MANITOBA PUBLIC UTILITIES BOARD

re:

MANITOBA HYDRO

2023/24 and 2024/25

GENERAL RATE APPLICATION

Hearing

Before Board Panel:

Robert Gabor, KC - Board Chairperson

Marilyn Kapitany - Board Vice Chair

Carol Bellringer - Board Member

Hamath Sy - Board Member

George Bass, KC - Board Member

HELD AT:

Public Utilities Board

400, 330 Portage Avenue

Winnipeg, Manitoba

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Pages 887 to 1089

APPEARANCES

Bob Peters	)Board Counsel
Sven Hombach	)
Brent Czarnecki	)Manitoba Hydro
Odette Fernandes	)
Deanna Hiebert	)
Byron Williams	)Consumers Coalition
Chris Klassen	)
Antoine Hacault	)MIPUG
Melissa Beaumont	)
Carly Fox	)Assembly of
Emily Guglielmin	)Manitoba Chiefs
Markus Buchart	) MKO
Thomas Reimer (np)	) GSS and GSM
Robert Walichnowski (np)	) customer classes
William Haight	) Daymark Energy
Bradley McClelland (np)	) Advisors

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--- Upon commencing at 9:00 a.m.

THE CHAIRPERSON: Good -- good morning, everyone. I'm going to call on Board counsel.

MR. BOB PETERS: Thank you. Good morning, Mr. Chair, Board members, ladies and gentlemen, and a special welcome to Mr. Haight and Mr. McLelland's witnesses, Mr. Athas, Mr. Bower, and Mr. Smith.

This morning will be a presentation from Daymark Energy Advisors. We tried to squeeze them on the time last night and Mr. Haight caught us and responded appropriately harshly indicating that his -- his work had already been prepared and the witnesses were probably closer to the two (2) hour mark.

But, Mr. Chair, with the schedule today for everyone's availability, we do indicate and did indicate in our circular -- circulating email that Board counsel's questions could be flexible and could be asked on the public record tomorrow morning if the parties wanted to observe on the live stream that Ms. Schubert would have available.

There will be a -- an in camera session

tomorrow dealing with Manitoba Hydro witnesses and also dealing with Daymark witnesses, so we do have some flexibility at that time.

But we think we're in good shape. We'll proceed, Mr. Chair. I'd suggest you call on Mr. Haight and Mr. McLelland to introduce their witnesses and have them sworn before they provide their presentation to the Board.

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

MR. BILL HAIGHT: Thank you, Mr. Chair. Mr. McLelland couldn't be here today as a result of a pending trial that starts next week, but I am here to assist the Board and -- and the Daymark witnesses.

My name is Bill Haight. I am counsel to Daymark Energy Advisors. Sitting to my far right -- and each of them will pass along their own personal greetings when it comes their time to speak -- but sitting on my far right is John Athas who is principal consultant and vice president of Daymark Energy Advisors; Jeffrey Bower who is the -- a managing consultant with Daymark Advisors; and to my immediate right is Doug Smith who is also vice president and principal consultant for Daymark Energy Advisors.

Before we get to the meat of the matter, there's a bit of housecleaning that needs to occur, and just to place on the record that the Daymark Energy Advisors' CVs, the CVs for both -- for all three (3) of these individuals here have been placed on the record and are Exhibit 3, Daymark Energy Advisors number 3.

And Daymark has prepared a PowerPoint presentation that it proposes to take the Board through this morning; that has been provided to the Board. Ms. Schubert has it, and if -- that document I understand has already been marked as DE Exhibit 4.

So that -- I can tell you the PowerPoint presentation has been provided to Manitoba Hydro in advance. They've reviewed it for CSI and have approved of it. So what we have this morning is -- is the redacted version that does not contain any commercially sensitive information.

So as everyone in the room knows, Daymark has been retained by the PUB as an independent expert consultant and to provide opinion evidence on twelve (12) specific points.

And as Daymark is proposing to provide expert opinion evidence, I've spoken with counsel for each of the parties who have confirmed that they

acknowledge Daymark's expertise to give expert opinion evidence, and they acknowledge that they are independent experts, and therefore qualified to give opinion evidence.

Regardless of those acknowledgments, I think because this is a Board proceeding of record, I propose to take each of them through a very, very brief direct examination setting out their qualifications and independence.

I promise to the Board that I will be brief, and with your permission, Mr. Chair, I'll lead them through that just so that there's a record of their expertise and independence.

THE CHAIRPERSON: Certainly.

EXAMINATION-IN-CHIEF BY MR. BILL HAIGHT:

MR. BILL HAIGHT: Thank you. So beginning with Mr. Athas, you are the principal consultant and vice president for Daymark Energy Advisors?

MR. BOB PETERS: Mr. Chair, if I could interrupt my friend for a minute. In light of that, I wonder if it would be appropriate that we would just have the witnesses take their oath.

THE CHAIRPERSON: Yeah. Sorry. We

need them sworn in.

MR. BOB PETERS: And then we'll proceed --

THE CHAIRPERSON: Yeah.

MR. BOB PETERS: -- if that suits.

MR. WILLIAM HAIGHT: Thank you.

DAYMARK PANEL:

JOHN ATHAS, Sworn

JEFFREY BOWER, Sworn

DOUGLAS SMITH, Sworn

CONTINUED BY MR. WILLIAM HAIGHT:

MR. WILLIAM HAIGHT: So, Mr. Athas, you've indicated that you are a vice-president and principal consultant for Daymark Energy Advisors?

MR. JOHN ATHAS: Yes.

MR. WILLIAM HAIGHT: You hold a masters in science and mechanical engineering from Rensselaer Polytechnic Institute?

MR. JOHN ATHAS: Yes.

MR. WILLIAM HAIGHT: And you received that in 1982?

MR. JOHN ATHAS: Yes.

MR. WILLIAM HAIGHT: And for the

purposes of the record, that's R-E-N-S-S-E-L-A-E-R. You also hold an MBA from the University of Connecticut --

MR. JOHN ATHAS: Yes.

MR. WILLIAM HAIGHT: -- which you received in 1987?

MR. JOHN ATHAS: Correct. Yes.

MR. WILLIAM HAIGHT: You've been qualified as an expert and provided expert opinion evidence to this Board on two (2) occasions?

MR. JOHN ATHAS: Yes.

MR. WILLIAM HAIGHT: You provided expert opinion evidence on the NFAT review of Manitoba Hydro's proposal to develop Keeyask and Conawapa generating stations?

MR. JOHN ATHAS: Yes.

MR. WILLIAM HAIGHT: You provided expert opinion evidence to this Board -- this Board's review of efficiency Manitoba's three (3) year Energy Efficiency Plan?

MR. JOHN ATHAS: Yes.

MR. WILLIAM HAIGHT: And you've been qualified as an expert and provided expert opinion evidence to, among other bodies, the Nova Scotia Utility and Review Board?

MR. JOHN ATHAS: Yes.

MR. WILLIAM HAIGHT: And that's on multiple occasions?

MR. JOHN ATHAS: Many.

MR. WILLIAM HAIGHT: And also, the New Brunswick Energy and Utilities Board?

MR. JOHN ATHAS: Yes.

MR. WILLIAM HAIGHT: The Newfoundland and Labrador Board of Commissioners of Public Utilities?

MR. JOHN ATHAS: Yes.

MR. WILLIAM HAIGHT: The Arkansas Public Service Commission?

MR. JOHN ATHAS: Yes.

MR. WILLIAM HAIGHT: And the Rhode Island Public Utilities Commission?

MR. JOHN ATHAS: Yes.

MR. WILLIAM HAIGHT: And -- and you have provided opinion evidence to some of these boards on the issue of energy export forecasts?

MR. JOHN ATHAS: Yes.

MR. WILLIAM HAIGHT: And you are aware, sir, as an independent expert, your duty is to assist the PUB with objective and unbiased opinions that are within your area of expertise --

MR. JOHN ATHAS: Yes.

MR. WILLIAM HAIGHT: -- and within the -- the scope of work that's been provided to Daymark by the PUB?

MR. JOHN ATHAS: Yes.

MR. WILLIAM HAIGHT: And you're also area aware that your duty as an expert is to avoid assuming the role of an advocate?

MR. JOHN ATHAS: Yes.

MR. WILLIAM HAIGHT: Turning next to Mr. Smith. Mr. Smith, you are vice-president and principal consultant for Daymark Energy Advisors?

MR. DOUGLAS SMITH: Yes.

MR. WILLIAM HAIGHT: You hold a bachelor of science and accounting that you obtained from Syracuse University in 1991?

MR. DOUGLAS SMITH: Yes.

MR. WILLIAM HAIGHT: You have been with Daymark since 2004?

MR. DOUGLAS SMITH: Yes.

MR. WILLIAM HAIGHT: And, as vice-president and principal consultant, you have provided clients with advice on energy forecasts?

MR. DOUGLAS SMITH: Yes.

MR. WILLIAM HAIGHT: You have also

analyzed the risks on markets and asset valuation inclusive of the impacts of weather conditions?

MR. DOUGLAS SMITH: Yes.

MR. WILLIAM HAIGHT: And you have done so on countless occasions?

MR. DOUGLAS SMITH: Yes.

MR. WILLIAM HAIGHT: Yes. You have been qualified to give expert opinion evidence previously to the Public Utilities Board of Manitoba?

MR. DOUGLAS SMITH: Yes.

MR. WILLIAM HAIGHT: Specifically, on the 2017/2018, 2018/2019 GRA --

MR. DOUGLAS SMITH: Correct.

MR. WILLIAM HAIGHT: -- in which you provided opinion evidence on Manitoba Hydro's expert -- export revenue forecast?

MR. DOUGLAS SMITH: yes.

MR. WILLIAM HAIGHT: You also, at that time, reviewed Manitoba Hydro's export contracts and provided opinion evidence on those?

MR. DOUGLAS SMITH: Yes.

MR. WILLIAM HAIGHT: You have been qualified to give expert opinion evidence on issues relating to electrical utilities to, among others, the Maryland Public Service Commission?

MR. DOUGLAS SMITH: Yes.
MR. WILLIAM HAIGHT: The Arkansas Public Service Commission?
MR. DOUGLAS SMITH: Yes.
MR. WILLIAM HAIGHT: And the Maine Public Utilities Commission?
MR. DOUGLAS SMITH: Yes.
MR. WILLIAM HAIGHT: You are aware, sir, that your duty as an expert is -- require -- requires you to give objective and unbiased opinions on matters within your expertise?
MR. DOUGLAS SMITH: Yes.
MR. WILLIAM HAIGHT: And within your scope of work as prescribed by the Public Utilities Board of Manitoba?
MR. DOUGLAS SMITH: Yes.
MR. WILLIAM HAIGHT: You are also aware that your duty as an expert -- expert, excuse me -- is to avoid assuming the role of an advocate?
MR. DOUGLAS SMITH: Yes.
MR. WILLIAM HAIGHT: Finally, turning to Jeffrey Bower. Mr. Bower, you are a managing consultant for Daymark?
MR. JEFFREY BOWER: Yes.
MR. WILLIAM HAIGHT: And you've been

employed by Daymark in a variety of positions since 2010?

MR. JEFFREY BOWER: Yes.

MR. WILLIAM HAIGHT: And you have a certificate of geospacial analysis from Duke University in 2010?

MR. JEFFREY BOWER: Yes.

MR. WILLIAM HAIGHT: And I understand the study of geospacial analysis is the -- is, in a nutshell, the study of data mapping?

MR. JEFFREY BOWER: Yes.

MR. WILLIAM HAIGHT: You have a Masters in Environmental Management from Duke University, which you obtained in 2010?

MR. JEFFREY BOWER: Yes.

MR. WILLIAM HAIGHT: That one of the things you studied at Duke was climate change and its impact upon industry?

MR. JEFFREY BOWER: Yes.

MR. WILLIAM HAIGHT: Your consulting practice includes power market modelling and price forecasting?

MR. JEFFREY BOWER: Yes.

MR. WILLIAM HAIGHT: And you have been qualified to provide expert opinion evidence to, among

others, the Georgia Public Service Commission?

MR. JEFFREY BOWER: Yes.

MR. WILLIAM HAIGHT: The Arkansas Public Service Commission?

MR. JEFFREY BOWER: Yes.

MR. WILLIAM HAIGHT: And the Maine Public Utilities Commission?

MR. JEFFREY BOWER: Yes.

MR. WILLIAM HAIGHT: And you understand, sir, that your duty as an expert is to provide unbiased opinions and objective opinions on the matters within your expertise?

MR. JEFFREY BOWER: Yes.

MR. WILLIAM HAIGHT: And within the scope of work that's been prescribed by the PUB?

MR. JEFFREY BOWER: Yes.

MR. WILLIAM HAIGHT: And finally, you understand that your duty as an expert is to avoid assuming the role of an advocate?

MR. JEFFREY BOWER: Yes.

MR. WILLIAM HAIGHT: With those questions, Mr. Chair, and members of the panel, I -- I submit that Misters Athas, Smith, and Bower be qualified to provide expert opinion evidence to this Board.

THE CHAIRPERSON: Now -- thank you, Mr. Haight.

Now, as I understand, the question was put to the Interveners in Hydro before in terms of their being experts. So --

MR. WILLIAM HAIGHT: That's correct. Right. Prior to this morning.

THE CHAIRPERSON: So -- so we will qualify them as expert witnesses.

I'm not sure -- Mr. Athas has his light on, so I assume he's starting with the presentation?

MR. WILLIAM HAIGHT: That is correct, sir. You are on the ball this morning.

THE CHAIRPERSON: Second cup of coffee in me already. So thank you. Mr. Athas...?

CONTINUED BY MR. BILL HAIGHT:

MR. JOHN ATHAS: I forgot about the affirming of the qualifications step in the process.

Good morning, Chair Gabor, Vice-Chair Kapitany, Panel Members Bellringer, Bass, and Sy, Board counsel, representatives of Hydro, and the other stakeholders.

On behalf of the Daymark team, I want to express our -- our pleasure and appreciation of

being asked to support the PUB and the stakeholders in Manitoba once again.

I will kick off the presentation. The presentation duties will be shared by all three (3) of us -- of us here today. Feel free to ask questions as we -- as we go along.

The -- the slides for today have been redacted in coordination with Hydro's attorneys, and -- but we've kept that -- we've tried to have as much information on there for the discussion as possible.

The -- we have structured our presentation -- as you can see -- to cover all the items of our scope of work, the -- the information within the report. We have slightly reordered the discussion from the -- from the report because while sections of the -- all the sections of the report are covered, we believe this order will aid in conveying the information on a discussion basis in an efficient and effective manner. And we'll conclude our presentation with our findings.

As -- as with our prior opportunities as independent expert consultants before the PUB, we have worked within a well-structured tight scope of work shown here -- next slide, please -- shown here in a -- in a condensed manner.

And it has three (3) main questions that we have -- objectives that -- as we see the scope, to determine the accuracy and reasonableness of the forecast for export energy and capacity and -- and extra provincial revenues in the GRA application to determine the reasonableness of the operations performed by Hydro during the drought. And specifically, economic impact of -- in 2021/2022. And determine whether Hydro's recently modified modelling and hydrological practices have impacted the ability to respond to water conditions and/or the accuracy of the export revenue forecast.

In fulfilling these objectives, as an overall objective, the scope of work had specific items of -- that are listed on this slide. And we'll go through all of them. In particular, we'll be taking you through them on -- in -- during the presentation.

These specific requests are outlined in the report, but they also contribute to our findings and they -- and to our -- to us at -- developing our findings, and -- and they're very supportive of -- of -- of our findings and the discussion will show that as we go along.

Our approach -- our approach, as

always, was designed to review public information through analysis, public analysis, processes and performance of hydro through in-person interviews, supplemented -- that -- nicely these days with virtual discussions with a team from Hydro.

We -- we led -- those discussions resulted in volumes of -- of reports and presentations and policies being shared with -- with Daymark and that -- that we use for this report. And we appreciated the responsiveness and the amount of time that the Hydro team spent with us.

We made a -- we had -- made a complete review of the relevant parts of the interim rate application, the GRA docket and record from all stakeholders. We performed independent analysis of the information in some areas where it was warranted and used our experience to provide an assessment of the information analysis and conclusions.

We are here today to answer questions on -- that the panel, Board staff, the Company and the stakeholders have on the issues of our report, which has been already made a part of the record.

We would be remiss if we didn't discuss the context of -- provide some context to the review and the issues that were being discussed in the GRA

and brought -- brought Daymark into -- for support.

The -- the -- there is -- this is a period of significant change and major uncertainty for -- for Manitoba, for the regions close to Manitoba and -- and all of North America, if not -- if not further.

The energy industry transition is being driven and this is a very important part by, 'cause it makes it -- it adds to the uncertainty, by policy, economics and by the customers.

The demand within Manitoba is increasing and reducing the energy available for export. Hydro's profitable contracts are expiring. Core issues within MISO regarding resource adequacy are evolving and that creates an unknown and the -- and extreme water conditions have -- have occurred within Manitoba in consecutive years.

All these effects, the extra provincial revenue forecasts and our -- that -- determining what is appropriate for a GRA.

I will turn the discussion over to Jeff Bower to start the details of the discussion.

MR. JEFFREY BOWER: Okay. Thank you. Again, my -- my name is Jeff Bower and it's a pleasure to be here with you today.

We -- we'd like to start our

presentation today with a discussion of the MISO market outlook. The -- the MISO market is a topic of two (2) of the specific scope items from our scope of work, but beyond just those two (2), it affects a number of -- of other scope items related to the review of the extra provincial revenue opportunities for Manitoba Hydro.

And this topic really provides a foundation for several of the other topics that we will be discussing today, so we wanted to start with a -- here.

In addition, based on several of the information -- information requests that were received from -- from parties, we understand there's considerable interest in -- in the MISO market and our views of the MISO market, and so that's why I wanted to prioritize it as a foundational topic today. Next slide.

So the MISO market is Manitoba Hydro's key export market and it is the largest variable regarding the net extra provision -- extra provincial revenue forecast.

And as we note here, on the left side, the -- the MISO conditions impact both the value of and the demand for Manitoba Hydro's products. The

market pricing and that includes energy capacity and ancillary services products. And changes to these market products, over time, could impact the value of opportunity sales by Manitoba Hydro.

And in the broader market activity, in the MISO region, impacts the demand for Manitoba Hydro's products over time. So this includes elements like load growth and -- and shape, resource retirements, and -- and new builds, resource adequacy rules, US state and federal policies, customer preferences. And we'll be talking through all these today.

And this market activity impacts both the demand for firm sales by Manitoba Hydro, as well as opportunity sales.

So, in the context of the conditions of the MISO market, there are, really, I think, three (3) key questions that are pertinent to the GRA Review, the first being, you know, Manitoba Hydro is forecasting export revenue to decline over time. Is that reasonable?

The second being, Manitoba Hydro does not assume that diversity arrangements for capacity will be renewed and does not assume new future capacity sales. Is that reasonable?

And, third, should Manitoba Hydro be assuming a premium for its products in its long-term forecast?

So, there are a number of very inter-related market forces in MISO that are influencing the ability of Manitoba Hydro to sell its products into the market and impacting the price of those products.

And, unfortunately, it's not really a very straightforward story, where we can say MISO market changes are -- are good for Manitoba or are bad for Manitoba, in terms of their -- their revenue opportunities. There are some pretty complex interactions between these various market forces and there's a lot of uncertainty related to each of them.

So, for the purposes of this discussion, we've -- we've grouped these market forces into three (3) categories and we'll discuss each of these individually on the -- on the following slides.

The first being portfolio transition. This covers the types of generating resources that are on-line and the changes to that over time.

The second is resource adequacy, which is, essentially, whether MISO has the right mix of available resources to reliably meet load all through the year.

And the third is changes in demand. So, this is the -- both the amount of total demand in MISO at the time of system peak and the amount of energy demand throughout the year and this -- as we'll discuss, this includes changes to the seasonality of demand, which is something of interest.

The first category is portfolio transition. So, MISO, like most regions that use a large amount of -- of fossil fuels as part of their supply mix is in the midst of a very major transition to renewals and non-emitting resources.

The relevant MISO conditions related to portfolio transition are the rapid expansion of renewables and the retirement of conventional resources, primarily coal and -- and natural gas-fired resources.

This transition is being driven by a few key factors. So, in the -- in the centre box there we have a few of those. So, that includes state policies that are requiring a reduction in grid emissions, de-carbonization commitments of individual utilities, U.S. federal government incentives. This includes tax credits, the investment tax credit and the production tax credit. Those were both recently expanded and extended by the 2022 Inflation Reduction

Act in the U.S. and then, ultimately, this expansion of renewables is being driven by economics.

So, between the price declines of -- of wind and solar, the, you know, -- the capital costs price declines, federal incentives that are supporting development, essentially, utility planning processes in the U.S. are -- are consistently concluding that renewable resources are the lowest cost supply option for long-torm -- long-term portfolio additions.

So, looking at this at the figure that we have here on the page, I think this is probably familiar to you. I believe it was in a -- a Manitoba Hydro slide from their presentation.

This shows the expected change in total MISO energy supply over the next 20 years. The coloured bars represent different -- different fuel types and the -- the ones of particular note are -- are green is wind and the yellow is solar and it's showing the proportion of each fuel as a component of the total energy supply for different years, 2026, '31, '36, '41.

And, for reference, in 2021, wind and solar, together, made up 13 percent of total energy supply in MISO and, so, what this figure, which comes from a MISO -- well a recent MISO forecast, is showing

that, by 2026, they're expecting that 13 percent to increase to 28 percent of total supply and, then, by 2036, it -- it becomes more than 50 percent total supply.

So, this is, basically, just hammering home that -- that the -- the portfolio transition is -- is rapid and MISO is -- is expecting it to occur, you know, really, in the next 10 to 15 years, become a major change in -- in the supply.

THE CHAIRPERSON: Sorry, Mr. Bower, can I interrupt you for second?

MR. JEFFREY BOWER: Yeah, of course.

THE CHAIRPERSON: Where's Hydro bit on this list? I don't see any reference. Does it fit in 'other' or --

MR. JEFFREY BOWER: I believe it would be in -- in 'other'. That's a good question that I -- I didn't check, but I -- I do believe it would -- it would be in the -- in the 'other' category.

THE CHAIRPERSON: Okay. And according to this list, is Hydro water -- sorry, energy generated by hydroelectric considered renewable?

MR. JEFFREY BOWER: Well, in -- in this analysis they don't make a distinction of renewable or -- or not. In general, the definition of

renewable depends largely on the context. So, many states have renewable portfolio standards as -- as you probably know, and states have different ways of classifying hydroelectric in terms of whether it is renewable or which class of renewables Hydro complies with.

So, for example, there are -- are multiple states where you'll have a -- a tier 1 class which is primarily new renewables, new wind and solar, and you'll have a class 2, which would be existing Hydro.

So, there are other states that don't really make a renewable designation, they look for -- they have a clean energy standard and in those states usually Hydro is considered a clean energy, you know, qualifies as a clean energy resource.

THE CHAIRPERSON: Okay. Thank you.

CONTINUED BY MR. BILL HAIGHT:

MR. JEFFREY BOWER: So, with this portfolio transition, there are a couple key impacts on Manitoba -- that -- that affect Manitoba Hydro. First, the big issue is that renewable resources in the MISO market reduce energy market prices.

Market prices are set by the marginal

unit online in any given hour. And that's generally the most expensive and least efficient resource that is required in that hour.

So, as the regions adding these, you know, many gigawatts of -- of new renewables, those resources don't have a fuel cost, and so they are essentially priced at zero.

So, as those resources are brought on line, you need fewer of the more expensive/less efficient resources and so you -- you are lowering the market price because you don't need -- it's -- the market is no longer priced at that most expensive resource.

So, that's one (1) of the reasons why renewable resources are driving this reduction in the long-term energy price forecast. So, all else equal, this reduces Manitoba Hydro's revenue opportunities from -- from opportunity sales into MISO.

The other impact of this portfolio transition is that the -- that is relevant to Manitoba Hydro is that the renewable resources provide energy, but their capacity contribution is a bit reduced because of the intermittencey of renewables.

So, this lower capacity value has implications for resource adequacy, which is the next

category we'll discuss.

So, the second category of -- of factors is collected together under resource adequacy. So, resource adequacy is essentially an element of grade reliability. Is there sufficient supply to meet load plus required reserve margin in every hour of the year?

And so, the MISO conditions related to this are that, again, this major fuel transformation is under way. This is particularly true in Northern Miso. And there's a lot going on in this slide, so I'm going to try to take a minute to clarify what -- what we're looking at.

In the left-hand figure here, this shows the expected resource retirements and additions over twenty (20) years. And this is another MISO. This is the same MISO study that provided the figure from the -- from the previous slide.

The bars to the left of the axis show resource retirements, and the bars to the right are resource additions. This is a forecast by MISO. And each row of those bars shows a different local resource zone, or LRZ.

In LRZ 1, which is Minnesota, Dakotas -- the Dakotas, part of Wisconsin, and part of Montana.

That's the one (1) that's, you know, obviously closest to Manitoba and their -- their most immediate training partner.

That's the top set of -- of graphs, if you can see it there on the slide. And what we're highlighting here is that the change in portfolio for LRZ-1 -- that LRZ-1 basically has -- is -- is the area with some of the highest expected portfolio turnover. The -- the -- it has the highest level of -- of expected retirements and the highest level of expected planned additions over the next twenty (20) years.

The other figure that we have on the left here is -- or on the right here, excuse me -- is showing the -- how the change in portfolio is resulting in an expectation that there will be a shortage of firm capacity in the near future.

And so this shows -- this figure on the right shows the load capac -- what's called the load capacity balance for LRZ-1, again the northern MISO region.

The black line on this graph is showing the expected load plus reserve requirement, so that's what's needed to meet -- meet the load. The dark blue bars at the bottom represent existing resources, and the lighter blue bars represent planned resources.

The grey bars at the top are essentially -- they essentially represent the resources that are needed but are not yet online or planned.

So bottom line for this is -- is showing that load is -- is growing at -- at a pretty -- you know, expected to grow at a pretty steady rate, and that there, in the next few years, may not be enough firm supply resources to meet that load in -- in northern MISO.

So the driver of this capacity transition and the expected capacity shortfall is the retirement of fossil-fired thermal resources which provide very firm capacity and the additional of renewables which provide energy, but not as much of that dependable capacity that's needed for reliability.

And so the last relevant category in this resource adequacy -- or the last relevant condition in this resource adequacy category is the impli -- sorry; yeah, thank you -- is the -- is the implementation of the MISO seasonal peak requirements.

You've heard a little bit I think about these, but basically, the MISO seasonal peak requirements are intended to require that utilities have enough capacity in all four (4) seasons.

The driver of this change in the MISO market rules has been an increased concern in recent years that only planning for the summer peak, which has typically been the annual system peak, exposes the grid to reliability concerns in other seasons.

Renewable resources provide different amounts of capacity in different seasons, and extreme weather events have caused reliability concerns outside of typical system peak periods.

And so the last element for the -- item for this slide is the -- these impacts on -- of these conditions on Manitoba Hydro. They're complex and potentially a little counterintuitive. So all else equal, if you are expecting a capacity shortfall, that should be a good thing for Manitoba Hydro. It gives them an opportunity to sell some of their summer surplus capacity into the market.

However, at the same time, the implementation of these summer -- of these seasonal resource -- sorry, seasonal capacity requirements and the utility planning decisions that are going to be made in the MISO region to comply with those requirements may result in a reduced market demand for summer capacity. And we'll talk a little bit more about that in a moment. Next slide, please.

So this last category of the three (3) is the demand changes. So the relevant MISO condition here is that electrification of heat and transportation is expected to change the load amounts and load patterns.

Electrification is being driven by a few items. Policy is promoting the elimination of emitting technologies. Developments in the technologies have improved the efficiency of heat pumps and the range capabilities of electric vehicles, so customer preferences are -- are a big component of this change. And then the final is economics: technology costs to clients, policy-driven incentives, and lower-cost energy are making electrification more appealing to -- to customers in the market.

And the impact of this change in demand that is relevant to Manitoba Hydro is that the change in demand patterns could potentially alter these seasonal peak patterns that until now have created a natural market for Manitoba Hydro's surplus summer capacity.

So the figure that we have here on the slide is from a 2020 -- 2021 MISO study called, "Electrification Insights". It compares the 2040 hourly system load forecast under a reference case and

a moderate electrification case. So it's basically trying to see, you know, how does these electrification trends -- how could they potentially impact the timing of -- of peak loads.

And what it's showing is that, based on this -- this -- their assumptions on the moderate electrification case, the system becomes winter peaking. This is the orange line here. It shows that the January peak is 202 gigawatts for MISO as a whole, and the July peak is a hundred and ninety-three (193).

And the key reason as to why these electrification scenarios drive this change in the season of the system peak is that -- the high load that electrified space heating will put on the system.

So this figure here is for the full system, but individual regions, especially in northern MISO, may be more impacted by these trends or may be impacted sooner.

The demand changes interact with the resource adequacy issues we discussed on the last slide, and so as an impact -- as an example of the impact that this will have on Manitoba Hydro, if the winter capacity requirement for a utility in northern MISO becomes its planning constraint, meaning that it is driving the need for that utility to build or

acquire new capacity, the utility could decide to build a new resource that will meet that winter -- winter need.

And if it does that, it will, generally speaking, having that capacity available in the summer. So then that utility no longer has as much of a summer capacity need, and that may reduce the demand for Manitoba Hydro's surplus summer capacity.

So one other last thing here that's a bit counterintuitive is that this scenario that I just described, that could occur even if the utility isn't winter peaking necessarily because the capacity need is driven by a few elements simultaneously.

It's driven by what the peak load is for that season, what the reserve margin is that MISO is requiring for that season, and then the accredited capacity value of all of that utility's resources during that season. So accredited capacity value changes between summer and winter for certain fuel types. You can go to the next slide.

So when we combine these -- these MISO market forces all together, it results in a long-term market outlook that is very uncertain for Manitoba Hydro sales. It's clear that the MISO market will continue to develop renewables.

The interconnection queue in MISO is -- is showing resource -- the development activity. MISO transmission planning processes are -- are, you know, accepting the -- and -- and planning for the future with a lot more renewables. Policies will continue to require renewables, and economic drivers will continue to support the development of renewables.

At the same time, with the addition of more -- more renewables and related economic pressures on conventional resources, it is setting up some resource adequacy challenges where the region is building a lot, but firm capacity could be in short supply.

The MISO seasonal capacity contruc -- construct could also create some new pressures for certain regions and certain utilities, and these requirements for this seasonal capacity construct rules, they're just getting fleshed out, and so it's a bit uncertain how active the regions will be in transacting this seasonal capacity.

The creation of the seasonal capacity rules evolving at the same time that there's a high likelihood of load pattern changes further complicates matters. And it could take some time before individual utilities know what their capacity needs

are in different seasons and what the market options are for -- for securing capacity.

In addition, the options for capacity alternatives are changing the landscape of potential competitors for Manitoba Hydro's capacity sales. There have been some rapid declines in costs for battery storage.

These are stalled a little bit by inflation pressures and supply chain pressures in the last couple of years, but this new Inflation Reduction Act that was passed last year has new incentives that are supporting new development of -- of battery storage.

There are other alternatives as well including virtual power plants which may become -- which are becoming increasingly viable and -- and a low-cost option for capacity. And some regions have preferences for local resources over imports, and so that's a factor that -- that could affect the demand for Manitoba Hydro exports.

Lastly, we have discussed some ways in which Manitoba Hydro's energy and capacity might be restricted due to this MISO market evolution. But some of these changes could just as easily create new or expanded opportunities for Manitoba Hydro products.

The MISO region's building all these new intermittent renewables that need firming. Manitoba Hydro is a clean, reliable, and dispatchable resources. And all of those characteristics are very important for a region that is trying to maintain a reliable grid with a lot of renewables online.

But so far, MISO market rules and products do not provide a significant compensation mechanism for those qualities.

Other regions in the US have been grappling with the same challenge and have been developing some new products, and MISO is talking about that. That's part of what they call their reliability imperative, where they're looking at, you know, what market changes are needed in order to accommodate this new grid, but there's a lot of uncertainty about when and if those will -- will develop.

So, given all this uncertainty, we essentially conclude that for the GRA, the conservative assumptions related to the opportunities for MISO sales are appropriate based on what Manitoba Hydro can know today about products and pricing. Next slide.

And so, we're turning to the first

three (3) questions that we started with. Some of these we'll discuss a little bit more in section 5 of the presentation, but -- but to connect these to the discussion that we just laid out, the first, Manitoba Hydro assumes export revenue from the MISO market is declining. Is that reasonable? Yes.

We expect that additional renewables will reduce energy market prices which will lower the energy market revenue. And that's even setting aside that Manitoba Hydro's expected load growth will reduce its potential supply of -- of export energy volumes.

Number 2, Manitoba Hydro does not assume that diversity arrangements for capacity will be renewed and does not assume new future capacity sales. Is that reasonable? Yes.

While it is certainly possible that the market for seasonal diversity arrangements will continue, the disruption that's being caused by the seasonal capacity rules, load changes, and capacity build out and retirement means that assuming a minimum level of capacity sales would be highly uncertain.

In addition, it's important to remember that the market for capacity sales is highly dependent on individual utility actions. Each potential counter party utility has their own strategic and financial

objectives and is -- is an independent market actor. Manitoba Hydro really needs a counter party to make those sales.

And third, should Manitoba Hydro be assuming a premium for its products in long-term -- in the long-term forecast? We agree that in -- in a world where there is a priority on a decarbonized grid, a source of clean firm supply, like Manitoba Hydro, should be valued highly, and we think that ultimately it will be valued highly.

But the mechanism that will be used to value those qualities, when that value will be reflected in the market and what the dollar value of that -- that value for those -- those qualities will be is too uncertain right now to include in the forecast for the purposes of the GRA.

And, in addition, we don't know what other competing resources that can also provide these qualities, whether those will be more attractive to the MISO market than Manitoba Hydro's export capacity. So, excluding a premium is a reasonable conservative assumption for the GRA.

And now I'll pass it on to Mr. Smith to talk about inflow forecasting and energy modelling.

THE CHAIRPERSON: Sorry. If I could

just ask a question.

MR. JEFFREY BOWER: Yeah. Sure.

THE CHAIRPERSON: So, hypothetically, we could see a situation where Manitoba Hydro's energy is -- is required because of the increased demand, but there actually is no long-term commitment, so it sort of fills in the gap.

And hypothetically, you have the Northern states start subsidizing wind and solar. Essentially, Manitoba Hydro's available for use for a certain period of time, and then -- then it's dropped or reduced.

Is -- is that a valid scenario?

MR. JEFFREY BOWER: Yeah. And -- and it could be that -- you know, I think it's probably likely that Manitoba Hydro will always be -- or not -- maybe not always, but will continue to be needed in certain hours for much longer than -- than a consistent -- you know, if -- if they're building as much wind and solar as they're -- they're planning, what you call shoulder periods in the spring and fall when load is a lot lower and you've got all of these resources online, there's probably going to be enough renewables down already in the MISO market that the need for Manitoba Hydro's surplus energy in those --

those periods will be very diminished.

There's also a likelihood that they -- that they will continue to have because they're intermittent resources -- until they're fully backed by storage or some other dispatchable resource, there will probably continue to be hours and -- and seasons where Manitoba Hydro's energy -- surplus energy would be more in demand, but contracting -- you know, someone signing a long-term contact for that now I think is -- is probably pretty uncertain.

THE CHAIRPERSON: Well, that just led me to my -- you gave me the -- the next question, which is, most of the utilities in Canada -- I mean, I look at BC Hydro, Manitoba Hydro, and Quebec Hydro, which are the major exporters.

Are -- are we looking at a completely new phase of contracts? Because I'm just wondering if long-term contracts are going to go out of style. Interestingly, in the eastern -- eastern part of the -- of the continent we have a different situation because Quebec Hydro bought a US utility so it can determine whether the US utility's going to be buying from the parent company or not. We don't have a situation.

So, is it the view that the -- the old

days of twenty (20) and fifty (50) year contracts are sort of gone and everybody's going to be making decisions on a much shorter period of time?

MR. JEFFREY BOWER: I -- I'll start and see if -- see if any of my colleagues have -- have something to add. But I think that that's certainly likely -- or -- or possible, especially for this transition period that we're in right now.

I think that there is just a lot of uncertainty around, you know, MISO is expecting this massive build-out. It's still pretty uncertain exactly how that works and whether it works on the schedule that they think it's -- it's going to work on.

You know, the US is having a lot of conversations about transmission development to try and bring in resources from other regions, and that's potentially subsidized by the government.

So, I think that we're just in this period right now where there's a lot of uncertainty. And I -- I would expect that a fifty (50) year contract, you know, or -- or even a twenty (20) year contract right now, would be risky for a utility not knowing exactly what their needs are -- are going to be for -- for that -- that period --

THE CHAIRPERSON: Thank you.

MR. JEFFREY BOWER: -- if you have a...

THE CHAIRPERSON: Sorry, I've got a -- I'm sorry. I -- I believe he's going to answer. Then you can ask the question --

MR. JOHN ATHAS: I was -- since you mentioned the east and Hydro Quebec, I was -- I was just going to add to that, that -- so -- and this is public. You can -- you can find places where -- where Quebec talks about this.

You know, their -- their historic approach to contracting with the US has been for base load all-hours energy, and inclusive of the last two (2) contracts that they've negotiated with -- with Massachusetts and New York. But they recognize that long-term their value is likely to change into more of a balancing product.

And so, the transmission lines that come with the -- the two (2) -- the two (2) most recent projects will -- the value of those will extend far beyond the twenty (20) year contracts for energy. And -- and you can see them talking about part of the long-term value there is they expect to be a battery. They talk about they're -- they're the largest battery

available to those markets.

And so, as offshore wind comes online and other intermittence, there will be times when those regions have too much energy, and they can pass it on to Quebec. And then there are times when the mark -- markets won't have enough energy. And then Quebec will be able to -- to dispatch down.

Now, Quebec has long multi-year storage. They're not -- you know, I don't -- I'm not drawing a direct parallel to Manitoba Hydro's situation.

But the point is, is that, even in cases like that where they are continuing to find contracts, they are building and strategizing towards a future in which they will be interacting very differently with the same markets that they've done historically.

MS. CAROL BELLRINGER: Sorry, it was too close to what you were just talking about to weight. So, it's -- I'm going to ask you a relatively vague question and hope you can give me as a precise an answer as possible.

And we -- I'm going to not repeat all of the factors leading into it, but -- but we've heard from you and others it's too uncertain right now.

When won't it be so uncertain?

MR. JEFFREY BOWER: That's -- that's a good question. I think the -- the transition that the MISO market and other markets are underway right now -- - that have underway right now -- will extend for a long time.

So I think that we may not know for -- for a while exactly what the long-term, you know, opportunities are for -- for those types of sales.

We will start to understand things a bit more as, for example, you know, the MISO seasonal capacity construct rules start getting developed.

Once we've been through a couple of periods of compliance with those new rules, I think you'll understand a little bit -- we'll understand a little bit better how utilities are complying with the seasonal rules. That may add some clarity about whether there's short-term capacity opportunities for -- for Manitoba. Potentially, long-term as well. But that -- that really depends, as we said, on -- on utility decisions.

So I think those conversations between potential counter parties will help to -- to clarify what the long-term prospects are.

And then, I -- I would say that, you

know, while there's a lot of uncertainty, there are ways to evaluate the, you know, different scenarios and different futures.

It may not be the right thing for -- to -- to conduct for a GRA and that wasn't really conducted here, you know, testing multiple different market structures or -- or, you know, different configurations of -- of how the market develops over, you know, the next fifteen (15) years. That wasn't conducted for the GRA, but that may be something that is -- is worth -- you know, as part of an IRP or -- or another type of analysis. Hopefully that helped.

BOARD MEMBER BASS: Mr. Bower, I'd just like to check in to make sure I'm understanding this. So are -- are we just talking about -- and I don't know what the proper term might be, but perhaps spot sales into the MISO market.

Because during the GRA period, we still have the existing counter-party contracts and none of them expired during this GRA period. So we're still going to -- Hydro would still have the revenue coming from that, right?

MR. JEFFREY BOWER: Yes.

BOARD MEMBER BASS: So if that is all correct, what's the order of magnitude -- if -- if you

know -- of the annual revenue that Manitoba Hydro would earn from those, sort of, spot sales?

MR. JEFFREY BOWER: The --

MR. BOB PETERS: Mr. Chair, I appreciate Board Member Bass's question and I'm just looking to my friend Ms. Fernandes.

And what we are -- we are on the public record, Mr. Bower, as you know. And we want to make sure that if you are providing information that goes near that line, that we be cautious.

I will remind the parties that Manitoba Hydro has redacted, in its materials, the split between opportunity firm exports.

So the Board has access to that in confidence. But Mr. Bass's question is a -- it's an important question. I will just give my friend Ms. Fernandes an opportunity to indicate whether she is comfortable with that being pursued on the public record.

MS. ODETTE FERNANDES: Manitoba Hydro would consider that information commercially sensitive information. But I would recommend that maybe that question be responded to tomorrow during the CSI session.

THE CHAIRPERSON: Sure.

BOARD MEMBER BASS: So could we leave the -- the last part about the -- the number for the CSI session, but just confirm that check-in part that I asked in the beginning?

MR. JEFFREY BOWER: Yes, I think we can confirm the check-in. The -- the initial clarification that the contracts are existing. And so, the conversation about MISO market opportunities is basically for either opportunity sales or for new contracts that are not already, you know, done and assumed.

I think a lot of the factors that we're talking about would effect whether a utility would be interested in signing a new long-term contract. But it doesn't affect the existing contracts.

BOARD MEMBER BASS: Okay. Thank you.

MR. JOHN ATHAS: If I may, I'd like to just come back to one of the Chair's points and very quickly.

The -- the idea that -- you know, the question was, Is -- are long-term contracts just going out of style?

And, like, one of the things that's -- that's a condition now is that we've seen when -- a

lot of the economics of the renewables in the US are predicated on incentives from legislation. And I think there is a -- a rush to get those resources done because of the -- the economics can change with the -- with a law as opposed to a technology evolution and the like.

And it's -- and it's what we've seen in other places and other functionality, that the -- that that's where the rush is to get those -- to get the, you know, solar and -- and the wind facilities built on a big scale while the incentives are there.

THE CHAIRPERSON: I would just -- I would just raise, Mr. Athas -- and perhaps I'm wrong -- it's the economics and the politics of it.

Because the -- the concern I have is we're on the other side of the border. And when energy is required, we have North American policies. And when the United States decides it wants to create laws, we may -- may be viewed as a foreign provider, which is good to provide backup.

So, you know, I'll just sort of throw that out for -- for you to consider there. The -- if the United States starts introducing laws that provide subsidies for American companies to -- to produce energy through solar and turbines -- wind in the

United States, then it -- we're looking at a different -- we're looking at a different playing field, so.

MR. JOHN ATHAS: That's a very astute and accurate assessment of -- of conditions that can -- that can affect the -- the -- especially the near term of the next -- next five (5) years.

THE CHAIRPERSON: You know, when I -- when I first got involved here, I went through the history. And the history was twenty (20) year planning cycles. And as I understood from the evidence, Manitoba Hydro was told by companies in the United States, Produce as much power as you can, and we'll buy it all.

You know, I -- I understand, you know, we're into a major energy transition. So you know, we welcome your -- your -- your advice in this area.

CONTINUED BY MR. BILL HAIGHT:

MR. DOUGLAS SMITH: Shall we -- shall we move on then? So again, this is -- I'm Doug Smith. I'm happy to be back in Winnipeg. Back since the 2017/18 GRA. And it is -- it is nice to actually see my -- closer -- all right. Okay. Sorry about that. Oh, this -- there we go. Okay. Hopefully that's better.

So it is -- it is nice to be back. It's nice to see a little green. I've told a few of you, this is the first time I haven't seen snow on the ground while coming out to visit you all, so.

So I'm going to talk about the -- the inflow forecasting and energy modelling components of our scope. And you can see on the slide here, it -- it impacts two -- two (2) scope items that we had. And I want to -- to, sort of, set some context here.

This is about the process for producing an energy forecast in the end. That's -- that's the final consumption here, right? We go -- we -- we -- Manitoba Hydro has -- has water flows throughout their system and they convert that into energy, and that energy is used either domestically or -- or for export. And the forecast is about energy, but to get there, they have to first forecast their -- their inflows and reservoir levels out over time.

This is a bit of a deeper dive than we -- than we did back in 2017/18 into the mechanics of how their -- their forecast comes together.

And so we started, in discussing -- in talking to Manitoba Hydro and reviewing the record, to understand the watershed and the -- the system that -- that Manitoba Hydro is responsible for -- for

managing.

And I think, in a word, we should all think of it as 'complex'. It is -- it is a very large, one of the largest watersheds in -- in North America. It -- it extends far beyond Manitoba borders. So, you do not have control over everything that occurs within the watershed that -- that might very well impact the availability of water and the production of energy.

And there are a number of factors that are in play that require Manitoba Hydro to adapt and improve their -- their forecasting methodologies. Some of those that Manitoba has spent a lot of time on the record discussing are some of the technology and data improvements that are available to them, as well as the reason we're talking about all this change in the industry. Climate change is affecting, of course, our day-to-day weather and our expectations of -- of weather out over time. Next slide.

Though as -- as we understand it, there are three (3) fundamental forces that -- that Manitoba Hydro is -- is -- they're driving Manitoba Hydro to take their process -- to undertake their -- their process improvement for their short term hydrological forecasting.

And the first is a growing understanding, in the industry and amongst experts, that as climate change continues would -- to advance, older records, older flow records, older information may not be as predictive as a newer record set.

So, that -- that causes -- has caused Manitoba Hydro to re-look at how they forecast, especially in the near term.

The -- the second force is that there's simply better data available today. There's far more granularity in the hydrological record in recent years and that's important because if we go back to the idea that this is an incredibly complex watershed, where how in-flows and how reservoirs are being impacted by weather -- by climate, matters not just in the -- in the kind of gross -- at the gross level, but -- but in individual components of their watershed. And so the more refined into the data, the more refined the forecast can be.

And then the final -- the final influence right now is the -- the -- there -- the simple evolution of technology. The -- the -- the access to better data. The ability to use new forecasting tools and techniques and -- and the ability to draw new insights that were not possible

not too many years ago.

So, one of the approaches we took, and I -- I -- I should lead with I -- I don't think there's any confusion based on our -- our introduction of our CV's. We're not hydrological experts, that -- that's not what our scope was, that's not what our -- our mandate was here.

But we did review their documentation. We did some independent assessment of the tools that they chose, the approaches that they took and those tools have a strong reputation in the industry. They're used widely around the world. These are not either home grown or sort of, you know, mom-and-pop institutions. They are large frequently, multi-national often driven by -- by research institutions or universities and -- and -- and collectively they represent a strong platform for the -- the updates and methodologies that they're going through now and the -- and the -- the planned and -- and potential upgrades to come.

And without those updates and tools and technologies, they would not -- Manitoba Hydro would not be able to take advantage of that more granular data. They would not be able to reflect all that new information in their modeling and their forecasts.

They -- they -- they needed to update in order to be able to take advantage of that.

In addition, they're implementing this -- this process in phases. And -- and I think that's an important factor in all of this and -- and we'll probably talk more about that when we get to the -- the drought section.

But implementing in phases is -- is a sensible approach to -- to large technology change. They're -- they're not trying to bite more than they can. They -- they focused on a first phase, a set of -- of -- of what they call nodes or locations that they would update to the new -- new technology and the new data.

Doing it in phases does reduce some risk. It allows them to focus on -- on key areas. The areas they chose and -- and -- and this is on their record as well, but it -- it reflects a larger percentage of their energy than it does of their hydrology.

And -- and that reflects a -- a -- a reasonable and rational approach to implementing this. They -- they recognized that certain parts of their system are more influential over the results, than others, and they focused their development on those

that would have highest impact. Next slide.

So this is -- probably have been -- been seen quite a bit and -- and -- and maybe even discussed some in -- prior in the hearing. And I -- we can go into this as -- in as much detail as is necessary. I -- I -- I'm not sure it's -- it -- it needs a lot, but -- but I'm going to take a first pass at this and then if there are questions, either now or -- or during cross, we're happy to talk more about.

This -- this slide, this -- this graph, which is produced, I -- I -- by Hydro, I assume by -- by one of their hydrological engineers who loves their -- their data, this represents a single nodes -- the approach they take to forecasting a single node.

So, this is repeated over and over again, across their watershed. And it reflects the fact that over -- over different time periods, they're able to use different forecasting techniques to approximate the uncertainty in future hydrological conditions.

So, in the nearest term, they have the most certainty in the first weeks or so, roughly. And then they move to -- to their -- what they're calling their -- their physically based inflow forecasting, which, they have data for thirty (30) years for some

of the nodes.

And for the remaining nodes and for the additional ten (10) years, to get to the forty (40) year set that -- that is being discussed and was part of our scope, they used statistical forecasting.

And so if they have the physical base for a node, they used that. If they don't, they have the -- the statistical as a backup to collect the full forty (40) year flow record. And they do that out for the next -- for a total of roughly ninety (90) days. It depends on the season how far out they believe this -- this new -- this new methodology is predictive.

And then from there, then they blend into back to just a historical record. The -- the -- the traditional way that -- that you are probably used to seeing which is -- we just assume that whichever draw, whichever flow record we're talking about, it follows that historical record. And that is then done through the end of the budget year one (1).

So, that is what this is attempting to show here, is -- is that the change is in the -- is -- is from the date of -- of -- of the production of the forecast through the end of budget year one (1) and it's intended to capture the physical -- the -- the -- the predictive value of the short term physical

conditions, combined with blending to the historical record for the forty (40) years of data for which they have the additional granularity to be able to model the system in the more complex way that -- that -- that gives them better insight into their energy forecasting.

And then, from year two (2) on, from -- from budget year two (2) on, they're still using the -- the full hundred (100), whatever hundred and ten (110) or hundred (100)-- hundred (100) plus that -- that they've used historically.

But that it is -- that's what this is attempting to show and that's sort of a just a -- a sort of a brief walk-through of what has changed and what's -- what's involved in the process, as it was at the time of the forecasting for the GRA.

This slide is sort of another look at the same, the same information. So, I'll try to -- three dimensions here, so we're starting to get a -- a little complex here, but I'll try to make sense of this as easily as I can.

The -- the 'X' axis going up, that's the percent of nodes that they are modelling. So, in the end, they have to model all the nodes necessary for their hydrological forecasting.

The 'Y' axis across, those are the flow years. That's the -- that's the -- each -- each flow year is a -- is a record of history that they use for the purpose of -- of creating the ensemble, the -- the -- the range of uncertainty, and the -- and the 'Z' axis is the forecasting time period.

So, what this is showing is that, for the -- for the previous roughly 30 years, the last 30 years, the blue, that's the -- the physically based, so, in that case, they are using physical conditions, at the nodes for which that applies, to shape their forecast, using the flow year -- using each of those 30 flow years.

They then have to, for the remaining, and that's, I think, subject to check, 35 percent of the -- something like that -- of the nodes, a third, roughly, then, for the remaining nodes, they have to use the statistical methodology, because they don't have -- they had not implemented physically based in-flow forecasting, for those remaining nodes.

They have additional granular data from their 10 years of records. So, to get to the full 40, they, then, do statistical modelling; that's the last brown box to the left. So, for those -- those older 10 years of records, they're doing statistical

forecasting all along.

So, that's the data that they're blending together in that -- in that short-term period and, then, you can see in the grey, along the bottom, I know it's a -- it's an odd thing to try to follow, but, eventually, you go to the yellow, which is a blend and, then, the grey, which is just using the historical record, up through the end of -- of budget year 1.

That 40 years is what they have for that more granular data. They tested those 40 years and found that it represented, in their words, 95 percent of full hydrological variability, meaning that -- that, using those 40 years produced 95 percent of the 110 years historical range of uncertainty in flow conditions.

Well, maybe I'll -- I'll stop there, before I -- before I lose the rest of you.

I think the -- the -- the real take-away is it is a reasonable approach to transitioning to a new methodology that gives them much more granularity and ability to understand how localized flow conditions lead to -- lead to energy production, while still providing for a method that captures as much of the variability and uncertainty, because you

can't -- no matter what you think you know today, you don't really know what -- what the weather's going to be like next year or next -- next week, next month, you know, there's -- there's -- so they needed to have that -- that flexibility, that uncertainty, but they needed to modernize, to better capture the available data, and -- and we believe that this was a reasonable --

VICE CHAIR KAPITANY: Can I just ask you a question?

MR. DOUGLAS SMITH: Of course.

VICE CHAIR KAPITANY: You -- you had me Mr. Smith, all the way to "reasonable approach to transitioning to a new system". I thought you were describing what the new system is.

MR. DOUGLAS SMITH: That was probably poor wording on my choice, lumping two (2) things together. It is the new system. They are transitioning to it over the phases and over an approach and I don't think that we should consider -- so I -- so, this is the -- the system, using physically-based, using the more granular data. It also gives them the ability to -- some of those nodes, that are those granular nodes, allow them to model inflows from outside Manitoba, which is another piece

that -- that adds value to this.

So, it is -- it is the system and it is reasonable. It is also reasonable to have phased this in so that they reduce the risk of -- of some kind of catastrophic failure in the implementation or -- or just over taxing resources for implementing it.

VICE CHAIR KAPITANY: So, when you say 'phasing it in', you had talked before about how they take a node and then they repeat it over nodes and they use their most energy intense watershed -- part of the watershed to -- to start.

And so that's what you're talking about here, phasing it in, using the most energy intensive and then building on that as they go along?

MR. DOUGLAS SMITH: Correct. So, the -- the first 35 percent of nodes that they did captured roughly 50 percent of the water production, so -- so it was higher intensity, better -- more predictive of -- of energy than the remaining 65 percent.

And so, there's -- there were at least two (2) more phases. I'm not sure exactly where they are in that process today, but --

VICE CHAIR KAPITANY: Got it.

MR. DOUGLAS SMITH: -- that's the --

VICE CHAIR KAPITANY: Thanks. That's what I thought. I --

MR. DOUGLAS SMITH: Yeah.

VICE CHAIR KAPITANY: -- just wanted to confirm.

THE CHAIRPERSON: Sorry, Mr. Smith, can I just ask, what are other utilities doing? Are they -- if you go down to MISO, are other utilities using these kinds of new approaches as well?

Is this -- is this -- in your mind, is this a best practice that Manitoba Hydro is -- is applying, or is it just simply something, you know, each -- each of the utilities do it differently?

MR. DOUGLAS SMITH: So, let me -- let me take that in pieces. It is -- what they are doing is -- is definitely used broadly by utilities north and south of the border and in other parts of the world.

Part of -- part of the tools that they chose -- so -- so, the tools they chose are sort of -- it's a framework that allows integration of various data and -- and modelling components.

So, the -- the combination that they've selected and how they apply it exactly, I have no -- no knowledge of whether that's exactly how others are

doing it, but as a framework and as an approach, it is -- it is definitely well -- well used and standard.

(BRIEF PAUSE)

MR. DOUGLAS SMITH: Okay. Next slide, please. So -- so that was -- that was hydrology, which -- which is an interesting topic and an important topic in and of itself. But if that's where -- if that's where it ended, there'd be nothing to talk about here, because nobody turns their lights on with hydrology, with -- with flows of water, and -- and you're not selling flows of water down in -- into MISO or anywhere else.

It has to -- it was to be converted into energy. And so, the inflow process I just described, which is in and of itself, a complex modelling exercise is that an input into the energy modelling tools that they use to -- to produce -- to produce the amount of -- of energy that we'll later talk about, is -- is available for domestic use or -- or sale.

So, the energy modelling process is -- is similar to the process from 2017/2018 if you step up at a high enough level. There is flow forecasting

that flows into -- into models. The models are a short-term model and a long-term model.

They adjust for constraints, transmission constraints and -- and other. They -- they include uses of and markets for the energy and they produce a -- an energy forecast across all flow conditions entered into those models.

The modelling is a constrained economic optimization problem. So -- so what that means is the models are intended to maximize the value of water given whatever set of constraints are input into the model, and -- and that includes optimization of the storage of water. So it's not just the -- the sale or purchase of water, it's also the storage of water.

So in that sense, it's the same general process that's been used before. The differences are -- are mostly around tool changes and the capabilities that those tools bring.

So the short term, still HERMES, same tool that's been used in the past. HERMES has now been extended to -- to use for the -- the first year of the long term, the year 2 forecasting, which is the hundred (100) plus -- the first year of the hundred (100) plus record.

They now use HERMES for that. They

used to use SPLASH back when I did this last, but it's the same -- it's the same process, and it's a tool that's been used before. It's just now being used for that extra year.

Long term, which now starts in year 3, has seen a replacement from SPLASH to GSPRO (phonetic). And GSPRO is a -- is a tool that they license and that they -- they have implemented for -- for this optimization problem from year 3 until end of study.

And so when we were evaluating what has changed and -- and driving towards an opinion on that, which is part of our scope, the real focus clearly is on the replacement of SPLASH with GSPRO.

So I want to spend a little time here. We have more information in the report, and I won't necessarily go through every word on here, but I think it's important to start with the idea that SPLASH, which you're all I'm sure very familiar with, was internally developed.

It's been around for a very long time. It was very useful in its day. It -- it served them well for a long time. But as technology has evolved, just what the computers run on, as well as sort of how they -- they function, it was reaching end of life, or

at least end of useful life as -- as built, as constructed.

So there was simply the fact that they were going to need significant investment if they were going to continue to use SPLASH. That alone, I don't know whether that would have made a choice for them one way or the other. It was certainly a significant factor.

But when you add in that there were functionality challenges with SPLASH, having been developed so many years in the past, that if they were going to have to update, they would have needed to update these -- these functionalities as well to -- to create an equivalent opportunity to -- to licensing something else like GSPRO.

SPLASH does not model in and of itself solar. It only has two (2) -- it only has two (2) blocks of hours in a month, on peak and off peak, so it doesn't have the ability -- any tool like this has to optimize across a block at a time.

And if you only have on peak and off peak, you don't have a very refined look at loads or prices or -- or supply availability in a given month. You've -- you've kind of got a sledgehammer. You can pick it off in pieces.

And I'm not going to -- I'm not going to go back -- take us too back -- far back in -- in 2017/'18, but they did do -- they made efforts to work around that problem, and they -- and they had techniques and tools to allow them to -- to not make that as limiting as it could have been, but it was still a limiting factor.

Contrast that with their chosen selection of GSPRO. It's modern. It doesn't have any immediate useful life challenges around technology. It is a commercial product. It did not require them to invest the time, people power, or absorb the risk of developing new software or updating old software.

And it -- by being a licensed product, they get the benefit of all users. I'll just -- you know, as a -- as a quick anecdote, we use a different tool for our purposes.

The tool we use has been updated several times over the years because we found problems with it. We've found things that it didn't do quite as well as it could have, and our vendor has taken our feedback, taken that away, and issued updates.

Well, everybody else that uses that same tool gets the benefit of what we found, and we get the benefits of anybody else finding things and

updating it. So it's -- it's a large community and a -- and a growing current modern tool, and that's reflected in some of the -- the functional advantages that it has.

I didn't mention the -- the first one, but GSPRO does not have perfect knowledge of the future. So you put in a full year's worth of data or twenty (20) years' worth of data at a time, an older optimization tool knows exactly -- like SPLASH does -- knows exactly what's coming, what the loads are, what generation's around, what prices are going to be.

And unless you tell the software not to -- not to optimize off of that, the software will optimize with perfect foresight. That's not reality. That's not the world that any of us live in. It's not a best practice current modelling technique for optimization.

So GSPRO, while you put in all the information, it has imperfect knowledge. It reflects uncertainty as it's optimizing, so it doesn't know exactly how much water it can sell to maintain a reliable amount of -- of reserves. It has to account for uncertainty.

And then it -- it has much more granularity around the blocks of time in -- in a month

so that you can model super peaks, you can model periods in which markets are doing something different than just on peak or off peak. You can reflect other -- other limitations that happen within a month.

And finally, it -- it has a -- a much more granular topology so that it captures interprovincial transmission constraints and -- and other limitations that -- that affect dispatch. It's on a single bus to -- to use our terminology. It -- it reflects the -- the general topology of the Manitoba Hydro system.

So, with all of that, I come back to -- to sort of the -- the findings here. And I think the bottom line is, in both their inflow forecasting and their energy modelling, they have made significant upgrades to their methodologies, to their tools, and that those -- those data tools and techniques are appropriate and lead to a -- a better, more robust and nuanced forecasting system.

And then with respect to the forty (40) years, keeping in mind that forty (40) is required for all of that to happen, we found that the justification for the change is satisfactory. It's appropriate to move to that. It is, from our understanding, something that Manitoba Hydro plans to continue to

assess over time as to whether forty (40) continues to be the right number, or whether, as new data occurs, whether there's opportunity for continued growth.

This is not a static plan or a new methodology. It's -- it's a starting point that allows them to continue to grow and expand, and that that is an appropriate platform for -- for forecasting for a utility like -- like Manitoba Hydro.

THE CHAIRPERSON: Thank you, Mr. Smith. You know, I think this would be an appropriate time for the morning break, so we're going to break until 10:45. Thank you.

--- Upon recessing at 10:29 a.m.

--- Upon resuming at 10:47 a.m.

THE CHAIRPERSON: We'd like you to continue just -- I think the parties know this. We have a hard stop this morning of 11:30 because Ms. Bellringer has to go give a speech.

Well, I thought, if I'm going to get this...

(BRIEF PAUSE)

THE CHAIRPERSON: Anyways. So, we don't want to -- I don't want to force you, you know, be -- we'd like to get through this, but if not, we'll -- you know, we'll continue this afternoon, but we do have a hard stop of 11:30.

MR. BILL HAIGHT: We've had a chat at the break, Mr. Chair, about timing, yeah.

THE CHAIRPERSON: Okay. Thank you.

(BRIEF PAUSE)

CONTINUED BY MR. BILL HAIGHT:

MR. JEFFREY BOWER: Okay. So, again, Jeff Bower here. And I'll be talking through section 5 which covers several related topics related to the net extra provincial revenue forecast, the expert price forecast, the export contract assumptions, the expert volume forecast, and then the combination of these elements into the export revenue forecast.

And being mindful of time, I -- I will move pretty quickly, but -- but feel free to interrupt and ask questions as -- as needed.

So, the first element of these, the export price forecast, the energy price forecast is obviously a very key element of the extra provincial

revenue forecast as it -- it determines the price of -- - of opportunity sales.

Our scope of work, item number 1 here, is -- is long, but -- but the key is -- the essential task was for us to review the MISO price forecasts, including high and low sensitivities.

And this scope item acknowledged the fact that we may not get access to all of the confidential consultant forecasts that Manitoba Hydro purchases. And indeed, we did not get access to the full forecast, but we did get access to enough information to form an opinion about the reasonableness of the forecasts.

So, Manitoba uses two (2) forecasts. There's a short-term and a -- and a long-term forecast. The -- again, the -- the details of a lot of these are -- are redacted and confidential, so I'll -- I'm just going to move through the conclusions that we have in the public version of the report here.

There are two (2) sources that Manitoba Hydro uses to -- to develop the short-term forecast to provide an on and off-peak for the Minnesota pricing location.

And we've reviewed the forecast and we've reviewed their methodology that they use to

combine the two (2) forecasts that they -- that they acquire into their short-term forecast. And we've determined and concluded that it provides a reasonable base low and -- and high forecast for use in the GRA analysis.

We also find that a change since the last GRA is to use two (2) sources for the short-term forecast rather than one (1). We think that that is an improvement, particularly given some of the uncertainties that we've -- we've discussed, to have multiple views of the -- of the MISO market.

With a long-term forecast, Manitoba Hydro purchases five (5) independent third-party forecasts. It averages them together to create this consensus-based forecast. Again, they're provided as -- as monthly prices.

And we've reviewed both the process of developing the consensus forecast from the input -- five (5) input forecasts, as well as their method of developing the high and low forecast from those consensus forecasts. And we have, essentially, concluded that we believe that it provides a reasonable based low and high forecast range to be used for analysis in the GRA.

Manitoba Hydro also acquires capacity

priced forecast from the same five (5) vendors. We create a consensus capacity price by averaging these in a very similar way as they do for the energy price forecast.

We reviewed the range of capacity prices provided by the consultants and -- and the consensus average approach. And we find that this is a reasonable approach for developing a capacity priced forecast, although we note that this forecast is not actually used in the GRA because Manitoba Hydro does not assume that it will be making any capacity sales at this market based capacity price rather than the contracted prices.

The next scope of work item is related to export contracts. We reviewed for -- for this scope of work item, we reviewed their forecasted revenues from existing export contracts to determine if the revenue forecasts appropriate treated them and -- and was underpinned by these contracts.

Manitoba Hydro has fifteen (15) export contracts with eight (8) different counter parties at this time.

We reviewed the forecasts provided in the GRA, as well as the work papers that support that developed by Manitoba Hydro. And then we conducted an

independent review reviewing each of the contracts to basically line up the -- the contract terms with the revenue forecast that Manitoba Hydro developed, and then confirmed that it was reflected in the GRA work papers and the MFR-42 revenue forecast.

(BRIEF PAUSE)

MR. JEFFREY BOWER: And there's -- yeah, there's two (2) slides in a row that accidentally got duplicated there.

So, the next -- make sure I've got my spot. The next item relates to the volume of energy and capacity assumed for export. So, the amount of energy available for export is a product of the energy modelling processes that were discussed by Mr. Smith. These are -- are developed in the HERMES and GSPRO models.

And the export energy volume is the energy supply produced by the flow cases, so how much energy can they produced from the water in the flow cases and take up the domestic load and firm sales and that's the amount of -- that's the energy volume that can be exported to the MISO market at the MISO market export prices.

So, as Mr. Smith discussed, we reviewed that methodology, the tools that they use, and we concluded that it produces a reasonable set of outputs to be used in the GRA for energy volume.

And then for capacity volume it's a little different. It's not exactly the product of a -- - of a model in the same way. Instead, it's based on a standard capacity balance analysis, which is essentially how much capacity does Manitoba Hydro have and what are its domestic load and firm sales obligations.

The figure on this slide is -- is -- comes from our report, and it shows the summer capacity balance over time. Summer capacity grows as long-term contracts expire, specifically in 2024/'25 and 2029/2030. So, that's the dark blue section of this that -- that decreases over time.

The light blue is the surplus summer capacity available, and that grows because it's basically just filling in whatever -- whatever's left from how much capacity they -- they have to what their obligations are.

So, as we discussed a lot in the MISO section, we -- we agree with their approach for the GRA purposes of assuming no new capacity sales, and so

that -- that surplus is -- is a surplus at this time.

But as we discussed in our report, we do recommend that they continue to seek to monetize this growing surplus summer capacity.

The last item pulls these prior elements together into the export revenue forecast used in the GRA.

And so, on the export revenue, we concluded essentially that the -- as I discussed, the forecasted contract revenue is reasonable, the near-term market revenue values come -- that come out of the HERMES model are reasonable, the long-term market revenue values that are outputs of the GSPRO model are reasonable.

And so, accepting the export price forecast which we reviewed and determined as reasonable, we confirm that this methodology and -- and the revenues produced by this method are consistent and reasonable.

There's another item of the -- of the scope item, which was to review the fuel and -- and power purchases. A component of this is -- is redacted as CSI, but -- but, essentially, the purchased energy is the largest component of this -- this element of -- of the forecast.

And we reviewed their -- their methods and their work papers and concluded that it's consistent and reasonable.

So, now I'll pass it on to Mr. Athas unless there are any questions.

THE CHAIRPERSON: Sorry, Mr. Sy has a question.

BOARD MEMBER SY: Thank you. Thank you very much. I'm new in this role, so during my first two (2) or three (3) weeks I did quite of reading, and I stumbled on your -- one (1) of your reports where you gave an assessment of Manitoba modelling.

And you did mention a multi (INDISCERNIBLE) issue that was found in the modelling. Is that -- is that true?

MR. JEFFERY BOWER: Sorry, repeat that.

BOARD MEMBER SY: When you were assessing the models that Manitoba Hydro used for predicting its revenues, so forecasting model, economic forecasting model, you did mention a multi (INDISCERNIBLE) issue.

Is that -- is that the case or not?

MR. JEFFERY BOWER: I'm not sure if

you have a -- is there a section of the report that you're -- or a page that you're referencing?

BOARD MEMBER SY: No. It was just a pile of documents that I was reading. And it did mention, like I said, you know, you -- you think the model is -- is good in predicting, you know, demand forecast, but you highlighted a limitation of the model. And you -- it was Daymark made reference that it is a multi (INDISCERNIBLE) issue.

And I just want to know if that was in the case in those model that you guys reviewed or not. If not --

MR. JEFFERY BOWER: Maybe -- maybe we can take that back and take a look through the report and -- and -- no, no, not this report. I'm sorry. I'm sorry.

BOARD MEMBER SY: No, it wasn't this report. It was just a report that was made where you guys were looking at the different -- the forecasting model that Manitoba Hydro used, and it was mentioned, that.

I -- I could maybe go back and check and see where that was, but it wasn't part of this --

MR. JEFFERY BOWER: This was perhaps from the prior...

THE CHAIRPERSON: Was it the 18 --

MR. BOB PETERS: Mr. Chair, we'll -- we'll find that reference from -- from Board Member Sy, and we will provide it to Mr. Haight.

THE CHAIRPERSON: Okay. Yeah, we --

MR. BOB PETERS: I'm not -- I do recall -- only because it's a word I don't understand. I do recall it. And we will -- we will bring it to Mr. Haight's attention. He can address it to -- to the Board Member Sy.

THE CHAIRPERSON: Okay. Perfect. Thanks.

MR. BOB PETERS: Yeah. Thank you.

MR. JEFFERY BOWER: Yeah, we would be happy to take a look at that.

MR. JOHN ATHAS: Okay, changing a little bit to quickly go through the scope of work at item 7 because it's pretty -- fairly straightforward. The -- Hydro had been asked by the PUB to make an estimate of the revenues that -- that Hydro realizes from the ability to export energy produced by the Keeyask generating station.

And -- and Daymark was given -- its primary task was to test the reasonableness of Hydro's response and, if necessary, provide an independent

assessment.

So, the -- the key aspect of -- if we can move on a slide. I'm sorry.

The key -- key aspect here is that it's -- to understand is that it's not a simple accounting exercise to take the -- some of the revenues and apply it to Keeyask as the system is dispatched and optimized as a whole. And you -- and so much changes by the presence of one resource or another, and especially a resource the size of -- of Keeyask.

So the -- so in trying to figure out exactly what revenue is associated with -- with the presence of Keeyask, you know, the -- you'd have to make some very, kind of heroic presumptions on changes in sales and purchase of energy of MISO participants. Even changes in investments on the system transmission configurations, as we know that that was part of the NFAT and the like. And the timing of each generation facility being utilized on the hydro system.

So the Hydro sought to bracket the -- the potential value of the revenue by looking at three (3) -- three (3) scenarios.

Scenario 1 is where they essentially used non-firm energy prices throughout the horizon to value Keeyask energy. So it was not assumed to be

serving any contracts and getting any extra -- any extra value from that.

Scenario 2 was there was a contract with Minnesota Power that was very much associated with -- with Keeyask and the NFAT proceeding. And that -- that was directly attributed to Keeyask in scenario 2. Plus the amount of Keeyask received -- a kind of prorated share of the remaining contracts in -- in scenario 2.

And in scenario 3, rather than just that -- that direct kind of assignment of the Minnesota Power contract, Keeyask was just energy -- was associated as a revenue from -- a prorated share of all export sales by proportion and amount of generation.

So the -- the key is here is that that provided a -- that provided a good boundary for what types of revenue of the -- what levels of revenue are associated with -- with Keeyask as it -- when you look at it as an export generating facility -- export energy generating.

But the -- but the -- so I think it provides, in order of magnitude, there wasn't a specific analysis that this was feeding into with the request and stuff. So it's hard to gauge whether

there -- whether it's got some of the proper nuances.

The -- the things that are -- that are reasonable -- that are -- would show up in a more rigorous analysis are that you would start thinking about the average price energy from the time -- the amount of -- associated with the amount of generation by Keeyask on a day-by-day basis.

You might start changing -- trying to account for changes in contracts.

You'd look for the -- potentially the impact on MISO prices that would happen with and without Keeyask.

And the -- and the other thing that's there is that the -- the basic premise behind the NFAT -- the planning exercise that went into the NFAT was that Keeyask would -- is being -- was being added to eventually serve the retail load in Manitoba on -- when its year of need arrives. And its -- and provide the energy -- dependable energy with that.

Now, naturally, with the characteristic of -- of the large hydro of the whole facility there, there is definitively off-system sales associated with all the resources that are used for domestic -- to provide domestic energy and capacity.

So that creates a little bit of a --

you know, a complication so -- it's not -- not a very simplified analysis. And in some ways, one would have to get very -- kind of come up with different revenues associated, depending on what the purpose of the number that you're going to -- to use going forward.

But we found that their -- that their simplified method showed a reasonable range for -- for people to think about the amount of revenue that -- that is an export -- that is considered -- that is happening because of Keeyask presence. And -- and thus, we didn't need to do our own independent assessment of that.

So I'll turn it over to Doug, Mr. Smith.

MR. DOUGLAS SMITH: I'm okay with Doug. Thank you.

So I think we're doing okay on time. I know this is an area of high interest, so I'll try not to move through it too quickly, but I'll try to keep us moving as well.

There were three (3) scope items related to drought. And the language of those are on this and the subsequent slide. I'm not going to read through it, but I think that the key is -- is that we were being asked to review whether the -- the use of -

- of tools and procedures and policies, especially as they have changed, how that impacted Manitoba Hydro's ability to -- to reliably operate its system while balancing its -- its mandate to economically dispatch.

To ask if there were any policies or procedures that we considered right for -- for enhancement.

And then, specifically, to -- to focus on -- on the change to the forty (40) year record and the hedging activity that occurred during -- during the drought.

So I thought it would be -- be helpful to start by just providing a little context here. 'Drought' is a -- is a word that's convenient. It's needed to have a -- have a conversation about complex hydrological activity. But it is a complicated story.

And it's especially complicated when you're talking about as large a watershed as you are for Manitoba.

It -- the watershed itself can, and frequently does, experience drought, flood, normal conditions sort of throughout its watershed. It's not just in drought or not in drought.

And to the extent that we can even talk about it in the simpler form of in drought, it's not

in drought in the same place each time there is drought.

And so -- so where -- and as we discussed earlier, different parts of the system have a -- an outsized or a larger impact on energy production. So where drought is occurring has a material impact on Manitoba Hydro's ability to produce energy and -- and to dispatch their system reliably.

It's also important to -- to recognize that drought is experienced by Manitobans far outside of just power generation. You can -- it can have agricultural impacts, it can impacts on transportation, fire prevention. It has environmental impacts. And it has quality of life impacts for -- for some of your citizens in terms of the use of the waterways and the access to water.

So -- so there are many other aspects of managing drought that Manitoba Hydro, as the stewards of water, are -- are responsible for before, and in addition to, managing the -- the power generation.

And then, finally, for -- for the delivery of power, there are -- because of this complexity, there are often competing priorities that -- that can necessitate hard choices that Manitoba

Hydro has to make. There are many stakeholders that are interested in -- in how Manitoba Hydro operates the system, and they have competing priorities in terms of -- of how they view or use or see the utility of the water.

So cost optimization remains important, even in drought. That's why we're here. But it is not the only factor.

And so, when we are looking at drought operations and when we did investigate drought operations and -- and talk to Manitoba Hydro, we had to look through multiple lenses; not just the lens of -- of cost optimization or value optimization.

This is replicated in our report. I won't go through it in detail. It's just an overview. It came from a filing. It's a summation of a longer filing.

It just -- it just articulates that drought comes in over time. It is not an instantaneous event. In the industry, it's frequently defined as a deficiency of precipitation over an extended period of time, usually a season or more, resulting in water storage. It is a timed event. It occurs over time.

So, for life purposes, we can just

think of it as -- as weather conditions that worsen over time to cause duress on the system.

So, Manitoba Hydro has a number of tools at their disposal when they're -- when they're looking to manage drought. The Drought Management Planning document, which is part of the record, is a significant planning document for them and identifies priorities and constraints. It identifies a broad set of Manitoba Hydro teams that are to be engaged in the process of managing through drought. It references and is inclusive of specific policies that we also reviewed.

The Policies Act is guardrails to -- to provide some -- some limitations on how Manitoba Hydro can and should act, not just in drought, but in general. And -- and those policies also provide for oversight and authority to take actions, depending on what those actions are.

And they also use weekly team meetings. We'll discuss that in a -- in a minute here, but they -- they use a consensus building methodology to bring together various experts to -- to ensure that this complex set of priorities are being managed.

So, I know this has been presented -- it's in our report. It's -- it's in the Drought

Management Plan. I -- I won't go over this in -- in detail, but I think that the way I think about this as a modeler -- as -- as -- as someone that is experienced in doing the type of -- of modeling they do, although not specific to this -- to their system, is, you have a series of constraints and we -- I talked about this earlier.

It's a -- it's a -- it's a constrained economic optimization problem. You are trying to optimize your water, given a set of constraints. And the reason that's important, especially in drought, is as -- as drought occurs, as -- as conditions get worse, constraints become more and more binding.

There are more conditions, more situations where one of those other constraints acts to limit your choices before you get to an unconstrained economic optimization, which would be your idealized version.

So, in addition to those -- those overall priorities, there are the -- the -- the Corporate guidelines or the policies that -- that set forth the rules of engagement, if you will. The -- the actions or the activities or the approaches that Manitoba Hydro staff can take when considering certain types of activities.

And the three (3) that were relevant to the activities that we were reviewing for scope, are -- - are the three (3) that we list here.

So, the Generation Planning P195, that ensures proper planning for future dependable energies, so that -- that articulates the -- the requirement for a long-term view on ensuring sufficient dependable energy, in the future, to meet -- - meet all dependable requirements of domestic load plus firm sales under adverse conditions in the future.

P197 is -- identifies risk appetite and approach to trading and sets boundaries and also provides for some level of latitude to traders and gives -- gives them guidelines around how to consider risk in trading.

And P190, which works in concert with that, provides the approval authority -- authorities at various levels needed to either trade at different volume levels or trade different products.

So, this all really comes together and -- and -- and the -- the primary, the crux of managing both in normal conditions, in flood or in drought, is there a weekly planning meeting -- the RPPS.

And that's where -- that's where they -

- they -- all the different pieces of information and all the expertise comes together.

So, it's a -- they -- they bring a -- a roughly hundred (100) page presentation, give or take, that walks through all of the modeling scenarios and -- and insights from the next -- last week that talks about different criteria or -- or -- or limitations that have to be considered, given current water conditions.

That it -- it might talk about some of the other stakeholder challenges or -- or concerns that -- that have come to mind and it -- and it walks through all this in -- at considerable detail and it's provided to this broad set of -- of experts within the organization. And those experts are identified in the -- in the drought planning the -- the -- the organizations within Manitoba Hydro are all identified within the drought planning document.

And those experts come together and they build a consensus. And -- and the essence of -- of -- of why this is important, is the -- the -- the constraints on the system to the extent possible, they're modeled in their tools. So, transmission constraints are in their tools. Reservoir limits on -- in terms of -- of a minimum or maximum. That's in

their tools.

But the -- but some of the constraints are simply too complex to easily convert to a set of inputs into a -- a tool -- into a dispatch tool. And so it is important to have this post-processing time to look at the results and to apply their professional judgment and their expertise across this broad range of -- of -- of teams within the organization to ensure that they are best meeting the -- their mandate which is -- which is to economically manage the system given those priority constraints.

And the outcome of that is -- is a consensus. It's -- it's -- it's a plan for moving forward.

In addition to the weekly -- into the -- into that weekly meeting, which -- which is ongoing and it's -- it's part of their ordinary process, during the -- during the late July, early August, somewhere in that time frame, they stood up a specific oversight team to -- to provide additional and closer oversight of what -- what the RPPS was doing, the decisions that were being made and -- and how -- and how to provide that oversight at an appropriate level, given the increasing severity of the drought and the implications of the decisions they would have to make.

That committee received presentations from -- from the RPPS, or a sub-set of that team. They were engaged in conversations. The -- the presentations were tailored to whatever the specific challenges or concerns were and they -- and they indicated a -- a level of -- of back-and-forth discussion between the RPPS team members and the executive oversight committee that suggested appropriate oversight and engagement at the more senior levels to -- to ensure that the drought was being managed effectively.

So, that's -- that's all sort of the -- the high level story of -- of -- of what was happening, how their various components worked together to manage drought to effect decision making under duress in these conditions.

Scope Item 11 specifically requested that we look at the switch to the forty (40) year flow record and how -- how and if that affected Manitoba Hydro's actions.

It's -- it's difficult to call out any specific action that was taken or not taken, and call that due to a change in the flow record or really a change in any component of this.

This is a -- a -- you know, a -- a

large complex decision making apparatus that involves both the modeling, as well as the other components we've talked about.

However, they -- they did perform investigation after the fact. They have done some -- certainly I wouldn't call it, like a -- a -- a detailed like backcasting review or something, but they have -- they have done investigations into what insights they were able to glean with their improved methodology, forecasting methodology.

And those suggest that the -- the benefits that we discussed earlier today around -- around having a more -- a more detailed model of the system, of having the physically-based in-flow forecasting that -- that improves short-term forecasting, that -- that the combination of all that did provide insight and that, going forward, as they continued to both implement that system and just simply get more used to using it, that there's reason to believe that it will continue to improve.

So, I think all of -- all of that presents a story, where they have an improved picture of future water uncertainty. It's still a very fuzzy, uncertain picture. It is -- it is not something where they can easily forecast what is going to happen in

any period out into the future, but the sum total of all those upgrades, which necessitated the change to 40 years, it wasn't driven by a specific desire to change to 40 but necessitated it, that -- the combination of all that, is an improvement in their methodology and -- and was -- was appropriate and effective in helping them manage drought.

VICE CHAIR KAPITANY: Mr. Smith, just before you go on to hedging. I -- I didn't see it in your slides, but I read it in your report, and I think Manitoba Hydro said it as well, that they operate the system the same under all water conditions, including adverse water, and I just wondered, from your experience with other utilities, is that a normal process?

MR. DOUGLAS SMITH: Yes. I -- I -- I think that is the -- the process -- the process not changing is - is -- is a benefit. It is a strong -- you -- you do not want to have to stand up an entirely different process when you fall -- when you fall into different conditions. You're not -- your team isn't used to doing it that way. You're -- you're -- you're adding additional risk.

So, decisions will be different, right, different -- different pressures will mean different

decisions at any given time, whether you're in flood, whether you're in drought, whether you're just humming along, but, if your process remains the same, then you are far more likely to be able to lean on it and follow it when you're under duress, and -- and I think we should all be clear that, whether it's Manitoba Hydro dealing with drought or it's Texas dealing with a storm in the middle of winter, or -- or any other utility, it is duress for these people. They -- they are operating a very complex system that has very real life consequences for -- for their customers and it is a difficult situation.

When you are there, you want to be doing the same thing you've always done. You want to be doing it in a way that you are used to doing it. So, I -- I -- I would consider that a -- a benefit and a normal practice for utilities.

VICE CHAIR KAPITANY: Thank you, and bi-weekly meetings you said. Would that be your experience also that bi-weekly meetings in an adverse water would be --

MR. DOUGLAS SMITH: -- for -- for oversight?

VICE CHAIR KAPITANY: Yes.

MR. DOUGLAS SMITH: I -- I think I

don't know that I'd have a -- an opinion as to exactly how -- how frequent or -- or how normal that is versus any other periodicity. It's -- it's -- it's fairly frequent, I mean, you know, there's not a lot -- when you consider the level that they're operating at, that's a -- that's a very frequent period to get updated reports. They're in the details at that point. There -- there's, you know, at the high level, things aren't changing in two (2) weeks. It's in the details that they're changing.

So, they're -- they're providing quite a bit of oversight, when they're -- when they're talking to their folks every two (2) weeks.

VICE CHAIR KAPITANY: Thank you.

THE CHAIRPERSON: Sorry, Mr. Smith. We're five (5) minutes away. I'm just wondering -- we're not going to finish it this morning. So, the -- the question I have is is this an appropriate place to do the break or should we do another page or -- we have a number of things. I don't think we're going to finish Number 7, like, I can tell you we're not going to finish Number 7 before --

MR. DOUGLAS SMITH: Okay.

THE CHAIRPERSON: -- in five (5) minutes, so --

MR. DOUGLAS SMITH: Okay. How about just this slide, then, and --

THE CHAIRPERSON: Yeah. Sure. That'd be great.

MR. DOUGLAS SMITH: -- and I think that -- that gets us moving to the edging next.

THE CHAIRPERSON: Right.

MR. DOUGLAS SMITH: So -- so the last component of -- of -- revealed the operations was compliance with -- with policies and processes. They -- they clearly followed their processes. Their communications were very clear about their priorities.

One (1) of the reasons we put those -- those six (6) com -- pieces of the -- of the Drought Management Plan in our report is that they -- they communicated that to their executive team. The -- the goal was for everyone to understand what constraints they were operating, what -- what were the policies, how did they approach it.

There was clear indication of communication up and down the chain around those policies and the limitations and opportunities that they -- they placed upon them.

I think the -- the last point that we made, we made -- we made it in our report as well is

it's an expert decision system. It is -- it's dependent on a great deal of expert knowledge that exists within Manitoba and -- and its personnel.

That is a terrific way to build consensus in a complex system like that. It is -- it is a quality way to approach decision-making of this sort. It's -- it's prone to considerations of how do you retain that expertise if you have turnover, if you have other challenges where you don't have access to an expert at a given time.

There were many examples where getting the right person in the room was extremely illuminating for us when we were interviewing them. The right person could really talk through and help us understand what this all meant.

It's not always in a document that you can go see. And so, our -- our basic recommendation is that's a complex topic. It's -- it's certainly not something we're saying with clarity they should or should not do this or that, but it's a consideration that -- that we wanted the Board and stakeholders to beware that it's a risk that needs to be managed and -- and there are tools and techniques for documenting and memorializing expert knowledge that may be useful to Manitoba Hydro.

THE CHAIRPERSON: Thank you. We're going to take the lunch break now. We're going to shoot for 1:45. It -- it may be a few minutes later, but we'll shoot for 1:45 and start as soon as everyone is here. Thank you very much.

--- Upon recessing at 11:27 a.m.
--- Upon resuming at 1:45 p.m.

THE CHAIRPERSON: Welcome back, everyone. I believe we are at page 56. Is that right? Sorry. We're -- we're doing hedging? Is that where we finished -- ended? Okay, so.

MR. BILL HAIGHT: But before we begin on -- Mr. Smith continues on with hedging, he -- we have over the lunch hour looked into the question asked by Member Sy, and so we intend to respond to that firstly, and then --

THE CHAIRPERSON: Great.

MR. BILL HAIGHT: -- and then we'll deal with hedging.

THE CHAIRPERSON: Thank you.

MR. DOUGLAS SMITH: Great. Thank you. So the statement referenced by Member Sy was part of Daymark's IEC report on Manitoba Hydro's load forecast

that was presented as evidence in the previous GRA, the 2017/'18, '18/'19, whatever -- whatever the proper terminology for that GRA was.

That report was a separate scope of work performed by a separate team at Daymark. That -- that scope was not included in -- in this GRA, so the -- there -- the issue was not investigated this time around, so we have no comment on -- on whether or not that issue might remain for the -- for the current GRA.

All right. Hedging. And please tell me -- I -- I heard that you were having a little trouble picking me up, so let me know if I'm -- if I'm not doing any better.

So, in addition to reviewing Manitoba Hydro's operations during drought, we were also tasked with reviewing the -- their hedging policies and their risk management policy.

And just for -- for setting the stage, in the context of utility planning we can think of hedging as the -- as trading activities specifically designed to protect against financial losses. So in a -- in a world in which you expect to -- to transact in the future, you can hedge. You can buy or sell in advance in order to lock in prices and avoid future

variability.

Hedging is a normal and prudent activity performed by most if not all utilities, certainly all that I've been involved with. And -- and that -- that is for -- for, really, the reasons we were -- that -- that we itemized in the report and that you can see here, as well as others.

It -- we've all seen prices skyrocket up or move down quickly. Gas prices have fluctuated over the last year or more. We've seen how volatile these markets can be, and so limiting your exposure to that by locking in some -- some amount of expected volume of -- of transactions with a set price is a prudent activity.

So in the late summer, early fall of -- of 2021, as -- as drought was manifesting, was becoming more obvious that conditions were not improving, the precipitation was not coming, and that purchases were more and more likely to be necessary in the winter months to come, Manitoba Hydro was also phasing -- facing rising energy prices.

So this -- this graph here which I believe came from a response to a discovery question that was provided by Hydro shows for three (3) successive months what the forward curves looked like

for the winter months.

So the way to think about that is, in August of 2021, they were looking at prices from November through March, and the market was expecting prices to be around the -- that blue line.

And then in September, the market was expecting prices along the red line.

And then by October, they were -- the market was seeing prices -- expectations of -- of future prices over the winter commensurate with that green line. So, that's the environment that they were in.

So, the -- the dual factors of rising prices and increased expectation of a need to purchase over the winter provided an opportune time to consider hedging that risk. Increased volume and increased price, large upside risk. Next slide, please.

So -- so, they -- they did in fact enter into some hedges over time, the details of which are confidential. It was -- it was what I would call a laddered or -- or a periodic procurement, so it didn't happen all at once; that's -- that's appropriate. It -- it avoids over reliance on any one (1) day's market results, and it was in response to their policy and -- and procedure approach to -- to

reviewing their data.

The expectation or the -- the draw, the outcome that they were trying to protect against -- in particular, not -- not just solely, but as a good example, would be a significant winter storm commensurate -- or -- or at the same time as say a cold snap in -- in Winnipeg that -- that led to high loads.

So, the -- the fear, the -- the risk, is our markets -- the markets we -- we can go to for additional energy are skyrocketing because they're having their own problems at the same time that we need more, and that price and that volume could be significantly higher than budgeted for or expected.

In actuality, that event didn't occur. Winter was pretty calm. Purchases did not end up being -- imports did not end up being as high as expected. And the -- the hedges didn't -- the -- the event didn't occur. The -- the bad draw didn't occur. Next slide.

And so, the final result which -- that -- that middle slide I -- I know has presented before. The -- the middle slide -- or the middle graphic there was presented by -- by Manitoba Hydro showing the financial performance of the -- the winter hedging

activities in total.

I think the -- the key -- and we can go to the next slide. I think the -- the key takeaways from this should be hedging is an appropriate activity not based on the result of that hedge but based on the -- the risk mitigation effect.

So, all it would have taken was one (1) bad storm at the wrong time to create a number that would have been -- that would have dwarfed that 20 million, right. Really high prices at a time when you really need to buy a lot can add up to a lot more.

So, the -- the real focus for us was: Did they follow their policies and were their policies appropriate? And so, our -- our findings were they -- they absolutely followed their policies. There is clear documentation of communication around -- around determining whether to hedge and how much to hedge and how to approach that as -- as their -- as their projected operating condition changed over time.

There was clear presentation to their oversight committee. There -- there is no doubt that followed the policies and procedures that they had in place. And -- and as I said, the approach is sound. Go to the next slide.

I think that the final -- the final

point that -- that we wanted to make and that we made in our report is -- is perhaps a bit nuanced, but I'll -- I'll try to cover it fairly quickly here and -- and let us get on to -- to the rest of the Hearing.

The complexity of a hedging program ought to be commiserate with the -- the amount of risk that you are hedging and -- and taking on.

There -- I -- I have reviewed plenty of utilities that have far more transactional volume and amount at risk than Manitoba Hydro. They have far more complex hedging policies and trading policies as you would expect.

I think that, in general, the -- the level and approach to hedging that Manitoba Hydro engages in is appropriate. I don't think there's some significant disconnect.

But I think that there's an opportunity for them to -- to take a look at a few aspects of their hedging program to see if -- to see if small tweaks to how they approach that could help their team better evaluate risk when making decisions around -- around hedging.

And -- and fundamentally, I think that falls into two (2) areas. One is consideration of purchasing and sales as different hedging activities

worthy of different articulation of guardrails.

And the second is expanding their -- their structure around volumes to trade to incorporate some measure of volume at risk or dollars at risk and not simply volume or percentage volume hedging targets.

I think those two (2) could be done in a -- a not too complex a form, but they could add -- add value to their hedging program.

And I think, with that, I'll -- I'll turn it back to Mr. Athas.

BOARD MEMBER BASS: Just before we go on.

MR. DOUGLAS SMITH: Sure.

BOARD MEMBER BASS: On the question of hedging, if you consider a hedge of electricity with physical delivery as part of the -- the contract, is that any way a reasonable method to be selling electricity?

MR. DOUGLAS SMITH: Just -- so selling -- selling energy with -- with a commitment for physical delivery is certainly a product that is -- that is sold between utilities commonly. If that's -- I'm not sure if that answers your --

BOARD MEMBER BASS: Well, I think

you've got to the -- to the point. It is possible to -- to do.

So does the price -- if you go the hedging route -- vary materially from if you are selling on the opportunity market into MISO?

MR. DOUGLAS SMITH: So -- so all energy in -- in MISO clears day ahead and then real time. So all of it is -- is clearing at that marginal price.

If you're a buyer of electricity, if you have bought a hedge ahead of time, if you have -- if you have locked in a price -- which you can do from a -- through a number of counter parties -- a utility or a supplier or other -- other entity who is willing to lock in a price for you, you are now -- you're now -- you have shifted that price risk from you, as buyer, to the seller. And then, the seller will have to make their appropriate determinations of how to manage that risk and what actions they would take.

So you can certainly lock in a price even though the MISO energy market day ahead and -- and real time prices are -- are variable and contain that risk.

BOARD MEMBER BASS: Okay. And if you're shut out of the MISO market because the

market's now closed. I gather there's some time limits for providing certain information and -- otherwise you cannot proceed into those time frames to make sales?

So, could you use the -- the hedging markets with physical delivery, as an alternate method to make sales?

MR. DOUGLAS SMITH: I think I would probably defer that either to -- I -- I'm not -- I'm not sure, I'm qualified to -- to articulate what other mechanisms Manitoba Hydro has its disposal for any particular time frame with all of their different counter parties.

Typically, I guess, the spot market we're talking about, the opportunity sales that are occurring in this day ahead in real time, that's the -- that's the last place you -- you have to sell.

So, if you're -- if you're looking -- if Manitoba Hydro or anyone with power to sell is looking for alternatives, they're doing that ahead of time, not -- not after failing to clear in those markets.

BOARD MEMBER BASS: Thank -- thank you.

MR. JOHN ATHAS: Okay, turning to the

key findings. As you -- as you heard, we found the export revenue forecast to be reasonable and conservative in the sense that it -- that there has some uncertainty as a -- things that could happen in the future to make it lower than what it would turn out.

They -- they found in -- at the overall level, that the changes in the hydrology, methodologies and the inflow analysis and the modeling, are a positive change for Manitoba Hydro and -- and its customers.

And in those -- and in supporting those two (2) high level findings, you know, as we started this, I said -- that -- and part of our work -- scope of work, we had -- very individual things that we had to supply as part of the scope of work that would contribute to these overall -- the conclusions and other things that we reach.

And, fortunately, when -- if you -- when we walk down this list as -- of at the export prices, price forecasts were reasonable and these tested a sensitivity. The contracts were accurately reflected. The inflow of forecasting changes align with the modeling improvements and -- and the -- they're capturing the relative changes in -- in MISO.

Fortunately, when we go -- go down that whole list, we don't have conflicting ones where some of them are pointing -- where there's a -- no one (1) or two (2) that's -- that we're not viewing as reasonable and then we would have trouble figuring -- trying to decide how to conclude the overall as reasonable.

So, right now, the fact that the -- the -- the pieces seem reasonable and the -- and overall that these two (2) major conclusions of -- of the change in hydrology and inflow forecasting and the -- and the revenue forecasts, as reasonable and conservative, that -- they came out consistent. Go to the next slide.

Similarly on the -- on the drought operations and risk management that we -- we found that the -- started with the second one, that they -- they as Mr. Smith just finished speaking about.

They -- they followed their policies and -- and supporting documentations and -- and there could be some enhancements that might be beneficial, but they -- but that seemed to be -- that was a process that took place as an extension of their regular operations processes that they performed well in that aspect for -- not -- that might be the right

word.

But the -- and then the -- and the changes that they were able to capitalize and the changes to hydrology and energy -- energy forecasting and -- and the hedging to make sure that the -- that they could continually adjust the -- to the priorities that were front of them to have as much -- as much -- as little economic adverse impact or -- or as much economic positive impact that -- during the -- the drought.

The -- and similarly the -- the pieces all kind of point in the same direction of where we found reasonableness there with the -- it -- that it was appropriate to fundamentally operate the system the same during the drought; that the additional oversight and risk management that were executed, did not -- only enhanced the process, did not -- did not change the process so radically.

The -- all the changes that go along with the adoption of the 40-year hy -- hydrology process improved the picture in our -- in our mind of the range of outcomes and, therefore, were an effective tool for managing -- making decisions during the drought and -- and they -- that the -- there was -- the policies and procedures all seemed to be gearing

toward the -- toward supporting the team that's -- that's making those decisions in an effective and efficient manner.

The last sub bullet there is -- is what we were speaking about with the issue of some potential documentation around -- around the -- the kind of the storehouse analogies a little bit in -- in the minds of so many individuals that get together for that -- those consensus meetings and the like that somehow a process of documenting that would be beneficial going into the future.

So, that concludes our presentation of -- and we hope that it was worth the extra time that we have considered that you allowed and we're open for questions.

THE CHAIRPERSON: Thank you. We're going to start -- sorry with the Assembly of Manitoba Chiefs. Ms. Fox, are you doing -- Thank you.

CROSS-EXAMINATION BY MS. CARLY FOX:

MS. CARLY FOX: Thank you, Mr. Chair. Thank you very much for your presentation this morning. It was really helpful for me, in particular. I have a few follow-up questions, just to help clarify some things.

Ms. Schubert, can you go to Exhibit AMC-6-4? This is one of our Information Requests to Daymark, in response to AMC's Information Request regarding future pricing in the MISO market, Daymark responded here -- yep, perfect -- responded here that the decline in average market energy prices is primarily driven by an expectation that the MISO region will continue to add mostly renewable resources to the supply mix over time. Is that correct?

MR. JEFFREY BOWER: Yes.

MS. CARLY FOX: So, my question to you is: As more renewables are added to the grid, does their Effective Load-Carrying Capacity continue to decline?

MR. JEFFREY BOWER: In -- in general, that's true. So, the Effective Load-Carrying Capability helps -- is a method for quantifying the capacity contribution that a renewable resource or thermal resource -- it, really, any resource has -- it's -- it's how much does that resource help the grid meet -- meet load reliably.

And as the Effective Load-Carrying Capability study process typically evaluates resources based on their fuel. So, it'll evaluate solar resources together, wind resources together, and,

generally speaking, if you had more of a single type of resource, the relative contribution to reliability of that resource type declines because, for example, if you add -- if you add a lot of solar, when you get a cloudy day or -- or at night, that -- there's a lot more of that resource that is not available to -- to contribute to reliability.

And so, generally speaking, the -- the first -- and it's -- it's a similar trend with wind, although wind has the advantage of a little bit of -- of kind of spatial distribution that balances some of that -- that coincidence but, generally speaking, the more of a certain fuel type that you add, the -- the contribution to reliability declines for that fuel type.

MS. CARLY FOX: So, then, when you have a declining ELCC or Effective Load-Carrying Capacity, would it be correct, then, that the value of the renewable resources, from a capacity's perspective, would also decline?

MR. JEFFREY BOWER: On a per-megawatt basis of -- of nameplate, yes, that's right. So -- so, if you -- if you add a -- a hundred megawatt solar facility, and the ELCC says that resource gives you a -- a 20 percent of its nameplate as -- as reliable

capacity, you would get a 20-megawatt value for that.

As you add a lot more solar to the grid, that 20 percent might reduce to 15 percent. If that happens, each megawatt of nameplate solar declines a little bit, but you've added a lot more solar, so the total contribution of all the solar on the grid might go up, even though the per megawatt rating goes down, if that makes sense.

MS. CARLY FOX: Yeah, that does make sense. Thank you. So, would there be economic logic, I guess, in adding renewables when spot prices are low and ELCC is low?

MR. JEFFREY BOWER: Well, the -- the challenge with renewables is that, generally speaking, renewables aren't added -- aren't compensated at spot market prices.

So, in most markets, in order to build and finance a new solar or -- or wind facility, you need a long-term contract, a long-term PPI with somebody because of a -- a bank -- you know, a financial institution won't really back a project that doesn't have a -- a really stable and known revenue stream.

And so, spot prices -- this is one (1) of these dynamics about -- about the market and the

integration of renewables. These renewals are -- are getting built and, generally speaking, they're -- they have contracts outside the ener -- the MISO energy market that's compensating them.

But the addition of those resources is declining -- is -- is reducing the market prices that other resources get compensated at. And so, this is one (1) of the tensions of -- of the -- this kind of renewable transition and how it interacts with markets.

MS. CARLY FOX: Okay. Thank you. So, as Manitoba's assets are flexible, would it be possible for Manitoba Hydro to target sales in the hours where thermal units are -- are setting the price and market prices are highest?

MR. JEFFREY BOWER: Yes, they -- the -- Manitoba Hydro can -- can bid into the markets, generally on a -- on a day-ahead basis for -- for these opportunity sales.

And in general, there are, you know, day-ahead forecasts of -- of when, you know, what the prices will be at different -- different hours, and so they can schedule or -- or at least bid in there their energy at -- at certain prices at certain hours.

And, you know, in that way, sort of

target those -- those higher priced hours. So that is -- that is something that -- that is done and -- and -- I would guess probably is done.

MS. CARLY FOX: Ms. Schubert, could you bring AMC-6-8? This is another one (1) of our Information Requests.

So, when we -- when AMC asked you about future capacity sales, in this response you say that, Manitoba's Hyd -- Manitoba Hydro's approach to future capacity sales is reasonable, but conservative.

That's correct...?

MR. JEFFREY BOWER: (NO AUDIBLE RESPONSE).

MS. CARLY FOX: And then this morning you said that Manitoba Hydro has a consensus price for capacity.

Is that correct?

MR. JEFFREY BOWER: Yeah. They -- they have a -- they develop from the forecast that they purchased from the -- the five (5) -- their -- their five (5) consultants. They develop a consensus capacity price forecast.

So -- so the answer to that part is -- is yes.

MS. CARLY FOX: Okay. What about the

-- is there a consensus price being used in Manitoba Hydro's forecasts?

MR. JEFFREY BOWER: It's not part of the GRA Revenue Forecast, because they don't assume that there are any sales made at that price.

MS. CARLY FOX: Okay. In your review, did Manitoba Hydro undertake any analysis to ensure that it's planning to extract the maximum value on neighbouring markets from its assets?

MR. JEFFREY BOWER: Well, I -- I would say that the -- the -- through our review of the processes that they use to conduct their -- their energy modelling, both their short-term and -- and long-term energy modelling.

But I think, probably the short-term is the -- I more relevant here. They have tools that -- that help them determine what the, you know, economic optimal plan is for -- for their water in the short and med -- and medium term throughout -- throughout the year.

So, I think in terms of, you know, of their operational decisions to -- to maximize revenue from markets, I think that that -- that review of their tools and processes there gave us comfort that they had an approach.

In terms of -- if the question is more targeted towards long term, in terms of trying to, you know, find markets for long-term capacity sales and long-term energy sales, the -- I think some of the conversations that -- that we had with them on this I think probably aren't -- probably are -- are not appropriate for the public session here.

But I think that we did get comfort that -- that they are, you know, taking steps to ensure that they're -- they're exploring the opportunities that the markets offer to monetize energy and capacity.

MS. CARLY FOX: Thank you. We had a few questions yesterday to Manitoba Hydro's export panel regarding asset optimization for export markets. I just wanted to follow up on some of our questions there for you.

MR. JEFFREY BOWER: Okay.

MS. CARLY FOX: Do you agree that an optimization review is a review that would determine whether Manitoba Hydro is fully optimizing its assets in terms of value on export markets?

MR. JEFFREY BOWER: I'm not familiar with -- with specifically what an optimization review -- like that -- that term. That sounds like that's

what that would be, but I'm not sure if that's a term of art that I'm not familiar with.

MS. CARLY FOX: Okay.

MR. JEFFREY BOWER: If there's a reference, I can try to take a look, but...

MS. CARLY FOX: Well, given your scope of work, do you see any more in-depth review that could be done to ensure that Manitoba Hydro is optimizing future export opportunities?

(BRIEF PAUSE)

MR. DOUGLAS SMITH: I -- I think that there are conversations that we've had that -- that are confidential in nature that -- that give us comfort that -- that it's happening. And -- and certainly we took it as part of our scope to explore that question in a general sense.

I think that their trading desk -- any trading desk -- is -- is involved in discussions with counter parties all the time. They've got existing counter parties, they've got potential counter parties.

We certainly did not take it as part of our scope or investigate the depth and -- and sort of

completeness of those discussions, but we were -- we were confident that they were actively pursuing and engaged in the process of trying to optimize their available water given the constraints that they operate under.

MS. CARLY FOX: Thank you. Now I'd like to move -- I've got some questions on seasonal capacity auctions.

Ms. Schubert, could you turn to Exhibit DEA-2. This is Daymark's report at page 58. Oh, you already have it. That was so quick.

In this part of the report, Daymark noted:

> "Given Manitoba Hydro is forecasted to have a summer surplus in 2022 -- or 2023/'24, which is forecasted to grow in 2030/'31, without new capacity sales, Manitoba Hydro should take steps to pursue monetization of that capacity."

Is that correct?

MR. JEFFREY BOWER: Yes.

MS. CARLY FOX: Do you have any specific recommendations for how Manitoba Hydro can better monetize this capacity?

MR. JEFFREY BOWER: Yeah. I think continuing to engage in the MISO market with developments that are occurring with the MISO market and, you know, changes that they are implementing to their capacity auction rules.

I think continuing to engage with potential counter parties for -- for, you know, short or long -- discussions about short- or long-term contracts, those are all, you know, opportunities for, you know, trying to pursue monetization of -- of that capacity.

It's -- it's hard to know for sure, and I think -- you know, I talked a bit about this this morning but, you know, every agreement like that needs a -- a party on the other end. And so that's -- that's a big piece of -- of the uncertainty around, you know, future capacity sales, but continuing to stay engaged in those as the markets change.

And, you know, another thing I -- I discussed a little bit this morning is utilities are just starting to realize, you know, and -- and figure out what their seasonal obligations are and what the costs of -- of meeting those might be.

Utilities are constantly going through planning processes to -- to determine their lowest

cost options, so Manitoba Hydro continuing to engage is a way to make sure that they're able to monetize when -- when those opportunities come up.

MS. CARLY FOX: So I have a question for you following up on that about other markets.

Ontario for instance, are you aware that they offer seasonal capacity auctions?

MR. JEFFREY BOWER: I haven't looked into the Ontario capacity market much --

MS. CARLY FOX: Okay.

MR. JEFFREY BOWER: -- so I'm not specifically aware of that.

MS. CARLY FOX: Okay. What about New York? Are you aware that New York offers a monthly auction?

MR. JEFFREY BOWER: Yes.

MS. CARLY FOX: Okay. So would it be reasonable to assume that MISO will offer auctions similar to New York, do you think?

MR. JEFFREY BOWER: It's certainly possible. I think the move from a single capacity obligation period to -- to four (4) seasonal obligation periods is a -- is a really big step for MISO in -- in their -- what they're calling their reliability imperative discussions.

And it's -- I wouldn't say, you know, any -- anything's likely or -- or I probably wouldn't use that kind of terminology for predicting, you know, market changes just because they -- they're very situational. It's certainly possible and -- and something that's worth -- you know, worth monitoring.

MS. CARLY FOX: Okay. This morning when you spoke about expected future capacity constraints in the MISO market, so given the future capacity constraints on MISO, do you agree that future prices are unlikely to be low or at least as low as they have been in recent years -- capacity prices, I mean?

MR. JEFFREY BOWER: Yeah. I think the -- now, are you -- I guess maybe I can try to clarify. Are you talking about sort of the PRA capacity auction prices in -- in MISO?

MS. CARLY FOX: I -- this one? Okay. Can you, Ms. Schubert, bring up Exhibit AMC-8 and page 15 of that PDF. This is what we're looking at.

MR. JEFFREY BOWER: Yeah. So this is the historical clearing prices for the -- for the MISO Planning Resource Auction, or PRA. They run this auction yearly for the next capacity period.

There's a few intricacies of this -- of

this auction that -- that basically give it some limited -- some limitations on the relevance to opportunities for Manitoba Hydro to sell. So the MISO PRA -- some capacity markets in -- in other regions, all capacity that's needed to make the system reliable, clears through the auction.

The -- the independent system operator of New England runs a market like that, and all capacity flows through that. In MISO, it's a little bit different where utilities really are responsible for making sure they have enough capacity. And so if they own capacity, if they have long-term contracts, it -- that capacity may not clear through an auction, through the PRA auction like this.

And so what that means is that the capacity situation in MISO does not necessarily get reflected in the auction clearing prices, or at least not at the same time as there are capacity -- essentially capacity shortages.

So you'll see that, you know, for example, if you look kind of back through time and -- and across all these zones -- and I'll see if I can pick one out -- but you'll have -- occasionally have one (1) year kind of blips in the capacity auction prices.

So if you look at, for example, the 2020 to 2021 row, you look at zone 7. So zone 7 in that year cleared at two hundred and fifty-seven dollars ($257) per megawatt day, which is -- is close to the cost of new entry which basically means it was in a shortage and so the auction cleared at the price that would be, you know, required to build a new resource.

The next year it -- it declined to five dollars ($5) which is, you know, almost zero. It's -- it's as close to zero as -- as you can get at an auction like this.

So, you -- you can have these kind of one (1) year -- or -- or multi-year periods of high prices that may or may not align with -- with a, you know, shortage condition in the market that will persist for multiple years.

MS. CARLY FOX: Okay.

(BRIEF PAUSE)

MR. JEFFREY BOWER: So, the -- the -- this summary is from April 2022, the most recent planning reserve auction just the -- the results were just reported yesterday, I think. I think they just

came out yesterday.

It's the first -- yeah, hot off the presses. And it's the first -- the first auction that they've done for the four (4) different seasons.

And Doug may have to -- or Mr. Smith may have to support me with some of the details, but -- but all of the regions were -- were quite low, especially in Northern MISO.

So, even though in the 2022/'23 auction they were up at two hundred and thirty-six dollars ($236) per megawatt day, which is quite high, in this auction that the results just came out yesterday, they were down to five dollars ($5), something like that.

MR. DOUGLAS SMITH: Yeah. Low as two (2) in the winter, ten (10) in the summer, ten (10) and fifteen (15) fall and winter, all very low for all zones except for the zone 9, which is Louisiana and Texas.

So -- so, despite going to four (4), at least currently -- and again, this is one (1) year's results. And -- and I do think it's important to stress Mr. Bower's point. Almost all clear -- almost all capacity in MISO is acquired via some kind of self-scheduling by utilities. They build it or they purchase it ahead of time. It is not procured through

this market, through this auction.

So, that makes MISO very different from say New York, the example you gave earlier, but prices are back down. So, at least for one (1) year, in the first year of the seasonal, there was sufficient capacity in every season for all zones, as I say, except for zone 9.

MS. CARLY FOX: Okay. Well, I was going to ask you about what you thought it would be this next year, so I guess we can skip that. Let's go to AMC-7, please, Ms. Schubert, page 45.

So, this figure here, this is the planning outlook for Ontario's electricity system needs in 2024 to 2043, and it's dated December 2022.

And we showed this page to Manitoba Hydro's panel. And I believe it indicates that there's a need for thousands of megawatts of new capacity in Ontario.

Is that correct?

(BRIEF PAUSE)

MR. DOUGLAS SMITH: That would be my interpretation of the -- of the graph, yes.

MS. CARLY FOX: I don't know if you --

if you are aware, but yesterday Manitoba -- Manitoba Hydro said that it can only sell 50 megawatts to that market. Do you agree with that assessment?

MR. DOUGLAS SMITH: I -- I would defer to Manitoba Hydro on the specifics, but they -- they do not have a strong interconnection there. And Ontario from west to east within their grid does -- has some -- some challenges, as well, so I -- I know of no reason to -- to question that result, certainly not in a material sense.

MS. CARLY FOX: And in your opinion as a lawyer, I don't quite understand what 50 megawatts is, but is that significant?

MR. DOUGLAS SMITH: It's small.

MS. CARLY FOX: It's small?

MR. DOUGLAS SMITH: It's very small.

MS. CARLY FOX: Okay. Okay. Ms. Schubert, can you move to Exhibit PUB 17-8.

(BRIEF PAUSE)

MS. CARLY FOX: I forget to tell you this one before. And if you can scroll to page, the response in 'A' right here.

"The most recent MISO load forecast

does not anticipate the Northern MISO annual peak occurring in the winter at any point over the twenty (20) year forecast horizon."

So, when you talk about the system switching to winter peaking, understanding that there's some uncertainty, are current projections still fairly long-term?

MR. JEFFREY BOWER: Yeah, there's a couple elements here. One (1) is that when we reviewed the -- as I note in the second -- we noted in the second sentence here, the forecast also assumes relatively low levels of winter load growth, so it's unlikely that the forecast is projecting significant adoption of electrified heating technologies.

So, yeah, we -- we reviewed the -- the load forecast as part of our scope and -- and in reviewing -- responding to this Information Request.

So, there's a couple of elements. One (1) is that I think the -- the load forecast is probably not -- and they didn't conduct multiple sensitivities and scenarios like MISO did in that electrification insights report that I referenced earlier.

The load forecast -- the kind of

official MISO load forecast doesn't do those sorts of sensitivities, so I think it may be a bit conservative in -- in terms of -- of that.

The other piece that's a little more relevant is something I touched on this morning, which is, even if a region or a utility is not necessarily winter peaking, meaning that's the highest demand point of their whole year, they can still be in a situation where the capacity need in the winter is -- is what's driving them to build new capacity because they might have resources that are derated in the winter or they might have a higher reserve margin because MISO determines that there's higher risk of -- of outages in the winter, and so they require utilities to...

So, basically, what a reserve margin is, is let's say you're a utility and your -- your peak load is -- is a thousand megawatts. MISO will determine a reserve margin that you need to also provide. In addition to having a thousand megawatts to meet your peak load for that season, they'll say you also need a 12 percent reserve margin, or sometimes in the winter it's higher, like, a 20 percent reserve margin.

And -- and they make that determination

based on a lot of analysis, but -- but it's essentially saying, you know, what's the likelihood of resources having outages of, you know, extreme load events that -- that are making them want to make sure that there's additional capacity available.

So, even if a utility isn't winter peaking, it might have more of a capacity shortage or -- or constraint in the winter.

MS. CARLY FOX: Thank you. Would it be accurate then to say that in the next five (5) years the system is unlikely to switch to winter peaking?

MR. JEFFREY BOWER: I would say, as a whole, it's -- it's unlikely that -- that MISO will switch to winter peaking in the next five (5) years.

But -- but, again, whether or not that means that capacity needs in the winter might become constraining for certain regions, that -- that's harder to -- to speculate.

MS. CARLY FOX: What about ten (10) years?

MR. JEFFREY BOWER: I -- I'd have hard time kind of putting odds on it.

MS. CARLY FOX: Thank you. So, you mentioned if utilities start to build new capacity to

meet the forecasted winter capacity demands, this will take time, years, correct?

MR. JEFFREY BOWER: In some cases, yes. I mean, if -- if you're building a new nuclear plant, for sure. But, also, you know, natural gas plants, that sort of thing, those -- those take multiple years.

There are alternative options to get capacity to -- to help meet resource adequacy requirements. I -- I mentioned very briefly this morning virtual power plants, but that's basically aggregations of -- of demand response that are kind of accumulated and centrally dispatched.

So a simple example is water heaters or thermostats. There are programs and -- and in -- US markets are actually, by federal policy -- are -- are required to integrate those sorts of distributed resources as -- as -- as market participants in an aggregated basis.

So you can aggregate a bunch of -- of thermostats together and say, If I control them and it -- you know, I can take 25 megawatts off -- off the grid at one moment, then I get 25 megawatts of capacity value that I can sell.

Those sorts of options for -- or

basically, bring new capacity online -- are much shorter because a lot of those technologies are already out there, existing. And it's just a matter of software to get them up and running.

MR. DOUGLAS SMITH: And if I could just add, if you think back to one of the slides that Mr. Bower did this morning where he showed that load zone 1 had both the most retirements and the most additions, one of the fastest ways to create capacity if you are short is to simply delay a retirement.

So utilities have plans to retire, you know, dirtier plants or -- or older plants. In -- in periods of shortage, sometimes the choice that is made is simply to delay that a year.

So -- so if you -- if you need new capacity and you're going to build new capacity, but it's going to take two (2) or three (3) years to bring it on, you can take some of the steps that Mr. Bower was talking about. You can delay a retirement. You can do other things that bridge a gap that are potentially very low marginal cost versus going out and -- and acquiring other short-term capacity.

MS. CARLY FOX: Thank you. So would it be reasonable to assume that Manitoba Hydro will be able to continue to market at summer capacity at least

in the short to medium term?

MR. JEFFREY BOWER: It certainly can market it and -- and seek -- seek buyers for that. And I think there's -- there's at least some likelihood there -- there will be utilities or -- or entities that will be looking for -- for short-term capacity.

But again, whether it is more competitive than some of these other options, that -- that we discussed, I think it's a little harder to -- to speculate on that.

MS. CARLY FOX: Thank you, Mr. Bower. I just have a few questions left about hedging strategy, Mr. Smith.

Moving from what you were talking about just recently, you said most, if not all, utilities are engaged in hedging.

So my question to you is: Has Daymark reviewed hedging policies for both private and publicly owned utilities aside from Manitoba Hydro?

MR. DOUGLAS SMITH: We have certainly done so for -- for publicly owned, investor owned or -- sorry, investor-owned utilities and cooperatives, which are member-owned. So there -- there's a couple of examples I'm aware of for sure.

MS. CARLY FOX: Would there be different hedging strategies if you were a public versus a private utility?

MR. DOUGLAS SMITH: I think that there are approaches to hedging that are fairly universal. That -- that don't depend on what type of entity you are, but more on how complex your trading environment is, what -- how much -- how many dollars are at risk.

Within those frameworks, decisions that are made by an actual trading desk may differ between entities and -- and what's -- what's at risk and who's at risk.

MS. CARLY FOX: Thank you. Ms. Schubert, can you turn to Exhibit AMC-6-14. It was one of AMC's Information Requests regarding hedging -- hedging strategy.

And here, in the response, Daymark states that:

> "A reasonable strategy would not look significantly different from the current one but might be more explicitly based on value at risk either as a formal calculation or a stated policy goal."

Is that correct?

MR. DOUGLAS SMITH: Yes.

MS. CARLY FOX: Is Daymark proposing or recommending that Manitoba Hydro then formalize its hedging strategy using a value-at-risk approach?

MR. DOUGLAS SMITH: So let me try to take that in pieces. They have a formal hedging policy. So -- so we're not proposing that they -- that they have a policy. They have one.

That policy has -- places some -- some limits, some guardrails on -- on what the trading desk can do and on what types of approvals they need to get and the details of which are -- are confidential.

What -- what we are suggesting is that -- that for the types of trades that Manitoba Hydro engages in that we've observed, that some additional nuance to the existing policy might be beneficial to the traders and help lead to beneficial outcomes.

MS. CARLY FOX: Okay. And I believe those are all my questions, Mr. Chair. Thank you.

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

(BRIEF PAUSE)

CROSS-EXAMINATION BY DR. BYRON WILLIAMS:

DR. BYRON WILLIAMS: Good afternoon, members of the panel and good afternoon Daymark and learned legal counsel.

Mr. Athas, before there was a Daymark, there was La Capra, L-A, space, C-A-P-R-A. Agreed?

MR. JOHN ATHAS: Correct.

DR. BYRON WILLIAMS: And --

MR. JOHN ATHAS: One and the same entity.

DR. BYRON WILLIAMS: Yes. Daymark is the successor name for La Capra, agreed?

MR. JOHN ATHAS: It's just a name change. Just to make -- make -- be clear about that.

DR. BYRON WILLIAMS: And it was under the banner of La Capra that you and Mr. Pico (phonetic) appeared before the Public Utilities Board way back in 2014 in the need for an alterative hearing related to Manitoba Hydro's Preferred Development Plan, agreed?

MR. JOHN ATHAS: Correct.

DR. BYRON WILLIAMS: And it would be fair to say, Mr. Athas, that way back in 2014, prescient observers of the -- the marketplace, such as yourself and Mr. Pico, were -- were talking about uncertainties in the MISO marketplace, whether related

to carbon pricing or the emerging financial viability of -- of renewables such as wind and solar, agreed?

MR. JOHN ATHAS: To a limited extent, yes. There was another independent expert consultant that was tasked with the -- with the MISO market expertise specifically. I'm not sure I remember who.

But to the extent that we had somewhat of a melting pot of all the issues, we have -- we touched upon that.

DR. BYRON WILLIAMS: And certainly, it was back then, some of the uncertainties that we face today with decarbonization or the dramatic improvements in -- in -- in the renewables were starting to appear on the radar, even -- even back in 2014, sir.

MR. JOHN ATHAS: I'd say that it was -- that'd be -- I'm fairly certain that there was a declining cost curve. I'm not sure whether, a decade ago, there were -- that it was a dramatic level of change.

DR. BYRON WILLIAMS: Thank you. Mr. Bower, just in terms of the scope of work of your team -- and -- and you don't need to turn there -- but task to involve reviewing and assessing the reasonableness of Manitoba Hydro's forecasts of exportable surplus

energy and capacity. You recall that, sir?

MR. JEFFREY BOWER: Yes.

DR. BYRON WILLIAMS: And you were looking both at the test years and -- and out twenty (20) years, agreed?

MR. JEFFREY BOWER: Yes.

DR. BYRON WILLIAMS: It would be fair to say, though, sir, that in examining the energy volume forecasts for experts, Daymark's scope of work did not involve a detailed review of Manitoba Hydro's long-term resource planning assumptions. Agreed?

MR. JEFFREY BOWER: We reviewed, as -- as part of our scope, the reasonableness of the forecast of energy supply volumes.

As part of that review we looked at their breakdown and their assumptions about the -- the volume of energy that they would have over time, that is -- is a result, in part of, the -- the -- the models, the HERMES and GSPRO models, The -- the load obligations, firm sales and then opportunity sales.

So that -- that kind of makes up the -- the volume and where it goes question.

We did not have a specific scope item to -- to take a critical look at their resource planning assumptions in terms of capacity build-outs

of -- of new resources or -- or anything like that.

MR. BYRON WILLIAMS: Okay. And thank you for that. And, for example, you weren't vigorously testing their long range and estimates in terms of the contributions of imports or -- or purchases of wind or solar. Agreed?

MR. JEFFREY BOWER: We were -- we -- we reviewed the, I guess, the -- the -- the make-up of their supply and -- and the -- the breakdown of components. This will quickly get into, I think confidential portions of -- of the -- the study, but we weren't taking, as you say, a -- a critical look at their supply outlook, different plans, different, you know, not an IRP type -- type review.

MR. BYRON WILLIAMS: And analogous to that, as well, you weren't taking the critical look, and with no criticism of you, in terms of the robustness of Manitoba's Hydro's estimates, in terms of demand side management. That wasn't part of your scope of work.

MR. JEFFREY BOWER: Correct.

MR. BYRON WILLIAMS: You'll leave that to -- to another process and another day. Agreed?

MR. JEFFREY BOWER: It wasn't part of our scope for here today.

MR. BYRON WILLIAMS: And, Mr. Smith, you've had the good fortune to talk a little bit about hedging on a couple of occasions today and that was part of your scope of work task 10 and 12 to look at Hydro's operations during the '21/'22 drought.

Agreed?

MR. DOUGLAS SMITH: Agreed.

MR. BYRON WILLIAMS: And in a couple minutes I'll -- I'll humbly follow in the footprints of -- of Ms. Fox and go to page 93 of -- of your DEA Exhibit 2, but we won't go there for a second.

I want to back up a little bit and look more generally at risks in the marketplace that hydro faces or that other utilities, including those in the MISO marketplace fit.

Okay. So you're with me, Mr. Smith? We'll --

MR. DOUGLAS SMITH: So far. Yeah.

MR. BYRON WILLIAMS: And, again, at the highest of level, sir, you'll agree that Manitoba Hydro is -- is blessed with an abundance of hydroelectric resources. Agreed?

MR. DOUGLAS SMITH: I -- I would say we'd all agree with that, yes.

MR. BYRON WILLIAMS: And it has

immense storage capacity in the form of Lake Winnipeg and Cedar Lake. Agreed?

MR. DOUGLAS SMITH: It has storage. I guess it -- immense depends, I mean, you know, I -- I -- I review Hydro Quebec at times too, so I'm not sure I'd call Hydro's storage immense, but -- but it's sizable.

MR. BYRON WILLIAMS: It's sizable and as compared to non-hydroelectric utilities, that -- that level of storage is significant and perhaps, immense, in terms of that comparison, sir.

MR. DOUGLAS SMITH: It is significant, yes.

MR. BYRON WILLIAMS: And, in fact, leaving aside the other hydroelectric utilities, that availability of storage capacity of this magnitude is one (1) of the key advantages Manitoba Hydro has, as compared to many electric utilities. Agreed?

MR. DOUGLAS SMITH: I think -- I think that's a -- a fair statement. I think there's some constraints on that storage in -- in terms of the length of time it takes to release that storage, that -- that acts maybe as a bit of a -- a -- a dampener or governor against those benefits.

But -- but relative to someone who does

not have that at all, it is certainly a benefit.

MR. BYRON WILLIAMS: And, of course, Manitoba Hydro has a monopoly, to your knowledge, in the retail sale of power to residential and industrial business consumers in Manitoba?

MR. DOUGLAS SMITH: I have no reason to -- to disagree with that statement.

MR. BYRON WILLIAMS: And trust me --

MR. DOUGLAS SMITH: I'll trust you on that, yes.

MR. BYRON WILLIAMS: Okay, make sure you do it subject to check, sir, because --

MR. DOUGLAS SMITH: Subject to check.

MR. BYRON WILLIAMS: -- you can never be too careful.

And, of course, Manitoba Hydro is deeply integrated with the MISO marketplace. Agreed?

MR. DOUGLAS SMITH: Yes.

MR. BYRON WILLIAMS: Sells a lot of electricity into MISO. Correct?

MR. DOUGLAS SMITH: Yes.

MR. BYRON WILLIAMS: And --

MR. DOUGLAS SMITH: And purchases from --

MR. BYRON WILLIAMS: And it purchased

from it, especially at times of supply shortages in Manitoba. Agreed?

MR. DOUGLAS SMITH: Yes.

MR. BYRON WILLIAMS: Turning, really specifically to risk, as a hydro-reliant utility, Manitoba Hydro is heavily reliant on precipitation. Agreed?

MR. DOUGLAS SMITH: Certainly. Yes.

MR. BYRON WILLIAMS: And the amount of energy it can produce in any year, at least within the hydroelectric confines, is dependent on rainfall, snowfall, in combination with the amount of water in storage. Agreed?

MR. DOUGLAS SMITH: I -- I suspect that -- that their -- their hydrology experts would probably expect us to -- to accept that that's over simplified, but it's certainly -- my understanding, is those are key factors.

MR. BYRON WILLIAMS: And, of course, there can be material variations in the level of precipitation from month to month, or year to year. Agreed?

MR. DOUGLAS SMITH: Yes.

MR. BYRON WILLIAMS: And, as you've noted today, precipitation can be challenging to

predict.

MR. DOUGLAS SMITH: Correct.

MR. BYRON WILLIAMS: So, Manitoba Hydro has to be aware of the risk of volatility and supply that is correlated with weather conditions. Agreed?

MR. DOUGLAS SMITH: Yes.

MR. BYRON WILLIAMS: And, moving from hydroelectric utilities, to electricity generation in general, it would be fair to say that the level of energy produced by other renewables, such as wind and solar, is highly correlated with and fluctuates with the weather as well. Agreed?

MR. DOUGLAS SMITH: Differing correlations and differing weather patterns affect differing technologies, but it's certainly impacted by weather, by climate.

MR. BYRON WILLIAMS: And the availability of solar is highly dependent upon the -- the sunshine. Agreed?

MR. DOUGLAS SMITH: Yes.

MR. BYRON WILLIAMS: And, of course, wind, by definition --

MR. DOUGLAS SMITH: If wind's not blowing --

MR. BYRON WILLIAMS: It ain't blowing.

MR. DOUGLAS SMITH: -- it's not producing.

MR. BYRON WILLIAMS: And, to that degree, with those renewables, there is a high correlation with certain weather patterns and the amount of energy they produce. Agreed?

MR. DOUGLAS SMITH: Yes.

MR. BYRON WILLIAMS: And, in terms of demand and -- and risk, in terms of demand, of course, sir, you've accepted, subject to check, that Manitoba Hydro has an obligation to supply its captive residential, business and industrial customers with fixed electricity prices over extended time periods. Right? That's why we're here today?

MR. DOUGLAS SMITH: Yes.

MR. BYRON WILLIAMS: Okay. But it cannot be certain how much electricity their customers, especially the residential customers, will use at a certain hour, until the customers actually turn on the switches and draw the electricity.

MR. DOUGLAS SMITH: I certainly haven't -- haven't reviewed their load forecasting team or -- or their efforts in that regard. I, assume, consistent with any utility that they've --

they've got a quality forecasting team that has a good sense of where demand will be for -- for going out some distance, but there's going to be variability to that in the best of cases.

MR. BYRON WILLIAMS: And, of course, there will be significant variability depending on the weather. Agreed?

MR. DOUGLAS SMITH: Correct.

MR. BYRON WILLIAMS: If it's cold in the winter or hot in the summer, there can be significant uncertainty about the level of demand from -- from consumers day to day or year to year.

MR. DOUGLAS SMITH: Correct. And they can also move rapidly if a cold snap is predicted for one week and shifts to another or -- or something of that sort.

MR. BYRON WILLIAMS: So, Manitoba Hydro, and indeed all utilities, have to be aware of the risk of volatility in demand. Agreed?

MR. DOUGLAS SMITH: Yes.

MR. BYRON WILLIAMS: And for Manitoba Hydro you would accept that the demand for the energy they need to supply is correlated with and fluctuates with weather. Agreed?

MR. DOUGLAS SMITH: Could -- could you

repeat that, please?

MR. BYRON WILLIAMS: I might have been winging it, sir, but let's -- Manitoba Hydro -- you'll agree that Manitoba Hydro's, in terms of the demand for the energy it needs to supply, it's correlated with weather.

MR. DOUGLAS SMITH: Correlation is a -- - is a specific term. So, I -- I don't want to state more than I've studied or -- or looked at. They're -- they're probably some level of correlation, there are probably other factors in their demand that are not weather dependent.

MR. BYRON WILLIAMS: Let's got to price risk, sir, if we can and then we'll get to the -- - the hedging quotes on page 93.

You'll agree that electricity is both a basic necessity and a commodity, sir?

MR. DOUGLAS SMITH: Yes.

MR. BYRON WILLIAMS: And at the wholesale market, the spot level -- spot price level in MISO, there is significant volatility in the price of electricity in the course of a day, month, and year. Agreed?

MR. DOUGLAS SMITH: Absolutely.

DR. BYRON WILLIAMS: And it would be

fair to say that electricity is one of the most volatile traded commodities?

MR. DOUGLAS SMITH: I have not studied that nor really thought in those terms. So, I'm not sure if I'd be comfortable saying that. I -- I'm certainly comfortable saying it is a very volatile commodity.

DR. BYRON WILLIAMS: And would it be fair to say, sir, that prices in the wholesale market are also correlated or related to -- to weather? You've talked about a cold snap, you've talked about long --

MR. DOUGLAS SMITH: I -- I think it's fair to say that -- that, again, there's -- there's some correlation there. There's a -- it is a factor in energy prices. It is certainly not the only, and not always the dominant, factor.

We've seen prices move dramatically, due to the war in Ukraine, for instance, and the -- and the demand for worldwide natural gas that moved gas prices up significantly in the -- in the U.S., for instance.

So -- so, it is correlated. It is an impact. Sometimes, it might be dominant, such as during a storm. Other times, it might be minor.

DR. BYRON WILLIAM: Okay. Thank you. Just a couple more questions in this area. Pending emerging developments with batteries, it would be fair to say that many utilities face limits in the amount of electricity that can be practically stored.

Agreed?

MR. DOUGLAS SMITH: I think that's -- that's broadly true. I think, when you talk to, say, RTOs or utilities, about storage from their perspective, they will frequently talk about, for instance, the gas -- the natural gas plant system as a storage system, that is, it can be turned up or turned down to -- to account for changes in other -- in -- in -- in the variable risk you've been talking about: demand and -- and supply variability.

That's obviously a -- an emitting storage-like asset, if you will, not -- not typically what we think of storage, but that's how it often functions in markets.

DR. BYRON WILLIAMS: Renewables like wind or solar, in essence, at the time the energy is generated, it needs to be sold?

MR. DOUGLAS SMITH: Without additional technology, they are deliver or -- or lose.

DR. BYRON WILLIAMS: And limits to the

storage capability for those renewables are -- are -- are something that may differentiate electricity from other commodities. Agreed?

MR. DOUGLAS SMITH. Certainly. The -- the physics of -- of the electric system mean that the electrons, once generated, go somewhere, absent a mechanism to store them.

DR. BYRON WILLIAMS: And, if we seek, at a high level, to understand some of the volatility and structural price jumps in the marketplace, one element of that, of course, is the instantaneous nature of the product?

When the sun is shining and the wind is blowing, that's part of the volatility that --

MR. DOUGLAS SMITH: It is. Yes, it's certainly a factor and it makes it harder to avoid the volatility.

DR. BYRON WILLIAMS: At a high level, would it be understood that electricity utilities are exposed to joint price and quantity risk, both of which are correlated with weather variations?

MR. DOUGLAS SMITH: Again, sort of qualifying correlation as being, to some degree, without -- without trying to specify, yes, weather will certainly impact both price and quantity.

DR. BYRON WILLIAMS: And, of course, one of the risks that one might want to protect against is the risk that prices and demand will be going in -- in the same direction, either all up at the same time or all down at the same time.

MR. DOUGLAS SMITH: Absolutely.

DR. BYRON WILLIAMS: I wonder if we can turn to Daymark's report, DEA-2, under "Observations", there's three (3) paragraphs there, and I know Mr. Smith, you're familiar with them, you -- you are familiar with them, sir?

MR. DOUGLAS SMITH: I am.

DR. BYRON WILLIAMS: And at a high level, one of the things you're talking about in these three (3) paragraphs is some lack of symmetry in the risk that may arise in purchasing imports from MISO as opposed to selling it to MISO, agreed?

MR. DOUGLAS SMITH: Agreed.

DR. BYRON WILLIAMS: Okay. And just directing your attention to the first sentence under "observations":

> "Daymark observes that Manitoba -- Manitoba Hydro's hedging strategies -- strategy is focussed on the portfolio risk that is derived from

the volume of projected purchases or sales."

Agreed?

MR. DOUGLAS SMITH: Yes.

DR. BYRON WILLIAMS: Just in terms of portfolio risk related to volume, I wonder if you could just explain what you mean by that, sir?

MR. DOUGLAS SMITH: Certainly. So, especially in the context of -- of a utility attempting to estab -- you know, who's going to be establishing rates, the -- the effect of any one (1) decision, transaction activity, is -- is of -- is of limited value when you focus on just one (1).

The -- the goal is -- and -- and not -- not trying to speak for Manitoba Hydro, but in -- in general for utilities of this sort, the goal is to construct a portfolio of supply options that best mitigates the types of risks we're talking about; that is, a combination of owned resources, purchased resources, activities on the market, hedging activity. It could involve, you know, energy efficiency activities, demand-side components.

That -- that portfolio, or that combination of activities, typically a utility is attempting to minimize risk at that level.

DR. BYRON WILLIAMS: Thank you. And here you're talking in terms of the volume of -- of purchases and portfolio risks related to the volume, agreed?

MR. DOUGLAS SMITH: Agreed. This -- this is specifically focussed on the potential for market purchases or sales that are projected by the utility and the activities, the hedging, that is intended to mitigate or limit their exposure to the volatility that you and I have been discussing.

DR. BYRON WILLIAMS: And in terms of volume?

MR. DOUGLAS SMITH: Their -- their approach is predominantly focussed on -- on volumes of -- of hedges. One (1) of -- and I -- and I will apologize in advance, I don't believe I'm going anywhere near confidential, but -- but please, you know, -- I'll try to go slow and please stop me if I -- if I start to go to far.

There -- they have a goal of having their purchase or sale transactions be backed by physical deliveries. They don't want to be in a -- in a -- in a world in which they are operating purely financially and -- and buying and selling in that -- in that regard.

That means that a focus on hedging, the amount of hedge based on volume, it makes a lot of sense. It -- it helps protect against ending up -- it gives them a guardrail and it is clear from their activity, their -- their discussions that they -- that -- that they, the trading group, the -- the larger team that's engaged in planning their operations and their oversight committee all were involved in trying to set appropriate volumes based on the conditions they were at.

DR. BYRON WILLIAMS: Thank you. That's -- that's helpful. And just in terms of portfolio risk, other than -- there are -- presumably are portfolio risks other than in terms of volume?

MR. DOUGLAS SMITH: Absolutely. So -- so the -- I think the easiest way to think about this is if I project that I'm going to sell 100 megawatt hours then I -- I certainly -- and I want a hedge that -- so that -- I -- I know I'm going to need to sell -- or let's say purchase since that's what -- the -- the world they were in for the most part.

I need to purchase 100 megawatt hours. That's what I think I need but I'm projecting ahead. So, there's risk that a hundred (100) might be fifty (50) or it might be a hundred and fifty (150) or two

hundred (200), right? There's -- there's risk associated with exactly how much and -- and how accurate I can be given that my projection is based on an enormous number of complex factors.

There's also uncertainty as to what price I'll be able to -- or I will be required to pay if I wait until the need actually comes. So -- so that price uncertainty and the volume uncertainty in combination is the portfolio risk. The fact that either of those can be moving constitutes the world...

And -- and I guess the last piece that I would add, it isn't necessarily in this -- this sentence, but just because it's in -- in here overall, is: The impact on this is to their extra-provincial revenues which impacts their budget which impacts the GRA. So -- so this is not a hypothetical risk or a risk that doesn't manifest in their -- their financial results.

Whatever -- whether they -- whether they hedge or they don't hedge, they're -- they're subject to uncertainty and that uncertainty impacts their potential financial outcome.

DR. BYRON WILLIAMS: Thank you for that. And -- and it's not -- the question is not only whether they do or don't hedge, but also potentially

how they hedge, agreed?

MR. DOUGLAS SMITH: How they hedge, how much they hedge, certainly.

DR. BYRON WILLIAMS: And so one consideration for example might be jointly -- hedging joint price and quantity risk, agreed?

MR. DOUGLAS SMITH: Yes.

DR. BYRON WILLIAMS: On -- I'm still on page 93, still in the first paragraph on the fourth line, you note that there does not appear to be any distinction between the revenue risk borne by purchase transactions versus the revenue risk borne by sales transactions, agreed?

MR. DOUGLAS SMITH: Yes.

DR. BYRON WILLIAMS: And the point you're making is that these sales versus purchase transactions don't necessarily produce the same level of risk or type of risk for Hydro ratepayers.

MR. DOUGLAS SMITH: That -- that is the point I'm making, yes.

DR. BYRON WILLIAMS: And on the sales into MISO side, generally lost sales revenue has an effective floor of -- of zero unless the wind is really blowing and the sun is really shining.

MR. DOUGLAS SMITH: Yes, absolutely.

DR. BYRON WILLIAMS: On the import from MISO side, additional purchasing costs have no realistic ceilings in most market conditions.

MR. DOUGLAS SMITH: They -- they do eventually, but in practical terms, they can go up multiples of wherever they are today pretty quickly and easily.

DR. BYRON WILLIAMS: Thank you. Going to the third par -- paragraph -- and I know Ms. Fox was trying to get there -- but you use -- you suggest an approach of potentially differentiating hedge -- hedging strategies between purchase conditions and sales conditions, agreed?

MR. DOUGLAS SMITH: Yes.

DR. BYRON WILLIAMS: And I wonder if you can elaborate on -- on what kind of potential different hedging strategies might actually be employed?

MR. DOUGLAS SMITH: So I think, you know -- let me -- let me start with this. I -- I am not a hedging and trading expert. That -- that is not my expertise, and I'm -- so I'm going to -- I'm going to go so far and no further here.

It's an -- we made an observation that I think has merit and that I think that is -- that is

worth pursuing. We certainly aren't suggesting a solution.

I also want to say I think there are ways to do what I'm suggesting here without changing policies. So it -- I am not stating definitively what Manitoba Hydro is or is not doing outside of the hedging activity I saw, but the policies are fairly simple.

And I think, as I -- I think I mentioned this in -- in my presentation. I think, generally, that's appropriate. They're not doing an enormous amount of -- of transactions from what I saw. I don't think that they need to, you know, reinvent the wheel or invoke some -- some highly complex policy.

But given what we just discussed, the -- the value at risk, the amount of dollars, the amount of impact is not symmetrical. It's possible that there are -- it is definitely possible that there are ways to articulate hedging that still incorporate their volume concerns and their desire to back physically but accounts for the asymmetrical risk and helps put a finer point on perhaps focussing more of hedging on purchasing rather than on sales where there is less dollars at risk.

DR. BYRON WILLIAMS: Thank you. And - - and appreciate the limits of where you're prepared to go, and that's fine for -- for my purposes.

And you also learn -- used the -- the term 'more' -- at the very last line, "more nuanced trading limits". And again, I don't want to invite an extensive explanation, but I wasn't quite sure what "more nuanced trading limits" meant.

MR. DOUGLAS SMITH: I think it's really around what I'm saying here. So -- so without trying to put numbers on this at all, let's say that there's a policy that would suggest that you hedge 'X' percent of the volume, that that's -- that -- that whatever 'X' is, that safely keeps you in the realm of delivering physically against that while reducing the -- the overall portfolio risk, the risk to -- to revenues from your potential transactions.

You could look at incorporating in addition to that simply a percentage of financial impact in addition to financial per -- percentage of volume or something -- something like that that says we still want a limit. We still want to place limits around the physical so that we're -- or the percentage so that we stay in the world of physical delivery.

But, we want to give further guidance

within that boundary that says if you have -- if you're more at risk of having a large impact to the financial outcome, to the -- to the net revenue, you want to be higher in that range. And if you're having a smaller impact to the -- to the financial dollars, you'd want to be lower in that range.

DR. BYRON WILLIAMS: Thank you. I have a few short snappers. I hope to finish us off. I think most of them are to you, Mr. Bowers (sic), and -- oh. My snappers may be a little less short than I thought. I have a bit more time than I thought.

I'll -- but, Mr. Bowers, today in your direct evidence, you said, "For the GRA" -- General Rate Application:

> "...the conservative assumptions related to MISO sales are appropriate based on what Hydro can know today about its products."

Do you remember a statement to that effect, sir?

MR. JEFFREY BOWER: Yeah, to that effect.

DR. BYRON WILLIAMS: So when you used the term "for the GRA", sir, are you referring primarily to the '23/'24 and '24/'25 years?

MR. JEFFREY BOWER: I think what I -- well, what I'm referring to is the fact that, for a -- a GRA-type proceeding where you want to get the best estimate of -- of costs and revenues and -- and that sort of thing for -- for rate-making purposes, you want to have a high degree of certainty about revenues from something like a -- a market sale or -- or purchase that -- that might be subject to uncertainty.

And so, for example, when you're thinking about capacity, you know, selling capacity that -- that is surplus but you don't have a counter party and -- and you're not exactly sure how the market is going to look for that -- for that capacity, that excluding something like that may be appropriate for -- for a GRA proceeding.

DR. BYRON WILLIAMS: And -- and especially because we're just looking a couple years out in terms of setting rates:

MR. JEFFREY BOWER: Right. Yeah, that's part of it.

DR. BYRON WILLIAMS: Again, Mr. Bower, in your evidence this morning there was a discussion of potential future opportunities for Manitoba Hydro in terms of surplus capacity.

You -- you remember that at a high

level, sir?

MR. JEFFREY BOWER: M-hm. Yes.

DR. BYRON WILLIAMS: And one (1) of the things you indicated, you spoke about other regions bringing in -- in new products in terms of, I presume, capacity. Do you recall that statement, sir?

MR. JEFFREY BOWER: Yes, although I'll -- I'll kind of correct that -- that understanding about -- about that being focussed on capacity because it -- it can go beyond capacity.

DR. BYRON WILLIAMS: So, what I'd invite you to do, sir, is if you can give us just some illustrative examples of the new products, whether capacity or otherwise, please.

MR. JEFFREY BOWER: Yeah. I think the -- the fundamental point here is, as regions are all facing this -- the same challenge of renewables coming online, lack of firm capacity, everybody needs to operate their system in a reliable way every hour of the year.

And the -- some of these dynamics around the qualities of renewable resources is creating some strain.

So, in organized markets like MISO, and so that includes, like, you know, MISO, SPP,

California ISO, New York, New England, all of those organized markets that have market products that people can offer that -- that they're compensated for, you know, that includes the -- the products that Manitoba Hydro currently sells, which is day-ahead and realtime energy. They sell ancillary services of different types into the market.

All of those products are -- are trying to serve a function which contributes to maintaining a reliable system. And as there are new challenges that regions are facing, they're experimenting and -- and testing new products that have the goal of sending a price signal to a specific service that a -- that a generation resource can provide.

So, to give an example, we -- we talked a little bit about -- I think we mentioned in the report different kinds of -- of flexible ramping products.

MISO has a ramping product. Other regions have different types of products that -- that do something similar, but it's basically a service that says I can change output very quickly.

So, if the -- you may be familiar with the concept of a -- of a duck curve, but -- but, basically, as solar drops off in the evening, the --

the net load, so the load, you know, without that solar, goes up very steeply, and -- and that's a challenge that California faced kind of first of all the organized markets.

So, they created a product called a ramping product, which is something that can -- can ramp up quickly. Those sorts of products, and there are others that different regions are -- are implementing, again, they have that same objective of -- of filling a system need that's -- that's required for -- for reliable operation.

There's another product that -- that -- I don't recall which region exactly is developing this, but it's an inertia-based product because there's a -- there's a -- this gets way into the electrical engineering that I -- that I won't pretend to -- to be an electrical engineer, but it's basically a product that is -- helps maintain a reliable system in -- when there are a lot of inverter-based resources, like wind and solar.

And it's -- it's -- they're trying to -- the development of a product like that is, again, trying to send a price signal to attract resources into the market that can provide those services.

DR. BYRON WILLIAMS: Thank you. And

you've talked a little bit about the role of Hydro potentially -- especially while emerging storage comes online, in terms of shaping and firming other renewables.

I wonder if you can just elaborate on that just a little bit, sir.

MR. JEFFREY BOWER: Yeah. Similar to -- to the response I just gave, when markets have -- have needs for different things they develop products and -- and try to send price signals for that.

Wind and solar are, you know, you -- you discussed a little bit, but they're -- they're dependent on -- on their fuel, the -- the wind or the sun. And so, there are -- there are intermittency challenges for a resource that doesn't have -- you know, isn't coupled with storage or if the market doesn't already have enough storage to kind of smooth out that -- that output.

Hydroelectric resources are -- are an option for helping to smooth out that intermittency because it dispatchable. It -- it can be quick to respond to -- to the grid needs and -- and market signals.

DR. BYRON WILLIAMS: Thank you very much.

THE CHAIRPERSON: Sorry, Mr. Williams, you've got ten (10) minutes.

DR. BYRON WILLIAMS: We'll be done before that, sir.

THE CHAIRPERSON: Okay. That's perfect.

DR. BYRON WILLIAMS: I -- I'm as shocked as you are.

CONTINUED BY DR. BYRON WILLIAMS:

DR. BYRON WILLIAMS: But, Mr. Bowers, while I have you though -- and perhaps we can go to page 46 of Daymark's evidence, DEA-2, and it's -- it's the top paragraph.

Mr. Bowers, I'll just give you a second to look at it given that we have ten (10) minutes.

(BRIEF PAUSE)

DR. BYRON WILLIAMS: You've -- you've had a chance to refresh your memory, sir?

MR. JEFFREY BOWER: I have. I just want to look in my hard copy here just back a page so I can make sure I know which section we're in, whether this is short-term or long-term, but... Okay. This

is the long-term price section. Thanks.

DR. BYRON WILLIAMS: And -- and in fairness, sir, it's -- it's a long-term section, but you are adverting back to some of the observations you also made in the -- in the short-term section.

You see that, sir?

MR. JEFFREY BOWER: Yeah.

DR. BYRON WILLIAMS: Okay.

MR. JEFFREY BOWER: Yeah.

DR. BYRON WILLIAMS: And in terms of the -- you -- you note, first of all, that similar to the short-term forecast, the low and high sensitivities are not fundamental based forecasts, agreed?

MR. JEFFREY BOWER: Yes.

DR. BYRON WILLIAMS: And near the end of this page you -- you -- not this page, excuse me, this paragraph, you also note some potential limitations in that the implied heat rate does not change in those low and high -- high prices futures the -- because the methodology assumes no market response.

Did I -- did I have that correctly, sir?

MR. JEFFREY BOWER: Yeah, that's

correct.

DR. BYRON WILLIAMS: Inelegantly, but, okay, that's good to hear.

MR. JEFFREY BOWER: Right.

DR. BYRON WILLIAMS: So -- and -- and I understand what you're saying is that, for the purposes of the GRA, you know, what they're doing is -- is reasonable, I wonder if in the -- in the broader context of planning and resource planning, if there are any limitations of this type of analysis?

MR. JEFFREY BOWER: Yeah, I -- I would say that the -- and -- and the -- the context here -- I'll try to be relatively brief, but the implied heat rate is -- is a calculation that is -- is produced from the natural gas price and the energy price that is -- is part of a -- of a forecast.

So, if -- if, you know, you're -- you're -- you know, generally, the way that -- that price forecasters develop their -- their output is they have a model. They have a system that they are simulating. They have inputs of -- of what generation types are -- are available and online, what the loads look like, what fuel prices are, what resources get built over time, all of that sort of thing.

And so then they -- they run the model

and they determine what energy prices are output -- are -- are the output of that system, assume -- you know, given their assumptions.

Because natural gas is such an important resource for setting marginal prices, a very common way of -- of looking at the efficiency of a system is to just take -- take your -- your input natural gas price and your output energy price and do a calculation to figure out how much -- you know, how much the -- the fuel price is impacting -- is -- is producing the energy price. That's called an implied heat rate, and it's a -- it's a measure of system efficiency.

And so, what I -- what I'm talking about here in terms of the fundamentals-based forecast is that type of model, where -- where you put in all the inputs and you have a kind of cohesive system and you run it, that's -- that's essentially a fundamentals-based forecast.

What Manitoba Hydro has done to -- to create the low and high forecast here is to take that implied heat rate, which is the system efficiency in the reference case and then just put in a new gas price. And say, Okay, if -- when the gas price was our reference price, these are the energy prices it

produced. Let's test a higher gas price and see what energy prices are produced with that same system efficiency. And it's -- it's a reasonable way to -- to get a rough estimate of a high and low case.

The reason why it's not fundamentals based is because in -- in the real world, in reality, if you're looking twenty (20) years out, which is what these forecasts are, twenty (20) years forecasts, if you were in a -- in a world of persistent high natural gas prices, you might not build a new gas plant. There might -- you might look for lower cost options.

That might not be the optimal resource portfolio in the long term to build new gas.

Similarly, if you were in the low price future and you consistently have lower prices, you might build more natural gas as the -- the least cost option.

And so, your -- if you did that, your system efficiency -- that heat -- that heat rate, in reality, would be different than it is in the reference case.

And so, you would end up with a different fuel price because you -- or a different energy price because you have a different system efficiency.

That would be three (3) fundamentals based forecasts. It would be, like, basically, trying to incorporate the market response. When I say 'market response,' that is the change in resource build out that would occur if you were on that low price trajectory or that high price trajectory.

And so, that would make those low and high cases fundamentals based.

What we're concluding here -- let me just wrap up real quickly. Sorry, I know I'm eating into all of your ten (10) minutes. But --

DR. BYRON WILLIAMS: This is great and exactly what I was looking for. Thank you.

MR. JEFFREY BOWER: Okay. The -- what we're saying here is that -- is that for a rough estimate of low and high prices to give your -- a range -- that this approach is -- is reasonable. And that, you know, pursuing these -- these lower and higher fundamentals-based forecasts, they -- they may be, you know, either more expensive or, you know, maybe less available. There might not be five (5) different vendors that -- that you can use.

So -- so using this approach is a -- is a reasonable approach for -- for, kind of, bracketing the low and high.

I think going back to your question, the -- using a different approach might be more appropriate for a different purpose.

And so, if you're trying to get -- get a different view of what resource portfolios might look like over time, you might choose a different approach.

DR. BYRON WILLIAMS: Thank you. And just -- just to finish off -- and thank you for that thoughtful answer. It's very helpful.

Earlier today in discussing the MISO market, I'll suggest to you that you explained that capacity need is driven by, one, peak load; two, the reserve margin for the relevant season; and three, the accredited capacity value for the season.

Is that about right, sir?

MR. JEFFREY BOWER: Yeah, that'd -- yes.

DR. BYRON WILLIAMS: And so, when we use that term -- when we use a term such as 'resource accreditation', I'll suggest to you that that's the process of accurately measuring and assigning a capacity value to a resource based on its contribution to system reliability during periods of highest risks.

Is that kind of your understanding of

it, sir? In the MISO context?

MR. JEFFREY BOWER: I think I -- yeah, I would agree with that definition.

DR. BYRON WILLIAMS: And I'm not sure you -- you've memorized it yet, sir. But you're aware that in May of 2023, MISO issued a white paper titled 'The Draft Resource Accreditation Design'?

MR. JEFFREY BOWER: Yes, I'm -- I'm aware of a -- a MISO report, which is part of their ongoing effort to basically reconsider how they are accrediting -- accrediting -- I'll get that word -- accrediting capacity to -- to different resource types.

DR. BYRON WILLIAMS: And at a high level, with -- again, not asking you to repeat verbatim the report -- in determining the capacity value to a resource based upon its contribution to system reliability during periods of highest risks, would it be fair to say that MISO is debating the merits of moving from an average to marginal cost based accreditation approach?

MR. JEFFREY BOWER: I'm not familiar enough, I don't think, with that white paper to answer that.

I know that they are -- they are

considering several different factors in the accreditation process. And I -- I just -- I don't -- I'm not familiar enough with the white paper to answer that.

DR. BYRON WILLIAMS: That's fair enough. And I appreciate that.

Just to back up one step from that then -- and again, if you're unable to answer -- but as a general direction, would it be fair to say that one of the key objectives of MISO is to develop transparent market prices reflective of marginal system cost?

MR. JEFFREY BOWER: And are you referring to energy or -- or capacity? Or is there a specific product that you're --

DR. BYRON WILLIAMS: I'm thinking in the capacity -- if you can't answer it, that's fair.

MR. JEFFREY BOWER: I -- I think I'd have to -- I'm not sure I can answer that today.

DR. BYRON WILLIAMS: Fair enough. Mr. Chair and members of the panel, I -- I thank you for your time.

THE CHAIRPERSON: Thank you. We're going to take the afternoon break. We'll be back at 3:45. Thank you.

--- Upon Recessing at 3:31 p.m.
--- Upon resuming at 3:46 p.m.

THE CHAIRPERSON: Mr. -- Mr. Hacault is chomping at the bit. And -- and the motorcycles are -- are back again.

(BRIEF PAUSE)

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

CROSS-EXAMINATION BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: Yes. Good afternoon, members of the panel. Good afternoon Daymark Energy Advisors. Good to see some of you again. My name is Antoine Hacault, I act on behalf of the Industrials in this proceeding. And I'll be taking you through some of your slides and parts of your report and some other exhibits that -- or filings of Manitoba Hydro in this proceeding.

So, we'll start with this -- your slide deck page number 7 and the third bullet, you note, and it's also indicated in your report, that the Manitoba Hydro system is expecting increasing load growth.

Do you recall in saying this whether you were referring to load growth forecast as prepared by Manitoba Hydro? Or also the risks of faster growth than the load forecast?

MR. JEFFREY BOWER: I think this statement is generally referring to the load forecast that's included in the GRA, as we review it as part of the, you know, the export volume in -- in all of those components that I discussed earlier.

MR. ANTOINE HACAULT: Okay. And if we go to page 57 of your report, I think you deal with some of that in -- or that discussion, where you're saying in the Daymark findings that Manitoba Hydro's description of the drivers of the increase in peak are reasonable.

Do you recall what you would have meant by 'the drivers'? In other words, were they qualitative or quantitative?

MR. JEFFREY BOWER: The -- yeah, and -- and we know here, we did not review the load forecast in detail. That was not a -- an element of our scope. We reviewed it in the context of -- of, you know, kind of aligning on the -- the export volume forecast.

But as it -- as that -- as load

forecasts is -- is a component of that, we did have discussions with them when -- when we met in person on site at Manitoba Hydro to discuss their load forecast.

There is a -- a noticeable expectation of -- of load -- of increasing load growth in -- in their forecast, and so we discussed that with them.

I don't know if I recall all the factors. I know one was, essentially, price elasticity with lower prices. Load is -- grows a little more. I don't recall the other key drivers, but -- but as part of our conversation, we -- we kind of assessed that it was a -- a reasonable assumption, given our limited review.

MR. ANTOINE HACAULT: With your permission, I'll go to Manitoba Hydro's Appendix 5.1, Table 7. I show it as at page 22 of 77.

It's part of the load forecast that this utility has provided. And, in particular, I'd like you to look at the last two (2) columns to the right, where it says "percentage electric, space heat and percentage water heat." Have you found that?

MR. JEFFREY BOWER: Yes. I see those.

MR. ANTOINE HACAULT: Okay. And I'll ask you a broad question firstly and I might have some follow-up questions.

Do you have any opinions or views on the reasonableness of electric space heating remaining fairly constant from 2020 up to 2040 in the 40 to 41 percent. In other words, it assumes no take-up of things like heat pumps, or something else.

MR. JEFFREY BOWER: Yes, since we didn't review the forecast or the -- the assumptions behind it, I don't really have a -- a view or a comment on that.

MR. ANTOINE HACAULT: Let me try to, based on what you know is happening in the MISO market and policies, generally, is there anything you can offer to this Board as far as an assistance as to whether there might be up-take or change in electric heating?

MR. JEFFREY BOWER: Well, I can -- I can say similar to the conversation we had about electrification earlier in the MISO market, as part of the MISO market slides that -- that I covered, there is a lot of emphasis on electrification in many areas in the MISO market and -- and other markets in the United States.

As you noted, a lot of those are policy driven so there are a lot of incentives for -- for heat pumps as a way to decarbonize economy wide, to

try and encourage people to get off of natural gas or home heating oil as the -- as the heat source and move into electrification.

And so that's one of the key drivers for some of the electrified heat up-take in those regions.

MR. ANTOINE HACAULT: Okay. And would it follow that, in effect, in Canada and there's a lot of chatter about it and it's happened in an eastern province, at least, where there's policies where they've incentivized heat pumps to get off fossil fuels.

The consequence of that happening, should it happen in Canada over the next 20 years, would be that the potential for energy sales would go down -- energy sales in -- in -- in the export market.

MR. JEFFREY BOWER: Sorry. I think I missed -- I missed a part of the question. If you could repeat, please.

MR. ANTOINE HACAULT: Well, I'll maybe put a different question to you.

If -- would energy sales have a potential to go down if residential solar becomes big but peak only likely it'd go up?

MR. JEFFREY BOWER: Yeah. I think, if

-- if policies result in additional load growth, all else equals, so, mean -- meaning that no new resources are added to the system to -- to generate more electricity, an increase -- also an increase in load by any -- for any reason would reduce the amount of energy available for export.

MR. ANTOINE HACAULT: And the second question I asked was more focussed on solar.

If we did more solar in Manitoba, that would provide energy but, also, we might not be able to address certain peak times with that type of renewable resource.

MR. JEFFREY BOWER: Solar resources added in -- in Manitoba would -- would provide energy and would likely have a reduced, you know, maybe not zero, it depends on the -- on the timing of peak, but -- but, probably, a reduced impact on addressing peak demands.

MR. ANTOINE HACAULT: So, in Manitoba, generally, our -- our peak is sometime in January, where the days are short, so we get limited -- we wake up in the morning, it's dark, we get back home from work, it's dark, and that's when our peak is.

There probably is not much peak capacity that can be attributed to solar in January.

MR. JEFFREY BOWER: Without storage, if -- if -- if the peak occurs on a non-daylight hour in the winter, solar's not going to -- not going to contribute to reliability in that hour.

MR. ANTOINE HACAULT: I'd like to take you to Manitoba Hydro Exhibit 30. That was their slide deck and this is where they presented on how they would closely match supply and demand in the future.

And, on the left, they put a slide that deals with capacity and, on the right, a slide that deals with energy, and, as you see in the blue at the bottom, they do explain that this is Manitoba net of DSM, so demand-side management.

Now, with respect to these graphs, and your -- I started out -- your -- with your indication that Manitoba Hydro's description of drivers of the increase in the peak are reasonable, do these graphs fit in with your comments on load growth?

MR. JEFFREY BOWER: I don't think I can answer that. I have -- I don't know the details of -- of what all has gone into this -- this graph.

MR. ANTOINE HACAULT: Okay. Would you be able to comment on whether or not if growth occurred faster, which is the subject I just covered,

the need dates would come sooner? I don't think you need to see a graph for that.

MR. JEFFREY BOWER: All else equal, if load growth occurs at a faster rate, then a -- a year of need would likely be advanced, all else equal.

MR. ANTOINE HACAULT: Okay. And this question doesn't necessarily have to be answered by you, Mr. Bower, but we've been given a certain assumption on DSM.

If DSM was larger, is anybody on the panel able to comment whether that could reduce the Manitoba Hydro load on this graph?

(BRIEF PAUSE)

MR. BILL HAIGHT: I'm just going to repeat what Mr. Bower said, is that he's not able to answer based upon this graph, Mr. Hacault, because he doesn't know what went into it, but -- but if you want to take it outside of the graph, I -- I think they could probably make a stab at it.

THE CHAIRPERSON: I think Mr. Athas --

MR. JOHN ATHAS: I can take you --

THE CHAIRPERSON: -- was about to --

MR. JOHN ATHAS: Yeah, I think the --

the --

THE CHAIRPERSON: -- answer.

MR. JOHN ATHAS: Yeah, I think the -- the general statement, all else being equal if you -- if you do more DSM, and by more DSM I assume you mean more kilowatt hour -- more kilowatt hours -- kilowatt hours of savings.

Then you would -- then you'd have a lower blue point and you'd have less of a need for dependable energy or capacity, probably.

CONTINUED BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: Yeah, there are similar graphs and I could take you to it. I think it's page 56 and -- I have it, yeah. In 56, so I had put to you page 57 of your report, but on page 56 you had similar graphs, just maybe not quite as detailed, but they were capacity graphs.

If I look back again, just for a visual, again, I appreciate you may not know anything with respect to the graph, but on the right-hand side we have energy and it shows as being met, as you see a little on top there. It says, "Hydro". It's not only that and all the underlying data.

But do you have any comment with --

generally with your knowledge in the MISO market and how energies being met, whether addressing energy in Manitoba by wind is either inconsistent with or consistent with, or a reasonable assumption given what's happening in MISO and elsewhere?

MR. JEFFREY BOWER: And I'm not -- I'm not sure -- without having been part of the discussion when Manitoba Hydro discussed this graph or seeing some backup behind it, I'm not really sure what the question means in terms of using wind to meet Manitoba load.

I think we'd need more -- more details to -- to answer --

MR. ANTOINE HACAULT: I can --

MR. JEFFREY BOWER: -- the question.

MR. ANTOINE HACAULT: I'm -- yeah, I'm not too sure to what extent then you reviewed the Manitoba application. If I go to appendix 5.6, which is part of Manitoba Hydro's filing, page 2 of 2, it shows underlined data with respect to dependable energy.

And if you go on the left-hand side and find the third line down, it says: "Total new wind."

MR. JEFFREY BOWER: I see that.

MR. ANTOINE HACAULT: And if we go

across, we see that in 2033/2034 we start adding wind energy under this graph and you can see that it progressively increases until we hit 2041 for a total gigawatt per hour, I believe that's the metric, of 37.52.

Do you see that?

MR. JEFFREY BOWER: Yes.

MR. ANTOINE HACAULT: So, now having seen this table, I'll reframe my question again.

Do you have any comments or views that you can share with this Board on the reasonableness of an assumption of using wind to deal with energy requirements?

MR. JEFFREY BOWER: We didn't -- as -- as part of our scope, we didn't review sort of resource planning decisions or resource planning forecasts and -- and assess, you know, kind of the -- the economics of adding wind versus -- versus other resources.

So I don't think we would -- would have -- we -- we haven't done enough analysis to really draw a conclusion about the reasonableness of that assumption.

MR. ANTOINE HACAULT: Okay. Thank you. And I'll ask the question, and it may be the

very same answer. If we just flip a page back in this particular Appendix 5.6, we'll see that there's the capacity -- this is a capacity file and winter peak.

There's on the second line some thermal being added as a proxy. Later on in this table, again, with the knowledge that you have generally on net zero and greenhouse gas targets in the United States, do you think it's a reasonable proxy to put gas to meet demand?

MR. JEFFREY BOWER: I think the -- the answer's generally the same. We haven't reviewed their -- their planning assumptions.

The only thing that I can -- I can add is that adding thermal for capacity purposes is not necessarily -- it continues to be a component of -- of resource plans even in regions that are expecting to decarbonize because using thermal resources as -- as peaking resources only doesn't contribu -- contribute a lot of -- necessarily contribute a lot of emissions.

So it doesn't surprise me to see it -- see it in here, but again, we haven't reviewed as part of our scope their -- their planning assumptions in detail.

MR. ANTOINE HACAULT: Okay. And flipping back to the second page of this Appendix 5.6,

when you assessed and -- and commented that having reviewed the load forecasts at a high level, that the -- I think your words were "drivers of the increase in peak are reasonable."

But are you -- did you get into whether or not the elements such as firm energy were elements that were available during times of drought? So what level of dependability and energy did -- did you consider, if anything at all?

MR. JEFFREY BOWER: We didn't review those issues in particular in -- in the context of -- of the -- the load forecast statement that you -- you quoted.

MR. ANTOINE HACAULT: Okay. And that answer also applies to issues like demand-side management. On these tables, if we go on this particular table on -- with respect to energy, there's a -- midway through the table there's a heading 'Demand', and the second line on that -- under that title is, '2020 Efficiency Manitoba Demand-Site -- Side Management Forecast'.

There was -- did you do any kind of an analysis as to whether that was a reasonable assumption, whether there were other options for DSM to deal with load?

MR. JEFFREY BOWER: We didn't do any analysis like that as part of our scope here.

(BRIEF PAUSE)

MR. ANTOINE HACAULT: Is anyone on the panel able to comment that, if Hydro is facing resource shortfalls, would there be a role for DSM to play in dealing with those shortfalls?

We see that Hydro has put new thermal as a proxy. We see Hydro has put wind as a proxy. Is anybody able to comment on whether or not DSM could act as a resource to meet energy and demand?

(BRIEF PAUSE)

MR. JOHN ATHAS: We would -- we would certainly expect that that would -- and we -- we understand that there's an integrated resource planning exercise that was -- that's being done by Manitoba Hydro. So we would think that there's -- there's opportunities in the demand-side management to meet -- to help alleviate a need for capacity, for generation capacity.

We haven't -- we don't know if these

numbers have been -- that this line of numbers is a stretch number, that you couldn't go any higher than this or anything else. So, you know, it could be a potential number for all we know.

So I would be hesitant to say that -- that the number could be higher than that, but we do know that that should be a consideration.

MR. ANTOINE HACAULT: Thank you for that answer.

THE CHAIRPERSON: Monsieur -- sorry. M. Hacault, you have ten (10) more minutes.

MR. ANTOINE HACAULT: Yes. I think I've got about half a page left, so I'm hoping that I can finish early for once.

CONTINUED BY MR. ANTOINE HACAULT:

MR. ANTOINE HACAULT: Now, if I go back to Daymark's presentation at page 13, on the right-hand side of this slide, there's a table which is entitled 'Figure 13'.

Is it fair to summarize that what Daymark was intending to illustrate by this figure is that capacity is an increasing problem in MISO?

MR. JEFFREY BOWER: Did you say it is or isn't?

MR. ANTOINE HACAULT: Is.

MR. JEFFREY BOWER: Is. What we were intending to -- to demonstrate here is that the LRZ-1, which is the zone closest to Manitoba, is expected to -- is forecast to have potentially a capacity shortage in -- in the coming years.

MR. ANTOINE HACAULT: And when you say, "in the coming years," it's in fairly short order.

MR. JEFFREY BOWER: In -- in fairly short order, yes, all else equal, you know, without -- without any -- any new resources coming on line in that zone.

MR. ANTOINE HACAULT: And that could be affected if we look at the 'Z' or RZ-01 graph on the -- in Figure 7, we see that there's a lot of renewables being put into that market area, correct?

MR. JEFFREY BOWER: Yeah. The -- the -- on the left-hand graph, as you note, the -- the additions -- and that's additions between 2022 and 2041 -- but the additions are largely renewable -- renewable resources, although there are some gas or -- and -- and battery resources as well. And -- and again, this is from MISO's forecast that -- that was put out in 2022.

MR. ANTOINE HACAULT: And the large additions of solar would not give much capacity to the -- that portfolio?

MR. JEFFREY BOWER: On a nameplate basis, it would -- you know, I think we talked a bit about this, but the accredited capacity for solar is -- is reduced. It doesn't provide as much as a percentage of nameplate as -- as a thermal resource, for example, but it does provide some capacity value in -- in general.

MR. ANTOINE HACAULT: And the same would hold true of wind? It would provide some capacity in general, but the wind doesn't always blow, so there'd be some downgrading on the capacity?

MR. JEFFREY BOWER: Correct. There -- there is generally a -- a reduction in -- from nameplate for both solar and wind.

MR. ANTOINE HACAULT: With this -- I'll call it a problem, and maybe it's more a challenge than a problem.

Are you able to provide any insight for this Board on the expectation in the next ten (10) years or so of pricing for capacity?

Would it be a premium product or a low-value product?

MR. JEFFREY BOWER: Yeah, I think, you know, it -- it goes back to a lot of the issues that we discussed earlier and the -- the -- you know, the web of factors that really is driving the capacity market and -- or -- or the need for capacity.

And -- and so, you know, there's -- there's a distinction between a capacity price that might be reflected in the PRA auction price that we -- we discussed with the -- some of the cross-examination earlier versus the -- the market for capacity that might be done on a bilateral basis with -- with a utility counter party.

And I don't think that there's a good way at this point to give a ten (10) year forecast on -- on a capacity -- on a capacity price for MISO as a whole or -- or for LRZ-1 given this -- this uncertainty.

MR. ANTOINE HACAULT: I wasn't asking you to pull a magic value out of a hat, but you -- I was hoping that you might have some insight as to whether it would be expected to be a premium product or it would just be a low value product.

MR. JEFFREY BOWER: Well, certainly, I think we would agree that there's -- there's a need for capacity, and -- and that's what we're showing

here and that's what some other forecasts have -- have demonstrated, that there's expected to be a need for capacity. That doesn't necessarily mean that there will be buyers for Manitoba Hydro's capacity.

If utilities need to -- you know, I went through the -- the description of if winter -- winter peak becomes a planning constraint and they build their own capacity to meet their winter peak, they won't need anything in the summer because they've already built what they need, and so they won't be buying.

But I think, generally speaking, there will -- there are -- are -- you know, every -- every forecast that we're seeing from -- from MISO or -- or other entities is expecting that capacity will be needed in -- in the MISO region if the retirement plans and resource portfolio additions that are currently for -- you know, expected play out.

MR. ANTOINE HACAULT: Thank you for that. I have one (1) other exhibit I'd like to put to this Panel. It's PUB Manitoba Hydro 143, Round I, 43D, page 4 of 6.

We are -- like you, I get blind and I get blacked out. I can't see any underlying data. Yesterday Hydro confirmed that the winter values were

higher than summer.

Having -- I don't know if you can -- without getting into CSI, obviously, would it be reasonable to expect that the marginal value of capacity should be seeing increased values over the thirty (30) year time period?

MR. JEFFREY BOWER: Could you scroll up a little bit on the page so we can see. Thank you.

(BRIEF PAUSE)

MR. JEFFREY BOWER: Sorry, could you repeat the question one (1) more time. We're -- like, we heard you differently here.

MR. ANTOINE HACAULT: Well, that's okay. You can answer both. I've got two (2) minutes left.

MR. JEFFREY BOWER: Sorry, could you repeat the question.

MR. ANTOINE HACAULT: I think it was something along the lines, is it reasonable to expect that the marginal value of capacity should see increasing values over the next thirty (30) years?

MR. JEFFREY BOWER: I'm not sure we can answer this. We haven't looked at this -- this

table in much detail. I'm not sure exactly what goes into the basic marginal costs applicable to distribution level programs.

We -- we just haven't reviewed this, so I'm not sure we can really have an opinion on -- on what the trajectory should be for those -- those values.

MR. ANTOINE HACAULT: I'm not tying it specific. My question wasn't tied specifically to the table. My question was:

Is it reasonable to expect that the marginal capacity should be seeing increased values over the next thirty (30) years?

(BRIEF PAUSE)

MR. JOHN ATHAS: I think that it -- it would -- and on a real dollar basis, that would be not necessarily a good assumption. You could have the same resource being on the -- the margin for capacity. That whole chart that you had out there, that's going to be filled.

And it could be bio-diesel generation on -- on peak that -- that's viewed as satisfactory from the environmental standpoint, and that doesn't

change. It might go up with inflation, you know, or the like.

But -- so, if you're talking about something -- the implied more and more -- more and more shortfall implies a higher and higher -- higher and higher peak, that -- that's -- we're not talking about the energy market where a static set of resources have to go up the demand curve -- supply curve, we're talking about what -- what the market response.

So, I'd be really hesitant to -- to be making an assumption that the price has to go up.

MR. ANTOINE HACAULT: Okay. Thank you. That was a helpful answer. That completes my questions.

THE CHAIRPERSON: Thank you, Mr. Hacault. We're going to conclude the public session for the cross-examination of Daymark tomorrow. And then Mr. Haight has re-examination.

MS. ODETTE FERNANDES: Sorry, Mr. Chairman.

THE CHAIRPERSON: Sorry.

MS. ODETTE FERNANDES: It's Odette, from Manitoba Hydro.

THE CHAIRPERSON: Yes.

MS. ODETTE FERNANDES: I'm just confirming for the record.

THE CHAIRPERSON: Oh. I was just going to -- I had you in the script to ask you. So, you were -- you were at the end of the paragraph, so. And then move in camera to deal with the commercially sensitive information.

For the public session, Interveners may attend in person or watch online. The in camera session will not be live streamed and Interveners will be excluded from it.

And then I had to ask Odette if she had any questions or if we are just going with Mr. Peters.

MS. ODETTE FERNANDES: Sorry, I jumped the gun there, Mr. Chairman.

THE CHAIRPERSON: That's okay.

MS. ODETTE FERNANDES: No, I can confirm that Manitoba Hydro has no questions for this Panel. We thank them for their presentation and testimony today.

THE CHAIRPERSON: Thank you. Okay. So, we'll have Mr. Peters first thing in the morning. And then we'll go in camera. Thank you. Have a good evening.

--- Upon adjourning at 4:22 p.m.

Certified Correct,

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Wendy Woodworth, Ms.