this room at ten (10) to -- ten (10) to 11:00, please.

--- Upon recessing at 10:37 a.m.
--- Upon resuming at 10:52 a.m.

THE CHAIRPERSON: I believe that we are ready to resume the proceeds, so -- so Mr. Cormie, please.

MR. DAVID CORMIE: Thank you. I -- in the few minutes, we rethought the answer to the minority versus majority, and -- and there are significant accounting issues associated with holding a ma -- maj -- majority ownership issues, and the Company has, from a policy perspective, chose to say that we will not take a majority ownership in the line.

There -- there will be opportunities during the in-camera session to go into the business relationship in more detail, and I can speak to that other -- the details of that later.

So Minnesota Power is proceeding with the -- the Great Northern transmission line. They began public consultations. They've had several open houses with many communities, and they are working with state and federal regulatory process in order to permit the line in a timely manner so that the line can come into service in 2020.

In October of last fall, they filed

their Certificate of Need with the Minnesota Public Utility Commission. This spring, Manitoba Hydro and Minnesota Power expect to finalize the business arr -- arrangements. Minnesota Power will file for a presidential permit, and Minnesota Power, Wisconsin Public Service, and Manitoba Hydro expect to sign the facilities construction agreement with MISO so that this project can proceed.

In October of this fall, the Minnesota Public Utility Commission will commence their public hearing process on the line, and in the spring of 2015, Minnesota Power expects to receive its certificate of need and its presidential permit approval. And in the fall of 2016, line construction will commence with the line scheduled to go into service in the spring of 2020.

With regard to the 250 megawatt transmission line option, our development plans that have included Conawapa have always included the construction of a 750 megawatt line. Manitoba Hydro is in negotiations with Minnesota Power, Wisconsin Public Service, and others and Manitoba Hydro's discussion with the Minnesota Public Utility Commission have always been premised on sharing the costs of a 750 megawatt transmission line. On that basis, Manitoba

Hydro believes that achieving US regulatory approval for the 750 megawatt line has a high probability of success and that the line will be built.

There have been only very limited discussions on building a 250 megawatt line. As a result, whether a mutually agreeable arrangement with Minnesota Power to build and pay for such a line, and achieve regulatory approval is only hypothetical. In Minnesota Power's certificate of need filing, Minnesota Power stated that a 250 megawatt project would not meet the long-term needs of the region, would not prove to be cost effective for their customers, nor is it the environmentally preferable line over the long term.

A stated goal for transmission planning in the state of Minnesota is to maximize the use of transmission line corridors. Under this policy, it is risky to assume that Manitoba Hydro could build multiple small transmission lines into Minnesota over time when a single large line could be built in the first instance.

In addition, the recommendation to support a 250 megawatt line would eliminate the wind synergy benefits Minnesota Power, other utilities in Minnesota, and others in the MISO region would receive as the result of the development of Conawapa and a 750

megawatt line. These regional benefits won't exist with the 250 megawatt line and Keeyask, as it alone does not enhance the storage capabilities of the Manitoba Hydro system sufficiently.

The broad-based benefits associated with our Preferred Development Plan have created significant, positive support for building major transmission at this time in Minnesota. Switching to a 250 megawatt line would threaten that support, making regulatory approval more risky.

Minnesota Power has been proceeding with the development and permitting process in Minnesota for over a year. A switch to a 259 -- 250 megawatt line would require Minnesota Power to restart the entire public, state, and regulatory -- federal regulatory processes over from scratch. This would make achieving the 2020 in-service date very difficult, if not impossible.

A switch now to a 250 megawatt line will increase the cost of transmission service to Minnesota Power's customers. This is because sharing the costs of a big line produces significant savings associated with economies of scale. In addition, the other significant benefits Minnesota Power's load achieves under the 500 kV term sheet would be lost.

In total, the loss of these benefits will jeopardize the economics of the 250 megawatt sale agreement, thereby increasing the risk of achieving Minnesota regulatory approval for the 250 megawatt line. In order to proceed with this option, reopening negotiations may be required with Minnesota Power.

Lastly, I wanted to update the panel on the state of the 200 megawatt Seasonal Diversity Exchange Agreement that was signed with Great River Energy. The NFAT filing indicated that Hydro and Great River Energy had signed a term sheet to expand and extend the existing diversity agreement. The previous agreement was a 450 megawatts, expiring in 2015. This has now been increased by 50 megawatts to 200 megawatts, and with the date extended out to 2030.

Manitoba Hydro and Great River have finalized and signed these agreements. The agreement provides Manitoba Hydro with three (3) major assets, 200 megawatts of winter capacity, it secures over 1,900 gigawatt hours of dependable energy, and it transfers ownership to Manit -- to Manitoba Hydro to 200 megawatts of firm, northbound, MISO transmission service into Manitoba Hydro's hands.

This extension is a key component of our Preferred Development Plan, but it is common to all

planning scenarios. There's no capital expenditures required for this agreement, and there's no net cost to the agreement. The agreement received National Energy Board approval in October of last fall.

And that's the end of my presentation.

(BRIEF PAUSE)

DR. HUGH GRANT: Mr. Cormie, could I ask one (1) question? My understand -- currently Hydro has a reserve of 12 percent. This is in relation -- capacity in relation to domestic load.

Would the 750 megawatt line -- would that reserve be adjusted? I'm just -- you -- you were talking about the benefits of interconnectedness and reliability and sharing of reserves. Would that be the case or not?

MR. DAVID CORMIE: Mr. Grant, that's not my area of expertise. I probably would pass that over to Mr. Wojczynski to respond to.

MR. ED WOJCZYNSKI: Either Ms. Flynn or I could answer that. That would -- would not change the 12 percent reserve criteria, but what it would change is the probabilistic reliability assessment, which we will be presenting later on in -- in this

morning's evidence.

DR. HUGH GRANT: Okay. Thanks.

MR. DAVID CORMIE: I -- I think in -- to add to what Mr. Wojczynski had said, because we are generally building for energy and capac -- our capacity lags behind, freeing up additional capacity would just -- would just defer the need to build for our capacity to an even later date.

So because we're building for energy, you know, there -- there are reliability benefits, but we are building because of energy, not necessarily for capacity under the -- under the Hydro scenarios.

DR. HUGH GRANT: Could I just ask one (1) other thing, then? Just so I understand the size of the imports, I understand that Manitoba Hydro does a fair bit of arbitraging in the spot market or short-term market by bringing power in off-load and so on.

What -- what percentage of total imports would that -- those sorts of transactions represent as opposed to sort of firm commitments, if that's the right term?

MR. DAVID CORMIE: Almost all the arbitrage that is undertaken in a normal water year, or purchases are -- are for arbitrage purposes, except during the wintertime, and in the wintertime when we're

not purchasing for capacity, we'll be purchasing to displace the use of the combustion turbines over peak at Brandon, for example.

So we do purchase power, but not necessarily in the winter for arbitrage, but -- but the -- the new line will allow the purchase of more off-peak energy when prices are low, and -- and the purchase of that energy -- that purchased energy will be used to serve Manitoba load. Therefore, more water will be stored in the reservoirs at night, and that water can then be sold back to the market in the daytime to capture those opportunities.

So the bigger the transmission line interconnection, the bigger the ba -- the rechargeable battery is. And more can be purchased to charge the battery, and then more can be discharged during prime time.

MR. RICHARD BEL: I have a question concerning the slide about the window of opportunity, signed agreements. So we talked about a window of opportunity, and trying to make sure that the players in the MISO market don't start building their own plants.

But when I look at these agreements that are signed, they seem very short-term for us to build a

-- a lumpy seventy (70) year project. So I've got a four (4) year, a six (6) year, a fifteen (15) year seems the maximum, and then there's a nine (9) year.

So it's -- I'm -- I'm not understanding. If -- if we can forecast out and say there's this need, these utilities are seeming not to bet on that, because wouldn't they be wanting to sign longer-term commitments? It's a general -- it's a general observation. It seems a paradox.

MR. DAVID CORMIE: Mr. Bel, I -- I agree with you. It -- in -- in a perfect world where the future is known, Manitoba Hydro and its partner utilities could plan a perfect future. We don't know where prices are going to go. We don't know where carbon regulation is going to go. Neither of us want to enter into an arrangement like what happened between Quebec and Newfoundland for forty (40) or fifty (50) years, where there is a winner and a loser, and not knowing in advance who is going to be the winner or loser.

So generally, the -- the -- these contracts allow Manitoba Hydro and these companies to interconnect. The transmission will be there in perpetuity. And there will be opportunities as time goes on to renew those opportunities at a price that

continues to work for both parties. All these arrangements are win/win arrangements.

If we committed to forty (40) years, they committed to forty (40) years, and after even five (5) years the world changed, like has happened with shale gas, there will be a winner and a loser, and -- and nobody wants that. We -- we have a very limited set of customers. We want to have -- this to be a win/win situation for all.

And generally, having power purchase agreements that are ten (10), maybe fifteen (15) years, is probably as long as we want to commit. Knowing that the transmission facilities will be there, there may or may not be any surplus hydro available in the future because Manitoba load may have grown, but the world will have changed.

And -- and companies like this as a -- as an option for deferring or, you know, the -- the -- we like it and they like it because it gives us the right to revisit the decision in a reasonable amount of time.

What -- what we can't do is have transactions that are so short that they don't affect the generation planning process in these other utilities, so those end up being the spot-market

transactions.

So when -- for example, when Wuskwatim came in and we were faced with having the surplus, there was nobody out there who in a year or two (2) could change their construction plans or development plans to take advantage of the firm power because the -- because the opportunity occurred too short.

So we have to work with them in their planning horizon. So we have to -- we have to be out there ten (10), fifteen (15) years so that they can plan around the availability of the resource. So we need a marrying of the resource planning functions between the two (2) companies in order to integrate the Manitoba Hydro resource into their re -- into their resource plan and we can build our requirements into our planning requirements.

One (1) -- one (1) of the difficult things is that our planning horizon tends to be fifteen (15) to twenty (20) years. The US utilities are ten (10) to fifteen (15) years, and so you have this mich -- mismatch of planning. And that's why Manitoba Hydro has had to ste -- to step forward with regard to the building of the 500 kV line, because no one else is thinking that long-term.

And -- and the opportunity that occurred

was to get Wisconsin Public Service and Minnesota Power to start thinking strategically, what do they want in their portfolio in 2025 and beyond, and we convinced them that hydro was an option.

For a utility to take a strategic decision about its resource needs in the United States that long, that far out, is -- is -- was a -- was a real achievement. Normally, they -- they need power eight (8) years from the date, and the order a combustion turbine and they put it in or they -- you know, they're -- they're -- they have a -- they have a much shorter lead time. And we've been able to convince these utilities to start looking longer term, and -- and they've agreed.

MR. RICHARD BEL: Thank you.

THE CHAIRPERSON: Now, the -- Mr. Cormie, the -- you know, there'll be a billion dollar invested in that line by different parties and so on. I guess, I -- I guess the issue for me is to try and understand how the income will flow to pay off that investment.

And could you talk about that?

I mean, you have some committed -- some of that land is committed already based on future contracts. There's a portion of that land will --

which is not covered off by contract sales. And I'd like to understand how that -- how the -- how the money flows to pay for the investment.

MR. DAVID CORMIE: And I -- I have to be careful not to get into too much of the details, but let's speak about the revenue requirement of the line. The revenue requirement of the line are the annual costs of ownership, depreciation, interest, operating and maintenance costs.

Minnesota Power will be paying -- their -- their customers will be paying 33 percent of the line. That leaves Manitoba Hydro paying the revenue requirements on 66 percent, the -- the balance of the line, the 66 percent. And the details of how we -- we fund that we can talk about in the in-camera session.

But -- to -- and to the extent that we're able to recover some of those -- those revenue requirements through the power purchase agreement with Wisconsin, that'll also be talked about.

THE CHAIRPERSON: Just -- just to clarify, the -- my colleague Mr. Grant indicated -- talked about reserve capacity, but I just want to make sure I under -- I've got the term correctly.

It's 12 percent reserve capacity over and above the peak demand which encompasses domestic

and whatever you've contracted for?

MR. DAVID CORMIE: No, it's just -- it's just domestic load, and to the extent that we have sold power that includes reserves. But Manitoba Hydro is not selling power that includes reserve. We are selling system participation power. So if something goes wrong with our system, if there's a generator outage, Manitoba Hydro doesn't have to have backup reserve generation to fulfill that.

And the reason that's possible is because there's a reserve sharing arrangement in the United States where they get their reserves from -- from the market, rather than having Manitoba Hydro provide those reserves. So our firm power sales do not include reserves. We don't plan for those reserves. We only -- the 12 percent only applies to the Manitoba load.

That doesn't say that we can't enter into a -- a contract. We've had contracts with Ontario Hydro in the past that included reserves, and we would have to plan for that, but there is nothing in the portfolio of contracts before this body that includes providing reserves.

THE CHAIRPERSON: Mr. Wojczynski talked about the peak demand that was experienced in January

in Manitoba.

We were well off -- we weren't anywhere close to the 12 percent reserve capacity that was required through MISO, were we?

MR. DAVID CORMIE: No, we were -- we were not impinging on our -- our reserves at that time. No.

(BRIEF PAUSE)

MS. JOANNE FLYNN: All right. It's back to me, and I'll proceed by talking about development plans. As Mr. Cormie explained, we have opportunities to consider when planning the system, as well as addressing the needs that -- the -- the need that arises from Manitoba load. So, at a minimum, the development plans will all meet expected domestic load and the existing firm commitments.

Further to this requirement, we will formulate plans which incorporate opportunities such as building new transmission interconnections, or pursuing new export sales. The consideration of such opportunities is done for the overall benefit of Manitoba customers. The combinations of resources provide feasible development plans, plans which can be

put into place or built and which meet Manitoba Hydro's planning criteria.

Manitoba Hydro does not consider hypothetical or infeasible plans in its evaluation, and we do -- also do not have a do-nothing option. As presented in the NFAT submission, the closest representation of a do-nothing option is the Least Capital Cost Investment Alternative, which is Plan 1, the optimized All Gas Plan.

From an optimization perspective, Manitoba Hydro's planning process is ongoing, and the development plans included in the NFAT submission build on resource planning experience from the years leading up to the filing of the NFAT submission, including previous economic and financial analyses. The experience from past planning studies and economic evaluations contributes to the formulation of relevant sets of development plans for inclusion in studies on a go-forward basis.

In addition, Manitoba Hydro has used probabilistic analysis as a means of optimizing its development plans by recognizing the inherent uncertainties in the inputs. For the NFAT submission filed in August, DSM as a resource option was presented as a sensitivity at one and a half (1 1/2) and four (4)

times the base level. The analysis tested the effect of higher levels of DSM on selected development plans, as the details of the DSM potential study were not yet available. Updated analysis related to DSM as a resource option will be provided today.

This table lists the fifteen (15) development plans studied in the 2012 NFAT reference case, and the five (5) plans shown on the right of the slide, which were updated with 2013 assumptions. Of the fifteen (15) plans, five (5) include a 750 megawatt US interconnection, three (3) include a 250 megawatt interconnection, and seven (7) plans were designed for the purpose of serving Manitoba load without a new interconnection.

I'll just draw your attention to Plan 5 which appears on the left-hand side, and consists of Keeyask in 2019 followed by natural gas generation with a 750 megawatt interconnection, and is listed as including both the WPS sale and investment in the line.

The WPS sale could be designated as being supplied out of Keeyask, although we may new -- need new resources to meet Manitoba load, and in this plan those would be natural gas resources. So you do see a plan that has a WPS sale in it without Conawapa.

In the 2012 assumptions we included both

the sale and interconnection in the analysis, and I will show you shortly the list where we have removed the WPS investment for this particular plan in our latest analysis.

(BRIEF PAUSE)

MS. JOANNE FLYNN: The next slide shows the six (6) development plans that include the analysis of updated capital cost assumptions that we're going to show you today. And I will note here that the probabilistic analysis is based on the -- that we'll show you as part of today's new analysis is based on the 2012 assumptions with the exception of updating the capital costs for Keeyask and Conawapa, and updating the probability weightings associated with the capital cost factors.

THE CHAIRPERSON: Ms. Flynn, is -- I just noticed there were some -- there's some differences between the 2013 assumptions and the economic analysis. For example, I'm looking at -- I'm looking at Plan 4 which is showing gas at -- one showing gas at twenty-four (24) and the other gas at thirty (30).

Is there -- there a reason why the line

-- the economic -- pardon me, development plans don't line up with the 2013 assumptions?

MS. JOANNE FLYNN: Sorry, which slide are you looking at?

THE CHAIRPERSON: I'm actually on slide 33 and 34. I'm trying to --

MS. JOANNE FLYNN: Okay.

THE CHAIRPERSON: -- you know, you've done economic analysis on six (6) plans, five (5) of which are identified as 2013 development plans -- 2013 assumptions. I'm just wondering why the dates have changed. Is that...

(BRIEF PAUSE)

MS. JOANNE FLYNN: Yes. On slide 33 the plans with the 250 megawatt interconnection that show gas at 2030, that -- that would be as a result of the lower loads in the 2013 assumptions, so the resource would move to 2030. And actually that -- that should be what is also shown on page -- on slide 34.

So plan -- on side 34 where it says, "K19/Gas24," that should read, "Gas30."

THE CHAIRPERSON: Okay. Is the slide different on Plan 2, as well? Is that...

(BRIEF PAUSE)

MS. JOANNE FLYNN: Okay, one more time. Slide 34 is based on the -- as I just stated, was based on the 2012 planning assumptions. So under the 2012 planning assumptions that date would stay at 2024, so it would be similar to the planning assumptions you saw on the left-hand side --

THE CHAIRPERSON: Okay.

MS. JOANNE FLYNN: -- of Slide 33 whereas the 2013 assumptions would -- would cause the -- that date to move. So it is correct as shown.

THE CHAIRPERSON: Thank you.

(BRIEF PAUSE)

MS. JOANNE FLYNN: Okay. So moving on to slide 35. The DSM evaluation analyses the impact of increased levels of DSM on three (3) development plans. And if you look at the chart that shows the DSM options, you see firstly the 2013 DSM, and then Levels 1, 2, and 3 DSM with and without the pipeline.

So Level 1 DSM is approximately two (2) times the base DSM; Level 2 will be approximately four (4) times the base DSM; Level 2 after consideration of

the new pipeline load will be two (2) times DSM; Level 3 would be approximately five (5) times DSM; and Level 3 after consideration of the pipeline load would be two point seven (2.7) times DSM.

I will just also draw your attention to the development plans at the top of the page. And one of the updates to the -- to Plans 5 and 14 when we undertook this analysis was the removal of the WPS investment. So it's just the sale alone that's in these plans.

So this means that this has the effect of increasing the costs to Manitoba Hydro when we undertook this analysis, as the assumption is that Manitoba Hydro would then be responsible for those costs.

(BRIEF PAUSE)

MS. MARILYN KAPITANY: Can you explain why those -- the WPS investment would have been removed?

MS. JOANNE FLYNN: Because the -- the arrangement with WPS has now been finalized, and there is the sale arrangement with WPS, but they are no longer an investor in the line.

Okay. This next slide identifies the DSM options that we were going to -- or that we have evaluated under the 2013 assumptions under the reference scenario. So there are three (3) plans that we have done this analysis on: the Preferred Plan; Plan 5, Keeyask19/Gas with 750 line; and the All Gas Plan.

So we have the three (3) plans evaluated at four (4) levels of DSM, which gives you twelve (12) cases without the pipeline load, and then the same three (3) plans at Levels 2 and 3 of DSM, which gives us an additional six (6) cases with the expected pipeline load included.

And this analysis has been done based on the 2013 planning assumptions with updated capital costs for Keeyask and Conawapa, and without the investment in -- by WPS in the interconnection.

Okay. And now I'll move on to the topic of economic analysis methodology. In the NFAT business case, Manitoba Hydro has provided three (3) major sets of analysis: economic, financial, and multiple account. Each one (1) of the analyses has a separate and distinct focus and contribution to the overall evaluation.

The economic analysis focusses on the

overall economic value each plan creates over the asset life and, therefore, determines the investment value over the life of the longest-lived assets in the development plan. For the plans that were evaluated, the long -- longest-lived assets are the Hydro assets.

The financial evaluation focusses on rates and financial risk, and specifically on the comparative impact on future customer rates and the comparative exposure to financial risk. Affordability and temporal distribution of costs and benefits are addressed in the financial analysis.

The multiple account benefit-cost analysis focusses on the overall socio-economic benefit and takes into consideration consequences for Manitobans not reflected in the revenues and expenditures of Manitoba Hydro, and provides a comprehensive assessment of all the benefits and costs to Manitobans to address the question of overall socio-economic benefit.

The three (3) analyses together provide an overall robust analysis of the development plans.

Panel 2, this panel, deals specifically with economic analysis, provincial transfers, and reliability and energy security.

Panel 3 will deal -- the next panel will

deal with financial analysis including rate impacts. And the last panel will deal with environmental and social -- socio-economic benefits and impacts and multiple account analysis.

Economic evaluation is specifically intended to determine how much overall economic value each plan creates over the asset life. Manitoba Hydro's approach to economic evaluation is consistent with standard economic analysis methodology.

When evaluating and choosing among alternative development plans, it is appropriate to measure the incremental costs and benefits associates with one (1) plan relative to another plan. This means that costs and benefits that are common to all development plans are not included in the economic analysis, as these values are the same in each development plan.

The evaluation is done on a go-forward basis. This means that sump costs are not included in the economic evaluation, as they represent costs, or money, already spent, or commitments that can't be changed.

For the purpose of the economic evaluation, the net present value approach taken by Manitoba Hydro of discounting cash flows at the real

weighted average cost of capital is appropriate. This method allows for comparison of development plans on an equivalent basis, and is widely viewed as a standard and reliable measure of overall economic value for the plan.

And at this point we're going to have to do a little bit of shuffling to...

(BRIEF PAUSE)

MS. JOANNE FLYNN: Oh, sorry. Mr. Page and mis -- and Dr. Borison will elaborate on the use of net present value and discount rates in their directly evidence.

As the -- as the economic analysis is intended to represent the benefits and costs over the entire life of the assets included in the development, the life of the longest-lived project needs to be considered. This is done through residual value.

Once a study period has been identified, residual value is determined, generally, in one (1) of two (2) ways: by calculating the salvage value of the assets remaining at the end of the study period, and subtracting that value from the asset cost; or by identifying the remaining market value and adding it to

the analysis. Consideration of residual value is necessary to achieve comparability between plans.

Manitoba Hydro considers residual value by extending the study period to -- to seventy-eight (78) years, so that it includes the entire life of the hydro assets, and then identifies the remaining value of any other assets to the calculation of salvage value. In this way, the entire life of the assets is included in the economic analysis, and this is consistent with standard methodology. By extending the study life to accommodate those longest-lived assets, Manitoba Hydro's study period for the economic analysis is then set a total of seventy-eight (78) years.

Detailed forecast information is used for the inputs for the first thirty-five (35) years of the study period. Beyond thirty-five (35) years, the assumption is that load, the net of revenues and production costs, as well as capital replacement costs are held constant to the end of the life of the longest-lived asset.

As explained in Appendix 9.3 of the submission, beyond the thirty-five (35) year detailed study period, the replacement capital costs for assets that reach their life during the end of their life during the study period are included as well as major

capital maintenance for hydro generation. This is what is depicted in the graph on the left, the timing and value of a replacement for capital costs.

The average net revenues of the last three (3) years associated with each development plan are extended to the end of the study period. And this is shown on the right-hand side, the timing and value of net production costs. And this is also why you see a flat line on the graph after 2047.

(BRIEF PAUSE)

MS. JOANNE FLYNN: Generally speaking, despite our best efforts to understand the future, it remains uncertain. In the overview presentation on March the 3rd, Mr. Wojczynski talked about how Manitoba Hydro has expanded its evaluation to include probabilistic analysis using scenarios. In Manitoba Hydro's probabilistic analysis, the highest impact factors are identified, and uncertainty is defined as to high reference and low values on these high impact factors.

As shown on the slide, the combination of the factors with high reference and low values result in twenty-seven (27) scenarios: three (3) sets

of energy prices, times three (3) sets of capital costs, times three (3) sets of discount rates.

As you can quickly see, probabilistic analysis will grow exponentially with each added factor. And so in order to maintain the identity of the factors and to ensure reliable data could be used in the analysis, three (3) factors were selected as the basis for the analysis. These sets of factors represent market prices including natural gas, electricity, and carbon; capital cost of generation and transmission; and the discount rate.

As each combination of these factors does not have the same likelihood of occurring, probabilities are applied to the high reference and low factors, and subsequently the weighted average factors are applied to each development plan which then results in a probabilistic comparison of the development plans. And I will talk about that in a later slide.

In addition to the probabilistic analysis, Manitoba Hydro also conducted a sensitivity analysis on selected variables including drought, climate change, load, and in-service date delay. These variables were studied separately to determine their individual impact on selected development plans.

In addition, in Chapter 12 of the

submission which provided some updates to the 2013 planning assumptions, sensitivities were done as multipliers to the base DSM as the information from the potential -- DSM Potential Study was not available.

I will now turn it over to Mr. Page to speak on the topic of economic indicators.

(BRIEF PAUSE)

MR. IAN PAGE: Thank you. Ms. Flynn has reviewed the economic analysis methodology, and I will now discuss some of the economic assumptions that were necessary to undertake that analysis.

The economic ana -- economic outlook is prepared each spring at the beginning of the annual -- of Manitoba Hydro -- Manitoba Hydro's annual planning cycle. It's an annual forecast with the key economic variables that are used throughout the different types of analysis in the NFAT process. It is a consensus forecast with input from major forecasting agencies such as the Conference Board and Global Insight, and it's supplemented by shorter-term forecasts from num -- numerous financial institutions.

Consensus forecasting is generally seen as a more robust means of forecasting rather than

relying on a single source, and this is why organizations such as the Bank of Canada endorse this method.

This table shows some of the major indicators included in the economic outlook. It's not all inclusive. It -- there's a number of US indicators that we don't have on here as well.

The economic analysis that we're focussing on this week utilizes the real interest rates and discount rates, that is with inflation removed. The financial analysis that is the subject of next week's review utilizes nominal values, which will include the effects of inflation.

For example, the real WACC shown above the five-o-five (505) and five point four (5.4) on a -- on a nominal basis would be seven-o-five (705) and seven point five (7.5), respectively. The US exchange forecast that we see here are -- are the -- represent the number of Canadian dollars that would be necessary to purchase the US dollar. So these are showing that the Canadian dollar would be trading at less than par in -- in our forecast.

Now, the -- the basis for the analysis, as Ms. Flynn has talked about, is net present value, and this is the primary measure from Manitoba Hydro's

perspective. So NPV is a measure of -- it's a projected wealth project -- creation. So is the project or plan worth pursuing? It's prepared using a summation of cash outflows and inflows discounted to reflect the time value of money. Now, there's other methods that can be used to supplement the economic decisions as well as considering perspectives of the ratepayers and broader societal impacts.

Now, there has been some discussion by the experts -- independent experts on the use of IRR. Now, it's mainly useful for incremental analysis, such as when we were looking at the Wuskwatim here we were looking at a simple advanced deferral decision of Wuskwatim. It does allow for -- its main advantage, when we're looking at IRRs that allows you for comparison of projects of different sizes.

It has a number of problems though. One (1) -- its -- probably its major problem is that it -- it doesn't cope well with mutually independent decisions. Because, if you're following the IRR test you should pursue every option that -- that exceeds your hurdle rate, and sometimes those are competing projects and the meth -- methodology is very dif -- it can be adjusted to compensate for that, but it's sort of a backdoor way of doing the NPV anyway. So you can

-- instead of an awkward of doing IRR, you can just jump straight to NPV.

There is other -- some other technical issues like -- with IRR, is that it assumes that each year the cashflow that's produced from the project is reinvested at that IRR rate. And as the IR -- if -- in a project where the IRRs are high, that's almost never the case where those pre-cash flows get -- then get reinvested at that same project rate.

Now, we've talked about that we use some different perspectives through the analysis, so I just want to discuss that there's different discount rates we're using depending on the perspective we're taking. Now, the market analysis approach that Ms. Flynn has discussed, is looking at the -- at the project from Manitoba Hydro's co -- perspective.

So if we're looking at Manitoba Hydro's perfe -- perspective it's appropriate to use Manitoba Hydro's cost of capital. And in this case -- and I'll talk about this a little bit later -- is the -- our weighted average cost to capital. And as mentioned, we have our -- our reference case, which was in the 2012 filing, five-o-five (505). And then we have a low and a high case, as well.

When we're looking at the -- at the

multiple account analysis that was in Chapter 13 of the filing, there we're looking at a social dis -- broad societal discount rate that incorporates both interest rates and -- and society's time preference. And the -- down at the bottom of the table, when we're talking the -- the financial analysis, this we're using really a pure time preference rate, which is a short-term savings rate, because interest rates -- or interest costs and contributions to retained earnings are already incorporated into the -- into the projections in the financial analysis.

Now, for the selections of the discount rate, the discount rate rep -- is -- is intended to represent the opportunity cost of investing in a project versus an alternative of similar risk. And finance theory is that the project's value is not influenced by ownership, but by the nature of the project itself.

So obviously there's practical issues with finding a compa -- comparable to Manitoba Hydro generating station built on the Nelson River. And if we broaden that to look at pro -- companies building large hydro projects we still find that they tend to be regulated utilities, and in Canada, virtually all of those are also Crown owned. So it's -- it's hard to

get a good sense of -- of what sort of a market return is.

So most of these utilities are operated -- or regulated on a return-on-rate-base perspective. So for -- for those -- those entities, really their opportunity cost would be measured by that regulated rate of return, which is their weighted average cost to capital, plus any necessary risk adjustments that might be appropriate for that particular project.

Now, because we're oper -- we're regulated differently, we're not operated on a return-on-rate-base basis, we don't have a -- we haven't had a hearing to determine to the number of decimal poi -- points what the exact rate of return should be for Manitoba, so we -- we tend to use a proxy. And the proxy calculation assumes that, by looking at some of the major returns that are earned -- allowed are -- allowed in -- across the country, and Crown owned utilities -- we look at, sort of, private utilities, and then to broaden this -- this set, we also looked at distribution utilities, and even gas distribution utilities, and found that equity returns generally seem to be about 3 percent above the cost of -- of debt.

So, as an example for the calculation below, for the 2012 weighted average cost to capital,

we use our cost of debt at 6.3 percent plus that 3 percent equity adder. And we multiply that by the 25 percent weighting that equity has in our capital structure, and then we use the -- the debt rate of 6.3 percent and weight that at 75 percent, which gives us a -- a 7.05 percent nominal rate. And if we then divide that by the 1.9 percent inflation, we'll get -- we'll get 5.05 percent real that I showed you on a previous table.

Now, investors often use a risk-adjusted discount rate to calculate net present value. Now, Manitoba Hydro's base-weighted average cost of capital, it does include that 3 percent equity premium that I just referred to. And that's intended to accommodate normal business risks, and it also provides for ongoing contributions to retained earnings.

Now, Manitoba Hydro's policy is to adjust its weighted average cost of capital to incorporate additional risks. Now, the corollary to that is that if risk has been account for by some other means, then the risk adjustment factor could be reduced accordingly.

Now, for the Preferred Development Plan, or for the analysis of the Preferred Development Plan, detailed probabilistic approach to large impact risks

rather than attempt to capture these risks in -- in the discount rate. Now, since that major -- those major unique risks are -- are -- have been dealt with through that probabilistic analysis, then it's appropriate to use the weighted average cost of capital for this -- for the purpose of this analysis.

And now I will turn it over to Dr. Borison.

(BRIEF PAUSE)

DR. ADAM BORISON: Thank you very much. As has been mentioned earlier, my role here was to help support the uncertainty analysis and provide guidance about how to incorporate uncertainty into the economic evaluation. And I'll go over that fairly quickly.

So the big overview again is that -- and again, I specialize in uncertainty analysis, so I'll talk a lot about uncertainty. There are a variety of uncertainties clearly in the planning environment. We're here focussing primarily on long-term issues, so -- there's obviously volatility in very short-term issues. But the effort here was to try to figure out, if we're going to make a decision that goes for decades, how do you think about the uncertainty over

that fairly long period of time?

And in -- and in my experience, there are really three (3) elements, or three (3) key pieces, to doing uncertainty analysis, akin a bit to building a house.

The first is the formulation phase. I kind of think about -- that's kind of the blueprint. So you need to first say, Well, what are the elements of this analysis and how do they relate? And so we helped Manitoba Hydro decide -- and we'll talk about that in a second -- what are the elements of this analysis we really should be thinking about seriously?

The second piece is really the inputs. It's kind of like the materials you use to build your house. So there's a variety of inputs that are unique to uncertainty analysis like probabilities. And so we wanted to help make sure the inputs to the analysis are as good as possible.

And then the last piece -- again, maybe that's the house itself -- are the outputs. So once you do this uncertainty analysis, you have some familiar outputs and some not-so-familiar outputs, and part of our guidance and support was to help develop those and understand those.

And those are really the three (3)

pieces I'll -- I'll talk about very briefly.

You've heard a bit about my background. Again, I've done this kind of work quite a long time and -- and have done it for very many years in -- in similar situations. And our firm is essentially a fairly large consulting firm, New York Stock Exchange listed, with a pretty sizable energy practice. So as a firm, we have a lot of experience in the energy field generally.

But that's the background. I was going to talk about these (3) pieces and then a few key questions people have -- have asked about this.

THE CHAIRPERSON: Dr. Borison, I should have asked this question earlier. In terms of your experience with large hydro dams, can you talk about that?

DR. ADAM BORISON: That's a very good question. I have done -- well, let me say the good -- the good news is I've done a whole variety of very large assets. So nuclear plants. I've done hydro plants. I've done coal mines. I've done uranium mines, I've done hydro dams for water primarily. So I've done a lot of -- of analysis of various kinds of large capital investments.

I've done work on hydro facilities

specifically, mostly in California, not so much in Canada, but evaluating those specifically.

THE CHAIRPERSON: But nothing on the scale of what we're talking about here?

DR. ADAM BORISON: I've done investments that are this scale, but nothing -- no hydro facilities of this scale, no. That's definitely true.

THE CHAIRPERSON: But you -- in terms of the hydro facilities you did look at, you would be looking at the same time frame, wouldn't you? Like, in terms of --

DR. ADAM BORISON: These are very lived, yes. These were long-lived assets of similar -- similar issues.

THE CHAIRPERSON: To the -- to the extent that those -- those assets are longer-lived than regular -- other kinds of electricity generation assets.

Does that increase the uncertainty of the risk associated?

DR. ADAM BORISON: Yes, I -- I think the -- the fair statement is generally that's true. The longer the time frame, the more people would think -- again, there are some exceptions to this rule, but

more people would think, yes, that the number of factors and the uncertainty in those factors does get -- does get bigger. That doesn't necessarily mean, however, that the risk of the decision is bigger. But certainly the uncertainty can be bigger. That's definitely true.

(BRIEF PAUSE)

THE CHAIRPERSON: Just -- just a statement that I need to explore. Could you -- could you --

DR. ADAM BORISON: What I -- what I would say is, when you make -- I think it's a fair statement. When you make a big capital investment that you put a lot of concrete and you put something in the ground, then it would be natural to think of that as being highly risky. I certainly think -- yes, that -- that asset is going to go over a long time and it's going to be exposed to a lot of risks.

I do think you might say there are other kinds of investments where you're exposed to a lot of near term -- a lot of volatility, and those may have -- have large risks as well. So you make an internet investment. Right? You're not -- you know, Facebook

is very, very risky. It doesn't involve a lot of capital, but it's highly uncertain. So that would be my distinction.

I -- I don't disagree with the idea that when you build a long-lived asset, a long-lived asset, that, yes, you're lea -- you're leaving yourself open to a lot of factors that go into the far future. And those factors tend to get more and more uncertain. That's certainly true.

So the formulation. The formulation, basically, as I said, is kind of a blueprint. And, again, not going into great depth, but in general the blueprint has these four (4) pieces, fairly -- I think fairly straightforward. One (1) is: What are the decisions you can make? What are the alternatives you have? And in this case that includes both options, individual technologies, as well as plans.

The second piece is, again, the key thing here, the uncertainty. And in this particular application, like many, there are a long list of them. And we helped Manitoba Hydro decide which of those need the fullest treatment. And we'll talk a bit about that, but there were these three (3) that were the key ones.

The third piece, again, which people

often gloss over, but it's very important are the metrics or objectives that you might use. You know, you can use a lot of different measures for risk and for value. And so you have to decide what am I going to base my decision on, and we talked a bit -- we'll talk a bit about that.

And the last piece, which is perhaps a little more subtle is the timing of events. So people ought -- a lot of times people do uncertainty analysis, they don't think carefully about when do things happen and what do I learn before that happens. And so part of the form -- formulation phase is actually asking yourself, Well, if it's uncertain now will it be more uncertain later, or will I get to change my mind. That's the -- the optionality piece.

So part of what we tried to do and help Manitoba Hydro do is think through these four (4) pieces in -- in the blue -- blueprint of our kind of analysis. That was one (1) piece.

Then, the second piece, which again I mentioned earlier, is really the -- you know, the -- the data. The unique part of -- of this kind of analysis is really the probabilities. And there's a lot of discussion about how do you do that well. How do you come up with probabilities on -- on the far

future in a -- in a good way?

And what we, again, helped Manitoba Hydro do was to identify those -- the -- you know, these factors that really deserve that treatment; and then do the best possible of capturing what is the -- the feeling about how uncertain these might be. And there are some assumptions that we -- some observations, assumptions that we made in coming up with this, and these are described a bit here.

We picked three (3) uncertainties because of their impact, and their potential for dramatic change. And then we thought carefully about each of those uncertainties, both whether they are really separate, whether they are correlated somehow or not. And, again, we decided that they probably weren't sig -- significantly.

And then, lastly, there was a discussion about how many scenarios do we really -- really need to treat these. And, again, we can go into detail on that, but we followed what is generally good practice of picking a high, nominal, and low -- or high reference and low. Again, could go into more detail, but it helped in that process of coming up with a set of inputs that we believe helped represent the major, long-term uncertainties that might drive this decision.

That was the goal there.

And then the last piece, which is again not entirely straightforward is, well, now that you've done that analysis show me what it all means. And there were really four (4) kinds of outputs, and you've seen these -- signs of them. The first one (1) is just a value that a plant has in a scenario. Kind of a quilt idea. And that's a very basic output. It doesn't have a probability on it, but the NPV of each of these alternatives in each scenario is one of the most basic outputs. And we -- we obviously, you know, saw that.

The second one, called expected value, the average value, is really the probability weighted value of each alternative. And sometimes people tend to think that ignores risk. I just want to make it clear. That is a risk output. It takes a probability times an outcome. So all the risk is somehow factored into this single number, which is the average outcome. And that's the second -- well, probably most important or most common risk output.

The third piece, which was more of a challenge to display and -- and kind of internalize, is the range. What is the risk? Okay. You showed me this core value. What's the spread? How bad could it

be? How good could it be? And there, there are a variety of things that we helped them generate scatter plots, 'S' curves, to help convey that idea of what is the risk of the various plans.

And then the last piece which again is probably the most difficult to really internalize is, Well, that was great. You've shown me that risk, but what happens to my value and my risk if I can adapt. If I can learn about the future: gas prices, load, whatever it might be, and change, how does that affect the plan, and the value of the plan? Some more, some less. And those are the four (4) outputs that we -- we helped Manitoba Hydro generate.

So that's the -- that's the core analysis: formulation, inputs, outputs, and then what I tried to do here is based, to some extent, on the comments we've gotten back but also just on my own background, identify those -- some of the key questions people ask about uncertainty analysis and -- and the kind of analysis that we supported here, and -- you know, more broadly just the economic evaluation.

So let me just run though those again, not too -- not too quickly, not too slowly. The first one is NPV. People obviously have used other metrics; IRR, payback period, et cetera. I think it's fair to

say, and again I say this with some experience, that in this kind of field and this kind of work NPV is typically the gold standard. So I have a quote here from a -- from a textbook.

People use IRR. They use payback periods. They use these tools. They are insightful. They're helpful. But when it comes to the bottom line, What number gives me the best sign of the value this alternative creates? In a broad sense, it's NPV. That's generally what people would say, so we thought that's a reasonable thing to use as your primary metric. It doesn't mean you shouldn't have other metrics, but as your primary metric that's a good one to use. That was our -- our observation, and we supported that in the work.

The second one is this whole 78-year time horizon issue, and it is a very long time horizon. A lot of people make investments, and they don't look that far forward. Again, our take was that if you are a building an asset that might -- you're considering alternatives where one or more of those assets might have a long life, the world's very uncertain. Absolutely. But you owe it to yourself to think through how those alternatives might be different over that long time frame.

So if you're building a mine, much less a power plant, that's going to have a 50-year or 100-year life in Australia or in Chile, you might think, Well, I -- my -- my time frame might not be twenty (20) years but I'm going to have a mine after twenty (20) years, what's that worth?

So in our sense we basically thought, Having a long time frame to compare the assets makes sense. Again, discounting reduces the impact of that in the long term, but it's not unreasonable to say, Let's think through, if we can, what the implications are of these different alternatives are over a long time frame. And so we supported that idea of using a long time frame to compare the assets. Again that factored into the uncertainty analysis.

The third question, which again is -- I think is reasonable to ask is, Well -- and again, if you -- I know some of you have done economic analysis, maybe nearly as much as I have, to some extent, the -- or maybe more, the -- there is a lot of issue about -- discount rate is clearly a question here, and treating discount rate as one of those factors that you consider to be uncertain.

And what we recognized is that it is -- it is not uncommon -- it is well accepted over long

time frames both that have big investments involved and get intergenerational or long-term impacts, to treat discount rate itself as an uncertainty. And again, I have a quote about that here.

So the idea of saying, One of the things I'm cer -- uncertain about is how people will look at the time preference for money. It is a reasonable thing to treat that as an uncertainty, which was one of the major drivers of the three (3) that we had. That's one -- again, that's an issue that has come up.

The fourth question here is really: Is the approach that was taken here reasonable? And I just wanted to make the point here that, Yes, this idea of assigning a probability to different cases to then weighting those, getting an NPV and weighting those, is -- is accepted. And again I took advantage of a Nobel laureate as someone who said, Yes, this is one way of dealing with discovering uncertainty.

So the -- the purpose of these two (2) items is to say, The treatment of capital cost, economic conditions, all of those as uncertainty -- discount rate as an uncertainty is a -- is a reasonable thing to do.

And then the last two (2) -- two (2) points, again I apologize in a bit for using some of

these -- these jargon terms, but these are fairly important issues.

One (1) of the things I mentioned is that it's -- it's -- is a bit -- is -- there are many different ways of displaying risk and thinking about risk, and there are good ways and not so good ways, in my opinion, and so it's something that you don't always do, but if you were going to do it to look at risk, you need to think carefully, Am I conveying -- am I -- am I doing the right thing, am I really thinking about risk in the right way?

And what we -- the approach that we help Manitoba Hydro take is typically called the expected utility -- not utility in the power sense, or the utilitarian approach. It basically tries to look at the real wealth impact the alternative has on your audience.

So it's basically saying, at the end of the day, what impact is this really going to have on me? And that approach is widely regarded as the best way of conveying -- in an economic financial sense, of conveying uncertainty.

So in this case, you're trying to say, I have a curve. I have an -- a downside, an upside, and what does that really mean to me?

Well, it means how much wealth did I get or not get? And that's the so-called utilitarian approach, and the -- the 'S' curves you see, the box-and-whisker plots, those are all designed with this particular approach in -- in mind.

The reason I bring this up is because it has been suggested that there's an alternative to that, and that is to try to really look at what you could have had in a scenario.

So you might say, Well, if I did 'X' -- if I'd done 'Y', I would be much better off, and this is called the regret approach because it has regret in it. And it's very intuitive to think of it that way, Well, if I did, you know, if I did this -- if I had only bought that lottery ticket, I might have won a lot of -- you know, that might have been a good thing. Boy, I would have been very rich.

And it's not a bad thing to think about things that way, because that is natural. But by and large, that approach is regarded as descriptive, not prescriptive, and it does describe what we try to do and what we do, typically, but if you were going to give someone advice about a decision, you probably wouldn't recommend that.

And the reason behind that, and I could

go into more depth. I -- I won't do that right now, is that it has some odd qualities to it, that I could show you some examples where you might say, No, that doesn't make a lot of sense if I adopted that approach.

So in my experience, and it's something we've wri -- written in our reports, we would strongly recommend adopting what I call the utilitarian or expected utility approach. Base your decisions on the underlying wealth that is created. Don't base them on your disappointment or relief or what could have happened.

And, in fact, what I say in this -- in this presentation with this author, Dr. Bell, who happens to be one (1) of the primary authors who writes about this regret approach, even he really doesn't recommend it as a -- as a decision-making tool, really.

So again, my -- my view would be that -- again, to this -- I hope this isn't too much technical detail, that it is important to look at risk kind of in a logical and -- and correct way, and -- and we try to help Manitoba Hydro do that very thing.

Anyway, I hope that didn't go into too much detail, but that's essentially the summary of the -- of the uncertainty analysis work.

MS. PATTI RAMAGE: If there are no questions, we'll ask Ms. Flynn to come back and deal with MISO pricing trends and energy policy.

DR. HUGH GRANT: Could I ask one (1) question, purely selfish? We had some assigned reading to do, and I spent a lot of time cramming for the test, expecting and reading about hyperbolic discounting, and I understand that part of the rationale for that is, when there is this future uncertainty around discount rates, that you value the present highly and you value the distant future highly but not so much the intervening period, if -- if that's correct.

And my -- my question is, has anyone ever actually tried to pass this through a regulatory board?

DR. ADAM BORISON: I -- I think the fair answer to that is, no. I could look more -- in more depth, but, no, I don't believe that's -- that's true so much --

DR. HUGH GRANT: So interesting in theory, but hard to convince a public regulator of that?

DR. ADAM BORISON: Well, at risk of going into too much depth, I -- I do think there are cases where -- well, no, no, I'm not sure. I'd have to

go look more -- in more detail. I'm -- I'm pretty sure there have been no cases where people have convinced people to -- con -- convince regulators to do a -- to do a -- an in-depth analysis using hyperbolic discount rates. That's probably true, yeah.

MR. ED WOJCZYNSKI: Perhaps I could add to that though. I -- I don't think Ma -- it's Ed Wojczynski. We're -- we're playing musical chairs because of the space situation. I don't think Manitoba Hydro or its -- or its experts, and we have another one coming, Mark Shaffer (phonetic), who will be in the Panel 4, are suggesting we should use hyperbolic discount rates. I think the idea was to indicate that we have to be careful that we don't undervalue the long-term assets, or values with long-term assets, and that -- there's a tendency to do that with normal discounting.

And so we have to make sure that we -- we give appropriate consideration to the -- the long-term value or 'B' crest value of these long-term assets, particularly anything that has an environmental benefit component or impact component.

THE CHAIRPERSON: I'm looking at the clock. It's noon, so I suggest that it would probably be an appropriate time to break. And so I suggest that

we reconvene at one o'clock.

Now, are there any administrative matters to attend to before we -- we break? If not, have a good lunch. We'll see you at one o'clock.

--- Upon recessing at 12:00 p.m.

--- Upon resuming at 12:45 p.m.

THE CHAIRPERSON: Good afternoon. It's 12:45. I -- in the absence of any administrative matters, we'll resume the proceedings. I'll turn the microphone over to Mr. Wojczynski. No? Ms. -- Ms. Flynn? Sorry, Ms. Flynn. Thanks.

MS. JOANNE FLYNN: All right. The next section is MISO pricing trends and energy policy.

Electricity prices in the MISO region are expected to increase. Three (3) of the key factors driving this real price growth are MISO's need for additional generation resources, increasing fossil fuel prices, and expectation of carbon pricing.

Manitoba Hydro uses a consensus forecasting approach and engages a number of expert North American energy analysts to provide their independent views of the range of future price trajectories for electricity and its key drivers. In

this way, Manitoba Hydro's electricity export price forecast captures the expectation of rising prices and is a forecast that is appropriate to use for long-term resource planning.

There are a number of factors driving the need for new supply in the MISO region. The primary factor driving this need is the aging generation fleet, and expected unit retirements. Coal retirements are being driven by a combination of emerging US EPA regulations and moderate natural gas price expectations. The EIA's 2014 annual energy outlook pegged this retirement figure at 60 gigawatts, or about 20 percent of the existing US fleet.

Specific to the midwest region, MISO is projecting 12.6 gigawatts of regional coal retirements in its 2013 Transmission Expansion Plan. The other item of interest is that in addition to these coal retirement figures, most of the US nuclear fleet will be reaching the end of their extended sixty (60) year operating licence by the mid-2030s.

In addition, gradual regional electric load growth is expected. Although moderate, regional load growth of around one-half (1/2) of a percent per year is forecasted by numerous independent energy analysts, regional utilities, and the US EIA. While

natural gas will be a primary choice for meeting new resource requirements, renewable and non-emitting generation resources are preferable to avoid future environmental policy risks for US utilities.

The average cost of fossil fuels has been the most influential determinate of market prices for electricity in the US, as conventional thermal generation is dominate in almost all regions, including MISO. Over the past number of years, there has been a significant shift in the North American natural gas market. Prior to 2008 was the period of high commodity prices driven by concerns about resource scarcity. To bring in additional supply, L&G import capabilities were being developed at an extremely high cost of supply.

However, simultaneous to the -- with the 2008 economic downturn, the shale gas revolution has resulted in a domestic surplus of natural gas. It is important to note this new gas outlook has been incorporated in the annual gas and electric forecasts prepared by consultants and used in long-term planning. Expectations are that fossil fuel prices will grow in real terms.

As an example of this indicative trend, the US EIA's most recent annual energy outlook projects

post-inflation or real price growth of 3.7 percent per year between 2012 and 2040. Over this same horizon, the EIA expects coal prices to increase 1 percent per year in real terms.

Manitoba Hydro expects that greenhouse gas emissions will be significantly constrained either through legislation and/or regulation. Greenhouse gas emissions continue to face increasing constraint through federal regulation in the US and Canada. The Obama administration continues to pursue its energy and environmental objectives through regulations led by the US Environmental Protection Agency.

In addition to the mercury regulations that are driving major coal retirements, the US EPA is in the process of finalizing a number of other regulations to deal with air and water pollutants, in -- - including coal ash and cooling water regulations. Although these will not have the same impact as the mercury regulations, they will increase compliance costs for generators.

The biggest regulatory item on US EPA's agenda are regulations to limit CO2 emissions from new and existing power plants. Draft regulations for new power plants were released in September of 2013, and require coal plants to at least partially implement

carbon capture and sequestration, which many view as effectively banning new coal plants. The EPA conducted extensive consultation with stakeholders and are currently drafting regulations to limit CO2 from existing power plants that states will use to design their own implementation plans. These are expected to be released in June of 2014.

There is uncertainty around the stringency of potential targets, as well as the compliance options that may be available to meet these targets. The final design of these regulations could have a transformative impact on the US electricity sector, and specifically, its coal fleet. Recognizing the potential significance of these regulations, stakeholders are weighing in with their preferred compliance options. For example, Great River Energy is advocating for a MISO-wide carbon price.

In addition to federal legislation and regulation, state provincional -- provincial and regional greenhouse gas ini -- initiatives are in various stages of operation. For example, the Western Climate Initiative cap and trade system currently established in California and Quebec, the Regional Greenhouse Gas Initiative in place since 2009 for nine (9) participating northeastern and -- and Atlantic

states, alternative carbon pricing mechanisms, such as British Columbia's Carbon Tax, Manitoba's Co -- Coal Tax; and Alberta's Emission Intensity Reduction Program.

At the state level in Minnesota, the Minnesota Public Utilities Commission requires utilities to include the future cost of carbon regulations, currently valued between nine (9) and thirty-four dollars ($34) per tonne in their resource plans beginning in 2019. Utilities are also required to include social and environmental costs of carbon in their resource plans.

At the federal level in Canada, Environment Canada has finalized regulations limiting CO2 emissions from coal-powered plants, and this was done in 2012, and are working to draft regulations to limit CO2 emissions from natural gas-fired plants.

As discussed, there are broad expectations by industry analysts and other stakeholders for significant constraints on greenhouse gas emissions within the MISO electricity market. Manitoba Hydro manages this uncertainty and expected carbon valuations similar to other key inputs into the electricity export price forecast. External consultants provide their own independent expectations

for the timing and valuation, if any, of a carbon price under their base case, as well as for high- and low-sensitivity cases.

In 2013, the majority of the consultants included a carbon price in their base case; however, a few expect no pri -- carbon price in their base case through the forecast horizon. Incorporating all perspectives, including those with no carbon expectations, equally moderates the average embedded carbon price that affects the average electricity price forecast.

While increases in electricity prices due to carbon pricing is expected, this impact on the reference economics is modest. In terms of the range of uncertainty, it is important to note that the low case in the -- the electricity export price forecast has no carbon price expectations. This is consistent with the need for consideration of a no-carbon case.

Consensus forecasting has been validated by a number of different economists, statisticians, and other academics as a robust approach to reducing forecasting error over the use of a single forecast.

According to the literature, combining multiple forecasts leads to increased forecast accuracy. And in many cases, one can make dramatic

forecast improvements. By simply averaging the forecasts by using at least five (5) independent market experts, Manitoba Hydro employs a consensus forecasting approach that avoids the risk of assigning too much weight to one (1) single view of the future.

Manitoba Hydro engages price consultants that are well established, reputable, and are active throughout North America in providing expert advice on regulatory, financial, and technical issues. They use sophisticated methodologies and simulation tools to ensure model market operations.

For example, they all employ formal production costing models that use comprehensive algorithms to simulate actual market dispatch characteristics. They also all use consistent methodologies to calculate the value of capacity in MISO, using a net cost of new entry analysis.

It is important to note Manitoba Hydro does not provide direction on assumptions for key pricing factors to be used, ensuring the independence of forecast results. The price forecast consultants are required to make their own assessments of a number of pricing factors, including but not limited to fuel price, future load growth, generation additions and retirements, and future legislative requirements.

Manitoba Hydro requests at a minimum three (3) different future outlooks to be provided. In addition to the reference or base case, Manitoba Hydro also requests an upper and lower bound of prolonged pricing. These provide a range of plausible price futures and support assessing uncertainty in power resource planning.

For example, the low price case would typically contain assumptions of abundant domestic natural gas resources, no carbon constraints or pricing, minimal environmental regulations, low economic growth, and low electric demand.

Manitoba Hydro recognizes uncertainty is inherent in any long-term forecasting. However, the process Manitoba Hydro uses ensures that an independent expert view of the range of market price forecasts is used, limiting any potential bias in long-term planning and resource selection processes. Therefore, Manitoba Hydro's consensus electricity export price forecast is appropriate for long-term resource planning purposes.

I'm going to turn it over to Dr. Murphy now.

(BRIEF PAUSE)

DR. DEAN MURPHY: Thank you. I'd like to take the opportunity to give you a very brief overview of the MISO market, the -- the -- Manitoba Hydro's export market, the factors that drive power prices, and at least the Brattle Group's view on what -- what prices might prevail in the future.

Before I talk about the particular factors that affect energy prices, it's worth saying a few words about how our energy prices are derived, how power prices are derived. Energy prices, you can -- you can view it in terms of energy prices and capacity prices, and these are bundled in different ways in the market, perhaps as a long-term firm contract.

But fundamentally underneath, you can separate energy prices, which is the short ren -- short-run market, the -- the actual energy delivered, and capacity prices, which is the value that's put on the ability to deliver energy when it's needed, but not the energy that actually is delivered at that time.

So energy prices are driven by the short-run variable costs of operating the electric system that exists at that -- at the time, in -- in that short run. It's not affected by the sunk cost of developing that system. It's not affected by the cost of expanding that system in the future. It's really

just the short run operating costs, and -- and those consist primary of fuel, and also emissions costs, and particularly potentially in the future, a CO2 cost.

So the -- so the energy price in a competitive power market is going to be set by the short-run variable cost of operating the marginal unit, which is the last unit that needs to be operated at that point in time to serve the load that exists at that point in time.

It -- it's fairly straightforward conceptually. It gets a little more complicated in actual operations, but -- but that will -- but -- but that is a very useful concept, is the energy is really just driven by the cost of producing that last marginal unit of energy from the system that exists at that point in time.

Capacity, on the other hand, is deliv -- is driven by the supply and demand balance. If there is a lot of excess capacity in the market relative to the demand, capacity will earn very little, perhaps even nothing. So it's -- it's driven by that balance between supply and demand.

When capacity is needed, the value of capacity is driven in part by the cost of developing new capacity. So if a combustion turbine, a peaking

plant, is the -- is the most economic choice for developing new capacity when that capacity is needed, the cost of actually building that plant will help to set the capacity prices.

But there's one (1) further wrinkle that you need to consider, which is the -- that last resource that's added to meet the capacity needs of the system will earn some energy revenue once it's in place and it operates, and its ability to earn energy revenue offsets the amount that it needs to earn from the capacity market.

So, for instance, the -- the numbers may not be familiar to you, but if a combustion turbine costs seventy dollars ($70) a kilowatt year in its -- to recover its fixed costs, the -- the cost of building and the fixed cost of operating the plant, but it can earn ten dollars ($10) per kilowatt year in the energy market, then it really only needs to recover sixty dollars ($60) from the capacity market. It'll get the rest of its -- what it needs to earn a fair return from the energy market.

So -- so think in those terms. Energy price is driven by the short-run variable cost of operating the system that exists at that point in time. Capacity prices are driven by supply/demand balance.

They rise when supply and demand come into balance, when capacity is needed, but they're offset by the energy -- by the energy value of the next new resource.

So to get into the particular factors that drive these, fuel price and emissions costs, and here, a CO2 price, because that's the -- the most significant potential emissions cost, are really the primary drivers of energy prices. On the fuel price -- let's talk fuel first.

The biggest effect is from natural gas. In MISO, MISO is a coal-dominated region. Coal provides the large majority of the energy in MISO. Something like 75 percent of the energy is provided by coal. But gas prov -- gas plays a bigger role in the share of price setting than its share of energy, and that's because it's often -- when it is dispatched, it's the resource that is setting price. So -- so it -- it has a sort of an outsized role in setting prices in MISO relative to what otherwise looks like the coal-dominated system.

Coal prices can also be important, but a rea -- another reason why gas prices are more important than coal prices in setting power prices is that coal prices tend not to be as volatile. They don't move as much. They're not as uncertain as -- as gas prices.

And so -- so really, natural gas price is the -- the most important fuel price to consider.

Coal also plays a role, and going forward in various different scenarios, of course, the -- the weight that's put on those differs depending on what the resource mix is in the future. If we go into a future where we retire a lot of coal capacity, build a lot of gas capacity, then gas becomes even more important in setting price. An alternative future that has a lot of remaining coal capacity and -- and not so much additional gas, gas would be less important, relatively.

So -- and -- and as we've seen, gas prices have fallen dramatically in the last few years with the shale gas revolution. And this -- this fundamental change in gas prices, as was suggested earlier, really -- really has -- it did come as a surprise to the -- to the market, one. Five (5) years ago, certainly six (6) years ago, it was not really on people's radar screen. The US was building LNG import terminals because we were running out of gas and we were going to have to build -- we were going to have to import gas to meet our needs.

Now, with shale gas, we've got more than we know what to do with almost. And some of those

import terminals are being re-purposed as export terminals. So that's a -- that's just a reflection of the change -- the fundamental change in the gas market over the last few years.

Let me turn to -- to climate policy and the potential CO2 price as drivers of power prices. And, again, the -- the primary effect here is on energy price. Both the stringency and the form of the climate policy will have an effect on energy prices. And, in particular, if -- if there is a CO2 price, that will go directly into the price of energy because it affects the short-run variable cost of operating a coal unit or even a gas unit.

Because MISO is so heavily coal dominated, a CO2 price would have a particularly large effect in MISO, more so than it would -- it would have a -- a bigger dollar effect in MISO than it would in, say, Florida or New England, or California, which tend to be gas-dominated regions. Gas is still affected by CO2 price, but only roughly on the order half as much as -- as coal.

There has been very little movement at the federal level in the US on climate policy over the last -- well, there hasn't been any movement yet that has actually att -- resulted in any kind of federal

climate policy, or at least not a federal carbon pricing policy. But there are other means possible to develop a -- a carbon price in MISO.

It's happened in other places. California has a -- a carbon price in the form of cap and trade. RGGI has at the New England states -- primarily the New England states also has a carbon price. There -- and there are other ways, in particular the -- the new EPA proposal that will -- is due to come out in June of this year, to regulate the carbon emissions of existing power plants, could ultimately result in a carbon price.

Now, my understanding -- I'm not a lawyer, but my understanding is that EPA does not have directly the authority to impose a carbon price, but that it will set the carbon standard that states must meet. And the states must develop their own plan for how to meet the carbon emission standards that are set by EPA.

A carbon price is a very effective tool for reducing carbon emissions. And so it's possible that sta -- one (1) or more states may use that carbon price -- may use the carbon price mechanism as a tool to meet those EPA standards, even absent any kind of federal carbon pricing climate policy.

Let me -- let me go on, because I'm sensitive to the -- the time limits that we have today, and talk about coal retirements. As I imagine you know, there have been and continue to be a significant retirements of coal-fired generating capacity in MISO and -- and in other regions as well.

To date, those are driven mostly by new EPA environmental requirements that, in -- in many cases for many individual plants, those plants would have to put on very costly and capital-intensive pollution controls in order to comply with the new EPA regulations.

And in the -- in the face of existing market conditions, many of those plants are looking at that -- at that choice and deciding that it's really not worth putting in 200 or $300 million worth of capital cost into a plant that is barely breaking even anyway because of the other side of the context, which is low gas prices which have brought down power prices.

So a plant that has not-so-good economics in the first place, if it suddenly has to put in a huge capital expenditure in order to keep running beyond 2015 or 2016, it may decide to retire. We've already seen -- I think it's about 6 gigawatts of retirement within MISO.

The -- the system operator expects a further 6 gigawatts of retirement in MISO. The surrounding regions in -- in the western part of PJM also have a lot of coal capacity which is affected by these regulations. They have already seen a lot of retirements. There have been additional retirements announced, and even more beyond that are expected.

So relative to a few years ago, we -- we are seeing and we expect to see more coal retirements to -- to reduce the -- the amount of coal capacity in the region. Now, put this in the context of a region that had a supply surplus. As of a few years ago. And what's happening is a lot of that surplus is being retired away.

MISO currently expects, and I believe that this is an accurate projection, that it will reach approximate capacity balance somewhere around 2016, in just a couple of years. That -- and -- and that's driven not primarily by load growth in MISO, because the load growth is low, as we'll talk about in just a moment, but mostly by the retirement of coal plants. That it's just ret -- we're retiring a lot of the surplus capacity the -- that was looking uneconomic in the face of low gas prices and new EPA requirements.

Now, if there is a climate -- any sort

of a strict climate policy, and particularly one that imposes a CO2 price, that will further harm the economics of coal plants, particularly the most inefficient coal plants. And that could -- that could trigger an additional wave of retirements of coal plants that could put MISO into the position where it actually needs a lot of new capacity, depending on the time frame when that might happen. That could conceivably happen within the next few years to the next eight (8) or ten (10) years.

I don't know exactly when that might happen, but -- but you certainly would expect to see -- in the face of a material CO2 price you'd expect to see some additional coal plant retirements.

THE CHAIRPERSON: Could you --

DR. DEAN MURPHY: But let me turn the page --

THE CHAIRPERSON: Dr. Murphy, could you -- I interrupt you for a second? I just wanted to --

DR. DEAN MURPHY: Yes, please.

THE CHAIRPERSON: -- get some understanding of the impact of nuclear power generation on the MISO footprint.

DR. DEAN MURPHY: I'm sorry?

THE CHAIRPERSON: The impact of nuclear

power generation, what's going on there with respect to the MISO footprint, but especially the northern part of that footprint; in other words, the -- not the new -- not the new additional MISO region, but the original MISO region.

DR. DEAN MURPHY: Right. Well, nu -- there certainly is a certain amount of nuclear capacity in that area, particularly in the Chicago region. There's a lot of -- there are a lot of nuclear plants. And those have formed the -- sort of the base of the supply curve, if you will.

And expectations up until quite recently have been that those plants would get a licence extension from forty (40) years to sixty (60) years. Some of them already have gotten that extension, and the -- the others are expected to, and that they would continue to operate for the remainder of that sixty (60) year lifespan, which gets you to substantial nuclear retirement starting around 2030 -- thir -- 2030 or 2031, and then continuing through the 2030s.

We've recently seen some other developments. Kewaunee retired early last year. In other parts of the country, we've had Crystal River in Florida, the San Onfre plant in California, Vermont Yankee in the Northeast, have retired. Some of those

have been due to particular problems at those particular plants, like the steam generator problem in the San Onfre plant.

Others, like Kewaunee, have been, not because of particular problems that -- operating problems at the plant, but because the market just does not justify the ongoing operating costs of -- of that plant, the same as happened for Vermont Yankee.

You might have seen a few days ago Exelon came out with a -- a statement that three (3) of its large nuclear plants comprising, I -- I don't recall if it's four (4) or five (5) units, are at risk under current low power prices that are -- that are really threatening the viability of -- of what were considered to be relatively financially stable nuclear plants.

If those plants were to retire, they are, in aggregate, about 5,000 megawatts of generating capacity, and that would have a material effect on -- on the supply curve in MISO. Just to put it in context, we've seen about 6,000 megawatts of coal retirements already, for a total of twelve (12) plus or minus gigawatts, or 12,000 megawatts of coal retirements expected by MISO.

If there were to be another 5,000

megawatts of base-load retirement, or even some -- some smaller fraction of that, that could also play a role in -- in power price formation in the Midwest. And essentially, what it does is it shifts the whole supply curve to the left, which means that prices will be higher without those nuclear plants than they would be with the plants.

Again, back to the short-run variable cost of the last unit that you need to dispatch to meet load. If you lose 1,000 megawatts of nuclear capacity at the bottom of the supply curve, you need to go 1,000 megawatts farther up the supply curve in order to meet load in a given hour when -- with that nuclear plant gone.

So I'll turn the page, and talk briefly about a couple of other factors that are, I think, a little less important than fuel costs and a potential CO2 price, and even coal plant retirements, but -- but not unimportant. The first of these is load growth, and here I mean load growth in MISO.

Growth has been quite low in the last five (5) to ten (10) years, particularly in the last five (5) years after the -- the recession. Load actually fell considerably, you know, around 2008, 2009, but the expectations are that we're not going to

rebound to a 3 percent load growth rate, which we saw as of a few decades ago, but rather that load growth will continue on this very low -- at this low level of maybe .7 percent, less than 1 percent, or -- or maybe as much as 1 percent.

And, so one of the reasons that I -- that I say that load growth is a less important factor for determining power prices in MISO is simply because it's not very uncertain. There's a general agreement that load growth will be low. Perhaps disagreement about whether it'll be .7 percent or 1.0 percent, but in the end, that makes very little difference to the supply/demand balance, and to energy prices.

And so simply because there's relatively little uncertainty in load growth, I would -- I would argue that it will not make a big difference in power prices in MISO. It is swamped by other effects. In particular, coal plant retirements, because the -- the coal plant retirements are -- if -- if MISO is right and they expect 12,000 megawatts of coal retirements, the difference between a .7 and a 1 percent load growth is three-tenths (3/10s) of a percent, so that's -- that's less than 1,000 megawatts of load growth. In fact, it might be a few hundred megawatts of load growth relative to thousands of megawatts of adjustment

on the supply side. So -- so I don't think it's a -- a terribly large effect.

And in the long run, supply responses to changes in load tend to mitigate those effects. If load grows, more plants are built. If load doesn't grow, fewer plants are built, or maybe more plants are retired, but it -- the -- the market naturally adjusts the supply to the demand in the long run.

There can be short-term deviations, but in the long run, we expect the market to adjust supply and demand, meaning that ultimately whether we had fast load growth and a lot of plants built, or a low load growth and fewer plants built, or maybe more retired, we end up with a market that looks relatively similar with similar kinds of capacity on the margin setting the energy price, and in long-term expectation, we should -- we should expect that the market will be in capacity balance.

We shouldn't expect the -- the market to be persistently out of balance for the next fifteen (15) or twenty (20) years. We'll have a -- a supply overhang and an excess of capacity. That's just very unlikely to happen because generators will find it uneconomic to stay around under those conditions, and some of them will retire.

One (1) other factor I wanted to mention is renewable additions. As I'm sure you know, the Midwest is a -- a prime location for renewable additions and particularly wind, and often transmission expansion is -- is necessary to go along with that, particularly when the -- the amounts of wind get quite large.

Renewable additions are driven largely by renewable portfolio standards requirements, and subsidies like the production tax credit, so they're not necessarily being driven by the market's need for additional energy, or at least not directly by the market's need for additional energy and/or capacity.

These tend to offset the effects of coal retirements, because if you retire a lot of coal capacity and you add a lot of wind capacity they offset, more or less, except, of course, that the wind capacity doesn't provide as much -- it doesn't -- the wind generation doesn't provide very much dependable capacity, and so it changes your capacity balance if you retire a bunch of coal and add a bunch of wind. The -- the -- there's not as much capacity after you've added that wind as there had been from the coal that retired, which perhaps puts more value on capacity.

And -- and this is why we've seen many

thousands of megawatts of wind added in the area with low grow -- low load growth. And what's happening is, we're coming into capacity balance, despite all those wind additions, and that's just because the wind doesn't provide very much capacity. You can't count on the wind blowing at the time you need the energy.

So -- so in the end, I -- I believe that renewable additions don't have a huge effect on power prices, in part because of these market responses that if there's an excess of capacity, more coal plants may retire or we may get less additions of gas plants. Again, similar -- a little bit similar to the story of load growth.

So I want to go on now and give you a picture -- and this comes from the -- the price forecast report that -- the 2013 price forecast report that Manitoba Hydro has included in its NFAT filing. This was a -- a page right out of that report. I've -- in the graphic, I've bolded the three (3) scenarios that Manitoba Hydro chose to use to draw from the -- from the larger set of scenarios that we analyzed. They selected three (3) to -- to go into their consensus forecast: their high, their -- their reference case, and their low, and I've bolded those here.

But this...

(BRIEF PAUSE)

DR. DEAN MURPHY: So what I'd like to point out here, of course -- I apologize for the -- for the delay. What I'd like to point out here is that the scenarios that we analyzed showed a broad range of potential future energy prices, and you can see there are some cryptic names on the scenarios here that -- that will give you a hint as to what's behind them.

But the -- the cases with high CO2 prices and/or high gas prices obviously lead to high electricity prices, and you can see a -- you can get a sense of the magnitude of those -- of those effects here. The -- the case at the very bottom, the extreme low, is a case that has no CO2 price, has continued very low gas prices -- in fact, even lower than they -- they have been historically and -- and today, and -- and, as well, retires relatively little coal generation. So you can see that the -- the real extreme values here are driven by high CO2 prices versus no CO2 price.

A slightly smaller effect in this -- in this case is gas price. The -- the high gas versus the

low gas, can still have a ten (10) to twenty dollar ($20) -- make a ten (10) to twenty dollar ($20) per megawatt hour difference in the energy prices.

So I think -- I think this is -- the most important thing to -- to get from this is the relatively broad range of future energy prices that is possible. I do want to comment that this extreme low case is -- is a particularly extreme case that -- that I believe looks at a confluence of factors that don't necessarily go together, but plausibly could occur together, all driving prices in the same direction, which is downward. You -- you might think of it as you -- you've got a number of dials that affect electricity price, and this scenario has all the dials turned all the way to the left.

So it -- it's a bit hard to see here, but you can see we -- we did a couple of cases that looked at different load levels, and we also did some sensitivity analyses in addition to look at different load levels, and we found that load levels have a relatively small effect on power prices.

So, and just to provide maybe a little table that summarizes some of what I've said, this looks at the -- the different factors I've discussed: CO2 price, fuel prices, coal plant retirements, load

growth and renewal additions, and just puts into simple table form their -- their effect on power prices.

CO2 price can clearly have a big effect on power price, and relative to where we are now, there's only one direction that it can go, clearly. There's -- so there's no CO2 price now. Any CO2 price would push power prices upward, so it's upside potential only relative to current prices.

Gas price can either go up or down from where we are now, and so that -- that has a big effect, but it could go in either direction. The gas prices are up from the very low levels they -- they had in 2012. They've come up since then, and -- and are expected to -- they're not expected to return to those very low levels, although that is a possibility.

Coal retirements do increase power prices by shifting that supply curve to the left. There have been a lot of coal retirements already. A number of additional plants have announced plans to retire by 2015 or 2016 when the EPA requirements, emissions requirements come into effect. Further -- further announcements and retirements are -- are likely as well.

Load growth, not so much of an effect, in part because there's not a lot of uncertainty in

load growth, and in part because the supply response tends to mitigate the effect of load growth. And similarly with renewables, there is perhaps a little more uncertainty in how much renewables will be added, but it can oft -- also drive a supply response, either additional retirements or fewer retirements, more or less additions, that tend to -- that tend to counterbalance that.

That's all I've got at this point on -- on power prices in MISO, and we have --

THE CHAIRPERSON: Could you -- I just -- I just want to go back to the transmission with renewables. So large transmission additions, we could raise the Minnesota Hub price slightly. That, to me, sounds a little bit counterintuitive.

Could you explain that, please? The -- the fact that adding transmission lower -- increases the Minnesota hub price?

DR. DEAN MURPHY: Yes, because Minn -- Minn Hub is -- has historically been a somewhat lower price than other areas within MISO than other surrounding areas driven in large part, and probably contributed by, Manitoba's exports to Minn Hub, but in large part due to a number of large, efficient coal plants in the area, and transmission connections

outside the area that -- that aren't sufficient to create conditions for free flow of power back and forth.

So Minn Hub has been traditionally a little bit of a depressed price relative to others. A big transmission expansion that is designed to allow wind power from the Dakotas to access, say, Chicago, going essentially through Minn hub, has the effect -- if you add a lot of wind capacity, your intuition is, well, that should depress prices. But what happens is it -- and it does have that effect, taken in isolation.

When you -- in order to enable the addition of that much wind, you'd have to beef up the transmission system, which actually puts Minn hub into a bigger market. It becomes part of a bigger market. It's no longer a somewhat constrained, smaller market that has prices that are a little bit depressed relative to Northern Illinois.

With a lot of additional transmission, it has the same price as Northern Illinois, because you can easily flow power back and forth across this now expanded transmission system. And so it tends to equalize the -- the region -- the prices over a larger region. And since Minn hub started as a depressed price, that effect could bring it up.

THE CHAIRPERSON: There's an earlier statement in relation to renewable additions, continued renewable additions likely. Now, you indicated that what was quite likely to happen would be the addition of additional gas generation.

Did I understand you correctly?

DR. DEAN MURPHY: Well, with respect to renewables, we expect to see additional wind generation added in MISO, in part to meet the renewable portfolio standards. Currently, the -- the states in the region are ahead of their renewable portfolio standard goals, but those goals are increasing over time.

We expect that those -- those increased goals will be met and quite possibly they'll be met before the -- before the goals have actually increased. As we are -- to basically a continuation of the situation we're in now. Now, I'm not sure I -- I understood the gas additions question.

THE CHAIRPERSON: Well, perhaps -- perhaps I'm confusing things, but -- but to the extent that there is competing renewable generation in the MISO footprint area, I mean, that represents competition to a -- a renewable resource for Manitoba.

DR. DEAN MURPHY: In -- in part, it can. In part, because of the different nature of the -

- the MISO wind resource versus, whi -- which is intermittent and non-dispatchable, versus the Manitoba Hydro resource, which is quite flexible. The -- the additional wind may actually increase the value of Manitoba Hydro generation because it does things, like it depresses the -- it might depress the average price, which is not good for coal plants. It's not good for nuclear plants.

It may cause additional retirements of coal and possibly nuclear plants if there's more wind added. For instance, a nuclear plant that runs around the clock will -- will be disadvantaged by wind that depresses power prices to even potentially negative values during the overnight off-peak times, because that nuclear plant still has to sell power at whatever the market price is.

Mani -- to the extent that there's flexibility in the delivery of power from Manitoba Hydro, Manitoba Hydro can choose not to export energy during the time of very low prices, and possibly to import energy. So that -- so there's a complement between the Manitoba resources, which are energy limited but flexible in terms of the timing of generation; and the wind generation, which is -- it's non-dispatchable and it's intermittent.

THE CHAIRPERSON: Would you qualify solar generation the same way?

DR. DEAN MURPHY: Solar is comparable to wind in that it is non-dispatchable and -- and it is intermittent and tends to not be as coincident with peak flow. It -- it's perhaps a little better coincidence than wind, depending on the particular site. But it's -- it's comparable.

Solar generation, of course -- keep in mind, solar generation is very small. The existing installed basis solar is very, very small compared to even wind. And even with very large growth rates it'll continue to be a relatively small portion of the system for some time to come.

THE CHAIRPERSON: You are aware, though, there was a large contract issued a few weeks ago in the -- in the Minnesota region for solar generation of a significant size.

So I -- I guess I'm wonder to what extent you see solar as being a significant factor in addition to wind generation as part of the renewal -- renewable portfolio.

DR. DEAN MURPHY: I think it can be a -- it -- it may be a factor in the very long run, probably fifteen (15) to twenty-five (25) years or

longer. It may become a large enough factor that it's driving the system. In the next ten (10) to fifteen (15) years, I don't see solar as being that big a factor.

Solar -- solar is having difficulties in the Southwest, where the solar resource is much better than it is in the -- the Midwest, the upper Midwest. The upper Midwest also has very, very good wind resources. So solar versus wind in the upper Midwest, wind, I think, has the upper hand for a while.

(BRIEF PAUSE)

DR. HUGH GRANT: Just can I ask one (1) quick thing on Slide 73, just the graph? What's going on in 2018/2019?

Is this the policy climate change that's happening that's causing this drive up?

DR. DEAN MURPHY: That's exactly what's happening. In the -- the scenarios that you see with a big price jump in 2018, those are the scenarios that had a high and early carbon price. And the -- the others that have a somewhat smaller jump in 2020, that's the timing of the -- the carbon price. It's a -- it's a lower but still material carbon price that

begins in 2020. That's what's causing the jump.

DR. HUGH GRANT: Thanks.

(BRIEF PAUSE)

CONTINUED BY MS. PATTI RAMAGE:

MS. PATTI RAMAGE: We're just going to quickly swap out -- I'm not sure who we're swapping out -- Mr. Miles for Dr. Jacobson. We thought this would make it more interesting for the panel.

(BRIEF PAUSE)

DR. DAVID JACOBSON: Good afternoon, Mr. --

MR. RICHARD BEL: Before --

DR. DAVID JACOBSON: Sorry.

MR. RICHARD BEL: Before we start, could -- could I ask a quick question about the carbon price? And it concerns the consensus forecast. And it was mentioned that there was -- a majority of consultants agreed intuitively that there would be a carbon price, and some disagreed. Could you expand a little bit on that disagreement?

Was -- is that because of an election or

where did that come from, the fact that some -- some consultants disagreed that the carbon price would be as early as -- as early as it's pointed out here?

MS. JOANNE FLYNN: Those are the views of the individual price --

MR. RICHARD BEL: Right.

MS. JOANNE FLYNN: -- forecasters that were part of the con -- that made up the consensus price forecast. But going any further than that would have to wait for the CSI session.

MR. RICHARD BEL: Okay. Okay, thank you.

DR. DAVID JACOBSON: Okay. Good afternoon, Mr. Chairman, Board members, ladies and gentlemen. My name is David Jacobson. And as they say, now for something completely different.

I found this -- this picture, which is kind of a cute illustration of -- of really why we're here. We're really trying to connect the generation to the load. And then this illustration, it needs an extension cord. And that's where I come in. I figure out exactly how to connect the load to the -- to the generation in the most reliable and efficient and economic manner.

And it also kind of illustrates demand-

side management, you know, smart load, know when to unplug, or smart grid, when to plug in. So it's a lot of -- a lot of interesting stuff there.

Now, in my brief presentation, I'd like to give an overview of the transmission included in the Preferred Development Plan hopefully to demystify, as much as I can, transmission. I know a lot of people are scared about it, but it's -- it's really quite -- quite simple once -- once you take the time to -- to look at it.

But before I begin, I'd like to mention that the Transmission business unit is a functionally separate group from -- from Power Supply and from Energy Marketing. If they want my services, they have to submit requests onto something called the OASIS, the Open Access Same-time Information System. And the requests are looked at in queue order, so it's a first come, first served kind of -- kind of process.

So if there's transmission that's available, the first one in the queue tends -- tends to get that, and MISO follows a -- a very similar process as we do in Manitoba.

And so we have two (2) -- two (2) type - - types of tariffs: an open access interconnection tariff for generators who seek to interconnect, and an

open access transmission tariff for those entities wanting to secure transmission service. And once all the studies are done and the cheque is cut, we'll start to build the facilities, and we'll own, operate, and maintain them, and -- and then we'll grant -- we'll grant them the service once the facilities are in service.

THE CHAIRPERSON: I don't want to slow you down, but could you repeat what you just said? Look, I can -- I can under -- we're going a bit fast, so I just want to make sure I understand.

DR. DAVID JACOBSON: From -- from the tariff part, or --

THE CHAIRPERSON: Can you explain the OASIS and -- and --

DR. DAVID JACOBSON: Sure. Yeah. Yeah, the Open Access Same-time Information System is -- is a web-based service where customers can submit requests. Like, for example, if Manitoba Hydro wants to export to the US of, say, 100 megawatts at -- at a certain period of time, there's -- they log onto the OASIS site and plug in all of their particulars, and then that triggers the -- the tariff to -- to come into play.

So I will be informed. We will set up a

scoping meeting, talk about, you know, exactly what the customer really wants. Like, they might say, I want 100 megawatts, but I'll accept partial service, which means it could be, you know, 50 megawatts for a bit and then jump up to 100 when the facilities go into service.

So we talk about all those details in the scoping meeting, and then we'll -- we'll document those details in a -- in a study agreement.

So we do our studies in two (2) phases. The first phase is a -- a system impact study where we take a high level view of the system and -- and the facilities required to facilitate the request, assuming there's no transmission capacity available, and then when -- when that study's complete, we'll present it to our customer, and assuming that they are in favour of proceeding, then we'll proceed to a facilities study where we will the determine detailed cost estimates -- estimates, and we'll present another report to the customer.

And again, if they're -- if they're satisfied and they're willing to proceed, then we will go -- go towards a facility construction agreement, which will detail, you know, the costs and schedule, and we'll also sign a service agreement for the

particular service that the customer has -- has purchased.

So that's -- hopefully that an -- answers your question.

THE CHAIRPERSON: So -- so are we talking about -- now we're talking a long-term contract, right? We -- we're talking about how you --

DR. DAVID JACOBSON: That's -- that -- that --

THE CHAIRPERSON: -- how you --

DR. DAVID JACOBSON: -- that's correct. That's -- typically it's five (5) years or greater for -- for long-term transmission service.

THE CHAIRPERSON: So how do you know -- how do you know you're going to have transmission available and you -- how do you know the price that you're going to pay for that transmission?

DR. DAVID JACOBSON: The price is posted on our -- on our -- in our tariff. How do I know? We keep track of -- of long-term service that we've already granted, and part -- part of the rules of the tariff is that we assume existing contracts are rolled over, or existing service agreements are rolled over.

So for the time frame of inte -- of

interest for the Manitoba/US project, currently there's 1,850, roughly, megawatts of long-term service that has rollover rights. So we assume that as a base and we look at how much transmission capacity is available, and currently that is 100 megawatts. We can -- we can transmit 1,950 without exceeding the transmission capacity.

The requested -- we received -- originally it was 1,100 megawatts, so -- but that has since changed to 750, and I'll get into the details in the presentation, but there's insufficient capacity to facilitate the request. So hence, we have to do a study and figure out, Well, how -- how can we best increase the capacity?

THE CHAIRPERSON: Okay.

DR. DAVID JACOBSON: Okay. This plot, obviously it's a map of Manitoba. It tries to summarize on one (1) page the Preferred Development Plan. So Keeyask and Conawapa are the two (2) plants in question that are planned to be developed in the Nelson River in Northern Manitoba, and they're part of a -- a family of -- of plants, so to speak, on the Nelson River that are connected to what I call the northern collector system, which is, in simple terms, a funnel that -- of lines that -- that connect the

generation together and -- and get it to the -- the high-voltage direct current converter stations.

What we do is we convert alternating -- alternating current to direct current at 500 kilovolt level for transmission to Winnipeg, and this is the most efficient manner to transmit power of this magnitude and this distance.

Also just to the -- the left of the -- of the northern collector system, we have a -- what -- a 230 kV alternating current grid that's isolated from the northern collector system, and plants connected to that system are Wuskwatim, Jenpeg, Kelsey.

And part of the Preferred Development Plan includes upgrading small portions of the 230 kV grid because of congestion. So we're pre -- proposing Kelsey to Wuskwatim a 230 kV line, 122 kilometres, Herblet to Overflowing River, 210 kilometres, and Dauphin Neepawa 130 kilometre line.

And then in -- in southern Manitoba there's a -- the Manitoba/Minnesota transmission project 230 kilometres connects Winnipeg to the US boarder which then taps into the great northern transmission line, and Mr. Cormie has given a pretty good overview of -- of that project.

In total including all of the lines in

the northern collector system, and the north/south upgrades which I just mentioned, and the MMTP project, it's about 850 kilometres of new transmission of various voltage levels with a rough cost of $775 million in -- in 2012 dollars or around a billion dollars in 2020 dollars. That -- so my next few slides will be talking about the different projects in a little more detail, just -- just so you see what they look like.

But just try to remember this -- this picture in terms of where -- where some of these projects are.

THE CHAIRPERSON: Mr. Jacob -- Mr. Jacobson --

DR. DAVID JACOBSON: Yes?

THE CHAIRPERSON: -- that -- that 122 portion between Kelsey and Wuskwatim --

DR. DAVID JACOBSON: Yeah.

THE CHAIRPERSON: -- that would be needed irrespective of whether we build -- we build Keeyask?

DR. DAVID JACOBSON: I'll be getting into that in -- in more detail when I -- when I go along but it's required when both plants are in service, Keeyask and Conawapa.

THE CHAIRPERSON: And the Dauphin/Neepawa is also linked to --

DR. DAVID JACOBSON: Yeah, the -- the three (3) red lines on -- on the western part of Manitoba, those are needed for -- when both Keeyask and Conawapa are in service.

Now, I just -- I just threw this picture on just to give a feel for, you know, how big some of this -- some of this equipment might be. And I'm sure you guys saw in the paper last year the transportation of -- of a big transformer from our -- or from the CG Power Transformer plants in Winnipeg. We had to get in the -- a carrier that was capable of carrying the space shuttle.

So one phase of a 230 to 500 kV transformer, 195 tonnes required a pretty significant piece of equipment to move. So that's the kind of equipment that's -- that comprises the -- the Preferred Development Plan from the transmission point of view.

Okay, this -- this is a very, very simplified single-line diagram. What -- what this shows -- I wonder if I can move my mouse here. I can't -- oh, can I? Starting from the top where it says, "Seven (7) units," those are seven (7) individual hydro generating units. That funny squiggly lines underneath

the -- the circle is a transformer.

So we transform from a low voltage up to a high voltage for efficiency reasons. And there will be individual step-up transformers with each unit, so there's seven (7) of those actually.

Going a little bit further down there's -- you see the four (4) and a circle. That means there's four (4) individual 130 kV lines, each is -- each line is a three (3) phase wire, so there's three (3) wires per -- per line, so there's actually twelve (12) -- twelve (12) wires there. So that's the 3 kilometre generated output line to a switching station.

Now, the switching station is -- is basically a ring bus of circuit breakers that allows switching between the units -- the unit lines that come to the switching station, and then the output lines that go to the -- the next station. That's simply what that is. So converts four (4) line in to three (3) lines out.

And as I mentioned, you have three (3) lines out, 35 kilometres each, and that terminates into the existing Radisson convertor station. And the total cost, I don't want to go into details, but it's $157 million.

Now, this is a complicated diagram. I

apologize for that. Mr. Cormie showed -- showed a very nice simple diagram that -- that showed the -- the new interconnection line goes from Winnipeg to a point near Duluth. Well, the actual substation involved are -- are the Dorsey substation, 500 kV; and the substation in the Minnesota Power territory is called Blackberry.

So within Manitoba we're going to build a 500 kV line from Dorsey to the US border, roughly 235 kilometres. Also within Manitoba there will be transformers, like the one I showed you that required a space shuttle carrier. So there'll be three (3) of those -- three (3) phases that'll be installed in Riel.

And we're also installing something fancy. You see it says -- it says, "G82R," and a fancy symbol there. That's -- that's called a phase shifting transformer. Now, what the heck is that?

Well, basically, if you think of -- of a faucet that you can control the output, that's exactly what this does. This prevents power flow from the US looping through Manitoba and causing congestion. So it's -- it's a fancy device to limit congestion within the tie -- the ties that comprise the Manitoba/US interface. And then in the US side there'll be similar transformation, five hundred (500) to two-thirty (230), connecting to existing 230 kV sub -- Blackberry bus.

Now, I've thrown a -- a couple of clouds on this diagram. You can see one (1) circling the 900 mva equipment. That's -- that's proposed in the Preferred Development Plan. There was also the potential in the future to upgrade the capability to 1,100 megawatts. As I mentioned, that was the original transmission service request. And that would req -- comprise 500 to 345 kV transformation, and then 300 -- 345 kV transmission lines to Arrowhead, which was -- which is very, very near Duluth. But that currently is not in the Preferred Development Plan. That's a future upgrade if -- if it's required.

And in terms of costs within Manitoba, the costs submitted in the Preferred Development Plan is $267 million, 2012 dollars. We are at the phase where we're finalizing the facility setting and the numbers in that study are slightly higher, 281 million, but not -- not significantly higher.

And we're planning on finishing our studies in roughly the next few weeks to -- to a month. And then once that study's complete and -- and accepted by the customer, then we will proceed to the facility construction agreement. And MISO is roughly on the same pace that we are.

On the US side, a 240 mile line -- it's

all -- it's roughly one-third (1/3) of -- of the line, slightly more than one-third (1/3) of the line is in Manitoba and two-thirds (2/3), slightly less, is -- is in the US. And the cost submitted for the Preferred Development Plan was $578 million; that has since gone down.

Minnesota Power has refined their route. Mr. Cormie mentioned that they're in the position of filing a -- for a route certificate, so from that process as well as refinement in their station cost estimates, they're currently a little bit lower than they were.

So a couple -- a couple of high level status points. One (1) thing we're currently doing is optimizing the facilities that have identified that with -- which had an initial target of 750 megawatts. And we're looking to see if we can increase that to 883 megawatts at no additional cost. And -- and those studies are -- have not been finalized, but that's currently the direction we're going.

One (1) point about the window of opportunity. Mr. Cormie mentioned that we are able to transmit up to 500 megawatts to Wisconsin, and how is that possible. But MISO has done a number of -- of studies as part of their expansion planning process.

And back in 2011, when they submitted their report, they approved $5 billion worth of upgrades to help fac -- facilitate renewable integration, or to help the states meet their renewable portfolio targets.

And roughly 2 billion of these facilities increased the Minnesota to Wisconsin transfer capability. And they're planned to be in service before 2020.

So the timing, as I mentioned, that this is a first come, first serve process, and the -- and the timing of the export requests that were submitted were -- were -- someone had a crystal ball. They're able to capitalize on these investments, and as -- as a result, we can transmit from Winnipeg to Minnesota -- or sorry, to Wisconsin without encountering significant transmission upgrades. If those requests were pulled today and restudied, I think the -- the upgrades would be quite different from what we're proposing.

Now this is an even more complicated plot, but the story gets a little bit more interesting as we add Conawapa. The top of the plot shows the northern collector system, and remember, that circle in northern Manitoba that I -- that I had drawn. All -- it -- it shows all of the existing and proposed hydro plants. So Keeyask is on -- on the left, my left.

Conawapa's on the right.

One (1) of the technical issues that we -- that we found when we did our analysis work is that when you put all that generation together in such a tightly co -- coupled area it -- it's akin to having all your eggs in one (1) basket.

So it -- we found out that a single disturbance tends to cause issues in Southern Manitoba in terms of load -- under frequency load shed. So to avoid that problem, we're proposing to split the northern collector system into two (2) isolated networks.

So Keeyask and Kettle will be connected to Bipole I, which is a DC transmission line, and Long Spruce, Limestone, and Conawapa will be connected to Bipoles II and III, two (2) separate isolated systems. So that -- that solves the eggs in one (1) -- in one (1) basket problem, but it creates another problem.

Our -- what we desire is to have sufficient HVDC output capability such that we don't require the use of generation reserves if we lose a part of it, and tha -- and that part of it is -- is a valve group, and what does a valve group mean?

Well, if I look at Bipole II, Bipole -- 'bi' means two (2) -- that means there's two (2) poles.

Now, within each pole, there's actually two (2) valve groups in series. So if we lose a valve group within Bipole II, we fundamentally lose 500 megawatts, or one quarter (1/4) of the Bipole II output capability.

Now, if we didn't have spare transmission, we would have to rely on generation reserves, which, a) is expensive, b) we -- we only carry one hundred and fifty (150) as part of our reserve sharing agreement with MISO. So to avoid calling in reserves for MISO, we would like to have sufficient spare transmission.

So that's where the north-south AC upgrade project comes into play. So we're proposing in our plan to put at least one (1) Kettle unit onto the northern AC system, and I -- and I showed you on the -- on the first slide of Manitoba, the three (3) red lines where we need upgrades to facilitate that.

Just as a point, that this is not Bipole IV. This is alternating current transmission. It's just a -- a -- mitigating congestion for putting the Kettle unit on AC. Yeah, so that's all I really want to see with that.

Breaking down to some smaller pieces, Conawapa will require five (5) 230 kV output lines, and they're roughly 7 kilometres each. Ten million dollars

($10,000,000) was the cost put into the Preferred Development Plan. And in the North-south Transmission Upgrade Project, as I mentioned, comprises several new 230 kV lines to avoid congestion in the existing western 230 kV network, roughly $200 million, and then there's some additional upgrades: filter, asynchronous condenser.

So the -- the lawyers were giving me a hard time yesterday, Well, what -- what is -- what does that really mean? So I tried to explain to them that, well, what we're really doing is, when we've -- when we -- when we were transmitting real power, is that -- that's considered -- like, you go to a bar and you buy the -- buy a beer. You need -- you need a certain amount of foam on the beer in order to, you know, have -- ensure that the beer's fresh.

If you have too much foam, it's not a good thing. No foam is not a good thing. So reactor power is kind of like foam on the beer, but not everyone understood that analogy.

So another analogy, grease on a -- on a -- on an axle. You don't want too much grease. It's messy. It gets, you know, dirty. No -- not enough grease you're going to have too much frict -- friction, it'll heat up. So it's just a -- it's a -- it's the

cost of doing business. It keeps the voltages within limits. So we have to, unfortunately, add these -- these special devices to make -- make sure everything works properly.

So those -- those kinds of upgrades another 143 million, for a total of 340. And that's all I had for transmission. I hope I've de -- demystified it for you guys.

THE CHAIRPERSON: Could you clarify something for me, please?

DR. DAVID JACOBSON: I'll try.

THE CHAIRPERSON: Page 80 and page 81, we're showing 235 kilometres to US at 173 million. And the next one (1) on page 81 we're showing 524 million. So I'm...

DR. DAVID JACOBSON: Three-fifty-three kilometres and then 240 miles. I think I did the math right.

THE CHAIRPERSON: Oh, I see. Okay.

DR. DAVID JACOBSON: Yeah, times one point six (1.6).

THE CHAIRPERSON: Okay. Okay. Thank you.

(BRIEF PAUSE)

MS. JOANNE FLYNN: Mr. Chair, in -- in the interest of time and because the interconnection assumptions have been discussed to some degree, we were going to skip this topic. And was also going to skip the next topic on capital costs for wind and thermal and proceed with Mr. Bowen's presentation on the capital cost for Keeyask and Conawapa.

MS. PATTI RAMAGE: Having said that, if the panel has any questions on those topics please feel free to -- to interject, or interrupt.

THE CHAIRPERSON: Could we agree that we'll -- we'll look at this at -- at the next break just to make sure we're comfortable with this. And then so -- so let's jump over to capital costs right away and...

(BRIEF PAUSE)

MR. DAVE BOWEN: Good afternoon. Again, my name's Dave Bowen. I'm here to talk to you today about the updates to the Keeyask and Conawapa capital cost estimates. Just a brief background, again, myself, I manage the Project Services Department within Newgen Construction. Our division is responsible for the final detail design, the

procurement, so all the tendering of contracts and the construction of both the Keeyask and Conawapa projects. And we're also accountable to -- to bring those projects in under the -- the controlled budget.

So I'd like to just go over a few term -- terms today. I'd like to -- this is a bit of a cheat sheet of some of the key items I'll be talking about today. The first -- the first item here is the estimate. This is the calculation of the range of costs to complete the cost -- the -- the project based on a set of assumptions.

Some of the key assumptions include the -- the project scope, the level of definition, so -- so what are we building, our schedule, and then the in-service date, when are we bringing the asset online.

The next term is what we call the control budget. It's established when the estimate, a -- a single number's approved by our executive. It's a benchmark for measuring the project performance on cost. It includes a contingency at a P50 value. So an equal likelihood of overrun and underrun, and also includes management reserves. It forms the basis for the capital expenditure forecast and integrated financial forecasts.

The next term is the -- is the NFAT low,

reference, and high. So again, the est -- the estimates used to derive these costs, they're representative of a range of possible capital costs that could occur and are inclusive to project risks and the labour reserve. They're key inputs into the NFAT economics and financial analysis, the probabilistic analysis, and they corr -- the -- the low, reference and high corresponds to the P10, P50, and P90 values.

I'd like to cover the -- the following topics today, provide a -- explain why and what we're updating for capital costs, touch on the recent history and methodology used to -- to update these costs, and then Part A and Part B really get into the -- what the results are for the -- for the control budget and for the NFAT, and then final, discuss a little bit about our project execution.

So why have we updated the Keeyask estimate? We've reached a major milestone in the -- in the project with the -- the close and pending award of our general civil contract for the project. Why is the general subcon -- civil contract so important? It represents the -- the largest component of our construction costs of any contract, roughly around 40 percent of those costs. It drives the construction schedule and the risk during construction.

In terms of the procurement process, we started with a request for a pro -- a qual -- a pre-qualification process over a year ago. We -- we garnered interest from some of the largest contractors in the world. We short-listed four (4) of the best ones for our project, four (4) joint venture teams. And that process -- that close, those tenders closed on December 6th of this past year. Since that time, we've been busy -- busy evaluating those -- those as we receive the proposals.

We have -- we got to the point where we awarded the general civil contract, it would be two (2) weeks ago at our board meeting, and we also at the same time, not only were we updating our control budget to test the adequacy of our control budget forward, but we were also re-evaluating the NFAT low, reference, and high to ensure that those costs were available for -- for this process.

In -- in terms of what was updated, well, we reviewed the main parts of the estimate. So what are the key -- key items that caused -- that could -- could cause cost change or risk change? We looked at our contingency and our reserves. And just to remind everyone a little bit about our history, back in 2009 and '10, that's when we did our first principles

bottom-up estimates for both the Keeyask and Conawapa projects.

That was based on the -- the same -- really, the same scope we have today, albeit it's -- it's a little more refined for -- for Keeyask. And it was based on the -- the results of the Wuskwatim Project to -- to that date and largely based on Limestone results.

In 2012, the -- the stress test that I spoke about back in the technical conferences, that was done to basically take the full learnings from the Wuskwatim experience, other learnings that have occurred in the recent Canadian marketplace, and adjustments to our estimate.

And -- and then, finally, today we -- we have again looked at our estimate and we've ta -- we've obviously had some changes, and we -- we've made some updates based on the culmination of those experiences and the experience, the -- the results of our -- of our general civil contract that we just received.

You've seen these slides before. I'd like to just maybe take one (1) of Dr. Jacobson' term, demystify our -- our methodology. So really, there's -- there's two (2) main steps to get to the point of a control budget. The first -- first step here is the

estimate development. This is the part where we develop our estimate.

In -- in terms of the -- so looking under step 1, you'll see the -- the base costs. So base costs include the point estimate. So what does it cost if we built the asset today, our overnight cost? And then we look at -- we -- we address risk and uncertainty using both contingency and reserves.

The -- the difference between contingency is -- is that's -- that's really -- when we look at project contingency, it's used to adjust -- address the uncertainty and risk associated with the estimate, and we expect to spend it. And management reserves, that -- that's controlled. There's a different governance on the management reserves. That's controlled by our board. So in the event that the -- the project -- one (1) of the reserve funds need to be accessed, we need to receive board approval to fund that.

And the difference, in terms of management reserve, it's the amount added to cover uncertainty with very -- items with very high risk impacts, but lower likelihood of occurrence, or -- and/or substantial risk items not appropriate to be covered with contingency, and -- and you'll see two (2)

examples of this through the labour management reserve and the escalation management reserve.

To get to our in-service cost, it's -- it's adding the impacts of interest and escalation, and then, of course, money spent to date and the interest that goes along with that money spent to date.

Step 2 is the budget scenario development. This is our control budget. At this point in time, we -- we take a -- once we develop our -- our estimate we take a step back and look at our risk and -- and the key drivers that could cost -- could cause cost change.

The illustration here, we -- we use this to develop different management reserves. This is an illustration of -- of -- just to illustrate that -- that fact. So we'll -- we'll look at -- look at those reserves. And ultimately, we'll propose different reserve funds to our executive to -- to carry -- to carry forward for the control budget.

I can say that from -- from at least my opinion, my perspective is that the project team, the -- the people responsible and accountable to execute the project, we're comfortable that they met the labour, and the escalation reserves approved are representative of the risk and -- and are appropriate for the -- for

the project.

In addition, this process here, it follows industry best practice and is used by other utilities throughout Canada. In terms of contingency, there's two (2) types of contingencies that -- that we look at. They are systemic risk and project-specific risk. An example of the system risk, if I were to get a -- get a price to build a 25 square -- 2,500-square-foot home in Winnipeg and I got that price from a builder and -- and -- that initial quote. And then if I decide to proceed with building that -- that home, and once I get into it and pick all my actual finishings, the finishings likely assumed in the initial quote would have been the bear bones or basic.

And once I -- once I get to the point where I've actually built my home and -- and picked all my finishings, well, quite likely, the price is going to go up. That's an example of systemic risk. And -- and it's an improvement to how we've done our risk analysis from Wuskwatim and it's something that we pay attention to.

The other -- other risk is project-specific risk. Again with the home example, if the foundation conditions were different than what was anticipated, this would be an example of a project --

of a project-specific risk.

So both -- we -- we've used the -- we used the same contingency consultant used for both the wind and natural gas options to analyze our contingency. These -- these risks, they're modelled and put on a Monte Carlo analysis. And the output of that on the right of the screen is a what we called a partin -- our contingency curve, so it's an 'S' curve, and it gives a range of cost at different probabilities.

So in terms of the control budget results, the following is a summary of -- of the key work and findings. So again we ad -- we examine the adequacy of the point estimate contingency in management reserves. So do we have -- are they appropriate, is it a true reflection of a P15 and do we have adequate funding going forward?

The point estimate was updated based on the general civil contract proposals, changes to some of our -- and updates to some of our estimate assumptions, and pricing received from all committed contracts to date. So committed being the -- the contracts that we've awarded to date, gone out to marketplace with.

Again, we -- we looked at the

contingency and we reran our contingency analysis. With that analysis we looked at the labour risk and -- and the updated reserve. The escalation reserve, it continues to -- to persist and -- or pardon me, the -- the escalation reserve continues to be included for escalation beyond the consumer price index, the forecast for that.

And for Conawapa, we -- Conawapa's been updated based on the Keeyask finding. So maybe a simpler way to say it, if we built Conawapa tomorrow, based on the Keeyask information, we -- we have the -- we can incorporate all that information.

Key assumptions of the -- of -- of the Keeyask estimate, we'll be awarding the general civil contract today. There -- there will be a press release. It's either gone out or it's going out shortly. Subject to all approvals, we'll start entering construction in July 2014. And our first unit in service is November 2019, so -- so, essentially, our schedule's unchanged.

And the reason our schedule's unchanged is that this is -- this is the -- the least cost option to proceed with the Keeyask project at this point in time for our controlled budget.

Again, we've incorporated the results of

the general civil contract. And in -- and in terms of scope of work, the -- the Keeyask -- the Keeyask project as a whole, it -- it's essentially the same.

So what are the results? The -- the control budget for -- for Keeyask has increased from 6.2 billion to 6.5 billion based on our current update. In terms of a breakdown of those costs, we have roughly -- there's roughly $210 million increase in the base costs, and a $60 million increase in interest and escalation, so associated financing. The six (6) -- the -- the 300 million in dollar increase represents about a 5 percent increase.

In terms of Conawapa, the scheduled assumptions, nothing -- nothing has changed. We're going to -- we're planning to start construction in January of 2018, again obviously pending all -- all approvals. And the first unit in-service would be in May 2026. Again that incorporates the findings from the Keeyask general civil contract, and all -- all contracts in place for the Keeyask predicted date. And the scope of work is -- is essentially the same.

The results for the Conawapa project: I -- I've tried to illustrate this in two (2) steps. On the left of the ten point two (10.2), that's our original CEF/IFF12 number with a 2025 in-service date.

The Keeyask -- the Conawapa project has -- has -- now has an in-service date of 2026, so approximate -- there's about $200 million in interest and escalation from just deferring the interest date one (1) year.

Moving -- so that was that change. In terms of up -- up -- the current update, there's a -- there's a further $300 million increase moving us from 10.4 to $10.7 billion. The increase is comprised of -- there's -- there's about a $50 million increase in base cost, and then $170 million in -- increase in -- in financing costs. And that's due to associated financing -- financing, and the -- the cashflow now incorporates the -- the cashflow timing from the Keeyask general civil contract which -- which causes a slight -- an additional interest in -- increase in interest.

To summarize the -- the control budget results, they've been -- the -- the control budgets, they've been updated based on the most current project information. Looking at the current -- current bids from -- from four (4) -- four (4) qualified builders for our general civil contract, the estimated methodology remains unchanged and applies industry best practices, and addresses risk using contingency and management reserves. And again this -- this update

forms our -- our -- will form the next -- our -- our revised control budget to manage the execution of the project.

I'll now explain the updates to the -- the NFAT low reference and high. The same est -- the same estimate --

MS. MARILYN KAPITANY: Can I just ask you one question before you go to that?

MR. DAVE BOWEN: Sure.

MS. MARILYN KAPITANY: So last week Mr. Wojczynski told us that on this -- the general civil contract, that April 4th is the date when you need to let the contractors know whether or not to go ahead with purchase of major equipment?

MR. DAVE BOWEN: Yes.

MS. MARILYN KAPITANY: So can you tell me how that fits in with -- with this picture, and -- and with the -- the increases you've described?

MR. DAVE BOWEN: Okay. The -- the Keeyask -- the Keeyask estimate, our control budget, is based on starting construction this summer. So we -- we basically starting -- we'll essentially start in water work in July of this year.

The -- the April 4th date there is -- is in place to allow our general civil contractor enough

time to basically ensure they're ready to -- to execute that work, and avoid any type of delay claim from that contractor to start work this summer.

It's really the -- the -- one of the -- it's -- it's a -- it buys us additional time to -- to -- basically is risk mitigation to spend the least amount of money before we make the next level commitment to -- with the general civil contractor. So in the event that we weren't given approval to proceed with construction, it would limit -- it -- it would limit the -- the amount of money that Hydro would be exposed to.

Does -- does that answer your question?

MS. MARILYN KAPITANY: Yeah. We were also told that there's been a certain amount of money that will have been expended on Keeyask before July. And so would this -- if -- if you give the go-ahead on this equipment is that included in the amount that was estimated as having been spent already?

MR. DAVE BOWEN: Okay. I'm just -- I want to make sure I'm -- are -- are you referring to the sunk costs in terms of the economic analysis?

MS. MARILYN KAPITANY: Yes.

MR. DAVE BOWEN: So -- so and to -- to the best of my knowledge, there is -- in the general

civil contract there is a -- a -- there's a break fee in the contract. So in the event that we cancel the contract, there's a -- a small break free -- fee. There's also a -- a small cost if we're -- if we decide that we need to defer a -- a year. There's a -- there's a small cost for that. I -- to the best of my knowledge those haven't been included in the sunk costs. They're -- they're relatively small.

THE CHAIRPERSON: Okay. I'm -- I'm not sure I -- I understand what you said. So -- so you go out and -- the contractor goes and spends 100 million April the 4th to buy some equipment.

Is that part of the -- the sunk costs if -- if the -- that we've been considering all along?

MR. ED WOJCZYNSKI: That's what I was going -- I was going to add that earlier, and I decided we're taking so long I didn't jump in. But it's an important piece of information. That is not in the -- that $100 million of equipment is not in the sunk cost. But what I've been told earlier, and our colleagues from the construction arm can add to my -- what I'm going to say now, is that the contractor would, let's say, spend $100 million and buy new equipment and -- and starting having it delivered to Manitoba or wherever.

Then if we all -- if we after that date cancelled, let's say on June 21st for the sake of discussion, that equipment could -- would then be resold. And it's not that you'd lose the full hundred million, but there would be some cost for that. But I -- I couldn't, myself, guess what that would be. So I don't know if Mr. Bowen could guess better, or one of his colleagues in the back.

MR. DAVE BOWEN: I -- I'd be -- I'd be speculating right now, but -- but one thing that, in terms of the hundred million dollars, we would get back 95 percent of those costs, just as a -- a high level estimate.

THE CHAIRPERSON: But that would be the cost to Manitoba Hydro as opposed to the contractor?

MR. DAVE BOWEN: Yeah, so if -- if we cancelled or -- or delayed, yeah, the cost -- the -- we -- we would -- we would get back, of the hundred million dollars outlaid for the equipment, we would get back 95 percent of that.

THE CHAIRPERSON: So the -- the 5 percent that's missing would be over and above the -- the contract abandonment costs that you cost -- that you talked about. You know, if you don't go ahead with the contract, you've got costs associated with that.

So that would be another cost on top of the rest?

MR. DAVE BOWEN: Correct.

(BRIEF PAUSE)

MR. DAVE BOWEN: Okay. I'm going to move on, then, to the NFAT low, reference, and high. So -- so the -- the capital cost inputs are key -- key inputs for the economic and financial probabilistic analysis. The same estimate is used to derive these results. The original values were based on our stress test, the contingency curve, that was der -- derived from our stress test back in 2012. So that would -- that formed the basis of our -- of our an -- original analysis.

The key variables include that -- an impact. Our capital costs include changes to contingency and the labour reserve.

One -- one key change that we've made here in terms of our methodology is that we've now incorporated the labour reserve into the cor -- into the contingency curve. It was formerly modelled outside this curve as a -- as a unfactored risk. So some of you may remember that the -- the old high for

Keeyask and Conawapa was the sum of the P50 value plus the labour reserve, the unfactored reserve. So we've now included the labour reserve. We've modelled that with the contingency curve to have a single curve.

Contingency is based on the updated contingency and assessment, and -- and one (1) of the other results and findings that are our range of results. So the difference between the reference and low and the reference and high is now larger. And you'll see that in the next slide. So there's a -- there's a lot of numbers here. Because this is new information, I -- I wanted to provide a little more information for the purpose of this -- this presentation.

The -- the first part here, the key variables, again the labour reserve in the contingency form that key variable. I've separated the results from both the contingency and labour reserve to illustrate what impacts they have to the low reference and high. So you could see that the -- the labour reserve, by adding it to the contingency curve, it increases the low reference and high by approximately $190 million.

The other -- other things I'd like to point out here is that for Part B and 'C', they show

the results have changed based on the -- the twenty-four (24) estimate update. So if you -- if you look at the base cost difference there's a -- there's a range between the reference and high of about 13 percent in base costs. And -- and the base cost difference, if we look at our reference case alone, the -- the reference case base costs have increased by about $560 million.

If we look at -- at Item C, the total in-service costs, again looking at the reference, the -- the reference costs for Keeyask have increased by about $640 million. And the range of difference, so the difference between the -- the low and the reference and the reference and high, is about 13 percent.

So the -- so the ranges did increase, and -- and the driving factor for this was the syst -- the amount of systemic risk in the -- the contingency model.

MR. ED WOJCZYNSKI: If I could just add a comment to that. So the addition to that was -- it's an improvement in the estimating, but in effect the increase in the range is due to a method -- methodology change. It's still -- we still have greater confidence in the estimate; it's just the methodology changes causing that range to increase.

MR. DAVE BOWEN: If I could touch on

the range as well, in terms of systemic risk. There's been too many projects in recent history that have had cost overruns. Our -- our contingency expert works for a multi -- multitude of clients that have experienced this, and -- and that's been incorporated in the model. That's -- that's another factor.

What -- what I can say today with that is -- is if you -- if you do draw a comparison to the Wuskwatim project at -- at the same point in time we are today, the Wuskwatim project had about a 13 -- a 10 to 13 percent increase in costs from the point in time when the general civil contract was awarded to completion. And so -- so what it didn't have are things like an escalation reserve, a labour reserve, which we do have now.

So -- so although you have industry with -- there -- there's many examples of projects with cost overruns, we do have a degree of comfort that -- that these have been incorporated. Certainly been accounted for in the -- in our control investment and are represented in the ranges here.

DR. HUGH GRANT: Can I just ask for information? On slide 101, the updated control budget variance, I'm just trying to understand the relationship between slide 101 and 107 -- should I be

comparing them at all till they say the reference case? So this is the actual cost point estimate of the...

MR. DAVE BOWEN: Slide -- slide 101 is the control budget --

DR. HUGH GRANT: Okay.

MR. DAVE BOWEN: -- and then one-o-seven (107) --

DR. HUGH GRANT: It's in the reference case.

MR. DAVE BOWEN: Yeah, it's a reference case. So it's a low, reference, and high.

DR. HUGH GRANT: But should -- should the numbers look similar from the reference case -- say the base cost difference and the reference case to the earlier slide, or not? Are they apples and oranges, I guess my...

MR. DAVE BOWEN: You're -- you're referring to the four point three nine (4.39)?

DR. HUGH GRANT: Not the Conawapa. The Keeyask one-o-one (101), please. So I'm just looking at the change --

MR. DAVE BOWEN: Yeah.

DR. HUGH GRANT: -- are we comparing the same time period?

MR. DAVE BOWEN: It -- it is the same

comparison. If there's any discrepancy, it's -- it's the amount of interest that could be captured in the base cost. I'll -- I'll have to check that for you. But that'd be the only -- only difference. I could assure you it's the same estimate.

DR. HUGH GRANT: Okay. 'Cause the numbers seem to go up much more dramatically when you look at the low reference high. I'm just comparing base costs, including sunk too. The percentage increase is much more substantial.

(BRIEF PAUSE)

MR. ED WOJCZYNSKI: While -- while he's looking at that, can I just clarify? Are you asking why there's a -- a bigger percentage increase in the reference estimate than in the control budget?

DR. HUGH GRANT: Yes.

MR. ED WOJCZYNSKI: Okay.

DR. HUGH GRANT: Because one -- the latter seems more than 10 percent, and on page -- slide 101, it's in the order of 5 percent.

MR. DAVE BOWEN: Okay, Mi -- Mr. Grant, I --just to make sure I'm understanding the question I -- I think you're asking, so the -- the control

budget's increased by 5 percent, and the -- the reference case is increasing by about 10 percent. I think that's -- I think that's the question you're asking, so why is -- what the difference?

DR. HUGH GRANT: More than 10 percent, yeah.

MR. DAVE BOWEN: There -- the difference is because the -- the labour reserve has now been included in the NFAT low, reference, and -- and high. So the -- the labour reserve amount was -- originally wasn't included at -- in the reference case, so there's a -- a $190 million increase for that. That -- that's -- that's the reason.

DR. HUGH GRANT: Okay.

THE CHAIRPERSON: And the difference between six point three-five (6.35) versus six point five (6.5), six point three-five (6.35) being the reference case 2014 update, and then the control cost, six point five (6.5)? Could you explain the -- the nuance for me, please?

MR. DAVE BOWEN: Yeah. In -- the -- the difference between the six point three-five (6.35) and the six point five (6.5), in our control budget, we're still carrying an unfactored labour reserve. So -- so the low, reference, and high uses a labour

reserve that's modelled probabilistically, so our control budget is higher than our reference case due to the labour reserve. The additional re -- labour reserve is in the control budget.

(BRIEF PAUSE)

MR. DAVE BOWEN: Yes. Okay. I'm going to move to Conawapa now. Conawapa follows the same methodology used for Keeyask. The -- the contingency labour reserve are -- are the key variables that change. Power data base costs show a range between the low and -- and reference of approximately 20 percent.

The -- the reference base cost difference is approximately 390 million -- million dollars more, and the in-service cost difference at reference is approximately $700 million more. The -- for the in-service costs, the range of -- of differences between the low and reference, and reference and high are approximately 20 percent. Again, this is because of the additional systemic risk in our model.

(BRIEF PAUSE)

MR. DAVE BOWEN: In terms of project execution, fundamentals to a successful project include a sound -- include many items below. We have a sound project delivery strategy. So what this means is that we're -- we're considering the -- the different project risks, the schedule, and capacity within the marketplace. Our contracts we developed are appropriately sized and various forms of contracts are used based on the scope and above considerations.

We have a comprehensive schedule. It links our design, our procurement in construction. So procurement is -- is all the work that we use to -- to tend our various contracts to ensure that we can meet our end service date.

Our team includes Manitoba Hydro expertise, world class design team, top tier suppliers, and the addition of -- of a world class contracting team with the general civil contract.

We have a mitigation strategy for labour risk, which includes building a premier camp to attract and retrain -- retain craft labour to perform the work. We have a -- we've also added a early contractor involvement process whereby it we've -- we've essentially hired the general civil contractor on about two (2) years before the main work, construction work,

to allow us to -- to work with that contractor to -- to de-risk our labour -- our labour risk. And -- and, basically, to make sure that they're ready for construction once the main first concrete construction starts in 2016.

We also continued to incorporate lessons learned from Wuskwatim and other projects moving forward. An -- and, again, an example of this is the early contract involvement process.

If there's no further questions, I'd like to pass it back to Ms. Flynn.

(BRIEF PAUSE)

THE CHAIRPERSON: Excuse me, Ms. -- Ms. Flynn, what -- how much time have you estimated for your portion of this -- of this par -- part of the presentation?

MS. JOANNE FLYNN: I would guess half an hour.

THE CHAIRPERSON: Okay. I think we better take a break.

MS. JOANNE FLYNN: Okay.

THE CHAIRPERSON: Let's take fifteen

(15) minutes, so back here at ten (10) to.

--- Upon recessing at 2:36 p.m.

--- Upon resuming at 2:53 p.m.

MS. MARLA BOYD: I'm tag teaming temporarily with Ms. Ramage.

THE CHAIRPERSON: Okay.

MS. MARLA BOYD: Just before we resume with the presentation, if Mr. Bowen could have a couple of minutes on the mic. He's got a couple of details with respect to the general civ -- civil contract that he wanted to share with the Board.

MR. DAVE BOWEN: The general civil contract, the -- it -- the press release just went out during the presentation that I was making. So we have awarded a contract to a joint venture of Bechtel, Barnard, and EllisDon. Bechtel, for -- for those who don't know, they were the general civil contractor for the Limestone Project.

So they have a -- a history, a -- a good history of success working on past Manitoba Hydro projects. They're -- they're also one (1) of the largest contractors in the world. So we're -- we're quite pleased to have such a -- a strong general civil

contracting team for our project.

(BRIEF PAUSE)

MR. DAVE BOWEN: The -- the joint venture is Bechtel, B-E-T-C-H-E-L, Barnard, and EllisDon.

(BRIEF PAUSE)

MR. DAVE BOWEN: Barnard. Pardon me. I -- Bechtel's -- I -- Bechtel is B-E-C-H-T-E-L.

(BRIEF PAUSE)

MR. DAVE BOWEN: EllisDon.

(BRIEF PAUSE)

MR. DAVE BOWEN: E-L-L-I-S, capital, 'D', O-N.

MS. JOANNE FLYNN: So now I'll go through the results from the economic evaluation. And I'm going to start with -- by summarizing the economics presented in the NFAT submission, and then I'll proceed

to the update to the economic evaluation, with respect to the increased levels of DSM and the results of the changes to the capital costs for Keeyask and Conawapa.

So on this chart from Chapter 9, or from the information from Chapter 9, based on the 2012 reference case, we see six (6) development plans shown here under the categories of 'no new generation', the '250 megawatt interconnection', '750 megawatt interconnection', which are representative of the range of the development plans that were studied.

The results are based on the 2012 planning assumptions, and at that -- in those assumptions 2022 was identified as the year of need for new resources. Also, at that time, at the time we were preparing for the NFAT submissions, Plan 4, which is the Keeyask/Gas 250 line, was considered a viable option, but it...

(BRIEF PAUSE)

MS. JOANNE FLYNN: But as -- I'll just -- at the time that we did the business case and submitted in August, Plan 4 was considered a viable option, but as explained by Mr. Cormie, this plan is no longer realistically viable, and the economic benefits

can now only be considered as hypothetical.

All of the economic comparisons used the metric of incremental net present value, which represents the incremental net benefit of the developmental plans as compared to the All Gas Plan, the All Gas Plan being the plan with the lowest capital cost relative to the other plans.

The results shown on this slide represent reference scenario assumptions. The chart shows that Keeyask in '22 followed by gas is the most economic plan when building to meet Manitoba load requirements, having an NPV of 887 million greater than the All Gas Plan.

Advancing Keeyask to 2019 and investing in a new interconnection improves the net benefits of the Keeyask plans followed by gas. Additionally, investing in Conawapa with the 750 megawatt US interconnection provides the greatest economic benefits under the 2012 reference scenario assumptions.

I'm just going to skip over this next slide as Mr. Wojczynski will address something similar in his presentation. The 2012 reference scenario, on its own, represents one (1) view of the future. Probabilistic analysis considers the impact of uncertainty, and the resulting scenarios represent

combinations of the high-impact factors with the range of high reference and low assumptions.

As each of the twenty-seven (27) combinations of the highest impact factors do not have the same likelihood of occurring, probabilities are developed for each set of factors, and they are shown on this slide.

The probabilistic analysis results can be displayed in a single chart, as shown on the slide. The colours on the chart are representative of how positive, the green colours, and -- or negative, the red colours, the NPVs are relative to the reference scenario for all gas.

All plans have a substantial range of outcomes which vary from the reference case. The degree and direction of this variation differs from plan to plan. Plans with an interconnection have the most upside post -- potential, and you can see that as there are more scenarios showing green. The expected value for each plan is calculated by taking the sum of the NPVs multiplied by their appropriate scenario probability, which is listed in the right-most column of the quilt.

The expected values, which can also be referred to as weighted average net present values,

incorporate the uncertainty associated with the highest impact factors, which are energy prices, discount rates, and capital cost as represented in these scenarios. In this analysis, using the metric of expected value, the Preferred Development Plan had the greatest incremental benefit.

In Chapter 12 of the NFAT submission, the analysis for the reference scenario was updated using 2013 planning assumptions for select development plans. Overall, the 2013 Manitoba load forecast decreased for both energy and peak demand, deferring the in-service date requirement by one (1) year, from 2022 to 2023.

2013 consensus electricity export price forecast was higher on average by approximately 7 percent. For 2013, it was assumed that the earliest possible in-service date for Conawapa would be 2026 as opposed to 2025 that was used in the 2012 planning assumptions. The real discount rate applied it for -- applied in the economic evaluation in the 2013 update is 5.40 percent, an increase from the 5.05 percent used in the reference scenario in the 2012 analysis.

The increase in discount rate reflects the update in the consensus forecast used by Manitoba Hydro for economic indicators. Shown on this slide is

the comparison of incremental NPVs of development plans relative to the All Gas Plan for both 2012 assumptions and 2013 planning assumptions. The effective changes in assumptions does not change the economic ranking of the development plans, but does result in a decrease to the incremental benefit of the development plans relative to the All Gas Plan, which is -- which for the Preferred Development Plan, Plan 14, is a decrease of over 200 million in net present value.

DSM, as a resource option in the NFAT submission, was presented as a sensitivity. A DSM sensitivity and DSM stress tests were undertaken to demonstrate the relative impact of higher levels of DSM on selected plans. In general, the development plan's analyzed benefit from increased levels of DSM with Plans 4 and 14 with new US interconnections deriving greater benefits than Plan 2, which is Keeyask/Gas with no new interconnection, the Preferred Plan remained the most economic under both levels of DSM in this submission.

In addition to probabilistic analysis, Manitoba Hydro also conducted a sensitivity analysis on selected high impact variables including drought, climate change, Manitoba load, and in-service date delay. These variables were studied in isolation to

determine their individual impact on selected development plans.

Drought is a significant event on the Manitoba Hydro system as the generation is predominantly hydro-electric. There are several occurrences of severe drought in the historical record that flows reflected by significantly lower than average revenue. The risks involved with drought have been either captured directly or studied separately through sensitivity analysis in the various stages of Manitoba Hydro's analysis. The net revenue cashflows used in the economic analysis are based on the average of all ninety-nine (99) flow conditions which directly includes the impact of all low flow conditions in the economic analysis. The impact of drought from a financial perspective is analyzed separately and will be part of the evidence given by the next panel.

The analysis related to the availability of emergency energy will be addressed later in this present -- presentation by Mr. Wojczynski.

The sensitivity analysis for drought compared the impact of a prolonged period of below average stream flows, a five (5) year drought, on the incremental net revenues for four (4) development plans. And those were the All Gas Plan, Keeyask22,

followed by gas with no new interconnection, Keeyask19, followed by gas with a small interconnection, and the Preferred Development Plan, which has a large interconnection. And this was done with four (4) different start dates, and those dates are shown on the slide. Both the impact of energy prices and the timing of drought on the present value of revenues were analyzed for low reference and high energy price scenarios.

Manitoba Hydro's analysis of drought demonstrated that prolonged drought has a significant impact on development plans both with and without large hydro-electric generation. At reference energy prices, the net impacts of drought on revenues is greater in plans with more new hydro-electric generating resources and increased interconnection capability as there is a proportionately greater loss of export revenue under drought conditions.

It should be noted that plans that have more natural gas fired generation, in particular, the All Gas Plan, are more sensitive to changes in energy prices as there is less ability to generate revenue in years above the critical flow year. The financial impact on the Corporation related to drought will be presented as part of the financial analysis covered by

the next panel.

An analysis was also conducted to determine the potential impact of changes in Manitoba load to the incremental NPVs of All Gas. Oh, pardon me, the incremental NPVs of the all Gas, the Keeyask/Gas, and the Preferred Development Plans. Comparison of these plans demonstrates the incremental effects of changes in load on plans with no hyd -- with no new hydro, one (1) new hydro resource, and two (2) new hydro resources with the new interconnection, respectively.

The sensitivity analysis was based on the 90th percentile and 10th percentile probability bands for energy and winter peak capacity Manitoba load forecasts. This means that there is an 80 percent chance that Manitoba load will fall between the high and low bands for any given fore -- forecast year. This sensitivity analysis shows that load changes have the largest impact on the NPV of the All Gas Development Plan, and the impact decreases with the addition of new hydro and a new interconnection.

With respect to climate change, an analysis was conducted to test how different climate change projections of future water availability would affect different development plans. Manitoba Hydro

takes climate change very seriously, and collaborates with international climate change experts to better understand the potential impacts of climate change on Manitoba Hydro's system.

Manitoba Hydro has become affiliated members of the Ouranos Consortium, who are international experts on climate change impacts. They provide Manitoba Hydro with the support, guidance, and data to carry out our studies. Appendix K of the NFAT submission contains Manitoba Hydro's climate change report, which outlines the Corporation's climate change strate -- strategies. Dr. Rene Roy from Ouranos will be providing evidence on Wednesday with respect to climate change impacts on water supply.

For the NFAT, Manitoba Hydro applied advanced climate science data in a sensitivity analysis to look at the impacts of climate change on the future water supply. A large number of global climate models were used to project a range of potential future water supply conditions, which captures a large source of climate change un -- uncertainty.

Most projections showed that the average annual future water supply is expected to increase into the future for the Nelson-Churchill watershed, where Manitoba Hydro receives its water supply. Global

climate models are strong at simulating average conditions over a year. Where they have a limitation is in the seasonal stream flow changes and future projections of extreme system-wide drought conditions. With respect to stream flow changes through each season of the year, the changes in stream flow into the future as a result of climate change are expected to be within the variability already experienced in our system.

Though there is general consensus in the scientific community that climate change could impact the frequency and severity of droughts within the Nelson-Churchill watershed, the global climate models are not yet capable of projecting a consistent signal of drought in this watershed. This is due to the inability of the models to accurately reflect all the factors that influence droughts in a watershed as complex as the Nelson-Churchill watershed.

Research is still ongoing and there is currently no utility accepted standard to assess potential climate change impacts on extreme system-wide drought for the purposes of resource planning decision making. Manitoba Hydro will continue to work with the experts in the climate change field to stay current on the latest developments related to climate change impacts on future water supply.

The overall conclusion of the climate change sensitivity analysis shows that the incremental NPV still favours the Preferred Development Plan under all assessed climate change scenarios. In addition, the expansion of our interconnection capability would allow Manitoba Hydro to better manage extremes as it provides access to a large market should there be an increase in water supply, and allows us to import during droughts.

Okay, now I'm going to present the results of the DSM and updated Keeyask and Conawapa capital cost changes. This chart shows the changes in net present value for the Preferred Development Plan under the reference scenario as compared to the All-gas Plan starting with the 2012 planning assumptions.

In Chapter 9 of the NFAT submission, the incremental NPV for the Preferred Developl -- Development Plan over the All-as Plan was one billion, six hundred and ninety-six million (1,696,000,000). With the updated capital cost for Keeyask and Conawapa, the net present value shows a deterioration down to 798 million, a change of 900 million in the incremental net present value.

In Chapter 12 of the NFAT submission, the effect of the 2013 planning assumptions resulted in

a decline in the net present value of over $200 million, reducing the incremental NPV to fourteen sixty-two (1,462). Further adjustments were made after the filing to reflect changes, including the removal of the WPS investment in the interconnection. These changes further reduced the NPV to one billion two hundred and forty-five million (1,245,000,000). Incorporating the capital cost increases for Keeyask and Conawapa then results in the net present value of 374 million, a deterioration of 871 million.

As I mentioned earlier, this assumes that Manitoba Hydro will always hold the transmission position without unwinding it. The changes in net present value result from the -- resulting from the update since the filing of the NFAT submission reflect the incorporation of new information. The deterioration in net present value in the one billion, four hundred and sixty-two million (1,462,000,000) is significant.

The 2012 NFAT reference case economic results were updated with the latest capital cost estimates for Keeyask and Conawapa as described by Mr. Bowen. The darker blue columns on this chart show the incremental NPVs from the 2012 reference case results from Chapter 9 of the NFAT submission. So a couple

slides ago, I showed you the numbers of the sixteen ninety-six (1,696) and the eight eighty-seven (887), so there they are again in the darker blue on the -- on the chart.

The lighter blue columns show the updated incremental NPVs assuming the increased capital costs for Keeyask and Conawapa. On a relative basis, the economics of Plan 4, Keeyask/Gas with a small interconnection, improve under these new assumptions to the point where Plan 4 has the highest incremental NPV. However, as stated previously, we can no longer consider Plan 4 to be a vi -- a viable plan, and therefore the results can only be considered as hypothetical.

The chart shows the decreased incremental benefit of the plans that include Keeyask and/or Conawapa when compared to the All Gas Plan. Manitoba Hydro also updated the probabilistic analysis to incorporate the increased capital cost for Keeyask and Conawapa for five (5) of the development plans. The table shows six (6) plans, including All Gas. You will note that there continues to be more green for the plans with hydro as compared to the All-gas Plan.

When looking at the expected value which incorporates the uncertainty through the probabilistic

weightings, the increased capital cost for Keeyask and Conawapa result in a change in the ranking of the development plans. The Keeyask/Gas 750 Megawatt Plan would rank ahead of the Preferred Development Plan.

At the reference scenario level, the Preferred Development Plan continues to rank higher than the Keeyask/Gas 750 Megawatt Plan.

The expected value of the Keeyask19/Gas 750 Megawatt Plan is still clearly better than the plans without an interconnection. And I will just mention that the probabilistic analysis is done on the basis of the 2012 planning assumptions with the exception of the increased values in capital costs for Keeyask and Conawapa and the changes in the probabil -- probabilistic weightings.

I'm just going to skip over the next slide in the interest of time and talk about the updated DSM evaluation.

This same slide was provided earlier and is repeated here just to remind us of the different levels of DSM that have been evaluated. The three (3) development plans evaluated are All Gas, Keeyask/Gas 750, and the Preferred Plan. For DSM Levels 2 and 3, the three (3) plans have also been evaluated with pipeline load. As stated earlier, it is not likely

that all of DSM Level 2 would be implemented, and it may be that DSM Level 3 is a higher level of DSM than is likely to occur.

So what level of DSM is economic? This slide compares the incremental net present value benefits for moving to higher levels of DSM under the three (3) plans. This slide shows that there are substantial incremental benefits associated with DSM Levels 1 and 2 for each of the three (3) plans.

Moving to DSM Level 3 results in negative incremental NPVs ranging from minus 39 million to minus 102 million across the three (3) plans. This means that DSM Level 3 is uneconomic regardless of which plan we are looking at.

This table provides development plan comparisons at different levels of DSM. These are comparisons of incremental NPVs relative to All Gas at each of the levels of DSM. So under the base level of DSM, the incremental NPVs, when compared to the All Gas Plan, are essentially the same for Plans 5 and Plan 14, at 377 million in incremental NPV and 374 million in the incremental NPV.

Under DSM Levels 1, 2, and 3, the Keeyask/Gas 750 Plan has a higher incremental net present value than the Preferred Plan with and without

the pipeline load. For example, under Level 2 DSM, the Keeyask/Gas 750 Megawatt Plan has an incremental NPV of 410 million compared to that of 45 million for the Preferred Plan.

The economic evaluation uses Manitoba Hydro's real weighted average cost of cap -- capital as the discount rate. Included in the real weighted average cost of capital is a return on equity above borrowing cost. This means that the NPVs are reduced when viewed from the Manitoba Hydro perspective. We are not suggesting replacing the discount rate in corporate economics with one that only reflects the cost of borrowing, but on this slide your demonstrating the return on equity available to Manitoba Hydro which is imbedded in the real weighted average cost of capital.

A portion of imbedded return on equity is required to maintain the debt-equity target of 75:25. It is recognized that the return on equity also provides a buffer against risk, or provides a net benefit. Under the 2013 assumptions with Level 2 DSM, the imbedded return on equity is one billion three hundred and nineteen million (1,319,000,000) on the Preferred Development Plan and 742 million on the Keeyask/Gas 750 Megawatt Plan.

This means if all the assumptions came out as projected in addition to the $45 million in net present value for the Preferred Plan, Manitoba Hydro would also gain one billion three hundred and nineteen million (1,319,000,000) in NPV.

For the Keeyask19/Gas 750 Megawatt Plan, in addition to the 410 million in net present value, there would be a gain of 742 million increment to the All Gas Plan. This view of the embedded return on equity is worthy of consideration.

I'm going to turn it over to Mr. -- Mr. Wojczynski.

(BRIEF PAUSE)

MR. ED WOJCZYNSKI: So, Ms. -- Ms. Flynn has just presented to us the economics of our development plans using the very latest information we have. Everything we had last week and this weekend, I might add, everything we have has been included in them. We've updated it to the very last minute. So it's -- it's the most current information.

And I think before I move on with this, it's useful pointing out that this -- that -- that what -- there has been a deterioration in the economics and

I'm going to comment on that right away. But in conjunction with that we have much more confidence in these results and in this information than we had, say, when we prepared the submission, or compared to Wuskwatim we were at the end -- Wukwatim-NFAT. One (1) rea -- there's a number of reasons. I'm just going to list two (2) of them, we're running kind of late here. And by the way, I notice we're setting a pattern. Last week Monday I was the last person in the day with the danger of boring you, and I'm afraid we're back in that same boat.

But anyways, so one (1) reason why we have much more confidence in this information is we have -- as Mr. Bowen indicated, we have much better information on the capital costs of the project. We have 80 percent of the project contracts committed -- or signed. We have a much better estimating process. We -- we've effectively got a significant buffer in the terms of reserve margin -- pardon me, labour reserve. Escalation reserve we didn't have in Wuskwatim. So we're in much better shape with Wuskwatim.

And secondly, we're much closer to the point of actually wanting to proceed with Keeyask. And in the case of Wuskwatim, it was a few years before we actually fully got into construction. Here we are, if

everything works out well in the next few months, we'll be starting construction in a few months. So we're -- we're in a significantly different ballpark with Wuskwatim -- than Wuskwatim. And, of course, we've got the con -- the export contracts Mr. Cormie is referencing. There are other factors as well, but I think I should move on.

So while the economics have deteriorated from the analysis in this submission, I think it's important to point out they are still positive. That is, the economics of the 750 Megawatt Interconnection Plan, certainly with Keeyask/Gas, not quite as absolutely certain as Keeyask/Conawapa, are at -- and -- and these analysis at the reference case, at least as good as -- as the Gas Plan, or somewhat better.

I -- I maybe want to reenforce the general principle that when you're doing discounted cashflow economic evaluations and you're using a weighted average cost of capital, in theory if you have anything above a zero on the NPV, that means that you should be proceeding with that, that you're better off with that. Because, as Ms. Flynn just indicated, when you're calculating the NPV with the weighted average cost of capital, you have already built into it a return on the equity that you are looking for, as -- as

-- let's call it as a minimum.

So I -- I just thought when we see these numbers come down, down to a few hundred million as opposed to over a billion NPV, it's not that there is no return, no positive return, it's just already something in the WACC itself.

These returns that we're seeing though, and Manitoba Hydro's very aware of this, are less than what you would expect that a -- private investor who is out in the market would -- would want to have. And -- but that is -- you know, there are a -- a number of comments I want to make on that. One (1) of them, we are a Crown corporation. We have a mandate to serve the electrical customers in Manitoba over the long-term. And we have a -- an -- a mandate to look at the short-term and the long-term of our customers and balance those. So we take a long-term perspective in a way that the typical private investor looking at what they should do with their money. So -- so we are looking in a -- in a different -- with a different set of criteria than -- than that typical private investor.

Secondly, the -- the plan of -- with the 750 megawatt interconnection are positive compared to the Gas Plan. We have the additional return to equity that Ms. Flynn was referring to. And even so, with

only the Manitoba Hydro corporate economics to make a decision, it -- it would be hard to make a choice between the plans. If that's all we are looking at, and given the large amount of investment, and given are the uncertainties that we have to -- to account, that would not be an easy choice to make. But the economics are not the only things that we're supposed to be considering.

Due to the Manitoba Hydro mandate, the NFAT terms of reference, there are a full range of perspectives that we need to account for, both impacts and benefits. And I'm just going to talk about that briefly now.

So we -- the on day 1, I'm not going to go through the longish explanation I had that day. These are the perspectives that are related to our mandate, and are the terms of reference, and our part of this NFAT submission, and we are going through in the course of this hearing process. We've just gone through the economics, and we're going to go through all of the other factors over the next few days. And that's what, I think, we'll plunge into.

But what I do want to say is, as Mr. Thomson indicated in the fi -- in -- on Monday last, that we -- the executive of Manitoba Hydro, the Board

of Manitoba Hydro, were presented not with these exact numbers. We had some proxy information which we used the high capital costs from the NFAT submission, which actually are just a -- are essentially similar to these numbers. Or, actually, in some ways it may be a little bit worse, but essentially similar to these numbers that Ms. Flynn just presented. So the executive of Manitoba Hydro, the Board of Manitoba Hydro, essentially saw the same information and, in consideration of -- of these numbers, and in consideration of the range of benefits that all still stand, all the other ones we've talked about in the submission, they reaffirmed that from Manitoba Hydro's point of view, this was a plan that was -- that was justified and met the needs of Manitobans in the best way to meet the meeds -- the needs of Manitobans.

So I'll move on, and go to the first perspective in addition to the ones that Ms. Flynn referred to. This is a graph of -- showing the same plans and scenarios that Ms. Flynn presented in her second last overhead. And this is a NPV to Manitoba Hydro for each one of those plans. And I won't repeat them, because they are the numbers that she just communicated.

But what I'm doing in this one, the

purpose of this is that the transfers to the province are a major component. We talked about that in the original submission. And whereas the -- the -- first of all we look at the economics to Manitoba Hydro and we'll look at the impacts on rates and the financial targets to Manitoba Hydro next week -- what's also of importance in the NFAT process is we have to look from a provincial perspective as well. And these are the transfers to the province.

If we look at the Keeyask/Gas plans under these scenarios -- and they'd be similar in other scenarios -- what with the -- the transfers of water rental, capital tax, debt guarantee fee, we're talking about in the Keeyask/Gas plans something in the order of three-quarters (3/4s) of a billion NPV of transfers to the provincial government.

If you're looking at the Keeyask/Conawapa Plan, with the 750 megawatt interconnection, you're talking about in the order of one and a half (1 1/2) billion. Now, that is a cost to Manitoba Hydro and it's a cost to the ratepayers, but to Manitobans, indirectly through the Government of Manitoba, it is a benefit and it has to be part of the consideration of this process. And it is definitely then a benefit to -- to the province as a whole.

I'm going to move on to the -- the next two (2) perspectives. And that's the -- the bulk system reliability and the energy security analysis from the Manitoba domestic customer point of view; not our export customers: Manitobans. And I should add that this is of particular interest to me and apt that I'm presenting this, because actually that was my Master's thesis. And my research associate work, and various papers I published was dealing with this topic of how -- what is the optimum level of reliability.

You're -- you're never going to have a hundred percent reliability in a system. You'd have to spend an inordinate amount of money. So you always have to balance how much you spend on reliability, and -- and accept there's always some risk. And to some degree this is what we're dealing with here. And in some of the discussion earlier this morning on import limits, and how much should we count on in our planning for importing over the tie-lines. That's very much tied into this issue: How -- how much is enough reliability?

We talked already about this a bit, and we're putting this up not because we want to be fearmongering. We're not fearmongering when we put this up. Manitoba has not had a ext -- major customer

outages from -- at the bulk system for forty (40) years. That's a very good record, and you can't find that in many other places.

And this just demonstrates whether -- Mr. Chair, you asked about, Well, wasn't this transmission outages. Some of the -- the widespread outages are from the bulk transmission system, some of these are from generation, and in some cases it's not due to a capacity problem but you can also have major outages due to energy shortages. And current recent examples in the developed world are Brazil, Chile, I think Columbia, have had in the last ten (10) years, and Brazil this year, because of energy shortages. It's not capacity. The capacity is there. They don't have the energy. They are having customer curtailments. Cutbacks on load.

So both capacity problems and energy problems can be -- cause a major detriment to customers in terms of them not being supplied, and that's why we have to have these -- these criteria.

And we've been somewhat insulated from that because of the major interconnection to the States, and because we have advanced generation and had exports from them, and if we need to we can always curtail our exports in -- in favour of our domestic

load. So we're -- we've been in a very favourable place, and -- and we're now going to analyse on a going-forward basis what it looks like.

There are two (2) elements to look at. One is capacity; one is energy. Reliability analysis, or the loss of load expectation is a standard industry engineering technique used around the world to evaluate capacity reliability. Do you have enough capacity on your system to meet your peak load? And as I said the first day, the report -- the -- we have a report in the submission on that, and I'm not going to go through the details of it.

I think what I will comment on is that NERC requires utilities to communicate what their LOLE is. It's a guideline. It's not a North American standard but there's an expectation -- it's not a mandatory standard but it's an expectation you meet that level. And I should point out that MISO has -- does LOLE analyses as well, and -- and they do that in part to buttress whether their reserve criteria is the -- is the right level of reserve criteria, and just like we use that to confirm our 12 percent reserve criteria.

So when we analyse the plans and -- and determine how much reliability we have, we have a

result where the plans with the interconnections and generation advance for export provide a much higher level of reliability than a plan where you have -- an All Gas Plan where you get just exactly the minimum amount of generation and nothing extra.

And if I show the graph. Where we have the load line, this is thousands of megawatts of capacity, and that's the amount of load that can be carried at -- in Manitoba at the point one (.1) days per year -- per -- per year reliability criteria.

And we've got the load line on here, and we could start with the All Gas sequence, which is the light blue. And you can see from that that -- 'cause we're putting just to meet the 12 percent reserve or the dependable energy requirement, that we're really just bouncing around at the criteria and have just the -- the minimum level of reliability that our guidelines call for.

If you look at -- the other extreme is the Keeyask19/Conawapa25 750 megawatt interconnection line we have -- let me see now, how much is it again -- we have 5 -- 500 to 1,000 megawatts more ability to carry Manitoba load than in the All Gas Plan.

The reason we have that is if -- first, we've advanced generation and, second, we've got this

tie-line that we can count on for imports. And in an emergency if we have to we can dump our exports and -- and import on an emergency basis over our tie-line. And some of this is not stuff you can use to met your 12 percent reserve. It's what you can do in an emergency. If you have a gas plan, those gas generators don't bring you anything extra. They use everything from them.

The second element is energy. Dependable energy is what we've talked about. We have a dependable energy criteria. Associated to that, we have an energy import limit that Ms. Flynn talked about earlier this morning, and I -- I should probably mention that in the Preferred Plan, we already are counting in a drought over 20 percent of our supply in the first twenty (20) years or so is coming from imports and thermal energy. Something like 12 to 14 percent, something in that order, are imports, and the rest is our thermal generation in Manitoba.

So we already are counting in a drought on a large portion of our load being met from thermal in Manitoba but -- but significantly from imports, and so it's not like we're not paying that attention or counting on it already.

And the question that comes up,

naturally, and it was asked this morning, is, Well, why don't we expand that? Why don't we count on -- on more than, say, a 10 percent limit of domestic load plus exports? Well, why don't we go further than that?

Part of the answer is that we don't have any reserve energy in our energy criteria explicitly built in. We have our dependable energy criteria, which is we -- we're able to meet the load under the worst drought on record. We've had two (2) or three (3) of those in the last hundred years.

And -- but if -- whe -- if that happens again, which in likeliha -- hood will happen, we have in our criteria no spare energy beyond that. If the drought is worse than the drought on record, if our load that year happens to be higher, if we have our Brandon thermal unit, if it's -- if it's down and not operating or our Selkirk units or our gas turbines, if we have outages of our import line, any one of those things happen, that we would not have spare energy beyond that dro -- the dependable.

So our -- our dependable energy criteria implicitly assumes that there will be some spare energy on the tie-line through imports and through being able to -- not to live in our exports in those emergency situations.

And if we were to change our energy import limit, we -- we would be cutting into that implicit reserve energy and putting our ability to meet the load at greater risk if these scenarios happen, these contingencies.

If we go to look at -- at comparing -- and -- and just to try and simplify, we didn't show all the other plans in here. We have that information available in the -- in -- on the record prior to the hearings. What this is, is what emergency energy would be available to meet Manitoba load if we had a -- a drought that was worse than the drought on record or one (1) of those contingencies I just talked about?

And you have the All Gas Plan. In that case, you've ma -- you've maximized your imports. You've run your gas and everything else to the maximum, and then if we look at the Keeyask/Conawapa Plan, we can cans -- we've got Keeyask and Conawapa advanced, and even though a large portion of their output would be sold on the export market, on the firm market, in that emergency, through a force majeure clauses in the contracts Mr. Cormie has negotiated, we can not deliver and use it first for Manitoba load.

Secondly then, we also have the room on the tie-line, particularly now in the on-peak, that was

not being counted on. We can now bring the energy in. So we have a much greater ability to service the Manitoba load in these negative contingencies in the -- in the plans with the 750 megawatt interconnection.

And maybe a -- another way to view this. Let's say these plans had the identical economics dollar for dollar. The plans with the 750 megawatt interconnection would provide us much more reliability and much more energy security for the same amount of dollars.

So that's finishing off the reliability and energy security perspectives, and just moving on to try and conclude the day's evidence. We started off this process a week ago, and in the original submission in last August, indicating that, from Manitoba Hydro's perspective, and I presented this overhead on Monday, that we had a fundamental decision coming out of this NFAT process. What will the long-term electrical future of Manitoba be like?

DSM will be in that future, but we feel -- we conclude that we'll need more than DSM. We will need new supply as well, and should that supply be hydro or should it be gas?

Secondly, if you've decided it should be hydro, and we believe it should be, should we take

advantage of the interconnection opportunity that we have to expand the interconnection? And to do that, you need -- you need to advance Keeyask and you'd have to commit to the 250 megawatt MP sale.

There was at the outset, we had the options of a 750 or 250 megawatt interconnection, and there was, If the WPS negotiations were successful, should we pursue them? Tho -- those were the decisions that were facing us when we wrote the submission and provided it to you, and -- and that we were at the -- at the beginning of this whole process.

But -- well, and these are the pathways that arise from those decisions, and I'm not going to repeat this. We talked about that on Monday, and we're running very late here.

But I will say we have more information now from when we submitted the submission. We've got more information on what's happening in the export market, the negotiations. We -- what's happening with Minnesota Power in terms of the transmission. Minnesota Power has submitted in the regulatory process certificate of need. The whole -- the economics of the world around us have changed somewhat, as we just saw today, somewhat significantly.

And, so when we started off with five

(5) pathways, in our view, Manitoba Hydro's view, and maybe no -- not everybody will agree, we think we -- that part of a healthy process is to reduce the number of options as -- as you get more information, and in our view, we only have three (3) pathways left that are viable options that are worth considering.

Should we go with gas initially? Should we go with Keeyask initially without an interconnection? Or should we go with Keeyask and an -- and the 750 megawatt interconnection with the various sales we've been talking about? And in our view, those are the three (3) decisions that we realistically have in front of us to make.

And what that leaves us in -- in terms of moving forward, you -- we make a decision. Should Keeyask be the next supply? We'd say, Yes, it should be, and in that case, Should we go down the 750 megawatt interconnection route, and make decisions at Con -- without Conawapa at some later date? We don't need to make those commitments today.

And we think that that's a fairly logical approach to go. In our overall conclusions, this is the last overhead, thankfully. I'm -- I -- I know that's what you all must be thinking. From Manitoba Hydro's point of view, the overall conclusion

is the -- the 750 megawatt line with Keeyask/Gas, and the various sales are justified in Manitoba Hydro's view. We provide the 3 to 400 million corporate benefits, all the various latest information you have just been presented.

In addition to that, we have the three-quarter (3/4) -- we have the three (3) -- I think it was around three hundred (300) -- 3/4 billion of the -- the return to equity. How much was that again? The -- I'm forgetting the numbers. Yeah, around 700 million returned to equity. That's already embedded in the WACC. We have around a billion in provincial transfers, and we have all the other benefits to the Manitoba society, to Manitoba as a whole, and we've got to look at the rates, the reliability, the energy security, the environmental socioeconomic issues, the benefits to the communities.

So Manitoba Hydro's conclusion is that the 750 Keeyask/Gas plan definitely is justified, and that we should proceed with it this time. The Keeyask/Conawapa plan, the -- it's not quite as clear as that right now, although there are major benefits, but there's a much greater investment required, and a -- as we've been saying, that -- that we'll have a better handle on that as we go along, and the final

decisions can be made later. Thank you.

THE CHAIRPERSON: For my benefit, could you go over the -- the reason why the 250 line has become hypothetical as opposed to viable? What -- what -- could you -- could you explain that one again to me? Somehow it -- it seems to have transitioned over the space of a few days to becoming hypothetical.

Could you -- could you go through that again for me again, please?

MR. JARED WHELAN: Maybe Mr. Cormie, who had talked about it earlier, should -- maybe just revisit that one, Dave, and -- and spend a bit of time on that?

MR. DAVID CORMIE: Yes. This is -- as I explained earlier, we have been doing all our planning with Minnesota Power and Wisconsin Public Service and with MISO based on the 750 megawatt tie-line. The -- very little work has been done on the 250 megawatt option.

To go to Minnesota Power today and say, We want to change to a 250 megawatt tie-line, given that all this information is in the public domain, it creates a very difficult situation for Manitoba Hydro to negotiate an outcome that preserves the benefits. Because the public process puts all the information on

the table, and we have no -- we have no ability to leverage that to preserve the benefits.

So it's something I'd rather talk about in the confidential process. But fundamentally I don't believe it's in the -- I don't believe those benefits can be achi -- can be achieved at this time because of -- of the writt -- because the public information is now on the record, and it -- it just won't be possible to -- to negotiate a -- an outcome that would reflect the benefits to show -- associated here. And -- and we can exp -- and we can talk about that more at a later time.

MR. ED WOJCZYNSKI: Mr. Chair, I'd just brought back the overhead that Mr. Cormie presented this morning dealing with that topic.

MR. DAVID CORMIE: In -- in addition to that, all those reasons that I -- I stated there, they -- they've already declared that it's not in the best interest of the customers. It's not in the best interest of the state. It's not in the -- it's not the environmentally preferred option. And -- and then in addition to that, to -- you know, they have no real reason to -- to subsidize the cost of the line as they have been to date.

THE CHAIRPERSON: And the

environmentally approved option, I mean, could you go over that for me, please?

MR. DAVID CORMIE: The environmentally preferable option is the issue of -- of state planning for transmission corridors. And the objective of the state planning process now is to -- to take the corridor and build the -- the largest possible capacity on that corridor, rather than continuing to -- to build small, you know, more -- and more transmission lines than -- than taking the corridor and building the largest possible line on that.

So in the scenario where Manitoba Hydro feels that it wants to continue to develop its hydro resources, and as we've -- as our history has demonstrated, each time we brought forward a large hydro project we -- we've increased our interconnected capability. The -- the State of Minnesota would prefer that we go, at this time, build the -- and -- and maximize the -- the use of the -- of the corridor that we asked for today and not to ask for a smaller corridor, and then in fifteen (15) years come back and say, Well, we want another corridor, and another corridor.

It -- it uses up land and -- and it affects the environment, whereas, if you essentially

take the same amount of land today and -- and build the big line, if you are thinking about additional exports in the future, now is the time to ask for the corridor and to have the state go through the process of finding the -- the appropriate corridor.

MR. ED WOJCZYNSKI: Maybe I could emphasize that Mr. Cormie just said that Minnesota Power had stated that the two-fifty (250) option didn't meet the needs of the region and wasn't cost effective for their customers. If I'm not -- my understanding is that was actually in their -- publicly in their certificate of need that they have filed.

MR. RICHARD BEL: I have a question of Keeyask/Gas. So the -- so Keeyask is built.

When would the first gas turbine be required under the latest information?

MR. ED WOJCZYNSKI: The -- that would depend on which of the scenarios we're looking at because there's different levels of DSM. And each level of DSM, or each load forecast would result in a different date. While -- while --

MR. RICHARD BEL: So Level 2 DSM? Lev -- Level 2 DSM, and --

MR. ED WOJCZYNSKI: Yeah.

MR. RICHARD BEL: -- and the 750 line.

MR. ED WOJCZYNSKI: The Level 2, if we go -- of course I now put the slides in the wrong place.

MR. KURT SIMONSEN: Excuse me, Ed. It's Kurt Simonsen. When you refer to the slides, can you give the page number, please, so that the transcripts can show for the people who are reading it where -- where exactly we are? We should have done that probably a hundred and forty (140) pages ago, but...

MR. ED WOJCZYNSKI: Certainly. Are the dates on there? Oh, okay. If we're -- we're looking at Slide 129 right now, and in Level 2 DSM Gas Plan...

(BRIEF PAUSE)

MR. ED WOJCZYNSKI: Yeah. The Keeyask would be in '19 and the gas turbine would be in 2030 in that case, and that's -- that's with the -- the sales, the MP WPS sales in place.

MR. RICHARD BEL: Thank you.

THE CHAIRPERSON: The incremental reliability gain from a 750 interconnection relative to what you're getting -- you will be -- you will be getting through Bipole III, could you -- could you

address that?

(BRIEF PAUSE)

MR. ED WOJCZYNSKI: Going -- am I too close now? Going to Slide 139. I need better glasses. Oh, it's not in slide mode, I'm sorry. Okay, that's better. If you look at this graph, we have done similar analysis for de -- for decades, and we have done them earlier with -- with the Bipole III analysis. And I know this is not the Bipole III hearing, but I think I can answer this question, that if we did not have Bipole III in place, and let's say we're looking at the year 2018 before we get into any of this stuff we're looking at now, if we did not have Bipole III, the -- the reliability line would be way below the load line.

What Bipole III does is bring Manitoba system back to where it's supposed to be, at the point one (.1) days per year, and without it, we were -- we were -- had a major deficit, and if -- you've heard this before in the newspaper and everywhere else, but if we'd -- if we'd had a loss of the lines, or more critically, the loss of the Dorsey station, in the case of the lines, there would be weeks and months of

blackouts, and particularly in the winter, and the case of -- of we loss the station, it'd be years -- four (4) years of rotating blackouts throughout the whole time.

And in the case of Newfoundland, the premier of the province had to resign because of the controversy associated with the blackouts. I shudder to think of what would happen in Manitoba if -- if that happened here.

THE CHAIRPERSON: Yeah. Bipole III is off limits to the panel, as you know, but what I'm -- what I'm interested in is, okay, assuming Bipole III gets built, what is the incremental gain that you will get on the reliability side from going to a 750 interconnection as opposed to having none at all?

MR. ED WOJCZYNSKI: This graph already assumes Bipole III is built, so the incremental reliability we're -- we're showing on this graph is starting from the assumption that Bipole III is already in place.

(BRIEF PAUSE)

DR. HUGH GRANT: I'm wondering if -- on Slide 139, some may see reliability, others may see excess capacity. So I'm wondering what's sort of the

optimal reliability thing? And -- and I -- I'm wondering if you'd also comment -- I'm just having trouble placing the re -- reliability argument in context and how much -- I'm not asking you to monetize it for me, but is there a way of thinking of reliability argument alongside the economic and financial?

MR. ED WOJCZYNSKI: You didn't ask us to monetize it, but you actually can do that. Now, you can't do it precisely, and it's -- and that -- that has been done in the past, including with Bipole III, but -- so you -- you can put a dollar value on having additional reliability. So to try and put it in context, what we use -- let -- let's just talk about generation here.

What we use is a 12 percent reserve criteria and say that's the minimum reserve we should have in our system, and below that, you stand too high a risk that you'll have outages. But even with a 12 percent reserve, you still have a risk of getting outages as we look at Alberta, New -- Newfoundland, Saskatchewan.

And so, by having more reliability than your minimum, you reduce the risk that -- that these kind of outages will happen. And I think if you --

well, yes.

DR. HUGH GRANT: And -- and I'd be right to say the cost of the additional capacity would partially depend on the buoyancy of export markets? In other words, you've had more generating capacity than you needed for the domestic load. If there is always viable healthy export markets, then the cost of carrying the excess capacity, if I can call it that, isn't as -- as harsh?

MR. ED WOJCZYNSKI: Yes. And that -- and that's another way of putting what I was trying to say earlier, maybe a better way than I did.

What I said a -- a few slides ago was that if you took this hypothetical case where you had the two (2) -- two (2) plans identical in -- in NPV cost, let's just take that for the moment, and -- and there was nothing else that was any different. The only difference is that one has more reliability than another, then what you're getting is additional reliability for free.

(BRIEF PAUSE)

THE CHAIRPERSON: I wonder if you could go back to slide 24?

(BRIEF PAUSE)

THE CHAIRPERSON: I'm looking very specifically at the dependable -- dependable supply line, which seems to be dropping around twenty (20) -- 2025/'26, '26/'27. Could you explain what's going on there?

MR. DAVID CORMIE: Yes, Mr. Chairman. At the -- in -- in that time frame, the existing contracts with Northern States Power expire. As part of that termination, the seasonal diversity contracts expire, and also the adverse water provisions that are built into those contracts are -- expire. So there's a reduction in dependable energy associated with the expiration of those contracts.

Should those contracts be rolled over on an equivalent basis, there would not be that -- be that dip at that time, and, so then it -- it -- you know, essentially that explains the -- the reasons.

THE CHAIRPERSON: So a follow-up question would be given that DSM will -- will shift that -- that Manitoba firm energy line downwards once it -- it -- once DSM is implemented at whatever level that's involved, it -- it does suggest that the amount of debend -- depenable supply available for contracting

has increased.

MR. DAVID CORMIE: Yes, if -- if the -- the Manitoba firm energy demand isn't as high as indicated here for -- for whatever reason, load -- load growth or DSM, there will be more opportunity to enter into longer and larger export contracts than we are planning.

I haven't indicated it here, but if you were to put -- and I think Mr. Thomson alluded this, too, in the -- in the -- on the first day of the hearing. All the contracts that we are in -- or all the -- all of the discussions that we are having with the various customers exceed the dependable energy supply line that we're showing there.

And so we're in discussions for more dependable energy post-Conawapa than -- than we have -- have supply.

So there is room there. And there's market interest there to -- to increase, should the Manitoba load be lower. And -- and we are continuing to seek out all opportunities, so that at the end of the day, we can bring back the best value and best portfolio to -- to fill the -- to fill that -- to fill that gap, or whatever it is.

MR. ED WOJCZYNSKI: You just men -- and

-- and another part of the answer to that is, as we just talked about, Dr. Bel asked about the in-service dates of the gas turbines. If we have a higher DSM, and we don't change the amount of exports, we would defer when the -- when the gas turbine comes in.

So you have two (2) choices. You can either defer when the gas turbine comes in that sequence, or you can do more from exports. You -- you have -- we have choices.

THE CHAIRPERSON: Mr. Cormie, you -- you -- I think your example, you talked about Conawapa as being -- once it's built, you -- you have available contracts.

But looking towards Keeyask, which is going to be much earlier, are you -- is it your goal to -- to sign more export contracts, firm export contracts, during that time period once Keeyask is built, over and above what we're seeing here?

MR. DAVID CORMIE: Yes, we -- well, I haven't shown the term sheets and the MOUs that are under discussion now that -- that we believe that we will sell all the -- the -- all the dependable energy, not just the hydro dependable energy that's coming off Keeyask. We will be able to fill that -- fill that, maybe not exactly a hundred percent, but very, very

close because you can see that we actually have a wedge of energy to sell, and people don't like to buy wedges. They want to buy, you know, a hundred megawatts for ten (10) years, and not a hundred in the first year, ninety (90) in the second year. So we may not be able to sell out in the -- in the very earliest years, but in a sense, we will sell out all the dependable energy. And so, yes, we are -- we're in discussions with -- with customers to sell the balance of the dependable energy, starting in -- in 2020.

THE CHAIRPERSON: I'm trying to understand the psychology of the -- of the buyer from the other side.

Now, why would the term of those contracts be four (4) or five (5) years, as opposed to, say, fifteen (15) years where you basically don't have to worry about it anymore. It's somebody else's problem to supply your ratepayers?

MR. DAVID CORMIE: I -- I can't speak for -- for the customers, but I -- I don't think we've been involved in a long-term sale of five (5) years. I think, generally, they would be in the ten (10) year time frame, and -- and we would use innovative contract structures, like we have done with the Xcel or the NSP sale agreements to deal with -- to deal with the -- the

drought and the dependable issue out in the -- in the longer time frame to manage that issue of the wedge.

For example, the NSP sale agreements right now put no net obligation on the Manitoba Hydro system in a sense. NSP is backstopping the dependable energy requirement of the contract with their own resources through the diversity purchases and our adverse water right to curtail deliveries if -- if it makes sense.

So we would -- if we get into the position where we're -- we're not meeting the long-term -- you know, the -- the dur -- the term of the contract that the customer would like, we would then negotiate something that would help -- have them provide the dependable energy that we could -- and we could exercise that right in order to get the term that would be appropriate for them.

(BRIEF PAUSE)

THE CHAIRPERSON: I believe that's all the questions that the -- the panel has for the time being. It is four o'clock, and we are considerably later than the schedule anticipated, so having canvassed the panel at the break, we're quite prepared

to continue working. So I would suggest that we turn over the mic to -- to Mr. Peters so that he can -- he can be -- commence his -- his cross-examination.

CROSS-EXAMINATION BY MR. BOB PETERS:

MR. BOB PETERS: Thank you, and good afternoon, with the emphasis on the afternoon, then, Mr. Chairman and panel members.

Mr. Wojczynski, before you run out of the room, if you were --

MR. ED WOJCZYNSKI: I'm just getting your book.

MR. BOB PETERS: Oh, you can hold off. That won't be seeing the light of day today, I don't think.

You're -- you are the senior executive responsible for the NFAT submission that's before the Board on this panel. Would that be correct?

MR. ED WOJCZYNSKI: Yes.

MR. BOB PETERS: And, Mr. Wojczynski, please understand and convey to your panel members that my questions are for the panel and I'm seeking Hydro's best evidence. Would that be acceptable?

MR. ED WOJCZYNSKI: Could you repeat that, please?

MR. BOB PETERS: Certainly. I'll say it a different way though. I'm not looking any one (1) individual's response. I'm looking for the Corporation's best evidence.

MR. ED WOJCZYNSKI: Yes.

MR. BOB PETERS: And if there's a fight, you can decide who's going to respond to my questions. Would that also be okay?

MR. ED WOJCZYNSKI: Yes. It's getting late in the day.

MR. BOB PETERS: And, Mr. Chairman, I'm prepared to indicate that because time is -- is compressed, if there are undertakings required to deal with answers, rather than seek out the materials, please -- please offer up the undertaking and we can decide whether to accept it or not.

And, Mr. Chairman, I also want to indicate to the Board panel that, if the panel has my point and wants to move along, please let me know and I will be pleased to do so, as will all counsel when it's their turn on the microphone.

I'll also indicate to the witnesses that my questions are not designed or intended to elicit answers that contain CSI. And that's understood, Mr. Wojczynski?

MR. ED WOJCZYNSKI: Yes.

MR. BOB PETERS: And should any of the response by Manitoba Hydro require the inclusion of CSI or, for newer guests, the commercially sensitive information, that can be provided either by way of an undertaking, or in the CSI session that'll be forthcoming.

Would that also be acceptable, sir?

MR. ED WOJCZYNSKI: Yes.

MR. BOB PETERS: All right. I recall your president, Mr. Wojczynski, saying that this NFAT is the culmination of up to ten (10) years for some people's work. Would that be true?

MR. ED WOJCZYNSKI: Yes.

MR. BOB PETERS: Are you one (1) of those ten (10) -- or, one (1) of those people?

MR. ED WOJCZYNSKI: Yes.

MR. BOB PETERS: And would you also agree that Manitoba Hydro's case, particularly its Preferred Development Plan, has -- had significant and material changes today?

MR. ED WOJCZYNSKI: Yes.

MR. BOB PETERS: Would you agree that Manitoba Hydro's case for the Preferred Development Plan has materially deteriorated?

MR. ED WOJCZYNSKI: Yes.

MR. BOB PETERS: And when I look at slide 100 and --

MR. ED WOJCZYNSKI: But it's still positive.

MR. BOB PETERS: I'm sorry, I didn't mean to cut you off.

MR. ED WOJCZYNSKI: Sorry. But it's still positive.

MR. BOB PETERS: All right. Let's -- let's -- maybe we will, with the assistance, fire up Manitoba Hydro's exhibit that you just had on the screen, Manitoba Hydro's Exhibit 95, which is the submission -- I'm sorry, it's the presentation of this panel. And --

THE CHAIRPERSON: I wonder while we're doing that, could I ask the witnesses, please, to shift their microphones over, because you -- you'll be talking to Mr. Peters this -- this way, so I think it would make for better sound, generally.

CONTINUED BY MR. BOB PETERS:

MR. BOB PETERS: We'll start with Manitoba Hydro Exhibit 95, which was the document that was handed out today, and if we could turn to page 123,

that would be of assistance to me and the panel.

(BRIEF PAUSE)

MR. BOB PETERS: Ms. Flynn, I believe it was you who was introducing this, but my questions aren't restricted to you, as I've indicated already. The -- I -- I want to just make sure the Board clearly understands what you've told them this afternoon in terms of the deterioration of the -- of the Preferred Development Plan.

That deterioration, when I refer to it, is in terms of the net present value dollars that the plan was expected to deliver, would that be correct?

MS. JOANNE FLYNN: Yes, that's correct.

MR. BOB PETERS: And so if we start on page -- on slide 123, Mr. Chairman, and it's the slide in front of everybody, when Manitoba Hydro filed its Chapter 9 on August the 16th of 2013, there was an indication that the --

MR. ED WOJCZYNSKI: I'm sorry, Mr. Peters, it's not in front of everybody.

MR. BOB PETERS: Oh, I'm sorry.

MR. ED WOJCZYNSKI: Or, at least it's not in front of us.

MR. BOB PETERS: Well, you've got the paper copy handy or not?

MR. ED WOJCZYNSKI: Yes. Yes, we can do that.

MR. BOB PETERS: Why don't we -- why don't we go from that while...

(BRIEF PAUSE)

MR. BOB PETERS: Ms. Flynn, have you a paper copy or your own computer copy of slide 123 of Manitoba Hydro Exhibit 95?

MS. JOANNE FLYNN: Yes, I have one.

MR. BOB PETERS: All right. Let's just review with the panel what you told them late this afternoon.

When the filing by Manitoba Hydro was made on about August 16th of 2013, there was an indication that based on the 2012 information the net present value benefit of the Preferred Development Plan when measured against the All Gas Plan was $1.696 billion positive.

MS. JOANNE FLYNN: Correct.

MR. BOB PETERS: Which suggests that there were financial benefits of approximately $1.7

billion for the Preferred Development Plan over the least capital intensive plan of the All Gas Plan.

MS. JOANNE FLYNN: That's right.

MR. BOB PETERS: And then what happened was there was also, if we read ahead in your filing up to Chapter 12, that that amount -- the 1.696 billion decreased to 1.462 billion, did it not?

MS. JOANNE FLYNN: Yes, it did.

MR. BOB PETERS: And that was based on the updates that you've told us about, including updating your -- your discount rate and -- and that then came out to 1.462 billion, correct?

MS. JOANNE FLYNN: Yes. There were other changes as well, but --

MR. BOB PETERS: Yes.

MS. JOANNE FLYNN: -- the end result was the one four six two (1,462).

MR. BOB PETERS: And -- and -- well, the other changes, you've mentioned them earlier today, included load forecast. It included a number of other factors.

MS. JOANNE FLYNN: Right.

MR. BOB PETERS: That was still at that time the highest NPV of all the plans?

MS. JOANNE FLYNN: Yes, it was.

MR. BOB PETERS: And then when we factored in the no WPS investment, that's a signal that instead of WPS investing in the 750 line, it was going to fall to Manitoba Hydro to invest in that line if they were going to try to keep that option alive.

MS. JOANNE FLYNN: With the WPS -- finalization of the WPS sale, and when -- and when it became clear that WPS wasn't going to invest in the line, we made the assumption that Manitoba Hydro would pick up the rest of the cost for the line. And our analysis does not consider in any way that we will unwind our position in that line. So for the entire analysis, we are -- we are paying for the cost of -- of the line at -- at the two-thirds (2/3s) level.

MR. BOB PETERS: And Manitoba Hydro knew it would have to pay for two-thirds of the 750 line in the United States even before it signed the 308 megawatt deal with WPS.

Isn't that correct?

MS. JOANNE FLYNN: I would have to defer to Mr. Cormie for that.

MR. BOB PETERS: Is that correct, Mr. Cormie?

(BRIEF PAUSE)

MR. DAVID CORMIE: Could you ask the question again, please?

MR. BOB PETERS: Manitoba Hydro knew that WPS was not prepared to invest in the 750 megawatt line in the United States before a signed contract was reached between Manitoba Hydro and WPS.

MR. DAVID CORMIE: Yes, that's correct.

MR. BOB PETERS: And Man -- and WPS, Mr. Cormie, made it clear to Manitoba Hydro months before that they weren't prepared to invest in the transmission line.

MR. DAVID CORMIE: They advised us of that last summer, yes.

MR. BOB PETERS: Thank you.

And, so, Ms. Flynn, on your chart the, "No WPS investment," brings down the net present value to 1.245 billion, and that's as a result of Manitoba Hydro having to make that investment as a proxy, if you will, for -- for WPS, or any other investor.

MS. JOANNE FLYNN: Yes.

MR. BOB PETERS: And, so it was just the updates today, is that the Board's understanding, which is the 2014 updates including the cost of Keeyask and Conawapa that have now driven the net present value of the Preferred Development Plan down to $374 million?

MS. JOANNE FLYNN: Yes, that's correct.

MR. BOB PETERS: And am I correct, Mr. Bowen, in the back row if you're -- if you have access to a mic, sir, you have a higher degree of confidence I understood from your evidence now that you've heard back from the Keeyask general contractors as to what the cost would be expected on Keeyask, correct?

MR. DAVE BOWEN: Correct.

MR. BOB PETERS: And I also understood --

I -- and, Mr. Bowen, as I understood your evidence to the panel this afternoon, you don't have equally as firm numbers with respect to Conawapa as you now do with Keeyask, do you?

MR. DAVE BOWEN: I think what I was trying to convey today for the -- for Conawapa is that if we built Conawapa overnight, it has all the pricing that we've -- and all the updates that we have for Keeyask. So be -- because it's in the future, the future has more uncertainty.

MR. BOB PETERS: All right. Well, let's just explore that last comment. That -- what I -- what I was trying to get at is that if Conawapa's going to be built in ten (10) for fifteen (15) or twenty (20) years from now, there's a lot of

uncertainty between now and then as to what those costs will be, correct?

MR. DAVE BOWEN: Yes. Yes, we don't have -- we don't have the market prices, so we've -- we've tendered out and have committed prices for 80 percent of the -- the contracts for Keeyask. We don't have those con -- any of those contracts tendered for Conawapa.

MR. BOB PETERS: So that adds additional risk to the -- to the Conawapa base price or the point estimate that would have to be developed?

MR. DAVE BOWEN: That -- that adds additional risk. I think it's -- it's captured in the larger range of -- of costs in the -- in the estimate provided.

(BRIEF PAUSE)

MR. BOB PETERS: And so, Ms. Flynn, we've seen then the economic evaluation of the Preferred Development Plan decrease by about 75 percent is what you've shown the Board this afternoon?

MS. JOANNE FLYNN: It might be something slightly less than that, but it -- it's in that order of magnitude.

MR. BOB PETERS: I also understood that this information has not, in terms of what's been presented today, been presented by Manitoba Hydro's management to Manitoba Hydro's electric board?

MR. ED WOJCZYNSKI: Actually, it has been presented. What I was saying earlier was that what we presented to the -- the Manitoba Hydro Board two (2) weeks -- or nearly two (2) weeks ago was using the NFAT high cost for Keeyask and Conawapa, which are very similar to this, and if anything, just a tinge higher, but, essentially, for all intents and purposes, the same cost, so they -- they have seen that, and the -- the DSM analysis.

So the -- something very close to what was presented today was provided to the Hydro Board. And -- and that's when they reaffirmed their conclusion that -- that, from Hydro's point of view, we should -- that it was still justified and we should proceed recognizing that the -- the Keeyask/Conawapa Plan compared to the Keeyask/Gas Plan, things have shifted a bit there and that that is -- from the Hydro Board point view, there is some change there.

MR. BOB PETERS: Sorry, I didn't understand. What's the change at their board level? They understand that Keeyask/Gas now has a higher --

MR. ED WOJCZYNSKI: Yeah.

MR. BOB PETERS: -- NPV than the Keeyask/Conawapa?

MR. ED WOJCZYNSKI: I'll -- I'll try that again. With the new information, including the levels of DSM, including the higher capital costs, including everything else we had available two (2) weeks ago, which is very similar to what was presented today, it's just been -- since then, we had the estimates confirmed and refined and approved, so -- but essentially was the same information. The Board -- the executive and Board concluded that proceeding with the 750 megawatt interconnection and Keeyask advancement and the MP sale, that that was definitely, from their point of view, justified.

The focus used to be more strongly on the Keeyask/Conawapa Plan. It's -- there still is a focus and a desire on the Keeyask/Conawapa Plan, but there's a recogni -- a recognition that -- a greater recognition than before that we -- we -- as we go along -- we'll have to revisit that as we go along.

MR. BOB PETERS: In terms of complete economic analysis, has that all been done with respect to the new information?

MR. ED WOJCZYNSKI: The conclusion that

I was just saying ha -- was based on the same information we provided here.

MR. BOB PETERS: All right, what was the NPV number provided to the Manitoba Hydro Electric Board?

MR. ED WOJCZYNSKI: I don't have that here right now, but they were very similar to these.

MR. BOB PETERS: All right. You'll undertake to provide that through your counsel?

MR. ED WOJCZYNSKI: We can -- we can do that.

MR. BOB PETERS: Thank you.

(BRIEF PAUSE)

MR. BOB PETERS: The request and undertaking, Mr. Wojczynski, was just to update the Public Utilities Board with respect to what incremental NPV of the Preferred Development Plan over the All Gas Plan was provided to Manitoba Hydro's Electric Board?

MR. ED WOJCZYNSKI: Yes.

--- UNDERTAKING NO. 22: Manitoba Hydro to indicate what incremental NPV of the Preferred Development Plan

over the All Gas Plan was provided to Manitoba Hydro's Electric Board

CONTINUED BY MR. BOB PETERS:

MR. BOB PETERS: And then my question, Ms. Flynn, was have the economics been run in total on the new information that you presented today?

MS. JOANNE FLYNN: The economics that we have run are the ones that you have seen today. So the only economics we have are for the plans that we presented to you today. So that's six (6) plans under the probabilistic analysis and...

(BRIEF PAUSE)

MS. JOANNE FLYNN: -- and three (3) plans under the DSM incr -- and with the increased levels of DSM.

MR. BOB PETERS: And the six (6) plans, if we go to slide 124, please, Ms. Villegas. And these are the six (6) plans that you were talking about that you've done the economics on?

MS. JOANNE FLYNN: These are the six (6) plans that we've done the probabilistic analysis

on, yes.

MR. BOB PETERS: But not the full economic runs on?

MS. JOANNE FLYNN: The -- the ones that we have done the economics for the increased levels of DSM are on slide 128. So they are the All Gas Plan, the Keeyask/Gas 750 Plan, and the Preferred Development Plan.

MR. BOB PETERS: Is it Manitoba Hydro's intention to perform the economic evaluation on all of the -- all of the other plans?

(BRIEF PAUSE)

MS. PATTI RAMAGE: Mr. Peters, I'm not sure if it'll help, but if somebody turns this mo -- monitor back on, I can get you to the slides you're --

MR. KURT SIMONSEN: We're trying.

MS. PATTI RAMAGE: Oh, okay. I'm following them here, but they're not coming up on the screen.

MR. KURT SIMONSEN: All right.

CONTINUED BY MR. BOB PETERS:

MR. BOB PETERS: But, Ms. Flynn, you

referred the panel to -- the Public Utilities Board to slide 128 to indicate which three (3) plans Manitoba Hydro updated the economic evaluations on?

MS. JOANNE FLYNN: Correct.

MR. BOB PETERS: And I asked you whether or not Manitoba Hydro intended now to run the economic evaluations on all the other plans that it did.

MS. JOANNE FLYNN: At -- at this point, we do not have that intention.

MR. BOB PETERS: Why is that?

MS. JOANNE FLYNN: These plans are quite representative of the narrowing that Mr. Wojczynski talked about, and we've kept the comparison to the All Gas Plan. We've spoken about how the Keeyask/Gas, with the small line plan is now -- can -- cannot be considered as a -- as a viable plan.

And, so the three (3) plans that we have chosen are the representative plans from the original fifteen (15) plans that we have.

MR. ED WOJCZYNSKI: Mr. Peters, perhaps I -- I could put -- ex -- explain, as well. From -- from our point of view, when you look at those fifteen (15) plans that we started in the original submission, I think it's very clear cut how some of them compare to

the others, and that doing -- repeating all these evaluations for all of them would not provide additional information that's needed.

And -- and then some of the plans, like the Pathway 4 Plans, in our view, are not that useful and interesting because there wouldn't -- once you have the 300 megaw -- 308 megawatt WPS plan, there -- there -- if you're going to do the -- the 750 megawatt tie-line, the -- the very logical obvious thing is you'd commit to that, so there would be no need to look at 750 megawatt plans without the WPS sale.

So a number of the plans in there do -- re-analyzing them today would not provide any additional information. In add -- and plus, there is the 250 megawatt tie-line option not being viable.

If you'd like, I actually did find -- I did happen to have the information with me at the table here of the numbers we provided to the Manitoba Hydro Board two (2) weeks ago. And we, at that time, did not have them for DSM Option 2 yet, but we had them for DSM Option 3.

So what we had was, at the DSM -- 2013 DSM level for Keeyask/Conawapa, it was three twenty-six (326) -- yeah, three twenty-six (326). And Keeyask/Gas/Conawapa -- pardon me, I'm sorry, the first

one was Keeyask19/Conawapa26 750, and that was three twenty-six (326). And Keeyask/Gas7 -- 25 750 megawatts was four nineteen (419). And Kee -- and then for Option 3 DSM Keeyask19/Conawapa26 750 megawatts was minus fifty-eight (58).

Oh, and with Option 3 DSM and the pipeline load for Keeyask19/Conawapa26 750 was 37 million. And for Keeyask19/Gas 750 megawatts was 403 million.

So as you can see, those numbers are fairly similar to what was being presented today.

MR. BOB PETERS: I was trying to write that down and also look at your slide 129, Mr. Wojczynski. Is that what you were updating for the panel just now?

MR. ED WOJCZYNSKI: I'd have to look at slide 129. I'm not sure which one that is right now. If you look at slide 129, I -- I could go through that again for you.

MR. BOB PETERS: Ra -- rather than do that, would you mind undertaking to -- to file with the Board?

MR. ED WOJCZYNSKI: A piece of paper?

MR. BOB PETERS: Yes.

MR. ED WOJCZYNSKI: Okay.

MR. BOB PETERS: With -- well, that'll depict the information that was provided to the Manitoba Hydro Electric Board approximately two (2) weeks ago.

MR. ED WOJCZYNSKI: Yes, we'll do that.

MR. BOB PETERS: Thank you.

--- UNDERTAKING NO. 23: Manitoba Hydro to provide to the PUB the same information that was provided to Manitoba Hydro Electric Board approximately two weeks ago

CONTINUED BY MR. BOB PETERS:

MR. BOB PETERS: And so I've heard from you, Ms. Flynn, that you're not going to do any more economic analysis on -- on the materials. When the Board looks at your -- your quilt on page 125, that quilt on page 125 is not representative of the information that you provided on page -- slide 123 of Manitoba Hydro Exhibit 95, is it?

MS. JOANNE FLYNN: Yes, it is representative of the information provided on slide 123. You will find in the second line of slide 123

there's the 2012 with 2014 costs for Keeyask and Conawapa with the incremental NPV value of 798 million. That is the information that is found on the -- on the quilt.

MR. BOB PETERS: Thank you, Ms. Flynn. Do you have a new quilt that contains the 2013 update with the no WPS investment with 2014 cost of Keeyask and Conawapa done?

MS. JOANNE FLYNN: No, we don't have a new quilt with 2013 assumptions. The -- it -- it takes a lot of time and effort to reestablish the probabilities around -- and the -- and the ref -- and the highs and lows around the assumptions. So for the -- so what would be required is, in addition to updating the capital cost portion of the scenarios which have new reference high and low values along with new probabilities, we would need to establish new reference -- or new highs and lows and associated probabilities for both the energy prices set of factors and for the discount rate set of factors, and that is -- both of those are time consuming exercises.

MR. BOB PETERS: And so unless this Board specifically asks for it, you're not going to volunteer it?

MS. JOANNE FLYNN: I -- I would venture

that we would have difficulty providing it in a timely fashion.

MR. BOB PETERS: And that means it takes many weeks to prepare?

MS. JOANNE FLYNN: It would take several weeks, yes.

MR. BOB PETERS: And so in terms of what this Board has to consider and the -- the best information it now has related to the updates you provided this afternoon is to look back to the 2012 information with the capital cost updates?

MS. JOANNE FLYNN: From an uncertainty perspective, yes.

MR. BOB PETERS: And there's no additional uncertainty done with respect to what the DSM level assumptions will do to that?

MS. JOANNE FLYNN: Can you -- I'm not -- I'm not sure I understand your question, Mr. Peters.

(BRIEF PAUSE)

MR. BOB PETERS: Ms. Flynn --

THE CHAIRPERSON: I -- I wonder, just to interject -- I just want to make -- make sure I understand. If -- if you look at slide 124 -- I'm

sorry, Mr. Peters.

If you look at slide 124, I'm looking at -- I'm looking at a -- the option that seems to me to be the closest to what we're being asked to -- what the -- what -- I'm sorry, what the Board of Manitoba Hydro is asked to consider, which is K19/Gas and then followed by seven-fifty (750).

MS. JOANNE FLYNN: Correct.

THE CHAIRPERSON: Now, we just heard from -- earlier that the gas one actually probably could follow -- in other words we'd go K19, seven-fifty (750), and gas?

MS. JOANNE FLYNN: Correct. Yeah. We just -- in -- in naming our plans we just put the generation first to align that.

THE CHAIRPERSON: Like I said, that would be probably the closest to what we're talking about. But in terms of having punted gas to later, what -- what would happen to the -- to that number, that -- that net benefit of six-sixty-seven (667)? If you -- if you defer gas to a later date, how substantial is that change in the value of -- the net present value of six-sixty-seven (667)? Is -- is it substantial? Is it...

MS. JOANNE FLYNN: Yeah. I -- I think

the best representation of that would be found in the DSM analysis in slide 130. And the intent of that slide is to -- is to show you -- to show the impact on the economics of -- of the different levels of DSM.

So if you look at the Level 2 DSM, under the two (2) plans, you see the net present value under Level 2 DSM, compared to the Level 2 DSM of All Gas, would be 410 million in net present value, and 339 million in net present value with the pipeline load in it. And for the Preferred Plan, would be 45 million and 139 million with the pipeline load in it.

So you're seeing the effects of -- of DSM within that plan -- with -- sorry, within that level of DSM. And you can see that at the base level of DSM, the -- the economics for the two (2) plans is in that $374-$377 million range. And that's compared to the base level with All Gas as well.

If you look at Level 1, compared to the All Gas with DSM at Level 1, it deteriorates a bit and goes to three-thirty-nine (339), and the -- the All -- the Preferred Plan drops to one-twenty-four (124). If you then move to the Level 2 of DSM, it actually increases, and this is all still compared within each level of DSM, so it's 410 million in net present value, compared to the All Gas with Level 2 DSM. And when you

look at it compared to the Level 1 DSM, the -- the net present value is actually higher.

MR. ED WOJCZYNSKI: Perhaps another way to express that is that if you're looking at the Keeyask/Gas Plan, whether you're looking at one (1) times DSM, three (3) -- three (3), four (4), or five (5) times DSM, the economics are more or less the same, around $400 million. For Keeyask/Conawapa there is some greater impact, but for Keeyask/Gas it -- it doesn't seem to -- the -- the economics don't seem to be adversely affected plus or minus some tens of millions of dollars.

So if you go to the analysis that Ms. Flynn presented with -- with that quilt at 2012, but with the higher capital cost, I think one could infer that -- that the DSM levels themselves wouldn't cause a big impact. It's -- it's export prices, capital costs, and discount rate that are the big drivers.

THE CHAIRPERSON: So the -- the impact of pipeline there is because you have less sales for export? Is that...

MR. ED WOJCZYNSKI: I'm sorry, there was some interesting noise that I couldn't hear you.

THE CHAIRPERSON: No, the -- the reason why that's turning negative with a pipeline load is

because fewer export sales available?

MR. ED WOJCZYNSKI: The -- maybe we should clarify. That -- that is not a negative. That was -- that's a positive three thirty-nine (339), or a -- I'm -- actually I can understand why you said that from accounting, right?

We -- we -- what -- the reason it was put in brackets was to separate it. Those are positive numbers. Oh boy.

THE CHAIRPERSON: But --

MR. ED WOJCZYNSKI: Boy, we sure misled you on that one.

THE CHAIRPERSON: But -- but three thirty-nine (339) is embedded in the four ten (410). It's not incremental to the four ten (410), or is it?

MR. ED WOJCZYNSKI: The three thirty-nine (339) is the benefit compared to All Gas assuming Level 2 DSM and the pipeline load. So it -- both All Gas and Keey -- Plan, and the seven fifty (750) tie with Keeyask/Gas, both assume Level 2 DSM and the pipeline load, and when you compare those two (2) you get 339 million positive in favour of Keeyask/Gas 750.

CONTINUED BY MR. BOB PETERS:

MR. BOB PETERS: Ms. Flynn, back to

slide 124 if we could, please. This slide, if you can look at it on paper if you don't have it on your screen, was prepared based on the 2012 NFAT assumptions. And those assumptions, if we flip back the page, show us the source of that data on slide 123, correct?

MS. JOANNE FLYNN: They are consistent.

MR. BOB PETERS: And the data points for the Preferred Development Plan were taken off of that chart?

MS. JOANNE FLYNN: Yes.

MR. BOB PETERS: And recognizing you don't have time to make me a new quilt, have you time, Ms. Flynn, to revise page 124 to leave on it what you have which, is the 2012 assumptions, and also now overlay the 2013 update which includes the no-WPS investment with the 2014 cost of Keeyask and Conawapa?

MS. JOANNE FLYNN: We can undertake to provide the information on the same -- on one slide.

MR. BOB PETERS: All right. Thank you for that.

--- UNDERTAKING NO. 24: Manitoba Hydro to revise page 124, leaving on it the 2012 assumptions, and also

now overlay the 2013 update which includes the no-WPS investment with the 2014 cost of Keeyask and Conawapa

MR. BOB PETERS: Mr. Chairman, I'd like to continue on with this panel, but I think what I'm going to do is I'm going to stay on Manitoba Hydro Exhibit 95, and just work my way through it. I made a number of questions throughout. And if at any time the panel has questions that they want to jump in on, certainly please do. And I'll -- I'll try to move along with some -- with some speed.

(BRIEF PAUSE)

MR. BOB PETERS: I wonder if we could take a five (5) minute break at this time, Mr. Chairman?

THE CHAIRPERSON: Yes, I think we should. And perhaps while we're -- while we're breaking consider how long -- or how -- how late we want to go after con -- consulting the panel. Thank you.

So let's take a ten (10) minute break, so ten (10) -- start -- start back at ten (10) to.

--- Upon recessing at 4:40 p.m.
--- Upon resuming at 4:51 p.m.

THE CHAIRPERSON: I believe we're ready to resume the proceedings. Over to you, Mr. Peters.

MR. BOB PETERS: Yes. And thank you, Mr. Chairman. I'll -- I'll be prepared to go ahead, I think, just to alert the parties, probably for another fifty/fifty-five (50/55) minutes, with your leave. And if at any time that changes, you will tell me.

CONTINUED BY MR. BOB PETERS:

MR. BOB PETERS: Mr. Wojczynski, we heard today from a couple of panel members that Level 3 DSM would not be considered economic, I think were the words. Was that -- is that correct?

MR. ED WOJCZYNSKI: Yes.

MR. BOB PETERS: What you're telling the Board is it would cost more to do those Level 3 than you would get in terms of a return in terms of savings?

MR. ED WOJCZYNSKI: Yes, and that's

using, effectively, the total resource cost test.

MR. BOB PETERS: Okay, that's what I just wanted to focus on for a minute. At the last general rate application that Manitoba Hydro came before this Board, I believe there was a directive of the PUB that Manitoba Hydro should use the RIM test, the Rate Impact Measure Test, to evaluate Manitoba Hydro's DSM programs on a portfolio basis and not an individual basis.

Do you recall that?

MR. ED WOJCZYNSKI: I'm afraid we probably should be having Mr. Kuczek here --

MR. BOB PETERS: Oh, I know.

MR. ED WOJCZYNSKI: -- for that. But -- but I -- I'll take that, subject to check.

MR. BOB PETERS: And so the question I had when I heard the comment a couple of times today was, when Manitoba Hydro says Level 3 DSM is not economic, does Level 3 pass the modified total resource cost test that the Board was suggesting Manitoba Hydro use?

MR. ED WOJCZYNSKI: Pardon me. Could you repeat what the order said?

MR. BOB PETERS: I don't have it even in front of me, but I -- I -- my -- my rec -- I'll tell

you my recollection, and you'll tell me if -- if I'm right --

MR. ED WOJCZYNSKI: Yeah.

MR. BOB PETERS: -- or wrong. My recollection is that the Board's direction in the last Manitoba Hydro GRA, which would have been Order 43 of '13, was that Manitoba Hydro should use the Rate Impact Measure Test to evaluate Manitoba Hydro's DSM programs on a portfolio basis and not an individual basis.

MR. ED WOJCZYNSKI: Okay, it's coming back to me now, even though I wasn't involved in that. And subject to checking with Mr. Kuczek, I'll comment the following, that this isn't a RIM test. What -- what I'm expecting -- my understanding at this point, is that what was being looked for and wha -- at least what Manitoba Hydro would interpret as being looked for, was that you evaluate the economics of the DSM using the TRC test, but that when looking at what will happen to the rates, that -- and you do a RIM analysis, that when doing the RIM analysis you should do it on a portfolio basis; but that when you're doing the economics you -- to determine how much DSM and what level of DSM, that at that point you should use the total resource cost test on the -- on the packaging of programs.

That may not be what was intended and I may have the wrong interpretation, but right now that -- that is my understanding of the situation.

MR. BOB PETERS: And so you're telling the Board that for the economic analysis -- and when you come back and tell the Board that Level 3 DSM may not be economic, what you're looking at it on is on a total resource cost basis on the portfolio of products that would be in your DSM portfolio?

MR. ED WOJCZYNSKI: Well, first of all, you can think of the Level 1, Level 2, and Level 3 DSMs as being portfolios in and of themselves, three (3) -- three (3) different portfolios. I'll -- I'll reword what I -- what I understand, again, subject to check, is that we're -- we evaluated three (3) portfolio sizes using the total resource cost test. And what I -- what -- my understanding is that our interpretation of the Board order would be that when we're looking at the rate impact of the Level 2 lev -- DSM, which we would be saying is the economic level, that we should assess the rate impact of the entire Level 2 DSM and not break it down into individual programs, and then say, Cut out that individual program in Option 2 because it has a RIM less -- because it has unfavourable RIM.

What I interpret the Board saying is

evaluate the whole Level 2 portfolio, and don't try and cut some programs out because it doesn't meet the RIM test. You take the whole portfolio that the TRC said was economic.

MR. BOB PETERS: And that's how you proceeded in -- in terms of what you filed before the Board today?

MR. ED WOJCZYNSKI: Well, we -- that -- that's how we evaluated on the economics. What we have not presented here is any RIM evaluation, and we have an evaluation that has been performed on the DSM that is an -- a -- a precursor to the RIM test, and -- but that has not presented here yet today. The...

MR. BYRON WILLIAMS: Mr. Peters, if -- if I might. Just the reference from Board Order 43/''13, I believe it's page 44.

MR. BOB PETERS: Thank you, Mr. Williams, I'll --

MS. PATTI RAMAGE: Yeah, if I could -- I -- I was just going to do exactly the same thing as Mr. Williams. It's page 44, and so the record is clear, it is not a directive. It is a comment from the Board, which is still certainly valuable, but just to be clear, it didn't appear in the directive section. It says:

"In evaluing -- evaluating demand-side management programs, the rate impact measure test should not be a barrier to higher levels of demand-size management savings and should be applied only at the portfolio level, not the individual program level."

And I -- is that what you're referring to?

CONTINUED BY MR. BOB PETERS:

MR. BOB PETERS: Thank you, Ms. Ramage. And I just wanted Mr. Wojczynski to just verify how Manitoba Hydro assessed level 3 DSM.

MR. ED WOJCZYNSKI: Yeah.

MR. BOB PETERS: And whether it was consistent with that, or whether it would need modification to be consistent.

MR. ED WOJCZYNSKI: Okay. And -- and now that I have the words in front of me, I think it confirms for me that, again, I would want to check with Mr. Kuczek. But that -- that what we are doing is consistent with what the -- the PUB had asked for in these words.

MR. BOB PETERS: And you'll undertake

to confirm to the Board whether the analysis done on the DSM Programs is consistent with Board Order 43/'13, particularly on page 44?

MR. ED WOJCZYNSKI: We'll -- I undertake to check that it's consistent with page 45 of that order.

--- UNDERTAKING NO. 25: Manitoba Hydro to confirm if the analysis done on the DSM Programs is consistent with Board Order 43/'13, particularly on page 44

CONTINUED BY MR. BOB PETERS:

MR. BOB PETERS: All right. Thank you, sir. Back to Manitoba Hydro Exhibit 95, and on page 4 of that document, we see some information that I think is consistent -- I had another exhibit, but this one (1) might be sufficient.

Ms. Flynn, I think you spoke to that today?

(BRIEF PAUSE)

MS. JOANNE FLYNN: Yes, I did.

MR. BOB PETERS: And the -- the purpose of your bringing the Board to slide 4 was to show the Board at what point in time Manitoba needed additional dependable energy as well as additional winter peaking capacity, correct?

MS. JOANNE FLYNN: Correct.

MR. BOB PETERS: And this -- when -- when you gave your answer, or you explained this in your -- in your presentation, I believe you indicated that this assumes there are no new exports.

Is that correct?

MS. JOANNE FLYNN: That's correct. It would only be the current level of exports before the MP sale and anything that's contingent on new generation.

MR. BOB PETERS: So put another way, Ms. Flynn, if Manitoba Hydro did not have exports, the date in which new generation is needed for Manitoba would be pushed out even further?

(BRIEF PAUSE)

MS. JOANNE FLYNN: Well, the date can't be pushed out any further than is shown on this slide, because these are current export commitments. So there

would be no change, and that is what the development plans -- the basis for the development plans -- there were, in the original submission, I think six (6) development plans where there was -- where it was set up just to meet Manitoba loads, so no new export commitments were considered in those -- in those plans.

MR. BOB PETERS: Well, what you have considered on -- on slide 4 of Manitoba Hydro Exhibit 95 is that Manitoba Hydro's Northern States Power contract that was for 500 megawatts and expires in April of 2014, you've assumed in here that it is renewed in May of -- of this year.

MS. JOANNE FLYNN: I believe it's 2015, but -- yes, because it is a signed contract, and the 375 megawatt and -- or, slash 325 megawatt sale to NSP does not require new resources, so it is a sale out of the existing system, and it is a committed, signed sale.

MR. BOB PETERS: I have that as May/'15 starting. Is that when you have it?

MS. JOANNE FLYNN: Yes.

MR. BOB PETERS: All right. So it -- it expires April of '15 -- the -- the current one, sorry, the current five hundred (500) --

MR. DAVID CORMIE: The existing one

expires April 30th of 2015, and the ex -- the renewal starts on May the 1st of 2015 and it goes to 2025.

MR. BOB PETERS: All right. And so, Ms. Flynn, you've indicated that -- that slide 4, with the new dependable energy also takes into account that in addition to serving Manitobans, Manitoba Hydro is going to serve the Northern States Power 375/325 megawatt system power sale.

MS. JOANNE FLYNN: That's correct, but maybe Mr. Cormie can explain again the package, which is the 375, 325, and the 350 megawatt diversity and the impact that has.

MR. DAVID CORMIE: Well, I -- I think Ms. Flynn said it. It -- it's -- oh, I'm sorry. The -- those -- the combination of the diversity agreements and the system power sale agreements do not require new resources to go to 2025. They can be served out of the existing system, and if necessary, we can utilize the adverse water energy under the contract to fulfill our obligations out to 2025 without having to build new resources.

MR. BOB PETERS: The point I was trying to get at, Mr. Cormie, and help the panel understand is that absent that NSP contract, if we can think of it that way, would there be a need for new Manitoba

resources as quickly or as early as shown on slide 4 of Manitoba Hydro Exhibit 95?

MR. DAVID CORMIE: No. The -- the NSP sale obligation is independent of -- of the Manitoba dependable energy situation until 2025. We can -- we can achieve the -- the contract obligations with the existing system.

MR. BOB PETERS: Thank you, sir.

(BRIEF PAUSE)

MR. BOB PETERS: Mr. Cormie, conceptually, then, if the Northern States Power 375/325 system partici -- system power sale out to April of '25 does not impact the requirement for Manitoba domestic customers' dependable energy, would it be fair to say, then, that Keeyask advancement is to partially serve that NSP new contract that starts in May/'15 -- May of 2015?

MR. DAVID CORMIE: No. Keeyask advancement would only be required to serve the optional 125 megawatt sale obligation that exists on top of the 325/375.

MR. BOB PETERS: And, in fact, the 125 megawatt additional sale to NSP is contingent on

Manitoba Hydro having new generation?

MR. DAVID CORMIE: There's a condition precedent in the agreement that allows Manitoba Hydro to -- if it doesn't build major new generation, to terminate the sale.

MR. ED WOJCZYNSKI: Maybe putting it in another way for clarity if there's any ambiguity. The NSP 375/325 sale does not affect the in-service dates whatsoever.

MR. BOB PETERS: And the new hydro on which the one twenty-five (125) is contingent, Mr. Cormie, or the new generation, is it tied to it being hydro generation or could it be some other source of generation?

MR. DAVID CORMIE: It's tied to major new hydraulic generation in Manitoba.

(BRIEF PAUSE)

MR. BOB PETERS: The question that one (1) of the panel members had for Manitoba Hydro was to deal with the reliance on imports, and it was indicated that, pursuant to Manitoba policy, the import limits are -- are tied to, I believe it's 10 percent of domestic requirement?

(BRIEF PAUSE)

MS. JOANNE FLYNN: It is 10 percent plus exports, and the other portion of the criteria is the size of the lines. We can't exceed the physical capability of the line. So those -- those kind of three (3) pieces have to be taken together.

MR. BOB PETERS: And in -- in terms of ballpark numbers, if the import policy was applied strictly, Manitoba Hydro would be able to import about 3,000 gigawatt hours of off-peak energy?

(BRIEF PAUSE)

MS. JOANNE FLYNN: With the current level of 700 megawatts of import capability on the line, that would be correct.

MR. BOB PETERS: And then for those who lived through the drought of 2003/'04, Ms. Flynn, Manitoba Hydro imported considerably more in that year, did they not?

MS. JOANNE FLYNN: Yes, they did.

MR. BOB PETERS: Probably up to 7,000 megawatts approximately -- or, sorry, 7,000 gigawatt

hours for that year?

MR. DAVID CORMIE: Yes, Mr. Peters. We -- we went above the -- the number because it was economic to do that compared to running the combustion turbines. Should there had been line limitations in place at the time, we would have been running the combustion turbines as the backstop, but we had the opportunity to take advantage of non-firm imports and -- and avoid running the more expensive combustion turbines.

So it was a decision that we took at the time because it -- it was significantly less expensive. There's no guarantee that that will always occur, so it was -- it was an opportunity that presented itself at that time because of the mild winter, and -- and -- but it was always backed up by the Manitoba Hydro capability at -- at Brandon and Selkirk.

MR. BOB PETERS: So you used the gas as a backup in the drought conditions only for the imported power?

MR. DAVID CORMIE: Yes, for -- for the energy imports of -- of -- that were well in excess of what was planned on a firm basis. They were backstopped by the unused thermal capability in -- in Manitoba, and we have put in natural gas positions in

order to protect that ability to generate with -- with na -- with natural gas.

MR. BOB PETERS: What do you mean when you say you put in natural gas positions?

MR. DAVID CORMIE: Well, we had secured the natural gas so that would -- was available, if necessary to run the combustion turbines, should the imports above that -- the -- the firm limit not being available.

So we had a plan that ensured that the supply was there, and then on a day-to-day basis, we -- we took advantage of the opportunity to import more and not run the -- not run the combustion turbines and sell the surplus gas back to the market.

MR. BOB PETERS: When you talk about importing firm energy, Mr. Cormie, was it in fact -- how -- what do you mean by, Firm energy was imported? Wasn't it all opportunity?

MR. DAVID CORMIE: No. The question is whether it's on firm transmission or not, and -- and whether it's backed by a resource. We were able to go to the -- the spot market and bring spot market energy into Manitoba on firm transmission.

In addition to that, we brought energy into Manitoba on non-firm transmission. To the extent

that we were exposed to non-firm transmission, we had a backstop at -- at our thermal generating stations so that if, for some reason, those interruptible schedules were cut, we would have the ability to -- to replace it with our own domestic generation. However, that would have been at a significant premium.

MR. BOB PETERS: That import, Mr. Cormie, was both on-peak and off-peak back in 2003/'04?

MR. DAVID CORMIE: Yes, sir.

MR. BOB PETERS: What was the split between on-peak and off-peak? Do you recall?

MR. DAVID CORMIE: I don't remember that. We would have maximized off-peak purchases first, and to the extent it was still economical to purchase on-peak, compared to running our combustion turbines, we would have done that second and then used the combustion turbines as a last resort, mainly because they are extremely expensive to run.

MR. BOB PETERS: Mr. Cormie, while you're still near the microphone, on tab -- sorry, on slide 18 of Manitoba Hydro Exhibit 95, you were explaining to the Board some of the benefits of being interconnected, and that led to export revenues of a certain dollar amount?

MR. DAVID CORMIE: Yes.

MR. BOB PETERS: On the first day of the hearing, Manitoba Hydro's president answered a question and indicated that there was $9 billion of revenue forthcoming under the signed contracts. Do you recall that?

MR. DAVID CORMIE: Yes.

MR. BOB PETERS: Do you recall my asking for an undertaking at that time for Mr. Cormie to put pen to paper and provide both a public and in a CSI version of how the numbers were calculated?

MR. DAVID CORMIE: Yes, I heard my name mentioned there several times, and we have -- in the process of filing that.

MR. BOB PETERS: Is there a -- maybe I'll wait till I see it before I have anything further on that. Thank you, Mr. Cormie.

MS. PATTI RAMAGE: I think we could get to you, Mr. Peters, almost immediately if you like.

MR. BOB PETERS: I'll look at it tonight. If you're telling me it's available now, I think it's probably better that we -- we look at it.

(BRIEF PAUSE)

CONTINUED BY MR. BOB PETERS:

MR. BOB PETERS: I'm not sure if the record is as clear as it could be with respect to the Minnesota Power two hundred and fifty (250) sale, and the line that's going to get that energy to Minnesota Power. And, Mr. Bowen -- I'm sorry, Dr. Jacobson, I believe, was the one who -- who provided some information, and if I could, sir, I just jotted out a few questions.

And I -- I'd like you to tell the panel what was the total capital cost of -- if -- if it was going to be a 250 megawatt line in the United States, what would be the capital cost of that line in Manitoba?

DR. DAVID JACOBSON: That number was -- was provided in one (1) of the IRs, and it depends if you want to talk about in-service costs or in -- or base costs, but it's in the order of a hundred million dollars in-service dollar costs TO 2020.

MR. BOB PETERS: In-service cost, I think, is appropriate, Dr. Jacobson, and if it was a 250 megawatt line, as was being discussed earlier on in the NFAT proceedings, what is the capital cost to run it from the Manitoba border to what you've identified as Blackberry, Minnesota?

DR. DAVID JACOBSON: It's on the order

of $250 million, US, in-service.

MR. BOB PETERS: And would the line terminate in Blackberry, Minnesota?

DR. DAVID JACOBSON: It could. I mean, we were talking with Minnesota Power of options of termination. Another substation option is Shannon, but the cost is very similar between Shannon and Blackberry, so.

MR. BOB PETERS: Is the cost of terminating it at Shannon or Blackberry built into that $250 million in-service number?

DR. DAVID JACOBSON: Yes, the costs include both line and substation.

MR. BOB PETERS: In terms of the capital costs in Manitoba, the expectation is Manitoba Hydro would pay a hundred percent of them?

DR. DAVID JACOBSON: That's according to our tariff.

MR. BOB PETERS: Will they pay a hundred percent of your tariff costs?

DR. DAVID JACOBSON: Okay. I should -- I should take a step back. When we determined the costs through our -- our study, the customer who requests the service will pay 100 percent of the costs, whether they have side agreements as -- as not some --

not germane, I guess.

MR. BOB PETERS: Would you know if Manitoba Hydro had a side agreement from your -- your separate division?

DR. DAVID JACOBSON: I -- I'm not aware of any, so as far as I'm aware, it's 100 percent paid for by -- by Manitoba.

MR. BOB PETERS: All right. And then if it was a 250 megawatt line in the United States to serve the 250 megawatt Minnesota Power sale that would terminate in Blackberry, Minnesota, who would pay the $250 million capital cost on that?

DR. DAVID JACOBSON: For that, it would be the entity who requested the service, and it would be determined by -- by MISO.

MR. BOB PETERS: Do we know the answer to that?

DR. DAVID JACOBSON: The assumption right now is that Minnesota Power would have paid it all in the sense that Minnesota Power requested 250 megawatts of service to supply their load. So that would have been the assumption.

It -- it's -- it's a little bit more complicated in the sense that both import and export were requested, so that -- that costs allocation would

have been for negotiation among the various entities of the -- of the transmission service request.

MR. BOB PETERS: And that would have been for Mr. -- Mr. Cormie to -- to negotiate, correct?

DR. DAVID JACOBSON: That's correct, yeah.

MR. BOB PETERS: But -- okay. And then the operating costs in Manitoba, would that out -- again be at -- paid 100 percent by Manitoba Hydro?

DR. DAVID JACOBSON: Yes.

MR. BOB PETERS: And how much are the operating costs on an annual basis for the 250 line in Manitoba?

DR. DAVID JACOBSON: That number just popped out of my head, but it's -- it's a relatively small number.

MR. BOB PETERS: To you maybe.

DR. DAVID JACOBSON: Well, compared to $100 million, it's -- it's quite small. It's -- yeah, I'd -- I'd have to look -- look it up.

(BRIEF PAUSE)

MR. BOB PETERS: Dr. Jacobson, let's turn to the 750 line, but before we do, and -- you --

you were present, and you've heard -- you've heard the panel indicate that the 250 line now becomes, I believe, the words are 'hypothetical'?

DR. DAVID JACOBSON: I've heard that, yes.

MR. BOB PETERS: You did a study on the 250 line, did you not?

DR. DAVID JACOBSON: I did.

MR. BOB PETERS: It wasn't hypothetical?

DR. DAVID JACOBSON: At the time of the study, it -- it was an option, a viable option, but I understand today that it is not a viable option.

MR. BOB PETERS: So it became hypothetical relatively recently? Would that be fair?

DR. DAVID JACOBSON: That would be fair, yeah.

MR. BOB PETERS: All right. And in terms of the 750 line, again, there would be costs in Manitoba?

DR. DAVID JACOBSON: Correct.

MR. BOB PETERS: And how much are those costs? And I think that was in your slides but do you --

DR. DAVID JACOBSON: It was, yes.

MR. BOB PETERS: How much was it in Manitoba?

DR. DAVID JACOBSON: Maybe 268 million, which has recently been updated to 281 million in 2013 dollars.

MR. DAVID CORMIE: You know, Mr. Peters, I wanted to jump in here. Mr. -- or Dr. Jacobson can build a transmission line probably from any point 'A' to point 'B', and I don't think the issue is whether it's physically possible. The question is, is whether the business case that was presented on Ms. Flynn's chart was hypothetical or not.

And it assumed that -- that if Manitoba Hydro were to go back to Minnesota Power and say, We now change the game. We're not building a 750 megawatt line. You're not going to receive all the benefits associated with the 750 megawatt line, that the -- that -- that the package would -- would stay exactly the same, except a 250 megawatt line would be built.

And so in Ms. Flynn's comparison of alternatives, she shows that the 250 megawatt line, in conjunction with Keeyask, has just a couple of hundred million dollars in benefits above the 750 megawatt analysis. And for us to assume that that $200 million in benefits would remain after we renegotiate the deal

with Minnesota Power. It's hypothetical. I've -- I would be hard-pressed to be able to achieve that, given that our entire economic analysis is now in the public domain, and I don -- I don't think I could negotiate something like that.

So it's only hypothetical from the business perspective. It would assume that everything else would stay exactly the same, and I -- and for the reasons that Minnesota Power stated in its certificate of need, that -- and I'm not -- I don't need to repeat them, but they're -- the -- the conditions have changed since they signed the agreement, and it would presumptuous of us to assume that we could -- can carry on with just a different line size without giving them additional consideration.

MR. BOB PETERS: We'll -- we'll come back to that, I think, Mr. Cormie, because I think the panel will be interested in following up on that discussion, and I -- I gathered from your previous answer to, I think, the Chairman, that you felt that that would be best talked about when we're in-camera.

Did I have that right?

MR. DAVID CORMIE: Yes.

MR. BOB PETERS: All right. So we can agree to maybe revisit that at that time, sir?

MR. DAVID CORMIE: Yes, that would be fine.

MR. BOB PETERS: And just so that those who aren't going to come with us in camera, you will at that time be disclosing specific negotiating information. Is that what should be expected?

MR. DAVID CORMIE: Yes, I can do that then.

MR. BOB PETERS: Back to our line, Dr. Jacobson, our 750 line that would go from the Manitoba border to Blackberry, Minnesota, you again had the cost on that one on one (1) of your slides. I think the next slide.

Do you recall how much that was?

DR. DAVID JACOBSON: Yes, I --

MR. BOB PETERS: Sorry, that's not --

DR. DAVID JACOBSON: -- give an indication of 579 million, and it was originally submitted, which has recently been reduced to 507 million US.

MR. BOB PETERS: And why did the price go down?

DR. DAVID JACOBSON: Basically, better information. They -- they've gone through several rounds of route selection, so they've got a very good

handle on where they expect the line to go, and they've also looked at their substation costs in more detail and have been able to reduce costs.

MR. BOB PETERS: And again, the understanding is 33 percent would be picked up by Minnesota Power?

DR. DAVID JACOBSON: That's what I've heard, yes.

MR. BOB PETERS: And 67 percent at this time by Manitoba Hydro?

DR. DAVID JACOBSON: Yes, that's what I've heard, yes. That -- that agreement is not under the Manitoba Hydro tariff, so I -- I'm just --

MS. PATTI RAMAGE: Mr. Peters, just to clarify, Mr. Jacobson and his business unit doesn't deal with the deals. He deals with the transmission, so he wouldn't be -- the questions, and I'll maybe ask Mr. Cormie to jump in on this, but those questions are better directed to Mr. Cormie.

CONTINUED BY MR. BOB PETERS:

MR. BOB PETERS: Well, I'll stay away from Mr. Cormie for just a minute on the transmission, because I think Dr. Jacobson can build it from -- I think Mr. Cormie said any -- from point 'A' to point

'B'. But, Dr. Jacobson, just --

DR. DAVID JACOBSON: It's -- it's only money.

MR. BOB PETERS: "It's only money." Apparently. The capital cost -- is -- is the 750 line, to your understanding, Dr. Jacobson, terminating also in Blackberry?

DR. DAVID JACOBSON: That is correct, yes.

MR. BOB PETERS: And it's not going to some other location close by that you'd mentioned earlier?

DR. DAVID JACOBSON: That's correct. The -- the alternative end point location, if we upsize the line at some future date, I mentioned was Arrowhead near to Duluth? So, yeah, that this figure shows the line going -- new line going from Dorsey to Blackberry as the Preferred Development Plan, and the additional facilities are not part of the Development Plan going to Arrowhead near -- near to Duluth.

MR. BOB PETERS: All right. My American geography wasn't one of my stronger suits as school, but where does Wisconsin enter into this -- into this schematic that you have up on --

DR. DAVID JACOBSON: Stone Lake --

MR. BOB PETERS: -- slide 79?

DR. DAVID JACOBSON: Stone Lake and Gardiner Park are in Wisconsin, so it's -- Duluth is quite near the Wisconsin border.

MR. BOB PETERS: Okay, how far is it, a couple hundred kilometres?

DR. DAVID JACOBSON: Yeah, less than that.

MR. BOB PETERS: And so there's a cost, I take it, from Blackberry? And -- and again, I'm not sure which cloud I'm supposed to look at here, but there's a -- there's a cost to go from Blackberry through to Stone Lake into Gardiner Lake?

DR. DAVID JACOBSON: No. The incremental costs to go from Blackberry to Arrowhead would result if the transfer capability requested by the customer increased from 750 to 1,100 megawatts. Arrowhead, Stone Lake, Gardiner Park are all existing facilities, no -- no cost there.

MR. BOB PETERS: But the cloud that you've now taken us to isn't the one that you understand is the preferred option that's -- that's between Manitoba Hydro and Minnesota Power?

DR. DAVID JACOBSON: The preferred option goes from, as I mentioned before, Dorsey to

Blackberry.

MR. BOB PETERS: Correct.

DR. DAVID JACOBSON: And there will be a transformation down to the 230 kV substation at Blackberry, and that is the Preferred Plan. The -- so that's the cloud on the left, plus the facilities on top of that. The -- the cloud on the right is an optional future upgrade. That's not part of the Development Plan.

MR. BOB PETERS: And I heard -- or did I hear correctly, and the panel hear correctly that once the energy gets to Blackberry, Minnesota, there is no additional cost to take it to Wisconsin?

DR. DAVID JACOBSON: You heard correct, yes.

MR. BOB PETERS: And that's because the MISO members are already picking up the cost of the transmission upgrade that would do that?

DR. DAVID JACOBSON: The existing facilities plus the incremental facilities that I mentioned due to the amped up eleven (11) decision by MISO to upgrade the -- the network, yes. That -- the -- those facilities will -- will allow up to 500 megawatts to flow from Manitoba to Wisconsin.

MR. BOB PETERS: At no additional cost

to the counterparty, as well as Manitoba Hydro?

DR. DAVID JACOBSON: That is correct.

MR. BOB PETERS: So who's picking up those -- those additional costs? Is that a -- a common cost to MISO members that...

DR. DAVID JACOBSON: Yeah, there's a formula in the MISO tariff where the -- the costs are -- are distributed, so-called Multi-Value Project.

MR. BOB PETERS: And in terms of the operating costs, Dr. Jacobson, the operating costs of the 750 line in Manitoba are approximately how much on an annual basis?

DR. DAVID JACOBSON: Are we talking operation in a control centre, or we're talking about maintenance costs?

MR. BOB PETERS: All of the OM and A costs attributable to the 750 megawatt transfer capability of the line in Manitoba.

DR. DAVID JACOBSON: It's -- if I remember the number correctly, it's on the order of nine hundred dollars ($900) per kilometre. So you multiply two-thirty-five (235) by nine hundred (900) to get a rough -- a rough annual cost of -- of line maintenance.

MR. BOB PETERS: That's simply maintenance?

DR. DAVID JACOBSON: Operations -- it's a tougher number to -- to figure out, because everything is -- like, is grouped together. So it typically isn't broken down on a -- on a project-by-project basis.

MR. BOB PETERS: And the operating costs in Manitoba are picked up by the party requesting the service, which would be Manitoba Hydro?

DR. DAVID JACOBSON: That is correct.

MR. BOB PETERS: And you're not aware of any side agreements?

DR. DAVID JACOBSON: I'm not aware of any, no.

MR. BOB PETERS: And then in terms of the operating costs on the American side of the border, are you familiar with who has responsibility for what portion of those?

DR. DAVID JACOBSON: Not a hundred percent, no. That's -- that's under the MISO tariff, and I'm...

MR. BOB PETERS: And you don't know how much those -- those are?

DR. DAVID JACOBSON: No.

MR. BOB PETERS: Do you know, Mr. Cormie? The annual operating costs for the --

MR. DAVID CORMIE: No, I don't.

MR. BOB PETERS: Is that information Manitoba Hydro has?

DR. DAVID JACOBSON: I -- I don't have it. I mean...

(BRIEF PAUSE)

MR. DAVID CORMIE: I'd have to check, Mr. Peters.

MR. BOB PETERS: Would you please undertake to check what the operating costs are on the 750 megawatt transmission line in the United States, and also indicate what portion is Manitoba Hydro's responsibility and what portion is the responsibility of Minnesota Power?

MR. DAVID CORMIE: I can provide you with the operating costs. I -- I can't tell you what the cost responsibilities are yet, because those haven't been determined.

MR. BOB PETERS: Thank you, sir.

--- UNDERTAKING NO. 26: Manitoba Hydro to indicate

what the operating costs are on the 750 megawatt transmission line in the United States, and also indicate what portion is Manitoba Hydro's responsibility and what portion is the responsibility of Minnesota Power

MS. JOANNE FLYNN: Mr. Peters, there's a slide that I did not go through this afternoon, slide 88, which doesn't provide, sort of the raw costs associated with the -- with the capital and operating, but it does provide a breakdown of the assumptions from the economic analysis in terms of what we assumed for the capital and operating costs for the 750 megawatt line under fi -- the five (5) development plans that have the 750 megawatt plan in it.

So I see the slide is up, and the left-hand side of -- hand side -- left-hand side of the slide shows the Manitoba portion of the line, and the split between capital and operating costs. And these would be in -- I'm just trying to -- 2014 dollars --

2014 base dollars.

So then you see the percentage? It's 100 percent assumed for the purposes of the analysis for the Manitoba portion being picked up by Manitoba Hydro, and then you see the US side of it, and you see the 40 percent and the two-thirds (2/3s), and the split that was used. And you find those numbers in Appendix 9.3, the cash flows for each of the development plans for the capital cost for the -- for the cap -- sorry, the -- the capital portion and the ongoing O&M portion.

And if you add those two (2) columns together, and just take the percentage of the capital cost as a proportion, you'll find that where we say it's 40 percent capital and operating together being picked up by Manitoba Hydro, that the assignment of capital costs represents 20 percent of the total for Manitoba Hydro, and -- just of that total of the two (2) combined numbers, and represents 35 percent on -- on the plans where we say that we're picking up 66 percent of the costs.

CONTINUED BY MR. BOB PETERS:

MR. BOB PETERS: The only difference between the 40 and 66 percent, Ms. Flynn, is that where you show 40 percent, Manitoba Hydro was assuming that

WPS would be the investor?

MS. JOANNE FLYNN: Yes.

MR. BOB PETERS: All right. Thank you for that.

Now, while we're talking about the -- the 750 line, that brings into play, Mr. Cormie, the 308 megawatt system power sale that you advised the Board of with respect to Wisconsin Public Service, because that's the line on which the energy would be transported, correct?

MR. DAVID CORMIE: Yes, that -- that project will make deliveries into Wisconsin possible.

(BRIEF PAUSE)

MR. BOB PETERS: And we also heard that last summer, WPS told Manitoba Hydro that WPS was not going to invest in the transmission line, correct?

MR. DAVID CORMIE: Yes.

MR. BOB PETERS: And so Manitoba Hydro wants to continue with the transmission line at its own expense because WPS is not going to buy a portion of it.

MR. DAVID CORMIE: Yes.

MR. BOB PETERS: Can you tell the Board

on the public record whether Manitoba Hydro was able to extract a premium for its energy product as a result of now also providing the transportation to get it to the purchaser?

MR. DAVID CORMIE: Manitoba Hydro determined that there was enough margin in the price that Wisconsin Public Service could pay -- was pay -- was paying that it can absor -- could absorb the cost of the -- of the transmission associated with delivering that power to Wisconsin.

MR. BOB PETERS: And, so while WPS does not pay any more on account of the transmission, Manitoba Hydro will earn less profit, if you will, because it's picking up the transmission costs.

MR. DAVID CORMIE: Yes. And as I -- I said earlier in the day, Manitoba Hydro determined that in scenarios where Conawapa was built, it was economic for it to absorb 100 percent of the costs, to the extent that we could have other parties contribute to the cost of transmission made the net present value of -- of those development sequences even more attractive.

Even if it wasn't -- even if we had to pay the entire cost, it was still attractive -- an attractive to have in -- in those scenarios with Con -- Conawapa, it was still attractive for us to pay for the

entire line. It becomes more attractive if others are willing to pay.

MR. BOB PETERS: But there's no certainty that anybody else is going to chip in on that 750 line and buy out Manitoba Hydro's share.

(BRIEF PAUSE)

MR. DAVE CORMIE: Without the line, Mr. Peters, there's -- it's not possible for Manitoba Hydro to sell the premium product that's available off Conawapa. And as -- as I mentioned earlier, these prices that are -- Manitoba Hydro is able to attract are -- are very attractive compared to our customer's alternative costs. And so there's a premium that's being paid for Manitoba Hydro power. And even if we discount that premium, in order to provide a delivered product it's still a premium compared to the -- to our price forecast.

So these are -- these are -- are -- these are attractive transactions even if we have to pay for delivery.

MS. JOANNE FLYNN: Mr. Peters, I'd just like to add to that that from the perspective of the economic analysis that we made the assumption that once

we pick up 40 percent, or 66 percent of the cost of the line, we never get any of it back. So that is already built in to the economic analysis. We have not built in any unwinding of the transmission position.

MR. BOB PETERS: Do you treat that like a sunk cost?

MS. JOANNE FLYNN: It's not a sunk cost. It's a cost that's affecting the economics.

THE CHAIRPERSON: Why would there be such a dramatic difference in -- in O&M costs between the Canadian portion of that line relative to the American portion?

(BRIEF PAUSE)

MS. JOANNE FLYNN: The ongoing O&M costs include all of the other costs outside of the portion of the capital costs that we are picking up. So I believe it has been stated earlier that we're -- we're going to limit our -- our ownership to 49 percent in the line, but there will be a need to compensate for the -- for the level above that 49 percent. And that is represented as an operating and OM -- ONMA -- OM&A cost rather than a copital -- capital cost.

CONTINUED BY MR. BOB PETERS:

MR. BOB PETERS: Ms. Flynn, I'm not sure I understood that answer to the Chairman.

What you're saying is you've taken money out of the capital cost column and put it into the ongoing O&M column?

MS. JOANNE FLYNN: Yes, we've done that because we would not be making an investment and the capital cost column represents an investment.

MR. DAVE CORMIE: So, Mr. Peters, the -- as I mentioned before, the -- Manitoba Hydro is responsible for paying the revenue requirements on that line. The revenue requirements are -- include the O&M costs, but they also have -- re -- somebody else is making the investment. We have to pay for that es -- that investment. They -- they need a return on their investment so that it's included in that.

And it also includes the -- the depreciation of the line over -- over the life of the line. So as I said, the -- the least expensive way for that line to be built would be for Manitoba Hydro to build it. But because these US transmission companies have the right to build and invest, they will only upsize the line if they -- if they are -- are compensated. And I indicated that they require

additional compensation in order to make their investment worthwhile. And those are all built into that -- those -- those ongoing O&M costs.

So it's -- it's to pay the entire revenue requirements associated with that line, not just the -- the maintenance, but -- and that's how the -- the NFAT analysis was done.

MR. BOB PETERS: And so those ongoing O&M costs the Chairman identified include Manitoba Hydro paying, in essence, a rate of return to Minnesota Power for their investment?

MR. DAVE CORMIE: Abso -- absolutely.

MR. BOB PETERS: And doesn't Minnesota Power already get a rate of return on their -- on their investment in Minnesota?

MR. DAVE CORMIE: They're -- they're getting a return on investment on the 33 percent of the line that they are building to serve their load. But then they would also want a return on the investment, because we're asking them to invest 51 percent. So there's an 18 percent that also they need a return on. And -- and they -- they will not -- they're not making that investment for -- for free, Mr. Peters. They are -- they're investing it on our behalf and they expect to earn on that.

MR. BOB PETERS: But I thought the 18 percent is just notional because Manitoba Hydro was putting up 66 percent, Mr. Cormie?

MR. DAVID CORMIE: No, you're confusing investment as opposed to who's paying the revenue requirements. And as I said, Minnesota Power will invest the money that's necessary to build 51 percent of the line. They only have to invest 33 percent in order to meet the requirements of their customers.

They're investing the additional 18 percent on behalf of Manitoba Hydro, and they expect to earn on that 18 percent. So they're -- they're going to the debt market and they're -- and they're also putting up their own equity. They need -- they need to enter -- earn a return on the equity portion.

And so when you -- and all those things feed into the revenue requirement. And it also feeds into the taxes that Minnesota Power has to pay in -- on -- on those -- on those earnings.

So it becomes a si -- it becomes a significant additional cost. Those costs have all been included in the -- in the NFAT analysis based on those showing -- on those numbers that Ms. -- Ms. Flynn has -- has indicated there.

MR. BOB PETERS: Can you put on the

public record, Mr. Cormie, what is the rate of return being paid to Minnesota Power on the 18 percent share of the investment of ownership, I should say?

MR. DAVID CORMIE: I -- I can't put that on -- on the record because that's still being negotiated. But what I can say is that under -- under FERC utilities are -- are able to earn as much as 12 percent on their -- on their transmission investments.

So that's -- that is -- it -- it could be as high as that.

MR. BOB PETERS: Sorry, I missed that amount, Mr. Cormie.

MR. DAVID CORMIE: Twelve percent.

MR. BOB PETERS: And you said it's still being negotiated. What -- what aspects -- is that the -- the 750 line is still being negotiated or the Minnesota Power contract itself is still being negotiated?

MR. DAVID CORMIE: In my presentation this morning I -- I spoke about the interconnection term sheet; that was slide number -- on page 27. It's the US interconnection term sheet.

That term sheet was filed with the -- the Board in -- in -- when it was signed last fall, and that lays out the -- the -- in broad terms, how

Minnesota Power will be compensated for the larger -- building a larger interconnection than it requires under the 250 megawatt sale agreement.

And we haven't -- we haven't finalized that term sheet and turned it into a contract. We're still -- we're still negotiating that.

MR. BOB PETERS: Two (2) quick questions, if I might. Is the termination point of the WPS sale Blackberry, Minneso -- sorry, Blackberry, Minnesota?

MR. DAVID CORMIE: No. No, the termination -- the -- the transmission service request that Manitoba Hydro has -- that Wisconsin Public Service has delivers the power into Wisconsin. The -- the facilities that are required to make that happen are only in Manitoba and Minnesota.

As Mr. -- as Dr. Jacobson indicated, there are facilities that will be built that -- that Manitoba Hydro and Wisconsin Public Service, because of our preferred location in the transmission request queue, we're able to capture that without having to build facilities from Duluth into Wisconsin.

MR. BOB PETERS: Mr. Cormie, the last question today, if I could. The transmission losses that are going to occur on this transmission line, how

have they been assigned or allocated as between the parties?

MR. DAVID CORMIE: As with all our agreements, Mr. Peters, Manitoba Hydro delivers the 300 mega -- that delivers the power at the border with the United States. And so our obligation is to provide 308 megawatts of power at the border. And that's where our obligation ends.

MR. BOB PETERS: That suggests that WPS then picks up a hundred percent of the transmission losses?

MR. DAVID CORMIE: No. It's complicated and probably a topic that Dr. Jacobson could speak to. But losses are recovered based on the marginal losses associated with the sales. And then because they are -- because they are -- and they're reflected in -- in the LNP prices, and then what happens is that because we're collect -- they're -- MISO is collecting losses based on the marginal, there's an over collection. And then that over collection is -- is alloc -- that revenue associated with the over collection is allocated back to load and MISO.

Our obligation is to deliver it and I -- I would expect that Wisconsin Public Service will be

getting -- be -- be treated as the average loss to -- through the loss payment program back to them. So -- but our obligation is -- is to deliver to the border, and that's where -- we're only responsible for the losses from generation to the border.

MR. BOB PETERS: Thank you, Mr. Cormie and panel. Mr. Chairman, those are my questions for this evening.

THE CHAIRPERSON: Are there any administrative matters to attend to before we adjourn?

MS. PATTI RAMAGE: I believe we have an undertaking that Mr. Peters referred to. In fact, we have a number of exhibits to file so that we don't mess up the numbers to get there. The first is -- will be identified Manitoba Hydro Exhibit 96, and that was the list of recommended reading that you received over the weekend, and you all got As in I understand.

--- EXHIBIT NO. MH-96: List of recommended reading

MS. PATTI RAMAGE: Second is Manitoba Hydro Exhibit Number 96 which -- oh, sorry, 97 which is the integrated financial forecast for 2013. That was filed as part of Manitoba Hydro's interim rate application last week and Mr. Peters had requested it

be filed in this proceeding. So we are -- we'll assign it an exhibit number.

--- EXHIBIT NO. MH-97: Integrated financial forecast for 2013

MS. PATTI RAMAGE: After that is 98, which is the capital expenditure forecast, CF13. That also serves to satisfy an undertaking given by Mr. Thomson, although I don't have the undertaking. Mr. Peters is signalling Undertaking Number 4. So that will satisfy that undertaking at the same time.

--- EXHIBIT NO. MH-98: Response to Undertaking 4

MS. PATTI RAMAGE: Then we have Exhibit Number 99, which comes from transcript page 141 -- or the undertaking given at transcript page 141, wherein Manitoba Hydro was to provide the firm price revenue for the contracts that are listed on Tab 13 of page 49 of -- I believe that would be Mr. Thomson's presentation. And it was provide information missing from column labelled "Period," and include the 308 megawatt contract with Wisconsin Power Service. So that's Undertaking Number 1 filed as Exhibit 99.

--- EXHIBIT NO. MH-99: Response to Undertaking 1

MS. PATTI RAMAGE: And last is Manitoba Hydro Undertaking Number 2, which is being filed as Manitoba Hydro Exhibit 100, where Manitoba Hydro is to break down, as by contract, how much of the 9 billion comes from which contract and for which product, as well as the time frame, and determine if Manitoba Hydro can compile a public version of that document. So this is the -- the public version of the document requested in that undertaking.

--- EXHIBIT NO. MH-100: Response to Undertaking 2

THE CHAIRPERSON: Thank you. I believe that's all for today, so we will adjourn for the day. Have a good evening, everyone. We'll see each other again at nine o'clock tomorrow morning. Thank you.

(PANEL RETIRES)

--- Upon adjourning at 5:50 p.m.

Certified Correct,

_____

Cheryl Lavigne, Ms.

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1,245,000,000 1479:7

1,319,000,000 1483:23 1484:5

1,462 1479:3 1522:17

1,462,000,000 1479:18

1,600 1322:18,21

1,696 1480:2

1,696,000,000 1478:19

1,850 1427:2

1,900 1337:19

1,950 1427:6

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1.245 1524:17

1.462 1522:7,12

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1/2 1320:2,8 1348:25 1387:23 1490:20

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