

MANITOBA CLEAN ENVIRONMENT COMMISSION

BIPOLE III TRANSMISSION PROJECT
PUBLIC HEARING

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TUESDAY, MARCH 5, 2013

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Brian Kaplan - Member
Ken Gibbons - Member
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Cathy Johnson - Commission Secretary

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1 Tuesday, March 5, 2013

2 Upon commencing at 9:00 a.m.

3 THE CHAIRMAN: Okay. Could we come to
4 order? We have a Bipole day ahead of us today,
5 with witnesses presenting on a couple of different
6 themes around the location, or the southern end of
7 the Bipole line.

8 Before we turn to the Coalition, the
9 secretary has a number of documents to place on
10 the record.

11 MS. JOHNSON: These are all the
12 documents that have been received since we went
13 into the adjournment. Many of them were referred
14 to yesterday.

15 So CEC 06 is the letter to Mr. Bedford
16 regarding the topics we're talking about today,
17 the rerouting of the line to Dorsey.

18 CEC 07 is the response to Mr. Meronek
19 regarding the motion.

20 MCWS number 2 is the letter to
21 Mr. Sargeant regarding the line rerouting.

22 MH 103 is the list of undertakings
23 from December 14th.

24 MH 104 is the response to the letter
25 from Mr. Sargeant regarding the Dorsey converter.

1 MH 105 is the letter to the department
2 with additional TAC comments.

3 MH 106 is the response to undertaking
4 regarding forest fragmentation.

5 MH 107 is the enhanced assessment of
6 the adjusted final preferred route for moose.

7 MH 108 is the letter to the department
8 regarding the mitigation measures.

9 MH 110 is the supplemental
10 environmental assessment on route adjustments
11 presentation from yesterday.

12 MH 111 is the EACP presentation.

13 MH 112 is the culture and heritage
14 presentation.

15 MH 113 is the moose and caribou
16 presentation.

17 MH 114 is the chart comparing the
18 VECs.

19 And MH 109 is the actual supplemental
20 report.

21 That's it for now.

22 (EXHIBIT CEC 06: Letter to
23 Mr. Bedford re rerouting of line to
24 Dorsey)

25

1 (EXHIBIT CEC 07: Response to
2 Mr. Meronek re motion)
3
4 (EXHIBIT MCWS 2: Letter to
5 Mr. Sargeant re line rerouting)
6
7 (EXHIBIT MH 103: List of undertakings
8 from December 14th)
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2

3 (EXHIBIT MH 110: Supplemental
4 environmental assessment on route
5 adjustments presentation)

6

7 (EXHIBIT MH 111: EACP presentation)

8

9 (EXHIBIT MH 112: Culture and heritage
10 presentation)

11

12 (EXHIBIT MH 113: Moose and caribou
13 presentation)

14

15 (EXHIBIT MH 114: Chart comparing the
16 VECs)

17

18 THE CHAIRMAN: Thank you. There is no
19 other preliminary business to take care of, so
20 Mr. Meronek, over to you.

21 MR. MERONEK: Thank you, Mr. Chairman.
22 I'd like to introduce the panel that's going to be
23 presenting evidence and be available for
24 questioning afterwards.

25 On my immediate left is Dr. Graham

1 Lawson from Albany, New York. To his left is
2 Mr. Art Derry. You all know Karen Friesen, who is
3 our tech person. And on her left is Mr. Dennis
4 Woodford. And they are ready to be sworn in.

5 THE CHAIRMAN: Thank you.

6 MR. DERRY: Art Derry.

7 Art Derry: Sworn.

8 MR. LAWSON: Graham Lawson.

9 Graham Lawson: Sworn.

10 MR. WOODFORD: Dennis Woodford.

11 Dennis Woodford: Sworn.

12 THE CHAIRMAN: Go ahead.

13 MR. MERONEK: Mr. Chairman, I have a
14 couple of preliminary matters before we get into
15 the evidence.

16 First of all, yesterday I submitted
17 some slides that are going to be used today. And
18 I also incorporated in my letter some minor
19 changes to the reports. And perhaps that letter
20 should be marked as an exhibit, my letter of
21 March 4 of yesterday.

22 Secondly, if I am a little cranky this
23 morning it's because at approximately 6:29 last
24 night, an e-mail from Shannon Johnson was sent
25 which attached two reports in the form of rebuttal

1 evidence. She says:

2 "Hi, Please see attached Manitoba
3 Hydro's rebuttal to recent evidence
4 filed by the Bipole III Coalition.
5 Regards, Shannon."

6 The "Hi" and the "Regards" clearly did not assuage
7 my upset. It wasn't until about 8:00 o'clock last
8 night that I was able to sit down with my experts
9 and go over this. We went into the wee hours of
10 the morning.

11 I had on several occasions asked
12 Hydro, through the Commission, to make sure that
13 if they were going to submit rebuttal evidence,
14 that it was done in a timely fashion, so that what
15 I call kitty by the door, gun and run conduct,
16 would be avoided. And this is what I call it.
17 It's inscrutable in my mind that we would get this
18 evidence at such a late hour, without any
19 opportunity to assess it and to prepare. I can't
20 fathom why it wasn't provided earlier. This is
21 too important a hearing, the subject matter is too
22 important to have conduct be embraced of this
23 nature.

24 To me, the most appropriate remedy
25 would be to have an adjournment, but I'm not going

1 to ask for that. We too, like the Commission,
2 want this to be over in the scheduled time. We
3 want to be responsible about this. So what we're
4 going to do today is present our evidence. I'm
5 going to ask questions of the panel, to the best
6 of our ability, on what has been presented last
7 night. But I am going to ask the indulgence of
8 the Commission, that if at the end of the
9 presentation on Thursday I need some time to
10 confer with my experts and to be able to properly
11 cross-examine, and perhaps even have clarification
12 from two of the witnesses -- Mr. Lawson will be
13 gone -- then I'm going to seek that ability to do
14 so either this week or early next week. But I
15 will hedge my bets, as it were, but I just want to
16 put the Commission on notice that we feel very
17 hard done by with respect to this late,
18 substantial evidence that's come in. But we are
19 prepared to proceed. Thank you.

20 THE CHAIRMAN: I'd like to take a
21 couple of minutes to address that.

22 Mr. Bedford, do you have any comments
23 on behalf of the proponent in this regard?

24 MR. BEDFORD: I can remind everyone in
25 the room that the date to which we committed to

1 file the rebuttal was today, March 5th. I did
2 that a month ago. So Mr. Meronek presumably knew
3 that. We have had two weeks since receipt of his
4 clients' reports to prepare the rebuttals, and I'm
5 pleased to say that we actually improved upon the
6 deadline to which I personally committed, which
7 was today. They were distributed last night.

8 Now, I'm sympathetic to the challenge
9 that any advocate, including Mr. Meronek, has
10 under circumstances like this to get documents, to
11 go through them, to sit down with his own client
12 and his own expert witnesses to go through them.
13 Which is why I was anxious, notwithstanding that
14 it was very short time for him, that he have them
15 before today so that he would have some
16 opportunity to go through them with his client.

17 To repeat, we had two weeks from
18 receipt of his. I could go through a litany of
19 challenges that we have had on our side to deal
20 with his expert reports, which included my primary
21 expert being unavailable to us until this last
22 weekend. And that would be Mr. Mazur.

23 I'm also sympathetic to anyone that
24 had to be up working on this material after
25 midnight last night, because I was up for several

1 hours after midnight last night working on this
2 material. So I am also quite sympathetic to
3 Mr. Meronek if he too was having to do that. But
4 Mr. Meronek is more experienced in the profession
5 than I am. He's been practising longer than I
6 have. He's a litigator. I have spent many years
7 as a litigator, and I simply say to younger
8 lawyers, it just goes with the territory. When
9 you're in a hearing wherein you're in a trial, the
10 reality is that you just have to work long hours.
11 And inevitably, human nature and condition being
12 what it is, you end up getting significant
13 material at a late time.

14 Now, I have no objections whatsoever.
15 In fact, I rather anticipated that the writers of
16 the rebuttal would be produced a week from today,
17 Tuesday, March 12th, and Mr. Meronek would be
18 cross-examining them on that material. So
19 practically speaking, he has a whole week to
20 prepare his cross-examination on that material if
21 he chooses. No objections if he wants to put
22 forward questions this Thursday on the rebuttal
23 material as well. So all arguably that we're
24 missing is he would have preferred, I do
25 understand that, several more days to have

1 Dr. Lawson, Mr. Derry, Mr. Woodford, Ms. Friesen,
2 go through the material.

3 That's what we're short here, is their
4 opportunity to thoroughly work and weave in their
5 reaction to that material in their presentations
6 today.

7 THE CHAIRMAN: Thank you.

8 Mr. Williams?

9 MR. WILLIAMS: Yes, just a couple of
10 brief comments. In terms of the prejudice to the
11 interests of the Bipole III Coalition, Mr. Meronek
12 can take care of that himself. From our client's
13 perspective, we're concerned about the prejudice
14 to the process. And we have got an important
15 piece of evidence today, new evidence put on the
16 record last night. And with respect, new evidence
17 that's not very well cited in certain
18 circumstances. It's difficult to tell which load
19 forecasts Manitoba Hydro is relying upon. It's
20 difficult to tell where their numbers are coming
21 from.

22 And so certainly our client is of the
23 view that Mr. Meronek would be well within his
24 rights to seek an adjournment. His proposal, as I
25 understand it, is to leave open the opportunity of

1 calling back his witnesses when they have had an
2 opportunity to review and to assimilate Manitoba
3 Hydro's information, and also to understand
4 through cross-examination where they are coming up
5 with these estimates.

6 And from our client's perspective,
7 that's an eminently reasonable position, and also
8 one that is best designed to assist the process.
9 If this evidence is important, and our client
10 certainly believes it is, then from our client's
11 perspective, if Mr. Meronek feels that he can't
12 adequately address these issues through
13 cross-examination, that that opportunity of
14 bringing back these witnesses should be offered to
15 him.

16 THE CHAIRMAN: Thank you. Any other
17 comments? We're going to recess for about five
18 minutes so the panel can discuss this.

19 (Hearing recessed at 9:12 a.m. and
20 reconvened at 9:16 a.m.)

21 THE CHAIRMAN: Mr. Meronek, I'm aware
22 that you had requested that Hydro submit its
23 rebuttal at an earlier time, but I am also aware
24 that we had said no, that we felt that the
25 two-week period was reasonable. If that

1 prejudices your evidence at all, we will certainly
2 entertain allowing you some time later this week
3 or early next week, or one evening this week or
4 next week to bring back your witnesses, if you
5 need to.

6 MR. MERONEK: We appreciate that.

7 THE CHAIRMAN: So proceed, please.

8 MR. MERONEK: Mr. Derry, I'd like to
9 start with you. I know that I had submitted a CV
10 of your background and experience way back when,
11 but if you could just indicate in your own words
12 to the Commission what your background experience
13 is and how it relates to this particular hearing?

14 MR. DERRY: Good morning,
15 Mr. Chairman, Commissioners, staff, participants,
16 Manitoba Hydro staff, and those in attendance. I
17 will go over my name again. My name is Art Derry,
18 a retired employee of Manitoba Hydro. I have been
19 a professional engineer since 1960, two years
20 after graduating from the University of Manitoba
21 in 1958. And no need to worry, I'm not going to
22 take up the whole morning covering my career,
23 which it appears that it hasn't come to an end
24 yet.

25 I will go over what I call my short

1 form CV. So in 1958, I had a Bachelor of Science
2 in Electrical Engineering from the University of
3 Manitoba. In 1960/61, I attended the General
4 Electric Power Systems engineering course, it was
5 an eight month course starting in September of
6 1960, ending in end of April '61. I was sent
7 there by my employer at that time, Saskatchewan
8 Power Corporation.

9 So from 1958 to 1967, I was employed
10 by Saskatchewan Power Corporation. I started out
11 as an engineer in charge of transmission planning,
12 and I spent about three or four years at that, and
13 then I became the engineer in charge of generation
14 planning. So I have the whole part of planning
15 process.

16 In fact, in 1960, I took part in
17 studies with Manitoba Hydro on the first
18 interconnection between Manitoba and Saskatchewan.
19 Those studies took place in Pittsburgh,
20 Pennsylvania at the Westinghouse Electric
21 Corporation.

22 In 1967, I left Saskatchewan Power
23 Corporation to come to Winnipeg, back to my
24 home -- I come from Pine Falls. And I was
25 employed by Atomic Energy of Canada from '67 to

1 1972 as an HVDC engineer on the Nelson River
2 Bipoles I and II transmission project.

3 For those who may wonder about the
4 involvement of Atomic Energy of Canada on the
5 Nelson River project, the Federal Government
6 provided funding for the first phase of Bipole I
7 and the two lines that were built from the north
8 to the south. So they had to have control of the
9 project. And at that time, Teshmont Consultants
10 were formed, which involved the Templeton
11 Engineering, Shawinigan Engineering, and Montreal
12 Engineering. And Teshmont is still here at this
13 time. In fact, I guess they are a subsidiary of
14 Manitoba Hydro, I take it.

15 During that time with Atomic Energy, I
16 attended studies in England on the Bipole I
17 project to do with the synchronous condenser
18 sizing and filters, et cetera. The project was
19 coming towards an end around 1970, the lines were
20 built. And at that time Hydro offered, just a
21 small group we had in Winnipeg here to look after
22 the project, there were engineers and other
23 people, Hydro offered jobs to those people so
24 they'd still be with the project. So we were
25 seconded for a couple of years while they sorted

1 out our pensions, et cetera. And I went over to
2 Hydro in 1970 as an HVDC planning engineer.

3 And my first project with Hydro was to
4 prepare a recommendation for the northern Bipole
5 II HVDC terminal location in the north. That
6 study resulted the recommendation that we go
7 through Heday rather than build the station like
8 they did at Dorsey where they put Bipoles I and II
9 together. I did the north part, I had nothing to
10 do with the south. My recommendation was to go to
11 Heday, and it wasn't taken too well by the
12 operating staff. I can tell you they wanted to
13 have it so they can have one operating place. But
14 we did win out. And it was a good choice to this
15 day. And Bipole III location is also going to be
16 located at another location, not at Heday, it's
17 going to be up by Conawapa.

18 After that, I became manager of
19 generation planning because I did have experience
20 in Saskatchewan. And my responsibilities included
21 the recommendation of inservice dates, first for
22 Long Spruce and secondly for Limestone.

23 Now, Limestone was started but the
24 load growth dropped off. At that time, we had
25 load growth at 6, 7 percent. Load growth dropped

1 off, a decision was made that we would stop
2 Limestone. We had just done the coffer-dam, so we
3 flooded it. So come 1984, we went out -- I should
4 say before that we had a 500, I worked 500 kVAC
5 interconnection with Northern States Power. And I
6 was involved in the contract negotiations on the
7 diversity exchange. That was the -- I guess it's
8 the contract that really made the line pay for
9 itself, to start it for both the utilities. And I
10 don't know if you know what diversity exchange is,
11 winter time when we have our peak days, they would
12 supply us capacity. In the summer time when they
13 had their peak, we would return their favour.

14 MR. MERONEK: Mr. Derry, if I could
15 ask you to just bring the mic a little closer to
16 you?

17 MR. DERRY: Okay. So under my
18 generation planning, we negotiated the power sales
19 as well. And with the sale to Northern States
20 Power of 500 megawatts that was negotiated in
21 1984, we were able to restart Limestone. And that
22 was a 500 megawatt sale. I worked on that
23 contract for that and I also participated. At
24 that time, we had to have hearings with the
25 National Energy Board and I participated as an

1 expert witness on that project.

2 So during the period of the '70s and
3 '80s, many significant decisions of new generation
4 and the 500 kV interconnection to the Northern
5 States Power were made. I must say I was proud to
6 play a role when I was with Hydro on decisions
7 that are still providing benefits to consumers of
8 Manitoba.

9 That's my CV. Before I start my
10 presentation, I want to make the following point.
11 Planning is not a rocket science, it's just common
12 sense, and let us all remember this as we proceed
13 with reviewing the various locations, options,
14 route selections, to minimize the effects of
15 Bipole III on the agricultural community in
16 Southern Manitoba, as well as keeping in the
17 forefront the need for improved reliability of the
18 Manitoba Hydro system to a catastrophic failure of
19 Dorsey Converter Station and northern transmission
20 line corridor.

21 Okay. The report subject is up on the
22 screen right now. I will read it out. It's
23 location options for Bipole converter stations
24 near Winnipeg, part one, Art Derry P Eng.

25 I'm going to go over the outline of

1 the presentation. The presentation will provide
2 options of converter station locations at nine
3 routes to achieve the same results or better to
4 the agricultural community, as well as offering a
5 more reliable system at a much lower overall cost
6 than that of either the CEC or Manitoba Hydro. It
7 will include discussion on the options, including
8 configuration of the lines to various station
9 locations, the timing, the cost, and the
10 reliability issues. They will discuss all
11 proposed routes with the prime function of
12 minimizing the effect on the Southern Manitoba
13 agriculture community, plus the reliability.

14 The main concern from a reliability
15 perspective is that both HVDC lines come into the
16 Dorsey station. And if Dorsey goes out for a
17 catastrophic event, then the heavily populated and
18 industrial areas of Winnipeg and Southern Manitoba
19 will suffer severe power outages.

20 The first consideration will be a
21 comparison of the CEC Inquiry Manitoba Hydro
22 Coalition route proposals. It will be followed by
23 the proposed converter locations of Bipole II and
24 Bipole III offered by the CEC, Manitoba Hydro.
25 And this report includes a discussion of the

1 reliability effect of such locations.

2 Now, the slide is up there. There
3 will be five options. The first one is the status
4 quo. Next, relocate Bipole II at Riel and build
5 Bipole III at Dorsey, CEC inquiry; locate the
6 converter station for Bipole III at Riel, a
7 Manitoba Hydro proposal; relocate a new converter
8 station for Bipole II at Riel, the recommended
9 proposal of this report; and build a converter
10 station of Bipole III in the vicinity of
11 LaVerendrye, recommended proposal.

12 The effect of corridor outages on the
13 existing Bipole I and II transmission lines will
14 be examined during the shoulder months, which are
15 the months of March, April and November, and the
16 off peak months of May through to October. The
17 capital cost of all the options will be provided,
18 as well as the capital costs for underground cable
19 proposals, the carrying charges for the Manitoba
20 Hydro option C, the CEC option B, part of it which
21 is the relocation of Bipole II to Riel, and the
22 recommended option, which is the relocation of
23 Bipole II; and finally the conclusions will be
24 provided.

25 So, first we'll look at whether the

1 line routes could be terminated that would provide
2 the least effect of the overhead lines from the
3 perspective of the landowners.

4 This figure 1.1 indicates the various
5 routes that we're going to be talking about. The
6 green line you should know, you've seen it enough,
7 I'm sure, over the last two months. That's the
8 Hydro proposal. It is some -- I'll go over -- the
9 red line is the CEC Inquiry, which would go
10 straight across Westburne to Dorsey. The red line
11 and then the purple line goes down to LaVerendrye
12 Bipole III location that we're suggesting is a
13 report recommendation. And there's another line
14 that was brought up to you by Mr. Ennis at some of
15 the hearings, and that goes from the Long Plains
16 First Nations reserve, follows the 230 kV line
17 that goes through Brandon. And then goes down a
18 route, that light green route that was put up by
19 Hydro, was never used. And then picks up on
20 another 230 kV line that goes into LaVerendrye.
21 So we're following routes that are already there.
22 It would mean you just have to extend that at the
23 right-of-way.

24 Okay. Now if we look at the CEC
25 proposed route, it's about 95 kilometres to the

1 Dorsey station, the red line. The Hydro preferred
2 route that goes in the green is 250 kilometres, or
3 230, I'm not sure. The Coalition proposed route
4 would come within 40 kilometres of the Bipoles I
5 and II lines, and then head in a northeast
6 direction to LaVerendrye, and the total of that
7 would be about 105 kilometres. And then
8 Mr. Ennis's route would be about 110.

9 So preparing the routes, of course,
10 the shortest, from a reliability perspective, the
11 shortest is the CEC, and from a reliability
12 perspective, no effect of reducing the deficit for
13 Dorsey outage, such as equivalent to the Hydro
14 proposal where they would refurbish Bipole II at
15 Dorsey. In other words, if you had a dozen eggs
16 at Dorsey, and you took six out and moved them
17 over to Riel, and you came back and put another
18 six in at Dorsey, so you end up with the same
19 problem with having all your eggs in one basket.

20 The Coalition alternative, on the
21 other hand, from Westburne is equivalent to the
22 Hydro Riel option from a reliability viewpoint.
23 However, from the perspective of landowners, it
24 would reduce the line length for 125 kilometres
25 resulting in less line being affected. It will

1 also have the advantage of utilizing underground
2 cable. From the point where it leaves Westburne
3 route to go southeast to LaVerendrye, resulting in
4 over 40 kilometres of overhead lines, reducing the
5 total to LaVerendrye to 190 kilometres of overhead
6 lines.

7 Mr. Woodford and Dr. Lawson will
8 discuss this alternative further in their
9 presentations, the cable route. Mr. Ennis's
10 alternative would reduce the line length by about
11 120 kilometres. It could be overhead lines
12 following the extended right-of-ways that I
13 discussed earlier.

14 I'm going to use this just to get our
15 bearings, so everybody knows when we talk about
16 Dorsey, Riel and the possible station near
17 LaVerendrye. So on the top, on the top left-hand
18 side you will see the Dorsey station. Of course
19 there is 3,800 megawatts right now of conversion
20 capacity there.

21 The Riel site, we are suggesting that
22 the Bipole II be -- a new Bipole II be built at
23 Riel, and it would be located at Riel.

24 And the third option is to put a
25 converter station over near the LaVerendrye

1 station.

2 On this map there, or whatever it is,
3 a drawing, you'll see at the bottom a brown line
4 that is a south corridor, which is an existing
5 undeveloped right-of-way. There is no lines on
6 there. It's been there for years.

7 November 22nd, 2012, a Hydro witness
8 commented in reference to a question to the
9 Chairman -- the question was, what about
10 LaVerendrye -- that it wasn't feasible to build
11 Bipole III at this location because they would
12 have to build five or six Hydro 230 kV lines to go
13 back from LaVerendrye over to Riel. I disagree
14 with that conclusion. It would take one 500 kV
15 line. And the right-of-way is there for it right
16 now, because that right-of-way was put in for a
17 500 kV line that was going to interconnect back
18 into Dorsey in the earlier years. And it never
19 got put in because Bipole III was never built on
20 the east side of Lake Winnipeg and terminated at
21 Riel.

22 And there is further evidence that
23 there is plans to put a 500 kV line on that
24 right-of-way in that Hydro capital venture
25 forecast. And Mr. Woodford will talk further

1 about this in his report as well. In fact,
2 there's plans to go all the way back to Dorsey
3 station with 500 kV. You don't see a right-of-way
4 for it there now, but they would have to get a
5 right-of-way.

6 Now, just to cover off, should Bipole
7 III, in the recommended plan, Bipole II would come
8 first and then Bipole III. In other words, Bipole
9 III will be delayed if we build a new converter
10 station at Riel for Bipole II. But should that
11 not happen, should Bipole III precede the
12 relocation at Bipole II at Riel, then that 500 kV
13 line would be required to go back to Riel.

14 This is an interesting figure, it
15 comes from a Hydro report, page 34. The report is
16 titled "Ultimate HVDC Development in Manitoba,"
17 authored by Mr. P. Lang and Mr. R. W. Mazur,
18 signed by Mr. G. Neufeld, and distributed to many
19 divisions, as well as to Mr. Tymofichuk, being one
20 of the executives.

21 Now, let's see what this figure tells
22 us. Let's start at the bottom. It shows from
23 zero to minus 2000. The existing system, it shows
24 how much deficits are starting in 2010. You will
25 note that they missed the five on 2050, but we

1 know what that is. We go up to 2020. So with the
2 existing system, we have a deficit, and we know we
3 have had that, and I'll show another figure
4 shortly, it's a Hydro figure. Again, you have
5 seen it before. But if we -- if they do, or they
6 are doing the Riel sectionalization, and I don't
7 know whether it's finished or not, then they
8 reduce the deficit from about 300 megawatts.
9 Because they can import more power from the U.S.
10 by having that sectionalization.

11 They show on there a Bipole III of a
12 thousand megawatts. I think at one time they were
13 thinking of only putting half a Bipole in. So I
14 guess when they wrote the report, they had put
15 that on there. But you can see now, if we
16 relocate Bipole II from Dorsey to Riel, we go into
17 the surplus position, just as well as if we built
18 Bipole II, 2000 megawatts. And I think the dotted
19 line is very accurate there, because Bipole I is
20 it 1800 megawatts, of course, and Bipole II is
21 2000. So depending on which one you lost.

22 So then on top of that, if you read at
23 the top, it shows what would happen if you had
24 three Bipoles, in other words Bipole I at Dorsey,
25 Bipole II relocated -- they don't say where and

1 they don't say when on this table, I'm going to
2 cover that -- and Bipole III, of course. And now
3 we have quite a big surplus. And I'll be showing
4 you later that that surplus could last at Hydro's
5 forecast rate of growth of 83 megawatts per year
6 to about 2050. It will add 25 years to that
7 2020 -- 2025 I should say.

8 I guess I think I have made the point,
9 that top line is three Bipoles, three different
10 locations.

11 Okay. I have just come back to the
12 options again, I can go through them quickly
13 again. Status quo; relocate Bipole II at Riel;
14 build Bipole III at Dorsey, CEC Inquiry; locate
15 the converter station for Bipole III at Riel,
16 Manitoba Hydro proposal. And remember, these A's,
17 B's and C's, because I am going to put the figures
18 to that later. D is relocate a new converter
19 station for Bipole at Riel; and E, build a
20 converter station for Bipole III in the vicinity
21 of LaVerendrye.

22 You've seen this one before. And now
23 I'm going to start off by looking at the status
24 quo sort of thing. You can see by 2017, Hydro had
25 projected a 1500-megawatt. By the way, this is

1 for the loss of Dorsey, in the peak period, in
2 winter period. And I define the peak as happening
3 somewhere between the month of December, January
4 or February. You can have a peak in either one of
5 those months, usually it's January more than
6 often. So I guess we can go to the next slide.

7 The next slide is the one that we have
8 prepared using the 2012 load forecast. I don't
9 know what forecast they used on that last figure,
10 but using the 2012 forecast, we don't come out
11 with very much different answers. You can see the
12 deficit starting in 2013/14, it goes from about
13 1050, 1100, up to 2000 megawatts come 2025, much
14 the same as the other. If we look at 17/18,
15 2017/18, I think is 1400 megawatts instead of
16 1500. We're not going to argue about that.

17 MR. MERONEK: Mr. Derry, just go back
18 to the last slide. Could you explain --

19 MR. DERRY: I'm sorry, I didn't cover
20 off the blue. There's two colours there. The red
21 forecast is the expected forecast of Manitoba
22 Hydro, and the blue one is -- says 10 percent
23 probability forecast. It's really the load
24 forecast -- the load forecast that they have come
25 up with. And I was interested in this. I wanted

1 to see what the difference would be. Because I
2 don't really think they are going to beat that
3 expected forecast, and I'll tell you why. From
4 1992 to 2012, the average load growth was
5 44 megawatts per year. And this forecast that
6 they are putting out now from 2012 to 2032 is
7 83 megawatts per year, twice the amount.

8 Okay. Now I'm going to talk about
9 the -- so, if we didn't do anything, just stay at
10 the status quo, those are the outage deficits that
11 we would suffer for a catastrophic outage at
12 Dorsey. And in the Teshmont reports, it has a one
13 in 200 year return period. It happened once every
14 200 years is the way I like to say it. So to have
15 such a failure, we agree something should be done
16 to cure the Dorsey problem.

17 Okay. Now we'll go to the -- this
18 first figure is figure 1.3(b), and that refers to
19 the CEC Inquiry. So what I've done here is I
20 said, okay, we had the figure 1.3 but it didn't
21 have any locations on it. It just talked about
22 Bipole II relocation, it talked about Bipole III,
23 and it didn't have any timing to it. So I put
24 some times on these things. So if we look at the
25 CEC Inquiry, we have a good idea of moving Bipole

1 II from Dorsey to Riel. Because you see, you get
2 there, you relocate Bipole II to Riel. And that
3 that is good, and this has been documented by
4 Hydro that any of these, Bipole III or Bipole II
5 relocated are only good until 2025. I extended
6 that line to show where you'd start going into
7 deficit again.

8 Now, the problem becomes one that you
9 have Bipoles I and III at Dorsey, so what are you
10 going to do in 2025, because you've got a deficit?
11 And looking at the report, the 2010 report, the
12 key findings, and you'll find them quoted in my
13 report, but I'm just going to make a short comment
14 on them. You will see they have suggested a high
15 voltage. They don't say 500, but they say a high
16 voltage AC transmission line north/south for
17 additional -- will be required for additional
18 north/south transmission beyond 2025.

19 And the second point was that
20 splitting Dorsey Bipoles I and II shall be
21 considered to reduce the power costs of
22 3800 megawatts.

23 So I have assumed to be able to have
24 something comparable to what you're going to see
25 in the recommended alternative, something has to

1 be done, you have to add 2000 megawatts to get
2 back up to that top line. And if you remember
3 Mr. Mazur's presentation, he compared the
4 2000-megawatt AC line to the DC line, for the line
5 lengths of 1300 megawatts, and it came out to be
6 \$4.18 billion, much more than the DC.

7 So this is what I have suggested they
8 would have to do. Now, if they didn't do that,
9 what else are they going to do? Are they going to
10 add 2000 megawatts of gas turbines? They have to
11 do something to be comparable, to get to that top
12 line that we have in figure 1.3 before, which we
13 are going to recommend as the report's
14 recommendation.

15 This ends up much -- identical, except
16 what we have now is we have Bipole III at Riel,
17 Bipoles I and II are still at Dorsey, so we end up
18 with the same problem. So I said again, well,
19 we've got to do something to get that same level
20 of reliability.

21 Now, this is a recommended
22 alternative. It ends up with, like I said in the
23 first case on figure 3, 1-3, there are three
24 distinct locations for the Bipoles. You would
25 relocate Bipole II to Riel first. That's 2017, we

1 never put the date on there, but that's where that
2 starts. But come 2025, then we're there if you
3 want, they build Bipole III at LaVerendrye. And
4 we have a system now that has three distinct
5 Bipole locations. So you could lose one and you'd
6 still have two. It's not just like losing Dorsey,
7 then you'd lose two of them.

8 Now, if -- I think I mentioned later
9 too -- if we don't pick up on the idea of
10 relocating Riel, Bipole II to Riel, and just
11 refurbish Bipole II at Dorsey, like Hydro is
12 recommending, it's going to be another 40 years
13 before you get a chance to redo it. There's a
14 window of opportunity there now. If you don't
15 take that window of opportunity, you're going to
16 just keep refurbishing. And it's not just
17 replacing the thyristor valves which Hydro has
18 used in costing, there are other components that
19 have to be replaced. And Mr. Woodford will talk
20 about the condition of, is it better to build a
21 new converter station or to refurbish?

22 And this one, this slide that's up
23 here now, this recommendation will be shown to be
24 the lowest cost and provide less effect on the
25 agricultural communities in Southern Manitoba.

1 So what does all this mean? Next
2 slide? What the analysis means, okay, we're not
3 saying stop the route selection for Bipole III, it
4 should not be stopped, it should be finalized.
5 And the location to where it goes should be
6 finalized. We're only talking about an eight year
7 span between 2017 and 2025, where we could have
8 some corridor problems. But I will cover these
9 off, and the ones that we have had to date and the
10 cost of those also.

11 So the location of Bipole II should be
12 at Riel we are saying for 2017. If you look at
13 the capital costs that I have in my report, you'll
14 see that Bipole II is 27 to 31 percent of Bipole
15 III in service costs. The reason there's two
16 numbers there, we don't know whether they are
17 going LCC or VSC, voltage source converters or
18 line commutated converters. They haven't made
19 their mind up yet.

20 One of the costs that you hear all the
21 time is 3.28, which is the voltage source
22 converters. And if they did go line commutated
23 converters, it's more like 3.98 billion, both of
24 those are billions. So then we say the location
25 for Bipole III should be at or near LaVerendrye by

1 2025. All the above minimizes the effect on the
2 Southern Manitoba agricultural community.

3 And I thought it would be nice to know
4 how much they have spent on Bipole III up to now.
5 I got this out of the financial forecast that
6 Hydro provides to the Public Utilities Board. And
7 up to the end of 2011 was actual, 2012 was
8 estimated, and I found it to be 194 million, about
9 6 percent of the Bipole II total cost of 3.28
10 billion.

11 Now, moving Bipole II to Riel doesn't
12 do anything for the transmission. We've still
13 just got two transmission lines. For Bipole III
14 we provide another transmission line. And in all
15 the reports that I've seen from Hydro, they never
16 did an analysis of what I call the shoulder
17 months, or the off-peak months, of how much the
18 deficit would be for the outages. Now, that's
19 what I'm going to present here now that I've done.

20 So if you look at the figure here,
21 that is the per unit for each month of peak of
22 January, that's how much the load drops off. So
23 if you looked at what I call the shoulder months,
24 starting in March, April and November, those three
25 months I call the shoulder months, they are about

1 80 percent of the peak, or 8.8 per unit if you
2 want to use per unit. If you look at the off-peak
3 period, which is May through to October, I
4 estimated that it would be about 65 percent of the
5 peak load. So using those peak numbers I went
6 through deficit calculations. Next slide.

7 So this is for the transmission
8 corridor outage and the shoulder months with the
9 peak of 80 percent. And those are the deficits we
10 have calculated for the two different forecasts,
11 the expected and the low forecast.

12 Now, you can see we're not talking
13 2000 megawatts anymore, we're talking from 2017,
14 something close to 400, going up to a thousand,
15 almost a thousand in 2025. And with an outage
16 like that, this can be handled by an increase in
17 the -- increase in the -- I'll get it yet -- in
18 the import capability from 900 to 1200 megawatts,
19 which is 300 megawatts. And there is in place on
20 the system right now 800 megawatts of load
21 shedding. Now, this load shedding is automatic
22 load shedding. So if you did have a loss, the
23 frequency drops, and those loads would be shed.
24 And so it is something that can be covered, it's
25 not an outage like Dorsey of say months or -- yes?

1 THE CHAIRMAN: Could you just define
2 what shedding is, please?

3 MR. DERRY: Load shedding, it's
4 sending a signal to a breaker that will open up
5 the line, that they will take the load that's on
6 that line off. Okay.

7 THE CHAIRMAN: Thanks.

8 MR. MERONEK: Sorry, Mr. Derry, is
9 another word for that interruptible?

10 MR. DERRY: Interruptible, it could
11 be, but that's not done the same way, this is done
12 by a frequency relay.

13 Now, what I was going to say is, in
14 the case of Dorsey we were looking at things that
15 had a one in 200 probability with a duration of
16 months, and Hydro's moved that up to three years.
17 Anyway, so we're in agreement we have to do
18 something there. This one is more like weeks,
19 this type of outage. Because all you have is a
20 transmission line. And if you have enough
21 equipment on spare parts and everything else, in
22 fact, the 1996 outage of the corridor, within one
23 week they had that full amount of power again
24 going, because they could parallel the lines. So
25 we're talking weeks here, we're not talking

1 months. And the load is down, it's not at the
2 peak. So we'll go to the next one.

3 This one I just included so you have a
4 good idea when you might have the tornado days and
5 the thunder storm days. This is out of the
6 Teshmont report. This is not mine, this is out of
7 the Teshmont report.

8 So it shows the months of June, July,
9 August are the ones that are worse. But we did
10 have one in September actually. We had a wind
11 event in September in 1996. Okay. The next one.

12 This is the same, this is 65 percent.
13 And you'll have to watch this, because the bottom
14 part is excess and the top part is deficit. I
15 wanted to stay the same as I did with the other
16 ones. So in other words, we are in an excess
17 position during the summer months until we get out
18 to about 2019, and then it goes into deficit. And
19 to be fair, I have not put in any maintenance.
20 Maintenance is performed on the system, on the
21 units during the summer months. And with the
22 300 megawatts extra of import capability, there's
23 1200 megawatts and 800 megawatts of load shedding,
24 or extra 300, 1200 megawatts of load shedding, I
25 don't see a problem here. Again, it's weeks, not

1 months.

2 I'm going to quantify some of the
3 events that have happened, only one in Hydro, I'm
4 going to tell what you it cost us later.

5 I guess that's here.

6 Cost of outages, this was the request
7 at the Public Utilities Board in this last hearing
8 by the PUB for Manitoba Hydro to quantify what the
9 loss was during that 1996 wind storm. That loss
10 is made up of lost revenues for export sales and
11 capital equipment that had to be replaced. Their
12 estimate came out to \$11.1 million. There was
13 another storm, I guess a winter, Dorsey storm in
14 2011, and that estimate is \$6.6 million.

15 Now, if you take the \$3.28 billion,
16 and take the annual carrying charges on it, which
17 was interest depreciation of about 9.1 percent
18 used by the PUB, you would come out to a carrying
19 charge of \$322 million per year. So are you going
20 to spend \$322 million to cover something that
21 costs 11 or 6?

22 Next slide. These are the capital
23 costs that we used in the report. The 1.2 billion
24 is a figure that came out of the IRs from Manitoba
25 Hydro. If you read the report, you'll see the

1 reference to it. So with Bipole II at Riel --
2 we'll go through each one separately -- CEC
3 alternative suggests -- you said moving Bipole II,
4 but the thing you would do is build a new Bipole
5 II at Riel, 1.2 billion. Replacing the Dorsey
6 Bipole II with Bipole III at Dorsey would be 3.14
7 for a total of 4 -- I'm sorry, the north/south for
8 compatibility, or comparison to what we have with
9 alternative D and E is 4.18 billion, which came
10 from Hydro. So we had 8.52 billion for that
11 alternative.

12 Now with the Manitoba Hydro alternative
13 we have the 3.28 billion in costs. And in the
14 report in appendix 1, you'll find the cost of
15 .54 billion, which includes the valves, new
16 transformers, replacement of transformers, moving
17 reactors and so forth. It's greater than Hydro's
18 estimate of -- I think their estimate was 1.1 --
19 186 billion for each location, the north and south
20 location or something like that.

21 Now, if you go to the Coalition
22 alternative we used the 1.2 again, and locating
23 Bipole III near LaVerendrye, we have a cost of
24 3.17 or 4.37.

25 Now, we made a comparison of the

1 capital costs, underground cable versus overhead
2 lines, and all these costs are in millions of
3 dollars. With Bipole III cable to LaVerendrye,
4 which is 65 kilometres, we came up with
5 \$292.5 million. Bipole III overhead to Riel,
6 credit 190 million of the overhead to conductor...
7 (POWER OUTAGE)

8 MR. DERRY: Going over this again
9 starting with A, which is the LaVerendrye site
10 it's Bipole III cable costs 292.5, all millions of
11 dollars, and then a credit, because you are now
12 doing away with 190 kilometres of overhead line,
13 which is at a million dollars per kilometre, 190.
14 So the difference is about \$102.5 million, which
15 is about 3.1 percent of the Bipole III cost.

16 And with Riel situation, you have to
17 put a line from Dorsey over to Riel. And if you
18 assume it was cable, 50 kilometres, we have a cost
19 of 225 million, and a credit there of 170
20 kilometres of line, because in the Hydro
21 alternative that they submitted in the
22 January 28th letter, it had a hundred kilometres
23 in the north part that came off around St.
24 Ambroise or somewhere, goes across and came back
25 down to Riel. And they had 70 kilometres on the

1 southern route, that brown route I showed you
2 before, so that's a credit of 170. So it's about
3 \$55 million more, or 4.6 per cent of Bipole II
4 costs, which is 1.2 billion.

5 Okay. Now this is an interesting one
6 here too. I have talked about the carrying
7 charges before. So the 322 you have seen, which
8 is the voltage source converters, and the LCC
9 alternative would come to 385. In that 322, I
10 have given a credit because Bipole III will reduce
11 the losses on the system by \$26 million, so that's
12 in the 3.22.

13 Now if you put Bipole II at Riel at a
14 cost of 1.2 billion, you're looking at carrying
15 charges of 109 million a year in that same period,
16 between 2017 to 2025. I guess if we have any
17 economists in the crowd, if you take the
18 difference of the 322 minus the 109, which I think
19 is 213 billion a year, and you take that present
20 value of those eight years at 6.1 percent, which
21 is Hydro's interest rate or discount rate, that
22 comes out to \$1.3 billion in savings, more than
23 the cost of relocation of Bipole II.

24 Okay, next slide. Okay, just go back
25 again to go over, before we give you the

1 conclusions. The recommendation, of course, is to
2 move Bipole II and build a new one at Riel, put
3 Bipole III in the southwest corner of Winnipeg.
4 Just because we show it there doesn't mean it has
5 to go at that location. It's up to Hydro to pick
6 that spot, but it's at that corner somewhere. So
7 that is the recommended location of this report,
8 recommendation to this report for the location.

9 So the conclusions, again, are that
10 it's the least cost alternative to relocate a new
11 Bipole II at Riel for 2017, locate Bipole III at
12 LaVerendrye by 2025.

13 And the last slide, just go back so
14 you can see the routes that were suggested.

15 And that concludes my part one.

16 MR. MERONEK: Thank you. With the
17 indulgence of the Commission, I would now ask
18 Mr. Derry some questions with respect to the
19 rebuttal.

20 Mr. Derry, do you have the rebuttal
21 evidence of Manitoba Hydro that was filed last
22 night?

23 THE CHAIRMAN: Mr. Meronek, ironically
24 the panel has not received copies of this
25 rebuttal. We are anticipating getting them by

1 noon. I'm not quite sure why.

2 MR. MERONEK: Then why don't I go
3 through with all the presentations, and then we
4 can pick up after that, when you have had the
5 copies that you can follow along with.

6 THE CHAIRMAN: Yes, that might be
7 helpful.

8 MR. DERRY: We're going to do it
9 later?

10 THE CHAIRMAN: Yes.

11 MR. MERONEK: We'll move over to you,
12 Mr. Woodford. And I would ask that you bring the
13 mic close to you so that we can all hear what you
14 have to say.

15 MR. WOODFORD: Mr. Chairman,
16 Commissioners, ladies and gentlemen, my name is
17 Dennis Woodford, as I said earlier. On my CV, I
18 graduated in 1966 and joined a company called then
19 English Electric, which was the manufacturer and
20 supplier of Nelson River Bipole I. And then
21 during that period of time until 1970, when I
22 worked with -- I worked on that project, from the
23 supplier's point of view, and did some work on
24 Bipole I in the United Kingdom.

25 1970, I moved to Canada, went to the

1 University of Manitoba, got a masters degree.
2 1972, I joined Manitoba Hydro in system planning
3 and continued working on Bipole I, but this time
4 from the owner's perspective.

5 I also worked on AC transmission
6 interconnections. And over through the 1970s
7 worked with Mr. Derry in establishing the 500 kV
8 AC transmission line to Minneapolis from Dorsey.
9 My side of it was the technical side. Mr. Derry's
10 was the important side where the money and
11 contracts was involved. I also worked on the
12 studies for Bipole II.

13 In 1986, I was appointed executive
14 director of the Manitoba High Voltage DC Research
15 Centre. And that had been established because it
16 was felt back in about 1980, that since there was
17 such a heavy reliance on the DC transmission to
18 bring power into Manitoba with Bipole I and Bipole
19 II now in operation, we needed a research centre
20 to help improve any reliability issues.

21 And so during the 15 years I served as
22 executive director of this independent research
23 centre, from which we received quite a few
24 contracts from Manitoba Hydro, we did look at
25 quite a few issues that related to reliability of

1 the Nelson River. To recount two, one was wall
2 bushing flashovers, that was studied to a great
3 extent and resolved with Manitoba Hydro. Another
4 one, which never was properly resolved, and that
5 was what we called anomalous flashovers. I won't
6 go into detail on that but we spent over 12 years
7 trying to study that and find out what occurred.

8 In about 2000, Manitoba Hydro assumed
9 responsibility for the Manitoba HVDC Research
10 Centre. It was taken over and eventually
11 incorporated into what is now Manitoba Hydro
12 International. I, having served 15 years as
13 executive director, it was time for younger and
14 smarter people to take over. So with Hydro's
15 blessing, I worked with them until the new
16 director was in place, and started my own
17 consulting company in electric power transmission,
18 particularly difficult situations of transmission.
19 And that was started in 2001.

20 And in that 12-year period that has
21 existed, we have undertaken over 300 projects
22 around the world involving AC and DC transmission,
23 from a large network grid we are working at the
24 moment with Teshmont Consultants, which is the
25 Atlantic wind connection, 7000 megawatts DC grid,

1 with cables undersea and underground cables on the
2 West Coast and the East Coast of United States --
3 that project is in progress, or at least it is
4 developing, it's not built yet -- down to small
5 projects, say down in Arizona, where someone is
6 putting up a 20-megawatt solar generator.

7 We have worked all over the world with
8 those 300 projects. So we have had quite a bit of
9 experience. We do the very difficult work which
10 many people need done in transmission, AC and DC
11 studies.

12 That is a basic summary of my
13 experience. Carry on?

14 MR. MERONEK: Yes, sir.

15 MR. WOODFORD: Thank you. Here we
16 have a graph that was published in August 2010, in
17 a CIGRE paper prepared by Manitoba Hydro high
18 voltage DC transmission engineers. CIGRE is an
19 international learned society based in Paris,
20 that's probably the most exotic or most important
21 learned society in this area in the world.
22 Manitoba Hydro contributes significantly to this
23 organization.

24 And in this paper entitled -- I forget
25 what it's entitled, but discussed -- that's paper

1 B4-101 -- it was about the replacing, or
2 refurbishing and developing the Nelson River
3 transmission, DC transmission systems. And this
4 particular graph published out of, reproduced out
5 of that paper, shows that as time progresses, with
6 a DC converter station, that you have to spend
7 money refurbishing it. It would be nice to build
8 a DC converter station and have it last 40 years
9 and do nothing, just like you would buy a
10 wonderful car like a Rolls Royce and expect to
11 have no maintenance for 40 years. However, as you
12 can see, you are maintaining it all the way along.
13 And after about, as you get to 30 years, you've
14 got to start to put big money in and replace a lot
15 of equipment.

16 And this is the window of opportunity
17 that Mr. Derry pointed out. And this is an
18 opportunity now, instead of spending that money,
19 putting some of it into building a completely new
20 converter station which we are suggesting be
21 located at Riel.

22 Now, here is a bird's eye view from
23 Google Earth of Dorsey converter station as it is
24 today. It's very interesting in that Bipole I,
25 1800 megawatts, look how big it is. That was the

1 one I worked on in the 1960s with the supplier of
2 the equipment. Now, look at Bipole II,
3 2000 megawatts, and it is much smaller. If they
4 went to voltage source converters for a
5 2000-megawatt converter station, it would be half
6 or a third the size of Bipole II. So things are
7 shrinking.

8 If we completely took Bipole II out of
9 commission, or decommissioned it, there would be a
10 big empty hole there. But I wouldn't suggest
11 doing that. I would say leave the buildings
12 there, and perhaps even leave the converters
13 there. But I'll explain that later.

14 So, in moving a Bipole such as Bipole
15 II to another location, there's a great example in
16 the City of Los Angeles where there's a
17 3100-megawatt DC link coming into Los Angeles from
18 the north, from the Columbia River. And at the
19 Sylmar converter station, during its
20 development -- it was originally developed about
21 the same time as Bipole I -- they have done some
22 refurbishment and they have expanded its capacity,
23 and they ended up in the late 1990s with aging two
24 converters that they had put in, and operating in
25 parallel. You can see the original one, Sylmar

1 West, 2000 megawatts, big station, all the
2 technology. Then they expanded it by
3 1100 megawatts and put in Sylmar East. And by
4 early 2000s, they figured that these converter
5 stations were aging and were going to cost a lot
6 of money to replace the bits and pieces. And so
7 it was decided to completely replace them.

8 And the way they did that was -- if we
9 go to the next slide -- they reduced the operation
10 down to 2000 megawatts by just having the Sylmar
11 West station in operation. And that was the
12 2000 megawatts. So they suffered a loss of
13 transmission capacity because they opened up the
14 line to the 1100 megawatts Sylmar East station.
15 And that's the one they refinished. And you'll
16 see how much smaller it is. And what they were
17 able to do is they tore out the insides, all the
18 valves, the converter transformers, the controls
19 and all the bits and pieces, out of that small
20 converter station and put in it -- go to the next
21 slide -- a 3100-megawatt converter station, with
22 all the new equipment in it. All that was old was
23 the building itself.

24 They then decommissioned the operation
25 of the Sylmar West station. You can see there's

1 no line anymore between the two, and it's now
2 operating functionally well at 3100 megawatts.

3 And the reason I bring this up is that
4 this was an example of being able to put in new
5 converters in a different location or a different
6 situation, similar but not the same, of course, as
7 what we're talking about with Bipole II being
8 taken over to Riel. But it did not require much
9 down time at all to the City of Los Angeles.

10 And in fact, it would be a good idea
11 to go down and talk to the folks at Los Angeles
12 Department of Water and Power and find out exactly
13 how much down time they had, if any, in this
14 complete reconstruction with a new converter at
15 Sylmar station. Because Manitoba Hydro has
16 emphasized several times in their representations
17 to you that to do this relocation of Bipole II at
18 Riel is going to require extensive down time, and
19 all sorts of problems and difficulties and
20 challenges. And I know there are challenges. I
21 don't disagree with that. But with good
22 engineering, as was able to be accomplished in the
23 City of Los Angeles, that this can be really
24 minimized. And if they wish to find more
25 information on this situation, they can go to the

1 Bonneville Power Administration up in the
2 Vancouver, Washington, where they are doing a
3 similar type of operation now. And Bonneville
4 Power Administration is a part of the U.S.
5 Department of Energy, and gain some -- see what
6 experience and what problems they are having in
7 their re-establishment of a new converter system.

8 So I bring these points forward to
9 present to you that this relocation or rebuilding,
10 or putting a new converter at Riel or Bipole II
11 may not be such a big, terrible situation as we
12 have been lead to believe.

13 Next slide. This is a diagram pulled
14 out of another paper presented by Manitoba Hydro
15 HVDC transmission planning engineers, it is figure
16 8 again, 103.1 -- 103. This is public domain
17 information, and it shows how they anticipate the
18 development of, as has been proposed by Manitoba
19 Hydro, of Bipole III at Riel, and Bipole I and II
20 remaining at Dorsey.

21 The interesting point I wanted to make
22 out, that with this we have two 500 kV
23 interconnections between Riel and Dorsey. There's
24 two black lines -- there it is. Anyway, you can
25 see that. Of course, they anticipate in the

1 future that there will be hopefully a second 500
2 kV line coming out of Dorsey.

3 So 500 kV double circuit with Bipole
4 III between Riel and Dorsey seems to have been an
5 issue that they are considering. And we know from
6 the representations made by Manitoba Hydro that
7 this is under consideration. And as Mr. Derry
8 pointed out, there is the right-of-way that could
9 go all the way from Riel, south of Winnipeg, up
10 past -- near LaVerendrye and presumably on up to
11 Dorsey, as they had shown there. And that would
12 be with Bipole III, it seems, for this
13 representation. It's only a representation, but
14 it's something that has been considered by
15 Manitoba Hydro, and it could be done, of course,
16 as a consequence.

17 Again, this is just a picture to show
18 how we would put Bipole II over at Riel, but we
19 would leave Bipole III there. You know, Bipole II
20 at Dorsey, don't decommission it for a while
21 anyway. And this is quite important because, as
22 is rightly being considered, there could be some
23 issues associated with building a new converter
24 like that. If you've got Bipole II that is still
25 functionable, heavens, just switch out the one,

1 the new one you are putting in and get it fixed,
2 and get it back to the old one and let it work.
3 That way you can minimize any down time.

4 This is another diagram of the same
5 thing. And one of the points that I wish to make
6 here is that we need to get, if we put Bipole II
7 down at Riel, we have got to build a DC line to
8 Riel. And there are a number of options.
9 Manitoba Hydro, as I'll show you shortly, have
10 proposed that that line will be over a hundred
11 kilometres long and go away north and come way
12 down to Bipole -- to Riel, if this was done.

13 The issue here I want to point out is
14 that by keeping the connection to the existing
15 Bipole I and II transmission lines, and not
16 disrupting them at all, except perhaps to have an
17 interconnection station, that we can still
18 parallel, at least from Dorsey up to in the
19 Radisson, in case we lose one line.

20 This now raises the issue, well, what
21 happens if we lose the section between Riel and
22 where it connects under the DC line? And of
23 course, we can't parallel that. And so my
24 preferred recommendation, and I don't think anyone
25 else will immediately agree with me, but I would

1 recommend that we put Bipole, the line from Dorsey
2 to Riel as an underground cable down the 500 kV AC
3 right-of-way, which is only less than 50
4 kilometres. And then if we did, we wouldn't lose
5 any towers due to environmental issues, we might
6 get some cable faults. And although I have got
7 Bipole II at Dorsey decommissioned there, why not
8 leave it in for a while, operational, just keep it
9 there? Don't use it unless you have to. And then
10 if you do lose that line or lose the other Bipole,
11 until you bring in Bipole III anyway, you can
12 bring in, start up, fire up the old Bipole II at
13 Dorsey and off you go. These are issues that I'm
14 presenting to you that haven't been really
15 studied. They haven't really been presented, and
16 they need to be.

17 Now, if we do convert or transfer
18 Bipole II away from Dorsey as we have proposed, we
19 do solve the problem of Bipole II going out and
20 Bipole I going out simultaneously. I know when we
21 were building Nelson River Bipole I and II at
22 Dorsey, some of the technicians that were working
23 out at Dorsey station were saying, you know, this
24 is pretty close to a runway, one of the runways
25 from the airport. And if a Boeing 747 came

1 roaring in and crashing down, it will take out the
2 whole station. So we recognized way back in the
3 '70s that this could happen. But by moving it, as
4 has been widely proposed to move Bipole II and
5 separate it away from Dorsey, and if the Boeing
6 747 crashed into Dorsey, then it would only take
7 out Bipole I. I'm just bringing that up as a fact
8 that we discussed that way back 30, 40 years ago.

9 Now, that leaves the transmission
10 lines, which Mr. Derry has discussed before. When
11 they go down -- here is the 1996 towers that went
12 down. And for some reason or other -- this is out
13 of the chapter II of the EIS, these pictures --
14 they've got 1991 written on them, but I guess
15 that's a mistake.

16 And as a consequence of this, we're
17 suggesting that, as Mr. Derry said, if we had good
18 inventory and we had good restoration practice in
19 place, this outage will not be very long.

20 Now, we have heard six to eight weeks.
21 This of course is a worst case scenario. Why do
22 we always have to have worse case scenarios
23 presented to us? When we have had an actual
24 situation that took I think five years, you said a
25 week, but I think it was five days when Bipole I

1 and II were back up and running. So there is a
2 worst case, which may be six to eight weeks, but
3 there is also a reasonable case. Where is this
4 reasonable case presented? We don't see that in
5 the submissions from Manitoba Hydro. And I'd like
6 to see some reasonable cases. I'm proposing to
7 you that with good inventory and a good
8 restoration practice, we can minimize the
9 possibility of this worst case scenario happening,
10 not the six to eight weeks.

11 And one of the things I would like to
12 also raise is, will severe wind occur when the
13 Bipole lines are going through the forest? There
14 have been some weather studies done, and I have
15 read, I think I have read all of them. But I ask
16 the question, in the forest, there is turbulence
17 created near, you know, within the first 30, 40
18 metres above the ground because of the trees. How
19 does this turbulence, as it comes across to the
20 lines, how does it impact the wind on the
21 conductors, which is what caused problems to pull
22 the towers over. On the prairies, there's nothing
23 to turbulate the air. And so, of course, we see
24 this thing happening. I would like to know the
25 answer to this. I don't know it. It's not in the

1 weather studies that I have seen. Does the
2 forest, lines going through the forest, do the
3 trees turbulate the air enough to cause -- or to
4 limit the lines coming down? The forces on the
5 transmission lines, maybe Manitoba Hydro can
6 present this at some stage, or someone can.

7 Next slide. Icing, big problem.

8 Here's a picture of an insulator. Studies done on
9 insulators show that as long as we're not near the
10 sea, the ice tends to be reasonably good
11 insulator, and it may hold full voltage. But on
12 the DC lines we can easily remedy that if we don't
13 trust full voltage on the insulators, and lower
14 the voltages, as we do when we have the fire under
15 the line, we have to lower the voltage of the DC
16 conductors so that the ionized air from the fires
17 doesn't cause a flashover to ground at the high
18 voltage. And so we could probably minimize any
19 flashovers occurring, at least on the DC line from
20 the insulators icing up.

21 Let's go to the next slide. Looking
22 at some recent icing conditions, and I can only
23 bring these two up because that's all I could find
24 on the weather station on the internet. For the
25 October 5th terrible ice storm in Southeast

1 Manitoba, the temperatures on October 5th, as is
2 shown there, maximum was 1.9 degrees Celsius,
3 minimum was minus 0.1 degrees Celsius in
4 Steinbach.

5 There was a severe ice storm in 2009,
6 February 2009, that went from Saskatchewan right
7 across into Manitoba and took out transmission,
8 probably more in Saskatchewan than Manitoba. But
9 in Brandon, the temperatures there as shown for
10 that day, maximum .8 degrees Celsius, minimum
11 minus 5.6-degrees Celsius.

12 The reason why I'm putting this up --
13 let's move to the next slide -- as a consequence
14 of the tremendous disaster in 1998 in Quebec and
15 the United States, well at least the United
16 States, with a terrible ice storm. In fact, this
17 is considered to be the most devastating natural
18 disaster in Canadian history, an institute was
19 formed in Boston known as the Institute for
20 Catastrophic Loss Reduction. And the first study
21 was the Hydro Quebec and Northern U.S. ice storm.
22 And this is a chart from that first study. And it
23 shows that icing, freezing rain which causes icing
24 is very much a function of altitude. And this is
25 a problem, of course, for airplanes which can be

1 quite high up, and they can ice at very low
2 temperatures, minus 20, minus 30 degrees, if they
3 are high enough. But in Manitoba, where we're
4 less than 3,000 metres above sea level, freezing
5 rain will happen around 0-degrees Celsius, which
6 is indicated by the two studies I have just showed
7 you, the two reports I have just showed you about
8 the two ice storms, which is around 0 degrees
9 Celsius. Now, why is this important? Let's go to
10 the next slide. Contrary to what is written in
11 one of the Manitoba Hydro presentations, when
12 you're in these ice storm conditions, the
13 conductors still get warm if they have current
14 going through them. You can't put current through
15 a conductor, no matter what the ambient
16 temperature is, without it getting a little warmer
17 than the ambient. And this is based on
18 calculations presented in IEEE standard 738, where
19 conductor temperatures above ambient are
20 presented. And using these calculations from the
21 standard, taking into account Bipole I and Bipole
22 II, assuming we can load the phases of the poles
23 up to 2000 amps, and there's two conductors in
24 each pole, each conductor should heat up at an
25 ambient temperature of 0-degrees Celsius. And in

1 this case, we had an 80 kilometre an hour wind.
2 That was the temperature -- and no sun shining, of
3 course -- that was the temperature rise above
4 ambient that would happen in the conductors. So
5 if we had 2000 amps, we've got 9 degrees of heat
6 above ambient. If the atmospheric temperature, if
7 the ambient temperature is around 0-degrees, then
8 any freezing rain hitting those slightly warm
9 conductors is not going to stick. Okay. It's
10 going to just drip off.

11 The problem is with freezing rain, if
12 it hits a cold surface like a road or a tree
13 that's been in the winter for a long time and is
14 cold, that freezing rain turns to ice, and sticks.
15 And accumulates. It's heavy, and it pulls down
16 trees, pulls down conductors, and does devastation
17 as we know.

18 And the secret is to prevent the ice
19 from happening in the first place. And this is
20 possible with Bipole I and Bipole II, from
21 preventing the icing from happening on the main
22 conductors.

23 Now, you'll still get icing on the
24 shield while it goes overhead, a little steel wire
25 about three-eighths of an inch or half an inch in

1 diameter, and you'll still get icing on the
2 insulators, and you will still get icing on the
3 towers. But they should be designed to handle
4 that. In fact, in the Hydro Quebec storm of 1998,
5 what they did after that was that Hydro Quebec
6 developed a device, or a power, which had two
7 functions. One function was to generate DC
8 current that they could push down this 735 kV AC
9 lines, which they have over there, and melt the
10 ice. It's harder melting the ice than it is to
11 keep it off in the first place. And then we're
12 going to use a DC converter to do that. That DC
13 converter, when there was no ice storms, can be
14 switched and operated in a different mode and
15 provide AC voltage control. And that is in
16 operation in Quebec today as a means of, if they
17 ever get another ice storm like they had in '98,
18 at least be able to keep the ice off some of the
19 critical 735 kV AC transmission lines. And they
20 wouldn't keep the ice off the shield wires, and
21 they wouldn't keep off the insulators, and they
22 wouldn't keep the ice off the towers, they would
23 stand up, or they should stand up -- otherwise
24 they are being designed inadequately. So it's
25 getting the ice off the conductors that's the key

1 factor for icing on these high voltage lines.

2 Converter controls, there has been
3 concern about all these controls if we change
4 Bipole II over to Riel. That's going to be a bit
5 of a headache, and that will be. But the Bipole I
6 and Bipole II controls are analogue controls, and
7 these are 30 years old. When I was at the
8 university in the early '60s, we used analogue
9 electronics in our laboratory work, didn't do any
10 digital stuff. But today everything is done
11 digitally and there are many projects of DC
12 transmission systems that have these old analogue
13 controls, and they are replacing them with digital
14 controls. And when they do that, they'll have
15 more flexibility and be able to do things that
16 they can't normally dream of with the analogue
17 controls. As long as we have a good communication
18 system in place, which we would do with fibre
19 optic cables underground -- well, they can do it
20 any way they want.

21 Resonance is raised as an issue.
22 Resonance is a sustained oscillation of DC line
23 voltage and current on the DC side of the system,
24 due to various reasons.

25 And this is raised as a big concern,

1 and particularly with this real long line all the
2 way down south of Winnipeg and over to Ste. Annes
3 and back into Riel. They have a problem with the
4 long distance. If we shorten the line
5 significantly, like we're trying to do, and
6 putting in a bit of cable as well, it will change
7 that resonance situation. And this need to be
8 studied. And I think this problem can be remedied
9 and studied and fixed without too much expense,
10 notwithstanding the fact that Manitoba Hydro is
11 concerned about the expense that might occur in
12 the remedy of the resonance situation.

13 Again, that has to be studied, and I'd
14 like to see the studies to show that this is what
15 the remedy would be.

16 And here is the case that Manitoba
17 Hydro has presented if we -- Bipole II located at
18 Riel. You see that -- let's see if I can get this
19 working again.

20 Okay. So they have this great big
21 line way up north, coming all the way down here.
22 I think it's greater than a hundred kilometres,
23 but nonetheless -- my recommendation, again, it's
24 just my opinion, put a cable in. Because if we
25 can delay Bipole III, as Mr. Derry has pointed

1 out, we have got \$322 million carrying charges a
2 year we are saving. And delaying even a year,
3 that \$322 million could be used in -- we could pay
4 for that cable, and other things as well.

5 Now, whether this line is DC, I don't
6 think it should be DC. That should be 500 kV AC
7 all the way from here to here, when it comes time
8 to build it. This is an arguable point, but
9 that's my position. And that 30 kilometre, the 50
10 kilometre line along the 500 kV right-of-way,
11 which would be cable, would be my preferred
12 opinion, but maybe I'm a voice crying in the
13 wilderness on that one.

14 And here again is just a reproduction
15 of that, the future. Putting in Bipole III, we
16 would come in the short route, so we don't go all
17 the way around the province to get to Riel. And
18 the 500 -- the issue here I think is the 500 kV
19 line to here. Is that a single line? My feeling
20 is that that -- and I'm pretty sure Manitoba Hydro
21 would view that a single line 500 kV from here to
22 here would be completely inadequate and that we'd
23 need to extend the 500 kV line up to Dorsey.

24 If perchance that Bipole III could be
25 delayed, we have Bipole II feeding into Riel, here

1 we've got an advantage and a benefit to Manitoba
2 Hydro, because we learned in the rebuttal that we
3 got late last night that they are really concerned
4 about the area, Winnipeg area transmission with a
5 heavy load west to east, and any power injected in
6 at LaVerendrye would exacerbate that. But if we
7 go ahead and put in Bipole II in the east at Riel,
8 then we are counteracting that flow, and it would
9 help resolve that issue until Bipole III comes in.

10 And then I would like to see the
11 studies of what would happen if we put these three
12 converter stations in the three different
13 locations, with a 500 kV ring right around
14 Winnipeg, and what would that impact have on the
15 Winnipeg area transmission loading west to east?
16 That would be a study I would like to see.

17 So conclusions, Bipole II inverter
18 could be located at Riel with little disruption of
19 power. And if you folks don't believe me, I
20 suggest you go and talk to the City of Los Angeles
21 and find out what they did. Three inverters at
22 three different locations around Winnipeg, that
23 will increase reliability. That's just plain
24 common sense, as Mr. Derry suggested, was
25 important in this matter.

1 Ice storms can be managed effectively
2 as it impacts the Bipole I and II DC transmission
3 lines. And really, if you have a severe ice storm
4 where you are going to endanger those lines, you
5 have got real troubles in this province. Because
6 you begin to lose your AC system. And that outage
7 that we saw before will last a long time, as we
8 saw down in Southeast Manitoba in October.

9 (POWER OUTAGE)

10 (Proceedings recessed at 10:50 a.m. and
11 reconvened at 11:05 a.m.)

12 THE CHAIRMAN: Okay. Can we come back
13 to order? We have a third presentation by the
14 Bipole Coalition. Mr. Meronek?

15 MR. MERONEK: Thank you, Mr. Chairman.
16 Dr. Lawson, could you please indicate to the
17 Commission what your professional background is?

18 MR. LAWSON: Yes. Mr. Chairman,
19 Commissioners, ladies and gentlemen, as far as
20 professional qualifications are concerned, I have
21 a BSs in Physics from the University of Edinburgh
22 in Scotland, and a Ph.D. in electrical
23 engineering, actually it was a study on high
24 voltage DC cables that I did for my Ph.D. at the
25 university of South Hampton. And I'm a chartered

1 engineer, U.K. chartered engineer, and I'm a
2 fellow of the Institute of Engineering Technology.
3 This used to be the Institute of Electrical
4 Engineers, but all of the institutions have merged
5 in the U.K. and now we call them the FIET,
6 engineering technology.

7 I am pleased to be in Winnipeg, it is
8 my first time. I do have distant relations here.
9 The Sinclairs came from Scotland many, many years
10 ago. My sister has met them, but I haven't, so
11 this is an opportunity to make contact.

12 Actually, I'm lucky to be here.
13 Because at Immigration when I mentioned Bipole
14 III, they almost turned me around, sent me back
15 home. Just a joke.

16 As far as my professional experience
17 is concerned, my 40 years engineering experience
18 is divided approximately in two, two periods of
19 about 20 years. First 20 years I worked with
20 Prysmian, it was Pirelli in my time, now it's
21 Prysmian. I joined Prysmian in 1970, and spent 20
22 years with them. I joined as an international
23 engineer, a person who was willing to travel. And
24 so during that period I worked in Brazil for three
25 years, in Italy for three years, and I was

1 actually the vice-president in charge of research
2 development and engineering, which is a planned
3 technology in North America. In these days the
4 company was called Pirelli Cables North America.
5 So I was responsible for plants in Canada, in
6 Montreal, in Prescott, Ontario and a plant in
7 Surrey British Columbia was subsequently moved
8 down to South Carolina, and also several plants in
9 the U.S.

10 As far as my experience is concerned,
11 I have worked with local engineers. I worked with
12 three different groups of Winnipeg engineers. I
13 have worked with Teshmont on a DC project in the
14 Philippines. I worked with Dennis's company,
15 Electranix, a project in Malaysia in 2007, and
16 also with Dennis on the MAPP project, that is the
17 Mid Atlantic Power Pathway, which was going to
18 have a DC connection across the Chesapeake. That
19 didn't happen yet so we're still waiting for that
20 one.

21 Other than that, I have spent almost a
22 solid year in Malaysia at three different cycles
23 of the same project. The first cycle was probably
24 the most exciting. We went through the complete
25 gamut of studies and surveys of specifications, of

1 the bid process, of selection of the contractor,
2 which was ABB. ABB actually started to make cable
3 for the project. This was in 1997, when there was
4 the currency crash in Southeast Asia, where the
5 Malaysian ringgit went from 2.5 to the dollar to 4
6 to the dollar, that killed the project. So that
7 was ABB with 30 kilometres of cable, not knowing
8 what to do with it.

9 I spent a lot of time at the plant, at
10 ABB's plant, several months, following the
11 development work, following the type testing, the
12 qualification testing, and also the manufacturing
13 of that 30 kilometre length.

14 And I did something similar for the
15 Neptune project. I actually think of this as my
16 project. I was in it from the start in 2002, and
17 worked in the Halden plant of Norway, again during
18 the development of a 500 kV DC cable. And that
19 didn't work out, so we changed suppliers. We
20 changed from Nexans in Halden, Norway to Prysmian
21 in Naples, Italy. And they were very successful.
22 And the project was brought in under budget and on
23 time in 2007.

24 Neptune is interesting because it does
25 have probably the largest land cable at that time.

1 It was about 23 kilometres in length. So that was
2 good.

3 Again, I witnessed all of the testing
4 in Naples, but I also witnessed the testing of the
5 land AC cables in Prysmian's plant in France, and
6 also in Delft, Prysmian's plant in Holland. So
7 that was quite an interesting experience for me.

8 In total I worked on 32 submarine
9 cable projects, and a large number also of land
10 cable projects since becoming a consultant.

11 So that basically is my qualifications
12 and background.

13 MR. MERONEK: Perhaps, now you can go
14 through your presentation, sir.

15 MR. LAWSON: All right. So I thought
16 we'd like some nice pictures to have a look at,
17 starting, on the right you have a 500 kV DC
18 termination. And if you look at the little guys
19 at the bottom, you can see just how high that is.
20 It's about seven metres long. And the length
21 really depends on the conditions. So it can vary
22 quite significantly according to the weather
23 conditions. And it depends on how many
24 millimeters of kV they require, and that
25 determines the total length.

1 And middle top is the transition
2 station of the Basslink project. And this is in
3 Australia, this is between Tasmania and Victoria
4 on the mainland. And I actually worked in the
5 project with Tasmania Hydro, but never managed to
6 get to Australia. I got to New Zealand three
7 times, but Australia never. And I worked on the
8 middle bottom picture is the Middletown, Norwalk
9 project, 345 kV project in Connecticut. This is
10 probably one of the longest cable projects of its
11 type in the world, about 20 kilometres, double
12 circuit. And this is a trench being infilled.

13 And the picture on the left is a
14 picture of the Norway to the Netherlands 450 kV
15 project. The double cable arrangement there was
16 relatively unsuccessful. It could only be laid in
17 very shallow water. And the deep water was two
18 separate cables. And you don't blame me for this,
19 because I think it was the utility's idea to do it
20 this way.

21 So next slide. This is a nice drawing
22 of mass impregnated cable, 500 kV. So you can see
23 the various layers. What I want to bring your
24 attention to is that the land cable will be very
25 similar up until the polyethylene sheath, number

1 seven if you can see that. And we have to bear in
2 mind when we're talking, particularly about
3 splices, and I think that we have a question here.
4 Splices for submarine cables needed to be flexible
5 in order to lay the cables, particularly if you're
6 laying the cables in deep water. And since
7 there's relatively little experience on land
8 compared with the experience that there is
9 submarine cables, DC submarine cables, something
10 like 4500 kilometres already installed. And about
11 half of that is in the voltage range 400 to 500
12 kV. So we need flexible splices. And these
13 flexible splices are really just a reconstitution
14 of the cable itself. And they are something like
15 5 metres in length. And since we had been dealing
16 mainly with submarine cables, when there is a
17 relatively big land cable project, you tend to
18 have the same splices. The industry hasn't yet
19 got to the point where it's developing rapidly
20 fitting splices, which are larger than the
21 diameter of the cable. And this could be a good
22 idea from the point of view of land cable splices,
23 they are not available as yet. I mean, even in
24 the Skagerrak four cable, which is the 90
25 kilometre cable that you mentioned which is going

1 in, in Denmark, the splices will continue to be
2 five metres long. And this is also the case in
3 the project in Neptune project in Long Island.

4 So that's why we have problems with
5 times of splicing times.

6 Now, I have said for the splicing
7 time, I said four days, and Manitoba Hydro had
8 said five. Well, you probably will get the answer
9 five if you ask the suppliers. And that is
10 because they are thinking in terms of splicing
11 submarine cables. If you see the armour wire and
12 everything else outside item 7, all these have to
13 be dealt with as well. So for a submarine cable
14 it is fairly typical to say five days. This isn't
15 the case for a land cable without the armour. And
16 that's why I dropped from five to four. And not
17 only so in the case of the underground cable that
18 we're talking about here, we're talking about two
19 cables. And two cables are fairly close together.
20 And so when you're doing the splicing, you can
21 actually work on the two cables more or less at
22 the same time. So your 10 days for two cables, if
23 they are in close proximity, will come to
24 something like eight. So that was the reason why
25 there's this discrepancy. Your five is good, but

1 I think my four is better.

2 Next slide. Just some of the main
3 cable links, in service or being installed at
4 present. Just to give you a flavour of the extent
5 to which these cables are being utilized.

6 The Fennoskan 2, unfortunately I
7 haven't put Fennoskan 1 in there, but I did want
8 to say something about Fennoskan 1 between Sweden
9 and Finland is quite important. Because at that
10 time, 1994 I think, the production capacity of the
11 manufacturers was about 120 kilometres a year,
12 quite small. So in order to have the Fennoskan
13 installed, it would have taken two years for one
14 supplier. But APP and Nexans got together and
15 they supplied half of the cable each, so they were
16 able to do it in much shorter a time.

17 This is relevant also to our
18 situation. I think we can consider the
19 possibility to have more than one manufacturer
20 doing this work.

21 Western Link U.K., third from the
22 bottom is very interesting. You'll see the
23 voltage, this is the first ever voltage at 600 kV.
24 Now, the interesting thing is that it's a similar
25 cable design but the material is slightly

1 different. Instead of paper tapes impregnated
2 with a viscous fluid, they have paper
3 polypropylene laminate tapes. In fact, the
4 laminate is good because it prevents the mass
5 impregnated liquid, fluid draining much more so
6 than standard paper cable. So you can operate at
7 a much higher temperature, much higher loads of
8 stress. So you have got 600 and you've got two
9 cables with 2000 megawatts.

10 This is going between Wales and
11 Scotland. It is a project which has been
12 undertaken by Prysmian. The Strait of Belle Isle
13 is a project which has just been announced
14 recently, fairly recently. It has gone to Nexans.

15 And this is interesting too because
16 it's a Bipole, and you see three cables in it, and
17 you see a spare. And Manitoba Hydro has expressed
18 interest to have a spare for the land cable. This
19 is a very difficult situation. And you have
20 icebergs and things to worry about. That's why
21 they have this spare. It's a very difficult route
22 as well. That's why they have the spare. And in
23 practice, very, very few of these projects -- and,
24 in fact, if you look at all of the projects that
25 are in service today, very, very few have spare

1 cables. And some do, I admit, but very few.

2 This is the same with land cables.

3 You find very few installations on land with spare
4 cables. Because -- well, from the point of view
5 of the spare cable for a submarine installation,
6 particularly in Belle Isle Strait, it doesn't make
7 sense. Because if there's damage, it will take a
8 long time to have the ship available and so on to
9 do the repair. But it's not true with the land
10 cable. If you have damage on the land cable, you
11 generally have spare cable available, so you can
12 make a repair and use the spare cable to do that.

13 So I really don't think that a third
14 cable in our case is necessary. The reliability
15 of these cables is such, and it's proven by the
16 amount of activity that's going on, the
17 reliability of the mass impregnated DC cable is
18 very, very good.

19 The other thing I should say here
20 concerns the nominal life. We have been saying
21 for generations that nominal life of these cables
22 is 40 years. But at least in two instances when
23 the cable was removed and tested, both chemically
24 and electrically, there was zero deterioration
25 after 30 years in service. The reason that these

1 cables were removed, they were no longer capable
2 of supplying the power required. They were too
3 small in other words. So they were replaced by
4 bigger cables. But deterioration doesn't happen.
5 So when we say nominal life of 40 years, that
6 really is nominal. And I don't think the cable
7 industry will say more at the moment than it's
8 nominal, but we expect it to be much longer than
9 that. But if you ask them how much longer, they
10 won't say. Presumably they don't know. There's
11 no indication of deterioration, so it could go on
12 for quite a long time.

13 Next slide. These are the standard
14 cable design parameters. The maximum conductor
15 temperature is very low at 55. This is because if
16 you have it higher than 55, there's a danger that
17 the compound will drain, the voids will be formed
18 and you will get deterioration. That's never
19 happened in practice if you keep the temperature
20 at 55. The interesting thing with the western
21 link, with the new laminate tapes, you can go up
22 higher, probably to 60, 65, rather than to 55, so
23 you get much more power.

24 I think we know the rest of the data,
25 probably not worth saying very much about it.

1 The ground temperature is favourable
2 at 14, maximum ground temperature burial depth.
3 If you go to tropical countries, you're dealing
4 with 30, 32 degrees. And of course that cuts in
5 significantly to your power transmission. But
6 here 55 is good, especially with a 14-degree
7 ambient.

8 Next slide. So we have two
9 possibilities. Either two cables per pole in
10 separate trenches, or one cable per pole in single
11 trench. Obviously we opted for B because of the
12 difficulties of splicing, the time needed to
13 splice basically.

14 Next slide. And these are the
15 trenches that we may have to consider, at least at
16 some stage. The one on the left is Long Island,
17 and they are putting in the first cable. Because
18 there are two cables go in there, they have a
19 return cable as well, low voltage return cable, as
20 well as the high voltage DC cable.

21 The trench at the right is quite
22 interesting. Because in this case, the Baltic
23 cable which goes between Sweden and Germany, at
24 that stage ABB did not want to have the risk of a
25 splice between the submarine cable and the land

1 cable. So what they did was they pulled the
2 submarine cable five and a half kilometres in this
3 trench that you see a section of here. So talking
4 about pulling cable into trenches, everything is
5 possible. That's five and a half kilometres. So
6 if you can get five and a half kilometres of cable
7 to your trench, you can pull it in.

8 Next slide. This is Europacabel,
9 which was published just recently. The emphasis
10 now at the lower voltages is in cross linked
11 polymer, DC polymer dimetrics. So at the present
12 stage of development, you can have 320 kV, but not
13 500 kV. It may take between three and five years
14 for the industry to fully qualify this kind of
15 cable for 500 kV operation. But in this booklet,
16 the interesting thing for me was that they also
17 comment on cost. And with this type of design,
18 they are costing the ratio between the equivalent
19 overhead line. And this cable is three to one
20 according to Europacabel, all of the cable
21 industries in Europe. And a lot of this kind of
22 cable is actually going in at the moment in --
23 well, submarine and land, but the land sections
24 are quite significant, between 45 kilometres and
25 75 kilometres, and this is a Bipole touching in

1 that case.

2 This is your neighbour, I think,
3 Alberta Energy. They did studies some years back
4 and their report is on line. Among other things,
5 they did a study of underground transmission
6 cables AC/DC. And for the DC, the 500 kV
7 2000-megawatt design that they produced and costed
8 is shown in this slide. And the cost for that is,
9 I think it's in the next slide. Next slide,
10 please? This is back to the Neptune with the land
11 cables, the big reels being delivered by barge to
12 the shore on Long Island.

13 Next slide. This is the question of a
14 spare cable. Neptune does not have a spare cable
15 installed, Neptune has a spare cable on reel.
16 This is a thousand metres of cable on this reel in
17 two layers, and they have limited to a thousand
18 because it's for long-term storage, just in case
19 there's any change of geometry of the cables.
20 There won't be, but they are keeping it to a
21 thousand for that reason. You could actually have
22 much more on the reel. And of course it was
23 transported on land. Looking at the background,
24 this is in Italy, it is not in Long Island. It
25 was transported in Long Island, though, because

1 the installation was fairly near to the Wantagh
2 Parkway on Long Island. The only problem they had
3 was they had to transport it during the night,
4 when the road was closed for that purpose.

5 Next slide. These are the costs. The
6 first one was actually based on budgetary pricing,
7 which I had for the Neptune project land section.
8 I'm not saying that that is the actual price that
9 we ended up with, that was a budgetary price
10 before contract was lead. So I did some
11 escalation there and obviously took the price of
12 the cable and doubled and so on, did the best I
13 could. Came out with 4.35 for route kilometre.
14 Estimate two was supplied by a supplier
15 informally, because it's very difficult for myself
16 to go to a supplier, who are very busy, and say, I
17 want you to tell me how much this cable is. They
18 want to know site conditions and all sorts of
19 things. But they were very good and they said, on
20 the basis of the length that you've told me and so
21 on, 5 million would be good. And these are
22 current pricing.

23 And then Alberta Energy report, you
24 can use the data which are also in the report, and
25 do a calculation there. That turns out to be

1 4.5 million per route kilometre.

2 So I was feeling quite happy with
3 these figures. What makes things difficult is
4 your spare cable that you insist upon, and as I
5 have said, I don't think it's necessary.

6 Next slide. This is how you can get
7 in real difficulties with costing. Because if you
8 take this Inelfe, that's the link which is going
9 in between France and Spain, it is also a 2000
10 megawatt link, four cables each Bipole into
11 separate trenches. But if you take the figures
12 and you just lump in the tunnel cost with the
13 civil works, you come out with 6 million USD. So
14 without knowing what's going on there, you can
15 say, well, that should be 6 million for the link.

16 Next slide. This is the transition station in
17 Victoria. That's the Basslink project, 400 kV.
18 That's the picture on the front page, front slide.

19 Next slide, please? Nothing against
20 overhead lines, that's a beautiful picture. In
21 fact, historically, cables were only used when
22 there was some problem. Either the land was of
23 extreme beauty, scenic beauty that they didn't
24 want overhead lines, so use cable, or in cities or
25 in offshore islands where you couldn't use

1 overhead lines, you used cables. So cables have
2 always been used where overhead lines had some
3 problems. As in this case, it seems quite
4 appropriate that cables should be used for at
5 least a section of the Bipole III.

6 The two pictures on the right actually
7 come from France. The left picture, 2004, is the
8 land, natural grassland they call it. This is the
9 land before the underground cable was laid. And
10 this is a 400 kV XLPE. I don't know the rating,
11 but it's three cables. That was installed in, I
12 guess it must have been just after he took the
13 picture, in 2004. And then we looked again in
14 2005, it almost recovered; 2006, he looked again
15 and the picture tells you that the land has
16 recovered. You do see a couple of trees missing,
17 but that's obviously necessary to take these out
18 for the trench. And this is a study which was
19 done for that purpose as well, to satisfy the
20 environmentalists that the land can recover. So
21 thank you.

22 THE CHAIRMAN: Thank you, Dr. Lawson.

23 Mr. Meronek, you had indicated earlier
24 that you'd like to sort of look at Manitoba
25 Hydro's rebuttal and ask your presenters some

1 questions based on that. Now, we have copies of
2 it, we received them during the break. But we
3 haven't had a chance to read them. If you want to
4 take us through it. I mean, not take us through
5 the whole thing, but as you go question to
6 question, if you can highlight it? If that works
7 for you, that would work for us I think.

8 MR. MERONEK: That's what I intend to
9 do, sir.

10 THE CHAIRMAN: Okay. Let's try that.
11 If we get thoroughly confused, it won't be new.

12 MR. MERONEK: You mean more thoroughly
13 confused.

14 THE CHAIRMAN: Better way of putting
15 it.

16 MR. MERONEK: Back to you, Mr. Derry.
17 Have you got the rebuttal evidence in front of
18 you?

19 MR. DERRY: I have it in front of me.

20 MR. MERONEK: I wish I could say the
21 same. Here we go.

22 Now, in the brief time that you have
23 been able to analyze the rebuttal, I want to
24 direct you to certain statements made in the
25 rebuttal and get your comments.

1 Firstly, on page one, under the
2 heading report part one recommends, the last
3 sentence of that paragraph states:

4 "Manitoba Hydro disagrees with these
5 assumptions..."

6 And it relates to your risk assessment for the
7 loss of the Bipole transmission lines based on
8 your analysis of alternate supply of load. It
9 says:

10 "Manitoba Hydro disagrees with these
11 assumptions as the assumptions could result in
12 extensive periods where significant load would be
13 exposed to rotating blackouts during the extremely
14 cold Manitoba winter months."

15 Can you comment on that observation or
16 statement by Manitoba Hydro?

17 MR. DERRY: First I want to talk about
18 the 1200-megawatt increase and the import
19 capability. This has been documented in my
20 report.

21 If you look at page 1-5, and you'll
22 find out where I picked that figure up.

23 Secondly, I have looked at the
24 shoulder months, I have not looked at the peak
25 months, and neither has Manitoba Hydro. They

1 haven't given you -- like I guess we have in a
2 way, we have looked at the peak months. But
3 normally in the peak months you don't have
4 conditions that would take out the Bipole
5 corridor. When you have a peak, you usually have
6 a high pressure area with minus 40-degree
7 temperatures, and you may have some winds in some
8 cases. But I have assumed that normally there
9 wouldn't be a problem. And I would like Hydro to
10 tell me if they have ever had a problem in the
11 last 40 years during the winter period with the
12 corridor?

13 I have looked at the shoulder months,
14 and I can go back to the slides if you want. And
15 I have concluded that because of the short time
16 period, and with the 1200 megawatts of import
17 capability and the load shedding, that we could
18 live through that period, which may be two weeks,
19 or a few weeks longer. I don't know about the six
20 to eight weeks that Hydro has come up with. So I
21 don't think there's a problem. That's my opinion.

22 MR. MERONEK: Secondly, just going
23 further down in the next paragraph, it states
24 that -- it's the whole issue of you having
25 inputted \$4.18 billion for a north/south 500 kV AC

1 line by 2025. And that's the assumption you made
2 as to what Manitoba Hydro intends to do. Manitoba
3 Hydro indicates that its development plans do not
4 indicate such a proposal.

5 MR. DERRY: In this overhead I have
6 assumed the 500 kV AC, and this is the line that
7 they are questioning. They said that it's not
8 been put in the plan. Of course, it hasn't been
9 put in the plan, but it does appear in that 2010,
10 the 2010 report that they have put out.

11 So something has to be done in 2025 to
12 make it comparable or compatible to the case in
13 the report where we have three separate locations,
14 where we have Bipole I, Dorsey, Bipole II at Riel,
15 and Bipole III at LaVerendrye. And that takes us
16 out to 2050 before we go into a deficit. In this
17 case they are stopping at 2025 and aren't telling
18 us what they are going to do. They say that will
19 be looked at later. But why would you go do that
20 when you can solve the problem now by relocating
21 Bipole II to Riel and building Bipole III at
22 LaVerendrye?

23 So some way there's got to be a cost
24 put in, or something. I'm not actually using the
25 cost in my -- in my analysis you will see later, I

1 have only looked at the analysis of Bipole III
2 coming into 17, compared to the relocation of
3 Bipole II, and that's where you'll get the saving
4 of \$1.3 billion, which we paid for relocating
5 Bipole II. So we don't have this problem where we
6 have to look at some solution later, we've done
7 it.

8 MR. MERONEK: Just for the record, you
9 are referencing figure 1-3(b).

10 Just over on page 2, in the second
11 paragraph, third bullet, there's an indication,
12 just repeating the testimony of November 22 of
13 2012, that LaVerendrye for a variety of reasons is
14 unacceptable as a termination point for Bipole
15 III. Can you comment on that, sir?

16 MR. DERRY: I think I did talk to
17 this. The witness suggested that he would need
18 five or six 230 kV lines to interconnect
19 LaVerendrye to Riel. And Mr. Woodford also
20 covered it. We know that there are plans to put a
21 500 kV AC line in there one way or the other, and
22 it will go from Riel to LaVerendrye, back up to
23 Dorsey. So I don't accept the 230 kV, he said
24 five or six 230 kV lines. If anything is going to
25 be done, it will be the 500 kV AC line.

1 MR. MERONEK: Over on page 3, Manitoba
2 Hydro has replicated your appendix 3 with visions
3 in green. Have you had an opportunity to digest
4 that particular revised appendix 3 and make sense
5 of it from your perspective?

6 MR. DERRY: Yes, I have. If you look
7 at the table and look at the green additions that
8 Hydro put in, I knew when I used the cost for
9 Laverendrye that there would be some other costs
10 and I didn't have them. I'm not experienced in
11 doing switching station design and stuff. So
12 fine, Hydro has added in 117 million for AC
13 station, 6 million for termination, and the line
14 of 84 million. I can't argue with the cost or
15 their costs, so that's fine. So it does increase
16 the cost of a Bipole III. And I'll talk more to
17 it on the next page, on 4 I think. And let me
18 look at the -- well, what they have done in the
19 case of Riel, they have come up with a cost of
20 370 million for their cable recommended by
21 Mr. Woodford, from Dorsey to Riel. I think we had
22 a cost of 225 million in our overhead. So some
23 way they have got a higher cost, and I don't know
24 why.

25 MR. MERONEK: Do you know where the

1 \$1.631 billion comes from in terms of the subtotal
2 in 2017?

3 MR. DERRY: Yeah, if you add up those
4 costs for Riel with the 370, and you come very
5 close, I think I got 16.1 or something. I don't
6 know. I had problems with it.

7 MR. MERONEK: All right. Over on page
8 4, Manitoba Hydro is pointing out that there have
9 been a couple of instances where a north/south 500
10 kV line has been referenced. One is in your
11 report, and then one is in the -- I'm looking at
12 paragraph 4, and that's the Manitoba Hydro report
13 that you have entitled "Ultimate HVDC Development
14 Manitoba." And the report, this response says
15 that the report doesn't specify the nature of the
16 line, the cost or the time frame. Can you comment
17 on that?

18 MR. DERRY: Can you give it to me
19 again? I didn't get the start, where you are
20 starting?

21 MR. MERONEK: It's in the fourth
22 paragraph starting with in the second instance.

23 MR. DERRY: Yes, I have got that,
24 thanks.

25 MR. MERONEK: Do you have any

1 comments?

2 MR. DERRY: The only comment I have is
3 that we're looking at reliability here. We're not
4 looking at bringing power from new stations in the
5 north. And if you did put in a double circuit 500
6 kV line to make it comparable to the alternative D
7 and E that the report recommends, then you would
8 use that cost of 4.18 billion that comes out of
9 the presentation by Mr. Mazur. You have to use
10 something because you've got to make them
11 comparable. In the case where they put the costs
12 in on the other side, they have not put any costs
13 in for -- like I had in the table where I put
14 4.18 billion in the alternative of the CEC and the
15 alternative Manitoba Hydro.

16 MR. MERONEK: Manitoba Hydro goes on
17 in its rebuttal to, the next paragraph, to talk
18 about the possibility of a 500 kV export tie line
19 which would increase the import capability as a
20 possible solution. Do you have any comment on
21 that?

22 MR. DERRY: Yeah. With an additional
23 500 kV AC line to the United States, you will be
24 able to import more than the 900 megawatts, or
25 whatever they use in the calculations for the

1 deficits. But there's a cost to this as well.
2 They don't get that for nothing. And whether or
3 not they would turn around and say, oh, but we get
4 a reliability benefit out of this of
5 1100 megawatts, and that's worth X dollars per
6 kilowatt, they may try to do that later. So
7 that's a cost and it's not showing up in this.
8 And we're not talking, like I said before, we're
9 not talking about any new generations. In fact,
10 Hydro said that themselves. They say this is a
11 reliability project, just reliability. And to
12 have the same reliability as you'd have in D and
13 E, you'd have to do something in the C and B cases
14 that I have shown before. There's got to be
15 something done, there's got to be a cost in there.

16 MR. MERONEK: Do you have any comments
17 on your table 1 that's been revised by Manitoba
18 Hydro on page 4?

19 MR. DERRY: Yeah. The one comment is
20 a typing error, the 3.37 should have been
21 referring to Bipole II -- Bipole III near
22 LaVerendrye should be down under the Coalition D
23 and E case. And the other comment I have, in the
24 table I had, I had 1.2 billion for the CEC
25 alternative, and 1.2 billion for the Coalition

1 alternative. All of a sudden they've got 1.43 for
2 the CEC alternative and 1.63 for the D and E
3 alternative. And I know the difference. It's
4 they are using cable instead of overhead, in the
5 case of CEC, some cable, and in the case of the D
6 and E it's underground. So let's be consistent.

7 I have a further comment here that I
8 don't think has been brought up by any of their
9 rebuttals or whatever they are. They have not
10 looked again at the annual carrying charges of the
11 alternatives. And even increasing the cost of the
12 D and E alternative to \$1.63 billion, if you take
13 the annual carrying charges on that and take the
14 difference between that and Bipole III
15 alternative, which I had done in the other case
16 and come out with \$1.3 billion savings, this will
17 give you a billion. Now it reduces to a billion
18 if you make that calculation. So you've still got
19 a billion dollars laying on the table.

20 MR. MERONEK: Over on page 5, the
21 second paragraph, in the middle of the paragraph,
22 it says that this recommendation, your
23 recommendation does not address the significant
24 risk associated with carrying out the Bipole I and
25 II separation project without having adequate

1 spare transmission to cover the planned and
2 unplanned outages that will be experienced during
3 the project. Can you comment on that statement?

4 MR. WOODFORD: Can you repeat the
5 question, in case I can answer that?

6 MR. MERONEK: If you look at paragraph
7 2 --

8 MR. DERRY: I can handle that one, I
9 think.

10 I guess what they are saying here is
11 that for the Dorsey station outage probabilities,
12 there was one in 200 years with a return period of
13 eight months to years. And this one they are
14 saying that the outage probability of the corridor
15 is, I think it's one in 17 that they were using
16 for tornadoes, and one in 50 for icing. And in
17 fact, I think in a later report by Teshmont, they
18 dropped that to one in 20 for icing.

19 Now, I have shown the cost of the one
20 outage that they had, or two outages. One was
21 11.1 and one was 6 point something. And I still
22 say that we have had one outage in 40 years. So I
23 guess we're due for another one pretty soon if you
24 want to get down to one in 17. But we only have a
25 span from 2017 to 2025, of eight years that we

1 have to worry about. Because after 2025, if you
2 follow our recommended plan, we have Bipole III
3 and there will be no problem. So do you want to
4 take the chance over eight years? You have taken
5 the chance over 40 and had one.

6 MR. MERONEK: Over on page 6 there are
7 a couple of issues flagged here by Manitoba Hydro.
8 One is the issue of your assertion as to shedding,
9 the shedding of load, and one is with respect to
10 what Manitoba Hydro says is an incorrect import
11 assumption in terms of import capabilities.

12 MR. DERRY: That goes back to that
13 same item that I referenced at the beginning, that
14 there is a report that shows that in the off peak
15 and the shoulder months, you could import an
16 additional 300 megawatts to take you from 900 up
17 to 1200.

18 MR. MERONEK: What about the issue of
19 shedding, as mentioned in the first full paragraph
20 on page 6?

21 MR. DERRY: Is that the part that says
22 low shedding is considered a do nothing scenario?
23 Manitoba is very evident, Manitoba is planning to
24 avoid to the extent possible... well, that's an
25 awful lot of money to spend for a case when it

1 might happen once in 17 years.

2 MR. MERONEK: Over on page 10, second
3 paragraph, Manitoba Hydro disagrees with deferring
4 Bipole III to 2025. It also disagrees with
5 locating the southern termination of LaVerendrye.
6 And it says in part:

7 "LaVerendrye is the wrong location due
8 to its proximity, electrical and
9 geographic, to Dorsey."

10 Can you comment on that assertion?

11 MR. WOODFORD: Could I comment on
12 that, sir?

13 MR. MERONEK: Sure.

14 MR. WOODFORD: Yes, that may be true
15 in terms of proximity effects. If Bipole III was
16 brought into operation, as I had mentioned in my
17 report, at LaVerendrye, it would have to go in
18 with a 500 kV ring, southern ring from Riel to
19 near LaVerendrye to Dorsey. And a single line
20 from LaVerendrye to Riel, 500 kV AC, is very
21 inadequate. But under these circumstances you get
22 enough strength and support to hold Bipole III at
23 LaVerendrye, with a 500 kV circuit running from
24 Riel to LaVerendrye up to Dorsey.

25 MR. DERRY: What about on page 10, the

1 bottom paragraph?

2 MR. MERONEK: Sure, you could take a
3 crack at that.

4 MR. DERRY: There's some talk that
5 LaVerendrye would be too close to Dorsey. Dorsey
6 had an outage probability of this one in 200.
7 They say that in this case, 25 downburst clusters
8 inside the damage path of 27 kilometres. Has
9 Hydro calculated what the outage probability would
10 be of both those stations going out if they are
11 separated? Is it one in 4,000 compared to one in
12 two? I'd like to know.

13 MR. MERONEK: All right. Then over on
14 the last page -- this completes my direct of you,
15 Mr. Derry. Do you have any comments with respect
16 to the conclusions that are reached by Manitoba
17 Hydro on that page that you haven't already
18 expressed?

19 MR. DERRY: No, I think I have
20 expressed all my concerns that the witness came up
21 with.

22 MR. MERONEK: Mr. Chairman, noting the
23 hour, I wonder if we should not take a break now
24 and then I'll pursue this afternoon the rebuttal
25 with Mr. Woodford, and then with Dr. Lawson.

1 THE CHAIRMAN: That's very good idea,
2 Mr. Meronek. Thank you. Thank you, Mr. Derry.
3 So we'll take a break now. We'll reconvene at
4 1:00 p.m.

5 (Hearing recessed at 12:00 p.m. and
6 reconvened at 1:00 p.m.)

7

8 THE CHAIRMAN: We might as well
9 resume.

10 MR. MERONEK: Thank you, sir.

11 Mr. Woodford, we left off with you,
12 and I would just like to ask you some questions, a
13 bit of a dog and pony show here with respect to
14 the rebuttal as it may relate to your evidence.

15 Firstly, on page 7 in the first
16 paragraph, Manitoba Hydro indicates that the
17 repairs on the northern DC transmission lines will
18 have a greater impact to restoration time than you
19 indicate. Do you agree with that assertion?

20 MR. WOODFORD: It appears that
21 Manitoba Hydro, Hydro's case for line restoration,
22 or line -- is fixed on a worst case scenario.
23 That includes the failure of both the DC
24 transmission lines, in the worst northern location
25 available, with the worst weather conditions. It

1 would be nice to see a reasonable scenario, and
2 the probability of each occurring.

3 We have presented, from our point of
4 view, a reasonable fair scenario, which for some
5 reason or other Manitoba Hydro is relentless in
6 considering only this worst case scenario of the
7 failure of these lines, six to eight weeks to
8 repair, it is all they will consider, for a very
9 low probability event.

10 MR. MERONEK: All right. Then the
11 question, I guess in the next paragraph, Manitoba
12 Hydro is asserting that your suggestion of
13 ameliorating equipment in such event, including a
14 sky crane, would consume too much fuel, cost too
15 much to be practical, and in addition to which tower
16 foundations may be damaged and very difficult to
17 repair. Can you comment on that assertion?

18 MR. WOODFORD: Yes. This may well be,
19 but it is again a worst case scenario. When the
20 one and only multiple tower failure occurred in
21 1996, wood poles were temporarily used. Is it
22 possible is the question I ask, is it possible to
23 use wood poles on a temporary basis to get one
24 line up while the tower foundations are being
25 repaired? I don't know the answer to that, I'm

1 not that sort of an engineer. Is it possible?

2 And if so, could we reduce the time from a worst
3 case scenario to something more reasonable, as was
4 the case in 1996.

5 MR. MERONEK: Looking over on page 8,
6 down at the bottom and I quote:

7 "The concern Manitoba Hydro has is
8 that in the absence of a DC connection
9 from Dorsey to Riel there is no
10 paralleling to deal with failure..."

11 Sorry, lost my place here. Okay, sorry, my
12 mistake.

13 On page 8, Manitoba Hydro, in the
14 middle of the page indicates:

15 "Manitoba Hydro notes that the
16 foregoing consultants and others in
17 Winnipeg with technical skills caution
18 Manitoba Hydro about the gravity of
19 the risks in separating Bipole I and
20 II without adequate spare
21 transmission."

22 Can you comment on that?

23 MR. WOODFORD: If part two was read
24 closely, it would be seen that we proposed leaving
25 the existing Bipole II converter in place, as I

1 mentioned earlier, and leave it functional to
2 avoid such a need for Bipole III to be in place.
3 This common sense approach has not been addressed
4 by Manitoba Hydro and their experts. When they
5 do, we would welcome a well-informed discussion on
6 the subject to see how these undefined risks
7 quoted in the question -- sorry -- these undefined
8 risks quoted in the question can be eliminated
9 without Bipole III being in place, as spare
10 transmission. Do we need Bipole III as spare
11 transmission? That's the key. The whole thrust
12 of building a new Bipole II converter at Riel,
13 while leaving the old Bipole II converter
14 functioning at Dorsey is to reduce such risk until
15 operation of the Bipole II converter at Riel is
16 working at an acceptable level of availability.

17 MR. MERONEK: Carrying on at the end
18 of 2.2 on page 8, Manitoba Hydro makes the
19 observation that the Commission didn't ask
20 Manitoba Hydro to identify a third site for a
21 southern converter station. Accordingly, Manitoba
22 Hydro is not ignoring a key finding regarding the
23 Dorsey converter station, but simply responded to
24 the question that was asked. Can you comment on
25 that statement?

1 MR. WOODFORD: Okay. The CEC inquiry
2 was not the total solution. We did not want to --
3 we did not want the issue to be left hanging that
4 the CEC raised, and that's why we have our
5 proposal.

6 MR. MERONEK: Paragraph, or section
7 2.3 at the bottom of the page 8, and I quote:

8 "The concern Manitoba Hydro has is
9 that in the absence of a DC connection
10 from Dorsey to Riel there is no
11 paralleling to deal with the failure
12 of the proposed 100 kilometre portion
13 of the Bipole II line from the tap off
14 point to Riel."

15 Can you comment on that statement?

16 MR. WOODFORD: Yes. I mentioned this
17 in my presentation. The 100 kilometre overhead
18 line route from Bipole I and II DC transmission
19 lines north of Dorsey to Riel, as they had
20 presented, would be again a worst case scenario.
21 Personally, I would prefer to run 500 kV cables,
22 as I said, from Dorsey to Riel on the existing 500
23 kV AC transmission right-of-way, less than 50
24 kilometres. This would be easily permitted, not
25 subject to environmental disturbances, and once

1 the splicings were stabilized, should be quite
2 reliable. The extra cost for the cable could
3 easily be justified on the savings of annual
4 carrying charges if we can delay Bipole III.

5 MR. MERONEK: Over on page 9 they talk
6 about, Manitoba Hydro talks about resident
7 frequencies, and you have commented on that in
8 your evidence already, correct?

9 MR. WOODFORD: Right.

10 MR. MERONEK: On page 11 there is an
11 issue of multi in-feed -- sorry, section 3.1.3 is
12 headed multi in-feed issues. And in that
13 discussion in the first paragraph, Manitoba Hydro
14 says and I quote:

15 "While LCC technology would present
16 greater challenges in maintaining the
17 required system performances, even VSC
18 technology would present a significant
19 challenge due to the electrical
20 proximity."

21 And then it goes on at the end of the page to
22 state:

23 "The Coalition proposal to locate the
24 converter for Bipole III at
25 LaVerendrye creates a different multi

1 in-feed configuration that can lead to
2 HVdc system recovery performance
3 issues which may result in higher
4 costs such as requirement for
5 additional synchronous condensers."

6 Can you respond to those statements?

7 MR. WOODFORD: Yes. This may be so,
8 but our experience, based on our simulations and
9 studies of the many years with voltage source
10 converter technology, and with Bipole III, add on
11 LaVerendrye in this case, we would assume, in
12 close proximity to the LCC converter Bipole I at
13 Dorsey, this would have a much reduced in-feed,
14 multi in-feed problem. By multi in-feed, what we
15 are saying here, or what I think is being said is
16 if we have a commutation failure, which is an
17 occurrence that would occur on Bipole I, that does
18 occur. We sometimes see it manifested with the
19 lights flickering. That may transfer over to
20 another Bipole nearby, and that would go into
21 flicker, exacerbating the total flicker. And
22 that's what the multi in-feed problem is.

23 Fortunately voltage source converters
24 do not fail commutation and tend to be fairly
25 robust and impervious to these sort of the things

1 happening. So if Bipole I goes into a commutation
2 failure, Bipole III, if located at LaVerendrye,
3 and if it was a voltage source converter, it is
4 open to question as to how much the impact of the
5 multiple -- the impact of Bipole I and Bipole II
6 will have -- Bipole III will have. And I would
7 propose that a detailed study using the latest
8 simulations technologies should be done so that we
9 can find out what really happens.

10 Now, in addition CIGRE, this
11 international electric power learned society, is
12 studying this issue at the moment. And when their
13 results are made available, these conclusions
14 should be brought forward, if available.

15 MR. MERONEK: Now, carrying on to page
16 12, firstly, at the bottom there is a reference to
17 NERC, North American Electrical Reliability
18 Corporation, and some issues that Manitoba Hydro
19 is throwing out in relationship to satisfying that
20 particular regulatory body. Can you comment on
21 that particular issue?

22 MR. WOODFORD: Yes. The delay in
23 Bipole III has been proposed, then the 500 kV AC
24 ring around Winnipeg may not be needed until then.
25 It is sensible to consider that with Bipole III

1 eventually coming into service with the delayed
2 requirement we proposed based on reliability
3 issues, and it being located near LaVerendrye,
4 that it can only be connected into the southern
5 Manitoba system on to the 500 kV ring for its
6 support and strength of operation. So if the 500
7 kV AC line section from the Bipole III point of
8 interconnection over to Riel has failed and
9 tripped from service, that 500 kV AC line section
10 to Dorsey would still be, and could handle the
11 Bipole III in-feed, perhaps with some controls
12 adjustment, if necessary. And one assumes that
13 when Bipole III is finally brought into service,
14 it would be -- it would be to deliver power to the
15 Manitoba load, and presumably the second 500 kV
16 interconnection to the U.S. would also be brought
17 into service at about the same time. For
18 potential sales south from this new northern
19 generation, the power is to be brought down Bipole
20 III. This would be a third section of 500 kV AC
21 transmission interconnected at the Bipole III near
22 LaVerendrye. So the NERC reliability standards
23 could easily be accommodated.

24 In any case, it is Manitoba Hydro's
25 responsibility to design the southern power system

1 with the 500 kV ring completed by Riel to Bipole
2 III near LaVerendrye to Dorsey, and the second
3 interconnection to the U.S. along with Bipole III
4 when it is ready to deliver real power from the
5 north. So that's my response to that.

6 MR. DERRY: Mr. Meronek, Art Derry, I
7 would like to add something to this discussion
8 about whether or not LaVerendrye is the right
9 position for Bipole III.

10 In the 2010 report on page 9 of that
11 report, they have what is called an option 3, and
12 that's Manitoba Hydro have an option 3, Bipole I
13 at Dorsey, Bipole III at Riel, Bipole II at a new
14 location. Then it goes on to say, not unlike
15 option 2, but with further splitting the Dorsey
16 station, this variation provides the greatest
17 three pole reliability benefit. A possible Bipole
18 II converter location could be at or near
19 LaVerendrye station or along the future south
20 Winnipeg transmission corridor.

21 So what they are saying is you can
22 locate a Bipole there, it could also be three, in
23 our case it is three. So it contradicts the
24 statement about LaVerendrye as another possible
25 location, they have assumed it could be.

1 MR. MERONEK: Thank you, Mr. Derry.

2 Moving over to -- or back up the page.

3 THE CHAIRMAN: Mr. Meronek --

4 Mr. Derry, you said 2010 report, is that the

5 Teshmont report?

6 MR. DERRY: No, it is the Manitoba

7 Hydro report called "Ultimate HVDC Development in

8 Manitoba."

9 THE CHAIRMAN: I think it is

10 referenced in here. Thank you.

11 MR. DERRY: Yes.

12 MR. MERONEK: Moving back up the page,

13 it is a bit out of order. In section 3.2 on page

14 12, it is stated at the end of the first

15 paragraph, should this 500 kV AC line be proposed

16 for the outlet transmission from LaVerendrye, the

17 cost needs to be included as part of the

18 LaVerendrye converter site. The line would also

19 require an environmental assessment and licensing.

20 And how does this impact your

21 presentation before the Commission?

22 MR. WOODFORD: Well, I agree with

23 this. With Bipole III delayed to when it is

24 really needed, as put forward in part one of our

25 report, then there will be plenty of time for the

1 permitting, and any extra costs are easily
2 accommodated by the huge saving in annual carrying
3 charges that comes with such a delay.

4 MR. MERONEK: And on page, or again
5 going further up the page in the second paragraph
6 of the rebuttal, Manitoba Hydro raises an issue
7 with power flows around Winnipeg predominantly
8 being from west to east, resulting in an
9 unacceptable loading of the existing transmission
10 in the Winnipeg area.

11 What is your response to that
12 statement?

13 MR. WOODFORD: I did touch on this in
14 my presentation. I will add to it.

15 With Bipole III delayed, as we
16 recommend, and Bipole II in-feed at Riel instead
17 of at Dorsey, then this problem is remedied or
18 postponed presumably, until Bipole III has to come
19 on line. In other words, the feed-in at the east
20 side at Riel from Bipole II will push back against
21 this natural flow west to east, and accommodate
22 that distress of the Winnipeg area transmission
23 system. If the 500 kV AC ring is completed around
24 Winnipeg, particularly when Bipole III is brought
25 on line, a response from Manitoba Hydro should be

1 provided after they have conducted an adequate
2 study to see what effect of Bipole III at
3 LaVerendrye, only LaVerendrye, has on -- as well
4 as the completion of the 500 -- sorry, as well as
5 the completion or implementation of the second 500
6 kV AC line to the U.S., what all that will have on
7 the loading of the existing transmission system in
8 the Winnipeg area. In addition, they should
9 seriously study the benefit that might be possible
10 by increasing the rating of Bipole II into Riel
11 and from Henday to perhaps 2,500 megawatts, or
12 even higher to 3,000 megawatts. Then there would
13 be the potential for delivering lots of power into
14 the eastern side of Winnipeg to combat this issue
15 of west to east loading on existing Winnipeg area
16 transmission.

17 So, in summary, Manitoba Hydro needs
18 to spend more time looking at the many options
19 that are possible beyond this fixed in stone
20 scenario that they are bringing before this
21 Commission.

22 MR. MERONEK: Going over on the last
23 page, page 13 at the top of the page, the rebuttal
24 evidence states in part, in the event of a loss of
25 500 kV AC line, the power will naturally flow out

1 to the other 230 kV and 115 kV lines of the
2 LaVerendrye and potentially result in overload and
3 potential cascade tripping. Is this a severe
4 problem that seems to be indicated?

5 MR. WOODFORD: Well, reading this, as
6 written by Manitoba Hydro in their rebuttal,
7 implies that they are considering, as I read it,
8 only one 500 kV line from this proposed point of
9 inter-connection of Bipole III near LaVerendrye,
10 and then that 500 kV line, single 500 kV line
11 would go on to Riel. That's how I interpret it.
12 This is plainly inadequate, as they state. Hence
13 when Bipole III is eventually brought into
14 service, the 500 kV AC ring around Winnipeg with
15 its point of inter-connection near LaVerendrye
16 should be part of the project.

17 The delay of Bipole III, perhaps as
18 much as 8 years, at \$322 million per year in saved
19 carrying charges, there is a lot of money to apply
20 to improving the transmission reliability of the
21 Winnipeg area, still leaving significant savings
22 to Manitoba Hydro and its customers who are
23 required to foot the bill.

24 It is Manitoba Hydro's responsibility
25 to investigate these options the Coalition has

1 brought forward, as well as other options that may
2 open up as a true planning study is undertaken.

3 MR. MERONEK: And lastly,
4 Mr. Woodford, on page 13 with respect to line
5 routing and impact on project schedule, Manitoba
6 Hydro expresses concern about the licensing delays
7 to get the transmission lines in place to
8 accommodate a 2017 in service date. Can you
9 comment on that concern?

10 MR. WOODFORD: Yes. With Bipole III
11 delayed, then indeed we have to get the
12 transmission in place with the new Bipole II
13 converter located at Riel. My personal preferred
14 way, as stated earlier, is to do this with
15 underground cable along the 500 kV AC transmission
16 line right-of-way that's in existence. And this
17 would require little permitting, little time in
18 permitting. One of the advantages of underground
19 cables is much reduced permitting time compared to
20 permitting overhead lines, as is apparent from
21 this hearing.

22 And now this was the case of the
23 project in Australia called Murray link, where 180
24 kilometres of underground HVDC transmission cable
25 was constructed in 2002, near where I grew up.

1 The cable option was applied because the line was
2 generating revenue for the many years it would
3 have taken to permit and build an overhead
4 transmission line -- might I add, across good
5 farmland. It is interesting to note that this DC
6 cable project was built by Transenergie, a Hydro
7 Quebec subsidiary, and has since been sold to a
8 company called Australian Pipeline Trust, and that
9 was transferred over from Hydro Quebec in 2006.
10 So let's not throw out underground cables as a
11 means of reducing permitting time.

12 MR. MERONEK: Thank you, Mr. Woodford.

13 Over to you, Dr. Lawson, I just have a
14 couple of questions relating to the rebuttal in
15 relationship to your report. Most of the
16 questions I believe you covered off in your
17 initial presentation, but I want to take you to
18 page 2 of Manitoba Hydro's rebuttal in
19 relationship to your report, and under the heading
20 scheduled risk due to field splices.

21 And as I understand, the concern by
22 Manitoba Hydro is that there will be a lengthy
23 period of time in terms of splicing of the cables,
24 presumably if there was only one crew working, and
25 which extrapolates over to a long period of time

1 as set out in the report, 35 months I believe.

2 Anyway, have you got any comments on
3 your experience in that regard?

4 MR. LAWSON: There isn't a whole lot
5 of experience with underground really. There are
6 short lengths at the ends of submarine cables.
7 But I think I did touch on the splicing time, and
8 I believe it is better to have a four day than a
9 five day, for reasons that I explained during my
10 presentation. But also I did touch on this too, I
11 mentioned the fact that when they had problems
12 with capacity, ABB and Nexans worked together on
13 the FennoScan project. So it is possible to have
14 more than one supplier. So if you are able to
15 have two suppliers, that's a great help. And
16 multiple teams must certainly be available,
17 because the business is buoyant at the moment and
18 the supplier can't manage with just one splicing
19 team. Two splicing teams would probably be
20 available for the single job anyway, so I think
21 you can rely on two. And there is the other
22 factor that when you have two splices to make off
23 in close proximity, then also the splicing time
24 comes down because the fitting out and so on you
25 do for two instead of just one.

1 MR. MERONEK: Manitoba Hydro would
2 respond and has responded in the rebuttal to the
3 effect that there are few suppliers, a few
4 factories, and they all seem to be booked up until
5 2017. Can you comment on that concern?

6 MR. LAWSON: Well, I think they said
7 there were four factories, four plants, three
8 suppliers. That would be ABB, would be Nexans,
9 would be Prysmian. Now, ABB -- sorry, Nexans more
10 or less own the viscous plant in Tokyo Bay, so
11 that would be the fourth. But we are forgetting
12 about the J-Power Systems Plant, and also there is
13 the new plant in Korea. They had just done a
14 project to an island in Korea with HVDC mass
15 impregnated cable. So there is another couple of
16 plants. The Japanese, the J-Power Plant, they
17 have qualified for the western link, so they have
18 a 600 kV HVDC mass impregnated cable qualification
19 already. They have not had any contracts, but
20 they are competent and I assume at the moment they
21 are available.

22 MR. MERONEK: What is your -- what are
23 your comments on it with respect to what is
24 happening in the industry in terms of increase in
25 capacity?

1 MR. LAWSON: Well, I did mention that
2 in the Fennoskan cable capacity was in the order
3 of 120 kilometres per year, per plant. And this
4 is because the process, the bottleneck in the
5 process is the impregnation, and particularly the
6 cooling of the impregnant under pressure is very
7 slow, but it is not high tech. So in order to
8 increase your capacity, you put in another tank.
9 In fact, ABB now have four tanks. Nexans probably
10 have four as well, I can't confirm that. And
11 Prysmian have four. So we are talking in terms of
12 capacity, something like 250 to 300 kilometres per
13 plant per year. And yes, they are very busy, and
14 Prysmian in particular with the western link,
15 which is 400 kilometres long, and then we have
16 just had the announcement that Prysmian also have
17 one part of Montenegro cable, which is 415. So
18 they have orders at least for 815 kilometres of
19 cable, 500 kV. So it is a busy period for them,
20 yeah. But I don't think -- I never heard of a
21 supplier refusing to take an order, or to make a
22 bid. Sometimes they make bids with very high
23 prices because they can't handle the work, but to
24 say they can't do is not the usual situation.

25 MR. MERONEK: In terms of the issue

1 of -- over on page 3 there is a concern about
2 regulatory requirements for cables. And there is
3 a comment there at the end of the paragraph that
4 says that, in reference to the picture at least,
5 that it is worth noting the proposed cable runs
6 through agricultural farmlands. I guess the
7 implication being that we are not really avoiding
8 agricultural lands by going underground cable, as
9 we intended to avoid by going with overhead lines.
10 So can you comment on that concern?

11 MR. LAWSON: Well, I did sort of touch
12 on that in the report I think. What I had in mind
13 was the alternative of using route 26 as a way for
14 ease of transportation and access. So that would
15 be slightly better. But there is no reason why
16 you can't have projects like the one in the
17 photograph on page 3. There is actually cable in
18 the trench, I think if you look closely, they
19 certainly have the cable reels installed ready to
20 do the pooling.

21 MR. MERONEK: There is, over on page
22 4, there is a comment under heading four, cable
23 supplier factory capacity and commitments for MI
24 cables. And at the end there is an estimation
25 that for the manufacturing and delivery of cable,

1 it could take at least two years. Can you comment
2 on that suggestion in terms of timing?

3 MR. LAWSON: Well, more or less
4 standard for a project of this nature is three
5 years. And that largely depends on whether the
6 client wants to have a type test done. You can
7 have a special type test for the particular
8 project, your project. Most owners do want that
9 special electrical test done before the cable is
10 supplied. It is not strictly necessary, because
11 if the supplier has already supplied similar
12 cable, it is not necessary and, therefore, you can
13 cut down the time. But as I say, usually three
14 years is the duration of this sort of project.

15 MR. MERONEK: And lastly, on the
16 bottom of page 4 there is a reference under the
17 heading "Logistics for Cable Transportation and
18 Accessibility at Site," the statement at the end
19 says:

20 "This is a significant challenge in
21 terms of logistics..."

22 And it is referencing the transportation and risks
23 of cable damage during transportation, handling,
24 and impacts on farmland. Can you comment on
25 whether there are significant challenges, whether

1 they are overstated?

2 MR. LAWSON: Only to say that every
3 project has its challenges. That hasn't stopped
4 the Neptune land cable going in, and doesn't seem
5 to have stopped the 90 kilometre Skagerrak 4 cable
6 going in, in Denmark. These things have to be
7 looked at. We know that the cable can be
8 transported on reels. At the moment I have
9 limited it, because of some uncertainty of how
10 much cable -- the reel will hold a lot more cable,
11 but you are not sure because it is mass
12 impregnated, how to fully load these reels. And
13 it is a question of also logistics, and these
14 things have to be looked at. But I think this is,
15 my opinion anyways, relatively high level
16 feasibility study. So we have done what we can.

17 The next step would be to have surveys
18 done of the opinions of the industry concerning
19 the results of the survey and so on.

20 MR. MERONEK: Thank you, Dr. Lawson.
21 Those are my questions, Mr. Chairman.

22 THE CHAIRMAN: Thank you, Mr. Meronek.
23 Manitoba Hydro?

24 MR. BEDFORD: Mr. Derry and
25 Mr. Woodford, good afternoon. My name is Doug

1 Bedford and I work at Manitoba Hydro, but of
2 course, my career at Manitoba Hydro has not
3 overlapped your respective careers at Manitoba
4 Hydro.

5 The first question that the Clean
6 Environment Commission posed in a letter that it
7 wrote to me on December 3rd, 2012, was whether or
8 not one could build Bipole III, and at the
9 southern terminal point connect the conductors of
10 Bipole III to the existing converter equipment at
11 Dorsey.

12 Now, having read your two reports,
13 having listened to your presentations, and having
14 listened to the answers to the questions that
15 Mr. Meronek posed to you, conclude that with
16 respect to that first question that the Clean
17 Environment Commission posed to me, you agree that
18 it is not recommended to place the southern
19 converter station for Bipole III at Dorsey and
20 simply use the existing converter equipment in
21 Dorsey to handle that?

22 MR. DERRY: Yes, I agree with you.

23 MR. BEDFORD: Now, with respect to the
24 next question that the Clean Environment
25 Commission posed in its letter to me, whether or

1 not it would be feasible to separate Bipoles I and
2 II and move one of them to the Riel site, I
3 understand, Mr. Derry, that you believe that can
4 and should be done?

5 MR. DERRY: I believe that you can
6 build a new station at Riel, not move the existing
7 Bipole II.

8 MR. BEDFORD: And you agree that if
9 one is to do that, it should be the southern
10 terminal point for Bipole II that is moved?

11 MR. DERRY: Can you repeat that again,
12 please?

13 MR. BEDFORD: If one were to separate
14 Bipoles I and II, and to move one of them to the
15 Riel site, you believe, as does my client, that it
16 would be Bipole II that you would move?

17 MR. DERRY: Yes.

18 MR. BEDFORD: And I've read,
19 Mr. Derry, your report, you think that should be
20 done now and can be done by 2017. And on page 20
21 of your report, I saw that you estimated the cost
22 of doing that to be about \$1.2 billion?

23 MR. DERRY: That's correct. That's
24 the number that I used that Mr. Mazur had been
25 using in his IRs.

1 MR. BEDFORD: And then as I have read
2 and listened to your recommendation, I understand
3 that you recommend that some 8 years from now, for
4 a 2025 in-service date, one would also then build
5 Bipole III; is that correct?

6 MR. DERRY: That's correct. And
7 that's the date that Hydro has indicated that it
8 would have to do something, from their figures,
9 1.3.

10 MR. BEDFORD: And your general
11 thinking, the price that you are using for
12 building Bipole III, but for in-service some eight
13 years later than what my client is proposing,
14 would be about \$3.14 billion, as I read your
15 estimates. Have I got that correct?

16 MR. DERRY: Now, can you tell me where
17 you found that in my report?

18 MR. BEDFORD: Page 20.

19 MR. DERRY: Correct.

20 MR. BEDFORD: And of course, your
21 estimate of 3.1 billion is very, very close to the
22 \$3.28 billion that my client has advised this
23 Commission is its estimate of the cost to build
24 Bipole III, correct?

25 MR. DERRY: The difference is the

1 shorter line.

2 MR. BEDFORD: And so if I try and
3 summarize your recommendation to the Commission,
4 between today and 2025, if your recommendations
5 were followed, you would have us spend
6 3.14 billion, plus about 1.2 billion, for a total
7 of about 4.2 to 4.3 billion to improve the
8 reliability of the Manitoba Hydro system?

9 MR. DERRY: And that's in 2017
10 dollars.

11 MR. BEDFORD: Now, as I understand it,
12 on the subject of separating Bipoles I and II and
13 moving the southern converter for Bipole II to
14 Riel, the primary difference between your views,
15 your recommendation and what my client is
16 proposing to do is that you would do the
17 separation, do the movement before Bipole III is
18 constructed, whereas in my letter of January 28th,
19 replying to the Commission, I said that the
20 separation should prudently take place only after
21 Bipole III is in service.

22 So that's a significant, the
23 significant difference between your
24 recommendations for separation and what my client
25 has proposed?

1 MR. DERRY: That's correct. We are
2 saying Bipole II should precede Bipole III.

3 MR. BEDFORD: Now, I do understand
4 that long before I joined the company, you did
5 work for a number of years in senior positions at
6 Manitoba Hydro?

7 MR. DERRY: What was that again,
8 please? I have a hearing problem.

9 MR. BEDFORD: You worked, long before
10 I arrived there, for a number of years in senior
11 positions at Manitoba Hydro?

12 THE WITNESS: Yes, I did. I never
13 mentioned this morning that I was vice president
14 of business development when I quit, when I
15 retired.

16 MR. BEDFORD: And of course, to your
17 knowledge, it is certainly true that Manitoba
18 Hydro has never attempted to separate Bipoles I
19 and II?

20 MR. DERRY: No, not while I was there.

21 MR. BEDFORD: And I'm assuming that
22 you've had an opportunity to read the letter that
23 I wrote on January 28, 2013, to the Clean
24 Environment Commission, providing answers to the
25 questions that it posed to me on December 3rd?

1 MR. DERRY: December 3rd letter, is
2 that the one in --

3 MR. BEDFORD: January 28.

4 MR. DERRY: Oh, January 28th, I'm
5 sorry. Yes, I have it here.

6 MR. BEDFORD: I told the Commission in
7 my letter that if one were to tackle the job of
8 separating Bipoles I and II, that amongst the many
9 significant challenges, there would be a major one
10 regarding the controls that exist today at Dorsey,
11 the controls that allow for an instant reduction
12 of power flow in that system in the event of
13 tripping.

14 Do you recall me advising the
15 Commission of that concern?

16 MR. DERRY: I put that in your letter,
17 but Mr. Woodford will handle that question.

18 MR. WOODFORD: What was the question?

19 MR. BEDFORD: I would suggest to you
20 that in light of the challenges and the
21 inexperience Hydro has in separating Bipoles I and
22 II, it would be foolish for any of us to assume
23 that in the process of going forward and doing
24 that there would be no power outages?

25 MR. WOODFORD: There would be possibly

1 minimal power outages, and that is why I suggested
2 you see what happened in Los Angeles, to see in a
3 similar, but not the same circumstances, what
4 outages occurred in that situation. By retaining
5 the existing old Bipole II in functional
6 condition, it could be brought up pretty quickly
7 if needed because -- if there was a major failure
8 in the cable to or the line to Riel, or the DC
9 converter station. But your question was about
10 controls. Tell me what your issue is there?

11 MR. BEDFORD: Well, the issue is I'm
12 informed, Mr. Woodford, that the controls are a
13 critical aspect of the operation of the
14 transmission system because they are our
15 protection or defence from cascading outages if
16 the lines are tripped. And accept that that's a
17 lawyer, not an electrical engineer, explaining to
18 an electrical engineer his imperfect understanding
19 of his client's system. That's what I'm told is a
20 critical challenge, is to in effect dismantle
21 those controls, with the view logically I suppose
22 of setting them up somewhere else. You have
23 reminded me of the example that you provided us
24 from California. I understand that the, I will
25 call it the old Sylmar converter station, was

1 damaged in an earthquake in the 1990s, and that's
2 what motivated the Californians to revisit what
3 they were going to do about refurbishing or
4 replacing that particular converter station. Am I
5 on the right track with that?

6 MR. WOODFORD: Yes, but it was also
7 damaged back in the '70s by an earthquake. So
8 that was the second damage. They had tried to
9 build the old station to be more resilient against
10 earthquakes. They succeeded to some success, but
11 not completely. And as a consequence they had to
12 build, as part of the consequence they had to
13 build a new, completely new 3100-megawatt
14 converter station at the east site, which they
15 were able to do, with new controls, completely new
16 controls, completely digital controls. And I
17 should raise the issue here that Bipole I and
18 Bipole II today, to my understanding, and I stand
19 corrected, are running on analogue controls, as
20 was the Sylmar station. Once you go digital and
21 once you use high speed telecommunications, as we
22 are proposing and as would be applied, and
23 engineered accordingly, then you can do a lot more
24 and have a lot more flexibility than if you still
25 stick with these old controls. And this is a

1 factor that's a real technical issue, I
2 understand, and I remember getting chastised by a
3 lawyer for saying that you are an engineer, don't
4 do legal stuff, and I appreciate your position.
5 And the controls are very important. But the day
6 has come where there is a lot more development
7 going on, and running continually now with
8 analogue controls of 30 plus years is not a good
9 idea. Now, you tell me otherwise.

10 MR. BEDFORD: Well, I will confess to
11 you that I've been known to chastise other
12 lawyers, but not engineers.

13 I understand that one of the
14 advantages they had outside the City of Los
15 Angeles, when they approached a somewhat similar
16 challenge with converter stations, was that they
17 had alternative sources in Los Angeles of supply
18 of power while they took one converter station out
19 of service and they put another one new into
20 service. Would I be correct?

21 MR. WOODFORD: No, not quite. Because
22 as I presented to you, they were at least able to
23 keep 2000 megawatts functioning while they rebuilt
24 the east Sylmar station. And then when it was
25 functioning and operated and commissioned, they

1 were able to connect it back in and take out the
2 old west side station. So the outage time was
3 minimal, if at all. Now, I don't know what the
4 outage time is.

5 I have worked with the Los Angeles
6 Department of Water and Power, and know them very
7 well. And if you folks contacted them and talked
8 to them about it, I'm sure they would be very
9 pleased to inform you what the true situation was
10 in that issue.

11 MR. BEDFORD: Well, either Mr. Derry
12 or Mr. Woodford, on the subject of outages. I
13 gather if we were to proceed with your
14 recommendation, separate Bipoles I and II, build
15 Bipole III eight years later, and in doing that we
16 did have an outage or outages, plural, the back-up
17 plan that you have in mind for my client is that
18 we could, as you put it, shed up to 800 megawatts
19 of load and import, I heard you say, Mr. Derry,
20 1200 megawatts of energy, primarily obviously from
21 our neighbours, the Americans. Have I got that
22 correct?

23 MR. DERRY: That's correct.

24 MR. BEDFORD: Now, when an engineer
25 says to a lawyer, we could shed up to

1 800 megawatts, the lawyer says in his mind, what
2 that really means is there will be no electricity
3 flowing in to whatever number of businesses and
4 homes we require 800 megawatts to power up. Have
5 I got that right?

6 MR. DERRY: That's right. But it will
7 only be for the time until the load drops off.
8 You are not at peak load all of the time. The
9 numbers you see are peak load. So there is the
10 situation where you have to shed and then you can
11 get them back on.

12 MR. BEDFORD: I did read, as I said,
13 your report, Mr. Derry. And I saw you
14 appropriately acknowledge that shedding load is
15 disruptive in the life of a province. But your
16 conclusion is that shedding is not a sufficient
17 concern to, in effect, motivate my client to want
18 to build Bipole III first for a 2017 in-service
19 date. Have I summarized that fairly?

20 MR. DERRY: That's correct. But I did
21 specify and gave you some examples of how many
22 dollars are involved in an outage, as compared to
23 the amount of money that you want to spend to
24 cover off that one in 17 year condition over that
25 eight years. And I don't think it is worthwhile.

1 MR. BEDFORD: And only fair of us, I
2 suppose, to recall, because my client is quite
3 mindful of this, as is apparent in its rebuttal
4 document, that when it comes to shedding, if it is
5 you or I that's operating one of those businesses
6 or living in one of those homes with no power now
7 coming in, we would likely have a very different
8 opinion than Mr. Derry's about whether or not
9 shedding is an acceptable solution to deal with an
10 outage caused by a decision to separate Bipoles I
11 and II, would we not?

12 MR. DERRY: Maybe those customers will
13 think about the fact that by adding \$322 million
14 to your rate base they are going to be paying a
15 heck a lot more money over that eight years.

16 MR. BEDFORD: And I think you are
17 right, we are always concerned about paying more
18 money. We seem to have a long history in this
19 province of bragging about the fact that we have
20 the lowest electricity rates in North America.

21 MR. DERRY: And I even brag about that
22 because I was involved in those decisions.

23 MR. WOODFORD: Can I add a comment
24 about load shedding?

25 MR. BEDFORD: Generally in

1 cross-examination the lawyer tells you, no, you
2 can't, but this lawyer is prepared to be
3 accommodating this afternoon, Mr. Woodford. We
4 are here to try and do the best we can to educate
5 five Commissioners, there is only four of them
6 present today, because I would like them to make
7 the best possible recommendations about my
8 client's project. So I'm sure they might be
9 interested if you have an additional comment about
10 load shedding.

11 MR. WOODFORD: Well, prior to 1980,
12 before they put in the 500 kV AC transmission line
13 down towards the Twin Cities, Bipole I was in
14 service and it had troubles staying in operation
15 from time to time and there was frequent load
16 sheds in the City of Winnipeg. It was so bad that
17 at those times the electrical clocks worked off
18 the frequency of the AC system, or batteries. And
19 I could never trust my clocks, so I had to buy a
20 wind-up clock, because I was ending up going to
21 work late. Because I still looked at the clock
22 that had been load shed, and my clock was running
23 very slow, sometimes I was an hour or two late.
24 So that's the consequence of, in our homes, of
25 load shedding. It is probably an irrelevant

1 statement, but I remember it very well because of
2 the late times I went to work because of load
3 shedding.

4 MR. BEDFORD: Well, it is not relevant
5 to anyone else in the room today, but I'm happy to
6 reveal to you that I brought one of my late
7 grandfather's wind-up clocks.

8 Now, Mr. Derry, you concluded that, in
9 the event of an outage, part of the back-up plan
10 work to import, and your number is 1200 megawatts
11 of power, primarily as I indicated from the
12 Americans, given how our international and
13 inter-provincial transmission connections are set
14 up.

15 My client assures me that the maximum
16 today is 900 megawatts, 700 of which they describe
17 as firm and 200 of which would be non-firm.

18 Can we at least agree that the firm
19 and non-firm are numbers that you understand and
20 recognize?

21 MR. DERRY: Yes, I understand.

22 MR. BEDFORD: Now, one of the things
23 that occurred to me, which I think ought to occur
24 even to engineers, is that it is one thing in
25 planning and studying to say you have the ability

1 through your system to import, be it 900 or
2 1200 megawatts. But be it 1200 or 900 firm or
3 non-firm, you must assume that you have someone on
4 the outside able and willing to sell you the power
5 to actually import. Am I correct?

6 MR. DERRY: I guess partially. What
7 I'm talking about, when you have an outage, what
8 will happen instantaneously is that those lines
9 will assist you as much as they can. If they
10 don't trip, then it is fine.

11 Now, in the longer term if you are
12 talking hours, yes, I've made the assumption that
13 you can import 1200 megawatts, be it from the
14 U.S., Saskatchewan or Ontario. And the
15 1200 megawatts is not my number, it comes from a
16 report that I've documented in my report,
17 referenced, and it was a 2001 study done by Hydro
18 where in the off-peak periods, which I call the
19 shoulder, the off-peak period, you could import up
20 to 1200 megawatts. That's where I got the number.

21 MR. BEDFORD: Well, some of the
22 engineers who succeeded you and Mr. Woodford at
23 Manitoba Hydro are being questioned on Thursday.
24 They are still scratching their heads, because
25 they can't determine how you found another

1 300 megawatts not having -- notwithstanding that
2 they have had the benefit of reading your report
3 and listening to you. So I'm not going to succeed
4 in resolving the mystery of how we moved from 900
5 to 1200, but my point was that we all need to
6 appreciate that the capacity to import depends
7 ultimately on the existence of a willing seller
8 who is able to meet your firm or non-firm demand
9 on an urgent basis for energy.

10 MR. DERRY: That's the whole idea of
11 having a power pool, everybody helps each other
12 when they are in trouble, and they are supposed to
13 help you.

14 MR. BEDFORD: In the event that we
15 proceed with your recommendation, we are in the
16 midst of separating Bipoles I and II and there is
17 an outage, or outages, would I be correct in
18 saying that situation of outages would be further
19 complicated if at the time they occurred my client
20 and the people in this province were experiencing
21 for example, low production in generation due to a
22 drought, or trying to cope with another
23 catastrophe that has affected one or other of its
24 generating stations? For example, we have had a
25 fire recently at our Jenpeg station which has

1 largely put it out of service?

2 MR. DERRY: You are telling me that
3 you have units out of service that aren't in the
4 calculations that I made, I guess you are saying?

5 MR. BEDFORD: My concern is your
6 calculations and your assumptions don't address
7 that there could be further complications caused
8 because of outage.

9 MR. DERRY: You are adding on top of
10 another here, you are adding many things on to it.
11 Again, as Mr. Woodford says, you are taking the
12 worst scenario that you can think of.

13 MR. BEDFORD: I know that Mr. Woodford
14 finds me depressingly pessimistic with the worst
15 case scenarios that I keep putting forward on
16 behalf of my client.

17 MR. DERRY: You didn't mention
18 maintenance in the summer period. I did mention
19 it in my report that my graphs that I put in there
20 don't include maintenance, and there would be
21 maintenance there. But the amount that is lost is
22 very minimum, and you could do up to another four
23 or 500 megawatts of maintenance within the months
24 of those summer months and still get it through.

25 MR. BEDFORD: Well, to bring this line

1 of questioning to an end, I want you, Mr. Derry,
2 or it could be Mr. Woodford, to assume that you
3 are in charge at Manitoba Hydro, and you are on
4 the cusp now of implementing the recommendation
5 that you described to us. Your dream is coming
6 true. And then one of your staff at Manitoba
7 Hydro points out to you that your first priority
8 always in the business of Manitoba Hydro is to
9 meet load, domestic load. And you are not
10 allowed, in carrying out your daily functions and
11 your jobs, you are not allowed to initiate or do
12 anything that risks you failing to meet load.
13 Now, if that conversation with your staff takes
14 place, and if the reality is that your first
15 priority is always to meet load and not to
16 initiate changes in your system that could lead to
17 outages, is it not true that you should not be
18 separating Bipoles I and II until Bipole III has
19 been built?

20 MR. DERRY: Well, I would say at what
21 cost? There is going to be a cost to this. You
22 can't design a system to be 100 per cent reliable.
23 So I would ask that person, whoever it was, what
24 is this going to cost us as, compared to doing the
25 alternate?

1 MR. BEDFORD: Well, the reference to
2 first priority, a lawyer can tell you comes from
3 the legislative mandate that Manitoba Hydro is
4 required and obliged to respect. But part of the
5 purpose in my question to you, and my illustration
6 of putting you back into the most senior job at
7 Manitoba Hydro, was to address something Mr.
8 Woodford quoted in his paper.

9 Mr. Woodford, that's at page 3, but it
10 will -- I'm sure you will recollect it quickly.
11 You chose to quote a report written by two people
12 I do know well, Mr. Mazur and Mr. Wang. Mr. Wang
13 has actually been here throughout the day. And
14 you were puzzled why, having recognized the wisdom
15 of separating Bipoles I and II at Dorsey, those
16 two gentlemen wrote:

17 "...but should not be pursued at this
18 time unless there is no other option."

19 And I would suggest to you that answers the
20 mystery that was in your mind; why, having
21 recognized the desirability of separating I and II
22 for reliability purposes would they then go on to
23 opine that this should not be done now unless
24 there is no other option.

25 Well, I suggest to you that's why they

1 wrote this should not be done now unless there is
2 no other option, because working at Manitoba Hydro
3 they are thoroughly cognizant of the company's
4 mandate not to initiate actions which could lead
5 to outages and thus violate the primary mandate to
6 meet load.

7 MR. WOODFORD: Thank you for your
8 question there. There is a lot in it.

9 First of all, Manitoba Hydro does
10 suffer outages, notwithstanding that mandate. And
11 so what? There is the potential -- or the
12 possibility of 100 per cent reliability to all the
13 customers of Manitoba Hydro is not possible, no
14 matter what you are doing, it is not achievable.

15 Now, I don't know whether the lights
16 went out today because of Manitoba Hydro, I
17 suspect it is because of the building. But lights
18 do go out. All right. So you can't maintain that
19 mandate, as you've put it, as you have worded it.
20 It is not possible. And we know that. We saw
21 that on October 5th, last year, when we had the
22 ice storm in Southeast Manitoba. You weren't able
23 to maintain your power supply to those customers
24 of Manitoba in that area. So these outages do
25 occur. And we are talking about extreme outages

1 where we are losing two Bipoles simultaneously,
2 which is not unlike an ice storm in Southeast
3 Manitoba. So we are not in a situation of being
4 able to provide that mandate at 100 per cent, 100
5 per cent of the time. You understand that, I'm
6 sure. And so we have to provide the best
7 reliability we can.

8 Now, in December I was in the United
9 Kingdom and I attended a lecture or talk given by
10 an executive of -- what is the U.K. power
11 authority -- National Grid. And they have got
12 some tremendous developments to do in the United
13 Kingdom. And the question he raised before us
14 was, where do we call the level of reliability?
15 And it was an unanswered question, but it is a
16 question that he had as a senior executive of
17 National Grid, where do we call the level of
18 reliability? Because to try and get close to that
19 100 per cent costs billions of pounds, but perhaps
20 to get to 99.9 per cent, it wouldn't cost so many
21 billions of pounds.

22 So as engineers this has to be -- and
23 folks administering the rates, this issue of
24 probability is a key issue of reliability, and
25 this is what we are here for. This is the whole

1 point of this presentation is reliability.

2 And again, when we have extreme
3 disturbances such as the October 5th wind storm or
4 something that takes out Bipole I and Bipole II,
5 these are extreme. And to say that we are not
6 fulfilling -- you are not fulfilling your mandate
7 100 per cent is not good engineering. It may be
8 good legal stuff, but it is not good engineering.

9 I have said more than I should. And I
10 want to make that point very clear to the
11 Commission, that's an extreme and important point
12 that reliability is a key issue, but the lights do
13 go out.

14 MR. BEDFORD: Of course. And there is
15 a difference, Mr. Woodford, between an outage
16 caused by a natural event like an ice storm, that
17 no human can claim credit for having caused, and
18 an outage that results from a decision consciously
19 made by a group of men and women, engineers, to
20 separate Bipoles I and II.

21 MR. WOODFORD: Such as?

22 MR. BEDFORD: Such as a decision made
23 by engineers to separate Bipoles I and II, knowing
24 that there is a risk of outages?

25 MR. WOODFORD: That is what Manitoba

1 Hydro has said. And I have presented to you today
2 that others have done this with minimum outage,
3 and the outages would be planned at a time when
4 the load could handle it, perhaps 3:00 o'clock in
5 the morning, I don't know. So that whatever
6 switching is planned happens. We are not talking
7 about equipment suddenly going up in smoke, are
8 we? We are talking about taking stuff out, taking
9 equipment or facilities out of service while we
10 put new service or new plant in. And that should
11 be planned so that when we do that it is at a time
12 when, hopefully, I'm asleep and don't know what is
13 happening.

14 MR. BEDFORD: Mr. Derry, I'm sure you
15 appreciate that one of the tasks that Mr. Mazur
16 and his staff had to undertake in the early stages
17 of considering Bipole III was whether or not there
18 were any alternatives to building another high
19 voltage DC line from Northern Manitoba to Southern
20 Manitoba. And you may have read about that
21 analysis that they did in chapter 2 of our
22 Environmental Impact Statement.

23 Were you able to do that?

24 MR. DERRY: Quite a while ago that I
25 looked at it but --

1 MR. BEDFORD: And logically, one of
2 the obvious alternatives to building another high
3 voltage direct current line from Northern Manitoba
4 to Southern Manitoba is to build a high voltage
5 alternating current line from Northern Manitoba to
6 Southern Manitoba. Correct?

7 MR. DERRY: That's correct, that's
8 where I got my figure of \$4.18 billion.

9 MR. BEDFORD: That's exactly what I
10 thought, because that is the number that they came
11 up with and I saw your references to that number
12 in your report. But that concept as an
13 alternative to Bipole III was clearly discarded,
14 because we are here today to consider a project
15 that is a high voltage DC line.

16 MR. DERRY: But I didn't discard it.
17 I said that you have to do something to make it
18 comparable to having three Bipoles. You can serve
19 the load out to 2050, with those two different
20 Bipoles. You have to do something in 2025, with
21 the Hydro alternative, because you are going to
22 start to go into a deficit again. So my proposal
23 would be build the north/south transmission line
24 to give you compatibility or comparability to what
25 we are recommending. Something has to be done to

1 get to the same level that we are at.

2 MR. BEDFORD: I understand that. And
3 what you are recommending is build Bipole III, not
4 a \$4 billion high voltage alternating current line
5 for Northern Manitoba to Southern Manitoba.

6 MR. DERRY: Or the alternative that we
7 have where we move Bipole II to Riel, and then
8 build Bipole III in 2025. But in Hydro's
9 alternative where they have 3800 megawatts at
10 Dorsey, and only another 2000 at Riel, that will
11 only take you out to 2025. You have to do
12 something in 2025.

13 Now, if you don't want to build a
14 north/south line, then put in 2000 megawatts of
15 gas turbine, which they did study in their study,
16 or build two lines to the United States, which
17 they did study, and came out and said, no, the
18 best alternative is Bipole III for that.

19 MR. BEDFORD: The sense of urgency
20 that you associate with the year 2025, I have
21 concluded from going through your paper more than
22 once, I will admit, is your concern that the
23 projections that the company has to meet its load
24 requirements will require additional supply of
25 energy from some source in 2025, be it new hydro

1 generation, as you say, could be gas turbines,
2 could be imports from another country, but that's
3 what drives your attachment to the year 2025. Am
4 I correct?

5 MR. DERRY: That comes from the 2010
6 report. I showed you the figure 1.3. If you
7 extend those lines down, which I did, and the 1.3,
8 B, C, D and E, you will see that you have run out
9 of capacity and you have to do something. I can
10 put it back up if you want to look at them on the
11 screen?

12 MR. BEDFORD: So whether one agrees
13 with Manitoba Hydro that Bipole III should carry
14 forward and be done now, so that it can be brought
15 in service in about 2017, or whether one finds
16 persuasive your recommendations for a very
17 different approach to the topic -- one aspect of
18 which you are recommending that I have clearly
19 read is that when it comes time in your
20 recommendation to put a second new converter in
21 Southern Manitoba, because you want to do one for
22 Riel more or less right away to accept separation
23 of Bipole II, so we will do another one for 2025,
24 for a terminal point for Bipole III, which we are
25 now building, in your recommendation, and you

1 would like to see that sited at the LaVerendrye
2 site?

3 MR. DERRY: That's correct. And I
4 just gave a statement a little while ago on that
5 same 2010 report, that is option three on page 9
6 of that report.

7 MR. BEDFORD: And LaVerendrye, you
8 know and I know, and some of us here will
9 remember, is presently the site of an alternating
10 current switch yard that forms part of Manitoba
11 Hydro's southern distribution system, no doubt
12 about that.

13 MR. DERRY: What was the question
14 again, please?

15 MR. BEDFORD: LaVerendrye today,
16 presently is the site of an alternating current
17 substation?

18 MR. DERRY: It is a 230 kV substation.

19 MR. BEDFORD: Sorry, I think I said
20 switch yard, and you are right, it is a
21 substation.

22 MR. DERRY: I'm not suggesting any
23 location. I'm saying that Hydro should look at a
24 location. We have shown it on the map at the
25 corner of where that existing corridor, which

1 doesn't have any lines on it, terminates. It
2 could be moved along that line. I don't know
3 where it is going to go, I leave that to Hydro,
4 that's an engineering decision.

5 MR. BEDFORD: In effect, if one has
6 the money to build a second new converter station
7 in Southern Manitoba, you would accept that
8 building it only 21 kilometres from Dorsey is
9 probably not the wisest choice of site. You might
10 be wiser to look at a different geographic
11 location, south, southwest of Winnipeg, correct?

12 MR. DERRY: You could. But has Hydro
13 done any reliability studies of what the outage
14 probability will be? You have a 1 in 200
15 probability for the loss of Dorsey. Now, if you
16 move one of those, if you take converters, one of
17 them out and put it at Riel and you want to build
18 another one at LaVerendrye, what is the
19 probability of both LaVerendrye and Dorsey being
20 hit by that same wind storm? Is it 1 in 200? No
21 it isn't, I am sure it is more like 1 in 4,000 or
22 something. You haven't done that study. Do that
23 study.

24 MR. BEDFORD: Before too many minutes
25 go by, I'm going to say something about

1 probability, and people who listen carefully will
2 begin to learn what grade I got when I studied
3 statistics at the University of Manitoba.

4 I think I understood, through
5 Mr. Meronek's walking you through the rebuttal
6 document, which for better or for worse we were --
7 we had to file yesterday evening. But I did hear
8 you acknowledge, so I won't belabour the point,
9 but you can confirm for me that to carry forward
10 with your recommendations there are somewhat
11 expensive items that you knew there would be costs
12 associated with, but you didn't have the materials
13 to estimate the costs, so you left them out, but
14 there is not really an issue that there are some
15 expensive items that would add to the costs of
16 your recommendation.

17 MR. DERRY: Yes, I did say that I
18 think when I replied --

19 MR. BEDFORD: For the sake of those in
20 the room who don't pay very close attention to the
21 evidence that's given, I have four items down, and
22 they would include a new alternating current
23 switchyard in association with wherever you sited
24 this second converter station, correct?

25 MR. DERRY: Correct.

1 MR. BEDFORD: And at least one now
2 high voltage alternating current line to carry the
3 power brought to the new terminal point for Bipole
4 III over to the east of Winnipeg to the Riel site?

5 MR. DERRY: That's correct.

6 MR. BEDFORD: And I'm told there would
7 be some termination equipment required at Riel to
8 accommodate the end point for that new high
9 voltage alternating current line.

10 MR. DERRY: That's correct.

11 MR. BEDFORD: And finally, I did hear
12 Mr. Woodford's preference for a new underground
13 high voltage direct current line running from
14 Dorsey to Riel, and that comes with a price tag as
15 well, easily in excess of 200 million, perhaps
16 more, depending on what Dr. Lawson may tell me in
17 a few minutes about pricing and splicing of
18 underground cables.

19 MR. DERRY: If I remember the number,
20 it was 370 million that you assumed, and we
21 assumed 275.

22 MR. BEDFORD: You are relying more
23 closely on Dr. Lawson's opinion --

24 MR. DERRY: That's correct, his cost
25 was four and a half times the cost of overhead,

1 and yours is something like seven.

2 MR. BEDFORD: Now, I also wish to
3 confirm that I detect there really isn't a
4 difference of opinion between the engineers that
5 still work at Manitoba Hydro and you, Mr. Derry,
6 and you Mr. Woodford, when it comes to the
7 prudence and wisdom of having alternative paths
8 for alternating high voltage current to flow in
9 the event that a single 500 AC line is tripped,
10 there should be other paths for the energy to go.
11 So whether or not they are an additional series of
12 230 kilovolt alternating current lines to
13 accommodate that, whereas I think I heard Mr.
14 Woodford say additional 500 kV lines that your
15 client, Mr. Bedford, may build some day, the logic
16 of having those alternate pathways to defend one's
17 self and to cope with the disaster of cascading
18 tripping is accepted by all electrical engineers.
19 Am I right?

20 MR. WOODFORD: Possibly you are right
21 there, but my recommendation -- this is my
22 personal recommendation as an engineer, that when
23 we build Bipole III, and if we build near
24 LaVerendrye station, that we will need to complete
25 a 500 kV AC ring around Winnipeg and make sure

1 that this converter station is interconnected on
2 to that 500 kV ring. So that if we lose one
3 section of that ring, it is not going to cause any
4 cascading outage. And it may require some
5 intelligent controls manipulation to help in that
6 situation. We do that today. We lose
7 transmission lines, major transmission lines, and
8 the power is quickly reduced on the DC lines so
9 that we don't cause the cascades that you were
10 talking about. So it would be an implementation
11 of a completed 500 kV ring, as well as intelligent
12 application of controls, high speed controls, to
13 ensure that no cascading occurs.

14 I would like to see such a study, it
15 will take time to do such a study, I don't expect
16 it here, but my understanding is that such a
17 design could be accommodated without cascading,
18 with Bipole III located at or near LaVerendrye and
19 connected into the 500 kV ring. And so that's the
20 clarification I would like to make to your
21 question.

22 MR. BEDFORD: Mr. Woodford, one of the
23 areas of law that I have had to learn something
24 about since I came to work at Manitoba Hydro is
25 generally called environmental law, and it wraps

1 into its umbrella things like hearings before the
2 Clean Environment Commission of the Province of
3 Manitoba. I have had to learn a little bit about
4 the challenges of all of the biological and
5 socioeconomic analysis that has to be done with
6 routing. So I listened with some quick interest
7 when Mr. Meronek asked you about my client's
8 concern about meeting a 2017 in-service date if we
9 were to go with Mr. Woodford's dream of an
10 underground route from Dorsey to Riel. And I
11 believe the words you used were an acknowledgment
12 that, yes, of course there would be permitting
13 necessary, but surely it would be easier, less
14 involved than these assessments for overhead
15 conductors and towers and so forth. And it
16 immediately crossed my mind that one of the huge
17 enormous challenges in this province, in the
18 neighborhood of this City, of putting these
19 conductors underground would lie with the concern
20 we have about aquifers. And they can be
21 incredibly controversial and of concern to people
22 that live in the city, and I suspect that that one
23 topic alone would require a lot of detailed
24 assessment, and a lot of science to be brought
25 forward, were we to seriously want to engage in

1 building an underground cable.

2 MR. WOODFORD: Could you tell me what
3 you mean by an aquifer?

4 MR. BEDFORD: Well, what I understand
5 by aquifers is that, in simple terms, there is
6 bodies of water that lie beneath the earth that I
7 walk on in this area. We draw on those aquifers
8 for water, and we have to be very careful about
9 tampering with that resource.

10 MR. WOODFORD: Right. Now, I think,
11 based on Dr. Lawson's presentation on burying
12 cables, you were only going down less than one
13 metre. That's less than the foundation of an
14 overhead AC line, or DC line. So how are we going
15 to impact the aquifer?

16 MR. BEDFORD: Not so quick.
17 Dr. Lawson may find himself agreeing with me in
18 about ten minutes. A metre may not be quite
19 adequate.

20 MR. WOODFORD: But the question I have
21 is, how can a metre deep channel impact those
22 critical aquifers?

23 MR. BEDFORD: Well, in the event we go
24 with underground, we may hire you to convince
25 those citizens of this province that there is

1 nothing to worry about with underground.

2 Mr. Woodford, I heard the reference to
3 Teshmont from you. And I also heard Dr. Lawson
4 mention that he has worked on international
5 projects with Teshmont. And I felt rather warmed
6 by the thought that Teshmont is a local company in
7 Manitoba. So I conclude that if you work with
8 them regularly, you do have confidence in their
9 skills and their level of expertise in doing
10 analysis and consulting for various companies?

11 MR. WOODFORD: Yes, but being an
12 engineering arrangement, some of our meetings are
13 very interesting as we have a difference of
14 opinion, and it is natural and normal, and
15 sometimes I'm right and sometimes they are right.
16 So, dealing with engineering situations, we have
17 to get to the best engineering solution possible,
18 and I would be the last to say in my profession,
19 me and my company, that we do change our mind from
20 one engineering solution to another, and better
21 engineering solution, if someone such as Teshmont
22 or Manitoba Hydro can convince me to do so. And
23 so, yes, I respect Teshmont, I work with them, I'm
24 working with them now on a very big project. And
25 we do have differences of opinion. We resolve

1 them and we try to come to the best engineering
2 position. They will have one position, we will
3 have another, and we come to an agreement in due
4 course and proceed forward.

5 MR. BEDFORD: Mr. Woodford, one of the
6 things that Teshmont has done in its career as a
7 consultant is provide assessments to my client
8 regarding Bipole III, which, as I understand it,
9 say that compared to a catastrophic event which
10 would destroy the Dorsey converter station, there
11 is a far greater probability with respect to
12 Bipoles I and II that a natural event will damage
13 or destroy a number of the towers and conductors.
14 Did Teshmont get that right this time in your
15 opinion?

16 MR. WOODFORD: I don't think that we
17 have been saying anything different than that. We
18 know that if we keep Bipole I and II together at
19 Dorsey, yes, that could all go out with an extreme
20 condition. We also know that all of the towers
21 could go down with Bipole I and Bipole II, as has
22 done in 1996. So I don't see what is new here.

23 MR. BEDFORD: Well, as I understand
24 it, if we accept the recommendation which requires
25 Bipole III to be built eight years after you

1 separate Bipoles I and II, we are to live with the
2 reality, the possibility, or the probability that
3 for a period of some eight years Teshmont's
4 probability predictions could well come true, and
5 that the response is, take a chance. Those were
6 the words I heard. Better to take a chance than
7 to incur the enormous expense of building Bipole
8 III.

9 MR. WOODFORD: Now, I thought we had
10 resolved the issue of Bipole I and II converter
11 stations going down by separating them. So that
12 we, as Mr. Derry has indicated, that if someone
13 worked out the probability of both of them going
14 out at the same time, that would be a probability
15 of great insignificance -- is that the word?

16 We also know that there is a
17 probability of the lines going out, one in 17
18 years, and we have had one in 40 years. So we are
19 expecting one any day now. So that will go out.
20 And so we are living with it. And since Manitoba
21 Hydro is going to take eight weeks to fix it, we
22 are in trouble.

23 MR. BEDFORD: I've heard for over a
24 decade now that in 1997, Manitobans experienced a
25 1 in 700 year flood. I will tell you, I do not

1 conclude from that fact that for the next 700
2 years there is absolutely no possibility of
3 another flood because the event happened to us in
4 1997. So I suggest to you that when Teshmont says
5 to my client there is a 1 in 20, or a 1 in 200
6 probability, but it is 1 in 20 for a natural event
7 damaging Bipoles I and II, that we could
8 experience two or three such events in the next
9 five years, or none at all, could we not?

10 MR. WOODFORD: That's correct. And
11 first I heard about 1 in 700 for the 1997 flood, I
12 always thought it was 1 in 100 years. So that's
13 news to me. And I hope this is not another
14 example of Manitoba Hydro's worst case scenarios
15 taken to the extreme. Do you have evidence to
16 show me it is 1 in 700?

17 MR. BEDFORD: No, but ten minutes ago
18 I warned you that I was not a star pupil in
19 statistics.

20 MR. WOODFORD: All right.

21 MR. BEDFORD: Good afternoon,
22 Dr. Lawson. If I was listening correctly, I
23 understand that you spent a part of your youth in
24 a city that's one of favourites, Edinburgh?

25 MR. LAWSON: One of my favourites too,

1 yeah, I did.

2 MR. BEDFORD: Now, as I noticed with
3 respect to Mr. Woodford, Mr. Derry and Mr.
4 Woodford, I read your paper more than once. I
5 found it frankly very informative. I listened to
6 your presentation, and I conclude that obviously
7 putting conductors underground, still in the year
8 2013, is more expensive than putting them
9 overhead?

10 MR. LAWSON: Correct.

11 MR. BEDFORD: And you've suggested to
12 us today about four times more expensive to put
13 the conductors underground?

14 MR. LAWSON: Um-hum.

15 MR. BEDFORD: You have had an
16 opportunity to read my client's rebuttal, and my
17 client thinks that the difference is higher than
18 four times, but obviously more expensive by a
19 factor, a considerable factor?

20 MR. LAWSON: Right.

21 MR. BEDFORD: I could not tell from
22 looking at the three estimates that you have
23 provided to us whether any of the three estimates
24 included an effort on your part, or someone
25 else's, to include the costs of environmental

1 studies and the acquisition of rights or interests
2 in land?

3 MR. LAWSON: Absolutely not. And it
4 is never the usual approach, when you ask what a
5 project will cost as far as cable is concerned, to
6 go into these issues. We should have probably
7 stated that our estimates had not included these
8 things, yeah.

9 MR. BEDFORD: So, we would all have to
10 prudently understand that if we were to proceed
11 with the recommendation that you and your
12 colleagues are advancing, that the costs would go
13 up by whatever those costs are estimated to be?

14 MR. LAWSON: Yes.

15 MR. BEDFORD: Now, I did notice in
16 your picture of a submarine cable that the core is
17 copper?

18 MR. LAWSON: The core is copper, yes.

19 MR. BEDFORD: Why, with these
20 underground cables, are the cores copper?

21 MR. LAWSON: Standard practice,
22 because the electrical resistivity of copper is
23 much -- conductivity I should say is much higher
24 than aluminum. Aluminum though is being used for
25 underground cables more in connection with the

1 XL-DC type of cable, the VIC type of cable, more
2 so than the mass impregnated.

3 MR. BEDFORD: You will recall that
4 your estimate number 1 is based on a budget you've
5 told us from a project in 2007?

6 MR. LAWSON: Um-hum.

7 MR. BEDFORD: In a common sense way,
8 you have brought that budget amount relevant to
9 the year 2007 forward by including an inflation
10 factor, correct?

11 MR. LAWSON: Correct.

12 MR. BEDFORD: Now, I understand that
13 since 2007, one of the challenging realities of
14 purchasing copper in the world is that the price
15 of copper has doubled, 100 per cent increase, well
16 beyond the price of inflation. Does that sound
17 familiar to you?

18 MR. LAWSON: Copper goes up and down,
19 yes. And generally when you get a bid from the
20 manufacturer, he will tell you what price the
21 copper was when you made the bid, yeah.

22 MR. BEDFORD: So we would be wiser to
23 follow your estimate number 2, which I gather was
24 a current estimate based on an inquiry that you
25 made privately?

1 MR. LAWSON: Right.

2 MR. BEDFORD: Because undoubtedly that
3 estimate would reflect the current price of
4 copper?

5 MR. LAWSON: I fully agree, yes.

6 MR. BEDFORD: Nominal life for an HVDC
7 cable underground, you've acknowledged at page 8
8 of your report, is 40 years. You addressed that
9 briefly in your oral presentation.

10 MR. LAWSON: Yes.

11 MR. BEDFORD: Can I fairly conclude
12 then that any utility such as my client, Manitoba
13 Hydro, that's considering the use of MI cable and
14 trying to compare that with what we are proposing
15 to do, which is an overhead cable, would wisely
16 have to factor in the reality of replacing the
17 underground in about 40 years?

18 MR. LAWSON: Yes.

19 MR. BEDFORD: I'm looking at your
20 presentation, I think the same information in
21 different form appears in your written report, but
22 I'm looking at the page that summarizes various
23 projects worldwide involving, I will call it
24 underground cable. But my colleagues who have a
25 greater interest than I do in this subject tell me

1 that all of these projects are submarine links,
2 with the proviso that in some cases the submarine
3 links, I would think in all of the cases
4 eventually the cable emerges from the depths of
5 the sea and is land, so that there will be some
6 segment at each end presumably that's underground,
7 but they are focused on submarine cables.

8 MR. LAWSON: I think I told you this
9 already. The title underground cable refers to
10 the project that we are considering. The fact
11 that it is here doesn't mean to say that these are
12 underground cables.

13 MR. BEDFORD: No, that wasn't my
14 point. My point was that in our experience on
15 planet earth to date, with using underground
16 conductors for high voltage transmission --

17 MR. LAWSON: Right.

18 MR. BEDFORD: -- the experience is
19 almost exclusively with submarine, because there
20 are no examples, and I'm assuming if there was a
21 good example you would have had it in your table,
22 of an underground, that is strictly underground
23 and not submarine?

24 MR. LAWSON: I did touch on that, and
25 I think I have already said that, but, yes, I

1 agree.

2 MR. WOODFORD: Might I just say that
3 the lower voltages, there are plenty of instances
4 of underground cable, DC, going long distances. I
5 have quoted that one, the Murray link.

6 MR. BEDFORD: The qualification,
7 though, Mr. Woodford and Dr. Lawson, was low
8 voltage. When we get to high voltage DC or AC, it
9 is a real challenge, I gather, because of the heat
10 that these conductors generate?

11 MR. LAWSON: It is not a question of
12 low voltage. Because the France and Spain project
13 is 320 kV, 2000 megawatts. The problem is it is
14 cross linked DC cable and not mass impregnated
15 cable. You are correct, there is not that much on
16 land, especially at 500 kV. We do have two very
17 significant projects, one which has already been
18 completed in 2007, the Neptune project on Long
19 Island. And we do have Skagerrak 4 going in now
20 in Denmark, which is 90 kilometres. And that's
21 500 kV. So these are very significant projects.

22 MR. BEDFORD: To me equally, perhaps
23 more interesting observation that my colleagues
24 have made about the examples that you have given
25 us, Dr. Lawson, is that they say with only one

1 exception, all of these projects are not examples
2 of transmission lines being constructed for the
3 purposes of reliability, but they are being built
4 to, I will use the word exploit opportunities to
5 sell energy from a seller willing to a willing
6 buyer, often if it is in Europe, from one country
7 to another?

8 MR. LAWSON: Correct.

9 MR. BEDFORD: And I understand that
10 one of the concerns still to date that utility
11 companies with wanting to use underground, when
12 their primary motive for construction is
13 reliability, is that it can be a challenge,
14 depending on the particular circumstances and
15 location of the project, to access the underground
16 cable when it stops working. True?

17 MR. LAWSON: Access is slightly more
18 difficult, yes, than the overhead lines.

19 MR. BEDFORD: And a particular
20 challenge, obviously, if one lives in the climates
21 such as we do in Manitoba, where the ground does
22 freeze, and that makes accessibility for
23 approximately four months, perhaps five months of
24 the year virtually impossible, correct?

25 MR. LAWSON: Not necessarily.

1 MR. WOODFORD: Can I just make a
2 suggestion on this? They are always digging up in
3 my neighborhood the ground in the middle of winter
4 to try and get the pipes working. What is the
5 difference?

6 MR. BEDFORD: I'm sorry, I was looking
7 at my --

8 MR. WOODFORD: The City of Winnipeg
9 has problems in the winter with pipes, underground
10 water pipes, and they are always digging up in my
11 neighborhood anyway, which is River Heights, in
12 the middle of winter, down into the frozen ground
13 to get at those pipes. So why can't we get down
14 to a cable one metre down, and not two or three
15 metres down, you know, that's -- I don't see this
16 is a big issue. Maybe you do, maybe Manitoba
17 Hydro does, but I certainly don't.

18 MR. BEDFORD: Dr. Lawson may be
19 telling me temperature and underground cables and
20 splicing is a concern. My understanding was that
21 you can't splice and construct in sub zero
22 temperatures.

23 MR. LAWSON: My information from the
24 industry is that minus 5 centigrade would be the
25 limiting temperature for installation and

1 splicing.

2 MR. WOODFORD: But couldn't you put in
3 a tent?

4 MR. LAWSON: Absolutely, yes.

5 MR. WOODFORD: For heaven sakes, we
6 put it in a tent, we put a heater in it, and
7 confound it all, we can run it for weeks and warm
8 it for splicing.

9 MR. LAWSON: As a matter of fact, you
10 always have a tent, always, and it is heated and
11 ventilated. So it is quite a sophisticated
12 operation. But I think the minus 5 centigrade is
13 more from the point of view of bending the cable.
14 They don't want to be bending the cable for
15 splicing purposes when the sub zero temperature is
16 lower than minus 5.

17 MR. BEDFORD: I saw the
18 acknowledgment, it is page 13 of your paper,
19 Dr. Lawson, that you were alert to the fact that
20 my client has said, were we ever to consider
21 putting a high voltage DC conductor underground,
22 because of our need to improve reliability, we
23 would put a third cable.

24 MR. LAWSON: Yes.

25 MR. BEDFORD: But refresh my memory,

1 is the cost of the third cable included in any of
2 your estimated prices?

3 MR. LAWSON: No. In my opinion it is
4 absolutely not necessary and it is never done.
5 Why would Manitoba Hydro be the exception?

6 MR. BEDFORD: But the point is, if one
7 could persuade whoever it is one might have to
8 persuade that we are right, and your opinion is
9 just a little bit too challenging for us to
10 accept, the price would go up?

11 MR. LAWSON: Okay. Thank you.

12 MR. BEDFORD: Now, one of the things I
13 learned reading your paper was just how few
14 manufacturers and suppliers of MI cable there are
15 in the world. I learned also that those that do
16 exist, a handful, are located in either Europe or
17 Japan, and you mentioned today Korea has come on
18 board with a new plant.

19 MR. LAWSON: Right.

20 MR. BEDFORD: I've also learned that
21 most of these plants seem to be fully occupied and
22 booked supplying the current order. But I did try
23 and sort out in my own mind that if one could find
24 a plant with some capacity this afternoon, and
25 place an order for say 65 kilometres of MI cable,

1 my conclusion was that between the date of placing
2 the order today and actually seeing delivery
3 materialize at a rail yard in Winnipeg, I would
4 have to allow about a year. Would I be correct in
5 that conclusion?

6 MR. LAWSON: Absolutely, that's about
7 right, I would say. And if I just say what I have
8 been noting down here, yes, Prysmian will be
9 fairly busy, they have two recent, fairly recent
10 contractor awards, one for the western link
11 between Wales and Scotland, that's 400 kilometres,
12 and one for the Montenegro link between Italy and
13 Montenegro is 450 kilometres. So they have about
14 850 kilometres.

15 Nexans should be finishing Skagerrak 4
16 beginning of next year, which is 215 kilometres,
17 but that should be finished.

18 Other than that, all I can find is the
19 Straits of Belle Isle, 108 kilometres. And
20 Montenegro, the second Montenegro cable is
21 actually being manufactured in Japan, because
22 Nexans owns more than half of the viscous plant in
23 Tokyo Bay. So that's where that is coming from.
24 That's not a Nexans project.

25 ABB, I don't know that they have very

1 much on their books at the moment. And J-Power,
2 in Osaka, Japan, probably have nothing on their
3 books at the moment, yet they have a plant there,
4 and they are fully qualified for this 600 kV very
5 high voltage mass impregnated cable. They have
6 done type testing, and I have visited the plant
7 while they were type testing, and they have plenty
8 of experience with the oil field cable submarine
9 work, but not with mass impregnated cable as such,
10 but they have the capability. And there is also
11 the Korean plant. They put in a 250 kV Bipole
12 between the Korean mainland and holiday island of
13 Jeju completed last year. So they have
14 manufacturing capability in that plant.

15 MR. BEDFORD: So in my mind I was
16 allowing at least a year before I saw the cable
17 arriving in Winnipeg?

18 MR. LAWSON: Sure.

19 MR. BEDFORD: And then I was trying to
20 visualize where and how one now handles it and
21 moves it, and puts it in the ground. And I keep
22 coming back to not being able to fully visualize
23 splicing. Splicing, I have learned through two
24 reads of your paper and listening to people, is
25 not what I do when I try and do some home repair

1 work with a pair of pliers and a bit of wire, much
2 more complicated it seems. So can you help us out
3 briefly with explaining to us what happens with
4 splicing?

5 MR. LAWSON: I thought I did that
6 already but I can do it again. It is a flexible
7 splice, one thing that's difficult from your
8 ordinary underground cable, which is generally a
9 splice which has a much larger diameter than the
10 cable itself, and is rather short. But this is an
11 inheritance, the flexible splice is an inheritance
12 from the requirement that they have for submarine
13 cables to have flexible splices for laying in
14 particularly deep water. So we have this at the
15 moment. As I said this morning, the industry has
16 not yet considered the development of a more
17 suitable splice for a fairly rapid splicing
18 procedure for land cable specifically. So we are
19 talking, in my opinion, something like four days
20 per splice.

21 MR. BEDFORD: Did your four day
22 estimate factor in the likelihood in the case of
23 my client having to have three cables spliced at a
24 time?

25 MR. LAWSON: No, I was working with

1 two cables.

2 MR. BEDFORD: Would the third cable
3 then take your confidence in four days and move it
4 up to perhaps five days?

5 MR. LAWSON: No, the spare cable still
6 would be four days, except it would be an
7 additional four days, wouldn't it? You would have
8 three times four in that situation.

9 MR. BEDFORD: Splicing done by, I
10 don't know, crews of two, four, a dozen, 50?

11 MR. LAWSON: Generally two, probably a
12 labourer as well.

13 MR. BEDFORD: So that the two key
14 persons on the crew are highly skilled labour?

15 MR. LAWSON: Oh, absolutely, um-hum.

16 MR. BEDFORD: And we have heard about
17 temperature, your written report said you would
18 have to factor in your construction schedule the
19 fact that you would shut down and not be splicing
20 and putting cable in presumably in the winter sub
21 zero months.

22 MR. LAWSON: Correct.

23 MR. BEDFORD: Although, I heard
24 Mr. Woodford, to use heated tents to carry on.

25 MR. LAWSON: It is the bending of the

1 cable. The splice itself is five metres long, but
2 in order to make that splice you have to be moving
3 cable a long way either side of that five metre
4 section. And they don't want to move the cable if
5 the temperature is below minus 5 centigrade.

6 MR. BEDFORD: So, I factored into my
7 calculation of years an allowance for three to
8 four years once we got the cable to Winnipeg, to
9 do all of the splicing, the trenching, the
10 digging, the laying of the conductors and filling
11 in the excavations. Does four years sound
12 reasonable?

13 MR. LAWSON: Three years sound good.

14 MR. BEDFORD: In addition, I know, and
15 I will respect the fact that it is not work that
16 you do, but I know that one has to go through
17 environmental assessment licensing and hearings
18 and so forth, so I factored additional time for
19 that. But unless you tell me to the contrary, I
20 suspect that's beyond the kind of work you do, so
21 you wouldn't want to give an opinion on the topic?

22 MR. LAWSON: Obviously, I'm aware of
23 the situation and I know that in some cases
24 permitting, et cetera, et cetera, has taken quite
25 a long time, yes.

1 MR. BEDFORD: My conclusion when I add
2 up the numbers that I've just been referencing is
3 that 2017 is impossible if one were to use
4 underground cable, but I say that less for your
5 benefit and more for some others.

6 MR. LAWSON: Well, I think we have to
7 leave that open. I don't think that we can really
8 say that at this moment.

9 MR. BEDFORD: Turning to your
10 presentation, given what I have lived through in
11 the last 24 hours in the province where I live, I
12 found it most interesting that you start us off
13 with a picture of Australia. And I concluded very
14 quickly you would have started me off with a
15 picture of frozen tundra if there were any example
16 in the planet of underground cable being used in a
17 climate with sub zero temperatures.

18 MR. LAWSON: Well, I think it is not
19 so warm in New Jersey or Long Island, and in
20 Denmark in the winter, where the 90 kilometre long
21 cable is going in.

22 MR. BEDFORD: Given the fact that the
23 ground does freeze here, one metre deep, probably
24 not a safe enough margin to put the cable in?

25 MR. LAWSON: I already discussed this

1 with the industry and they are not concerned, once
2 it is installed, if the temperature goes below the
3 5 degrees, minus 5 degrees. It is not a problem.

4 MR. BEDFORD: And I confess that I
5 misunderstood your motivation for showing us a map
6 of the proposed line from Perpignan to Figueres.
7 I thought it was because of the length, 65
8 kilometres was coincident with what is being
9 proposed here. You revealed you had different
10 motivation for doing that. Nonetheless, you will
11 agree with me, given the description beside the
12 map that you provided, this is cross linked
13 polyethylene cable that's being used in that
14 project, and you told us that is just not -- it
15 doesn't exist for a high voltage conductor at this
16 time?

17 MR. LAWSON: Right.

18 MR. BEDFORD: One of the projects in
19 the presentation is NorNed. I gather that's a
20 submarine cable leading from a site in Norway to a
21 site in the Netherlands, Dr. Lawson?

22 MR. LAWSON: Correct.

23 MR. BEDFORD: Can you confirm for us
24 that that cable failed after it was initially
25 commissioned?

1 MR. LAWSON: Yes.

2 MR. BEDFORD: And can you confirm for
3 us that the outage in that case was some three
4 months?

5 MR. LAWSON: No. You obviously have
6 confirmed that for yourself, so maybe I don't need
7 to. But, yes, this must have been some problem
8 during installation. I must say, very unusual.

9 MR. BEDFORD: That was the final
10 question. Do you know, because my sources don't,
11 what the cause of the failure was?

12 MR. LAWSON: No.

13 MR. BEDFORD: Thank you. I have no
14 more questions for you.

15 MR. LAWSON: I have a comment, if I
16 can?

17 MR. BEDFORD: Of course.

18 MR. LAWSON: Manitoba Hydro stated
19 that the overhead line cost is in the order of
20 .8 million dollars per kilometre. Now, I know
21 nothing about overhead line costs, so I consulted
22 some specialists. And I find that in the U.S. a
23 major consultant, major, who has done a recent
24 study on an overhead line cost, 500 kV,
25 2000 megawatts, and gives me a cost of

1 \$1.2 million per kilometre.

2 I also understand that when you are
3 making this sort of estimate there is a 25, 35,
4 range. I conclude therefore that the .8 of
5 Manitoba Hydro is at the lower end of the range
6 and it would be just as well to consider 1.2.

7 MR. BEDFORD: Thank you. My comment
8 would be that two gentlemen sitting beside you,
9 Mr. Derry, Mr. Woodford, hired the best engineers
10 to succeed them at Manitoba Hydro, and we have
11 such wonderful and highly trained staff at
12 Manitoba Hydro that we can bring this project in
13 at the 800,000 price point.

14 MR. LAWSON: I'm just saying that
15 there is range, and I believe that's at the lower
16 end of the range. It doesn't mean it is
17 incorrect, but it does mean it is not so
18 conservative.

19 MR. WOODFORD: Can I comment on that?

20 I have understood in reading previous
21 transcripts, I don't know whether it was the PUB
22 or the CEC, but the question was asked of Manitoba
23 Hydro, what is the variation, let's use the word
24 variation, on the costs of the transmission line?
25 And I can remember them saying plus or minus 35

1 per cent. Now, that may be an incorrect value,
2 but that's what was written somewhere in the
3 transcripts. And if we are talking about
4 \$.8 million plus or minus 35 per cent, I don't
5 know. Is it plus or minus 35 per cent? Has to be
6 something, because you can't be right on, and if
7 you are, you are super human. So what is it? And
8 is it plus or minus 35 per cent, plus or minus 25
9 per cent, plus or minus 15 per cent? So when you
10 state \$.8 million per mile, there has to be a
11 variation attached to that. What is it?

12 MR. BEDFORD: I have no further
13 questions. Thank you, all of you.

14 THE CHAIRMAN: Thank you, Mr. Bedford.

15 Before we take a short break, I would
16 just like to comment on the issue of flooding in
17 Manitoba. You should know that the Commission
18 conducted a similar review a number of years ago
19 into the expansion of the Floodway around
20 Winnipeg. The 1 in 700 figure comes from the
21 capacity of the expanded floodway. 1997 was about
22 1 in 100. 1996, one year before, was also about 1
23 in 100. And since 1997, there have been one or
24 two more almost 1 in 100 year floods.

25 We will take a break and come back

1 just after 3:15.

2 (Hearing recessed at 3:03 p.m. and
3 reconvened at 3:15 p.m.)

4 THE CHAIRMAN: Okay. We will
5 reconvene. The Consumers Association has a few
6 questions. Mr. Williams.

7 MR. WILLIAMS: Yes, and good
8 afternoon, members of the panel, and good
9 afternoon, Mr. Lawson, Mr. Derry, and Mr.
10 Woodford, and Ms. Friesen, of course.

11 Dr. Lawson, I don't think that I have
12 any questions for you, so you will forgive me.
13 Mr. Derry, I'm going to start with you and
14 certainly -- Ms. Desorcey is here, and she
15 certainly wants to extend her appreciation to the
16 Bipole witnesses for this thoughtful piece of
17 work.

18 Mr. Derry, I want to start really with
19 a question similar to what the Chairperson of the
20 Board of the CEC asked you. You made reference in
21 your evidence today and in your written evidence a
22 number of times to a 2010 report. Do you recall
23 referencing a report?

24 MR. DERRY: I have the report in front
25 of me here.

1 MR. WILLIAMS: Mr. Derry, when you
2 referenced the 2010 report, is that the report,
3 Ultimate HVDC Development in Manitoba, is that the
4 report?

5 MR. DERRY: It is called Ultimate HVDC
6 Development in Manitoba, SPD, 2010/14.

7 MR. WILLIAMS: And, Mr. Derry, I have
8 a good familiarity with the record. That's not a
9 report that I am familiar with. Is that on the
10 record somewhere and I have --

11 MR. DERRY: No, it is not on the
12 record.

13 MR. WILLIAMS: Would you be willing to
14 undertake to file that report on the record?

15 MR. DERRY: I think you should ask
16 Hydro to file it.

17 MR. WILLIAMS: It is a Hydro produced
18 report?

19 MR. DERRY: It is a Hydro report.

20 MR. WILLIAMS: So you have no
21 objection, but you think it should come from
22 Hydro? Is that your point, sir?

23 MR. DERRY: No.

24 MR. WILLIAMS: I guess I will defer
25 until Thursday then in terms of how I ask Manitoba

1 Hydro, unless Mr. Bedford wishes to volunteer to
2 file that report now?

3 THE CHAIRMAN: Go ahead, Mr. Williams,
4 and request it of Manitoba Hydro. If you don't,
5 we will.

6 MR. BEDFORD: The hearing is obviously
7 gone on too long, because we believe it was filed
8 quite some time ago, but we will look into it.

9 THE CHAIRMAN: The Commission
10 secretary scanned through the documents that have
11 been registered and doesn't find that one.

12 MR. WILLIAMS: And Mr. Bedford, if I
13 am hearing if it is not on the record, that Hydro
14 will quite happily put it on the record?

15 MR. BEDFORD: I will look at the
16 report and consider, and we will let you know.

17 MR. DERRY: If they don't put it on, I
18 can get a copy for you.

19 MR. WILLIAMS: So, Mr. Derry, I have
20 your undertaking that if Manitoba Hydro won't
21 agree to put it on the record you will do so? Is
22 that what I have?

23 Mr. Derry, this is not the first
24 regulatory proceeding that I have seen you at. I
25 have seen you at the Public Utilities Board as

1 well from time to time.

2 MR. DERRY: Once I think.

3 MR. WILLIAMS: And, Mr. Derry, would
4 it be fair to say that you certainly have
5 followed -- and I want to talk about load
6 forecasting for a couple of minutes -- but would
7 it be fair to say that you certainly have some
8 familiarity with the discussion of load
9 forecasting between Manitoba Hydro and the Public
10 Utilities Board? Are you familiar with any of the
11 discussions?

12 MR. DERRY: I have been keeping up on
13 the transcripts actually, even this last year.

14 MR. WILLIAMS: And going back one
15 hearing, sir, you will be aware indeed that the
16 Manitoba Public Utilities Board has raised some
17 concerns with the reliability of Manitoba Hydro's
18 load forecasts?

19 MR. DERRY: Yes, I am.

20 MR. BEDFORD: And the suggestion
21 being, sir, with regard to the 2011 and 2010 load
22 forecast, that they overestimate future load for
23 Manitoba Hydro. You are familiar with those
24 comments by the independent regulator?

25 MR. DERRY: I don't quite remember

1 those. I can't say yes.

2 MR. WILLIAMS: Fair enough. Turning,
3 if we could, to figure 1.5 of your Powerpoint.
4 Mr. Derry, it is not on this figure, but when you
5 were discussing this figure in your presentation
6 to the Clean Environment Commission this morning,
7 you made the comment that you -- you had some
8 concern that the Manitoba Hydro load forecast
9 might be overestimating the load in future years.
10 Do you remember making a statement to that effect?

11 MR. DERRY: I did say that and I
12 compared it to the 20 year load growth from '92 to
13 2012, 44 megawatts per year and the new forecast,
14 2012 to 2032 is using 83 megawatts per year.

15 MR. WILLIAMS: And thank you for that,
16 Mr. Derry. Those figures that you have cited with
17 the much lower historical forecast as compared to
18 the very aggressive future forecast, are those on
19 the record of this proceeding, sir, or did you
20 derive it from the Public Utilities Board?

21 MR. DERRY: I actually got these from
22 the PUB -- no, the 2012 forecast was put in as
23 information for this hearing.

24 MR. WILLIAMS: So if I looked for that
25 information I will find it based in the 2012 load

1 forecast?

2 MR. DERRY: There is another table in
3 here that I used for the peak versus the monthly.
4 It comes out of the 2012 forecast.

5 MR. WILLIAMS: I'm going to come to
6 that in just a second.

7 Mr. Derry, just as I look at figure --
8 staying with figure 1.5, and this is, if I look to
9 the 2017/18 year and using the Manitoba Hydro load
10 forecast, I'm correct in suggesting to you that as
11 of 2017/18 based upon Hydro's most current
12 forecast it is not at that 1500-megawatt hour
13 deficit in that particular year?

14 MR. DERRY: No, I think I mentioned in
15 my testimony it is around 1400.

16 MR. WILLIAMS: And it is really based
17 upon the more current Manitoba Hydro forecast, not
18 until 2019/20, that it begins to approach that
19 1500-megawatt deficit; correct?

20 MR. DERRY: That's correct.

21 MR. WILLIAMS: And, sir, rather than
22 taking what some might call an optimistic Hydro
23 load forecast, if we took the more conservative
24 purple estimate that you have provided on this
25 same figure, would I be correct in suggesting to

1 you that it is not really until the 2023/24 year
2 that Hydro is beginning to approach that
3 1500-megawatt deficit, would that be correct, sir?

4 MR. DERRY: Can you give that to me
5 again?

6 MR. WILLIAMS: Yes. Mr. Derry, what
7 I'm asking, and just to make sure I understand
8 your table correctly, if I take the more
9 conservative purple estimate, it is really not
10 until 2023/24 that Hydro begins to approach the
11 1500-megawatt deficit?

12 MR. DERRY: That's correct, yeah.

13 MR. WILLIAMS: And I may have misspoke
14 and said megawatt hour previously and I did mean
15 to say megawatt.

16 MR. DERRY: You mean megawatt, yeah.

17 MR. WILLIAMS: This can go either to
18 Mr. Derry or Mr. Woodford, but both of you I
19 believe used in terms of the relocation of Bipole
20 II to Riel the words in quotation marks "window of
21 opportunity". Do you recall making those
22 statements?

23 MR. DERRY: Yes, I put that in my
24 report, that's a portion of my report.

25 MR. WILLIAMS: Thank you, Mr. Derry.

1 And I'm not quite sure that I understood what you
2 meant by window of opportunity?

3 MR. DERRY: Okay. What we are saying
4 is that because Bipole II at Dorsey in the Hydro
5 alternative is going to be refurbished, means that
6 they are going to replace the valves and
7 transformers and everything else, and it is to
8 start in 2019. So if we don't take that window of
9 opportunity now and look at relocating it by
10 building a new Bipole at Riel, they will keep
11 refurbishing that for the next 30 or 40 years. It
12 is going to be that long before you will be able
13 to look at redoing it again somewhere else.
14 That's the window of opportunity.

15 MR. WILLIAMS: Thank you for that.
16 Figure 1.6, Mr. Derry, you presented this and I
17 will ask you to confirm without elaborating, you
18 presented this figure in addressing some of the
19 concerns that Manitoba Hydro had expressed in
20 terms of transmission loss?

21 MR. DERRY: That's correct.

22 MR. WILLIAMS: And in terms of
23 developing this table you use -- you talk about,
24 or in your evidence you talk about using 80 per
25 cent of peak, do you recall that, sir?

1 MR. DERRY: Yes, I do.

2 MR. WILLIAMS: And why 80 per cent of
3 peak per month?

4 MR. DERRY: That's what I call the
5 shoulder month. If you look at the chart and look
6 at March, April and November, they are all around
7 80 per cent. Now when we did the calculation for
8 the figure 1.7, we don't want to do three separate
9 months, we just used an average for those three
10 months, and it is around 80 per cent, so that
11 table 1.7 represents those three months at 80 per
12 cent of the peak. The load has come down that 20
13 per cent.

14 MR. WILLIAMS: And my question to you,
15 Mr. Derry, is why is it more appropriate to use 80
16 per cent of peak as opposed to peak?

17 MR. DERRY: Because we are looking at
18 the months that are off peak. The peak is in
19 January or December or February. So when you
20 think of the peak month, it could be any one of
21 those three. In this case of the figures that I
22 used, it was a January peak that Hydro has made
23 up, that comes from the load forecast of 2011. It
24 is a forecast that they have estimated the peak in
25 every month of the year. And that's what this

1 chart shows. Do you understand?

2 MR. WILLIAMS: That point I think I
3 understood before, Mr. Derry, but why is it more
4 appropriate -- and maybe I misunderstood the point
5 for these two tables, but have you chosen 80 per
6 cent of peak as compared to peak because there is
7 a lower -- you know, what I'm going to ask before
8 I'm asking it.

9 MR. DERRY: No. The peak volume was
10 used primarily to show the elevation of Dorsey to
11 tie in with Hydro's chart that they had put up
12 earlier, shown in figure 1.4. So if you looked at
13 figure 1.4 and 1.5, they show the same thing. I
14 just showed the deficit. I haven't tried to show
15 the load. You can't tell what it is from there,
16 you have to count the squares and try and figure
17 out what it is. So in this one I have used this
18 for the Dorsey outage peak load, that's what 1.5
19 load is. Those are the peak load months. And
20 that could be December, it could be January, it
21 could be February. The peak can happen in any one
22 of those months. But for the corridor outages I
23 used the shoulder months and the off peak months
24 in the summertime. And it is my feeling, and I
25 don't know if they have asked Hydro have they ever

1 had an outage of the corridor in the winter
2 period? And I don't know if they have or not.
3 Maybe they will come back and say they have. I
4 don't think they have. I don't know of any.

5 MR. WILLIAMS: And so you have used
6 less than peak or 80 per cent of peak because your
7 view is that an outage is more likely to occur in
8 the non-peak months in terms of transmission; is
9 that right?

10 MR. DERRY: Those shoulder months are
11 representative of ice storms. That's -- that
12 would have a 1 in 50 year, I think Hydro came up
13 with a 1 in 20 year, not Hydro, Teshmont, with a 1
14 in 20 later, but that's the probability of outage
15 in those months, and it would be weeks, not months
16 or years like the Dorsey station.

17 MR. WILLIAMS: Thank you for that. So
18 when I turn to figure 1.9, Mr. Derry, instead of
19 using peak or 80 per cent of peak, in this
20 particular figure you have used 65 per cent of
21 peak load.

22 MR. DERRY: That's correct.

23 MR. WILLIAMS: And presumably you have
24 done that because you are trying to reflect the
25 risk of more summer associated adverse events,

1 such as tornado and storms, is that correct?

2 MR. DERRY: That's correct.

3 MR. WILLIAMS: Now, Mr. Derry, stay
4 with figure 1.9 for a second. And while Mr.
5 Bedford has freely admitted he is not a
6 statistician and I believe he demonstrated that
7 today, I struggle with reading charts. And when I
8 look at this figure 1.9, what I see is that the
9 excess capacity is actually reflected towards the
10 bottom of this graph rather than towards the top.

11 MR. DERRY: Yes. The reason I did
12 this is all of the other graphs that you see, the
13 excess is positive, we show it is positive. So
14 taking the -- the deficits I should say are
15 positive, so we kept that same rule. Now the ones
16 that you see on the bottom are surpluses.

17 MR. WILLIAMS: So when I see all of
18 those colours, Mr. Derry, for the early years from
19 2013/14, through to 2021, 22, below the zero,
20 that's actually a good news story in terms of
21 capacity?

22 MR. DERRY: No, no, that's the
23 projection of the 2012. I haven't got any
24 historic ones in here.

25 MR. WILLIAMS: Okay. I think I have

1 the point of that table.

2 Mr. Derry, you had a discussion with
3 my friend, Mr. Bedford, about a capacity shortfall
4 around the year 2025, do you recall that
5 discussion?

6 MR. DERRY: That's right.

7 MR. WILLIAMS: And you made a
8 statement something to the effect, I will ask you
9 to recall, that you have to do something by 2025
10 to increase capacity. Do you remember making a
11 statement to that effect, Mr. Derry?

12 MR. DERRY: Yes, I do.

13 MR. WILLIAMS: And, Mr. Derry, what I
14 understand by that dialogue that you had both with
15 Mr. Meronek and my friend Mr. Bedford, was that if
16 you are going to do a true comparison of the costs
17 of the different options, you are going to have to
18 put in the expense associated with additional
19 capacity in 2025, one way or the other; agreed?

20 MR. DERRY: That's correct, to compare
21 it to the D and E option that we have proposed in
22 the report, you have to do something in 2025 to
23 get an excess again.

24 MR. WILLIAMS: And in your written
25 report you chose to -- to provide an appropriate

1 comparator, you used the 500 AC line?

2 MR. DERRY: That's correct, yes.

3 MR. WILLIAMS: But the point that you
4 were making, as I understand in your evidence to
5 Mr. Bedford today, is you could have just as
6 easily put in a 2,000 megawatt natural gas
7 generator, correct?

8 MR. DERRY: That's correct.

9 MR. WILLIAMS: Or you could have put
10 in the cost associated with increased capacity
11 from the United States?

12 MR. DERRY: In the EIS Hydro actually
13 used those two options to compare it against
14 Bipole III.

15 MR. WILLIAMS: So whether or not the
16 AC line is in their capital plans, the thrust of
17 your point, sir, is that there is going to be an
18 additional cost there, whether it is related to
19 natural gas generation, to import capacity, or an
20 AC line, correct?

21 MR. DERRY: That's correct.

22 MR. WILLIAMS: Mr. Woodford, about the
23 seventh page, and I just have a couple of
24 questions for you, about the seventh page of your
25 Powerpoint presentation, you make reference to the

1 Cigre, C-I-G-R-E, August 2012 paper. Do you
2 recall that, sir?

3 MR. WOODFORD: Yes.

4 MR. WILLIAMS: And in directing the
5 attention of the Commission to the bottom of that
6 paper, you noted that there were drawing inward
7 two future 500 kV lines, one to Riel and one to
8 Dorsey. Do you recall that, sir?

9 MR. WOODFORD: Yes, but I would
10 suggest that the top 500 kV line is the one in
11 existence, and the second one is the completion of
12 the ring, in my understanding and interpretation
13 of this paper and this diagram. The second lower
14 one is the completion of the ring around the south
15 of Winnipeg.

16 MR. WILLIAMS: And, Mr. Woodford, I
17 suspected when you were highlighting that, that
18 that was of some significance, but I'm not sure
19 that I totally grasped your point. So what is the
20 significance of that, sir?

21 MR. WOODFORD: The significance that I
22 see on it is that this has been contemplated by
23 Manitoba Hydro engineers. And I think the
24 Manitoba Hydro has said that they have
25 contemplated a second 500 kV line ring around

1 Winnipeg. It is certainly not being declared as
2 being a future consideration. Our position has
3 been that you need it when you bring in Bipole III
4 located at or near LaVerendrye. And that would
5 interconnect on to that second lower 500 kV line.

6 MR. WILLIAMS: And presumably address
7 some of the concerns expressed about the
8 limitations of the LaVerendrye site?

9 MR. WOODFORD: Yes, that would address
10 some of the concerns, and particularly at the blue
11 line, which is the contemplated second 500 kV line
12 to the United States, rather than take it out of
13 Dorsey, you would probably take it out of the
14 interconnection point where Bipole III meets the
15 500 kV ring. So you would have three DC lines
16 coming into that interconnection point.

17 MR. WILLIAMS: Just a couple more
18 questions. Mr. -- back to you for a second, Mr.
19 Derry. You recall both in your discussion with
20 Mr. Meronek as well as your discussion with Mr.
21 Bedford the possibility was raised of the risks
22 associated with a joint failure, both of Dorsey
23 and LaVerendrye. Do you recall that discussion?

24 MR. DERRY: Yes, I do.

25 MR. WILLIAMS: And Mr. Derry, I just

1 want to make sure I have your point from both of
2 those conversations. As I understand it, the
3 point you were making was that if we anticipate a
4 1 in 200 probability of a failure with Dorsey, and
5 let's say a 1 in 200 probability of a failure
6 associated with LaVerendrye, it would be incorrect
7 and simplistic to say that there is a 1 in 200
8 probability of a joint failure, it would be more
9 accurate to suggest that it is a 1 in 4,000 event
10 in terms of probability? Was that your point, Mr.
11 Derry?

12 MR. DERRY: The point was that -- what
13 is the probability of having both Dorsey and
14 LaVerendrye go out for the same wind storm? So
15 the probability most likely would go from 1 in 200
16 to 1 in 4,000 to have both out with the same
17 storm. And I don't think that anybody has done a
18 calculation of this, maybe Teshmont could redo it.
19 It is not 1 in 200 -- it is 1 in 200 in each
20 location to lose one Bipole, do you understand?

21 MR. WILLIAMS: Yes, I do, and I think
22 it relates to the point that Mr. Woodford has
23 made, and I just want to make sure I have his
24 point as well.

25 Mr. Woodford, you have spoken a couple

1 of times about Manitoba Hydro's proclivity to
2 present the worst case scenario as compared to
3 reasonable scenarios. Do you recall that, sir?

4 MR. WOODFORD: Yes.

5 MR. WILLIAMS: And in terms of modern
6 risk assessment, Mr. Woodford, would it be fair to
7 say that best practice says that we should look at
8 the magnitude or quantum of potential adverse
9 events, but we should also look at the probability
10 of those adverse events?

11 MR. WOODFORD: Absolutely. You would
12 look at the worst case scenario, but you would
13 also want to look at a more probable scenario and
14 try to evaluate the risks associated with that,
15 and do what you can to plan accordingly.

16 MR. WILLIAMS: And you made an
17 eloquent point in your conversation with my friend
18 Mr. Bedford to look at the -- you said it was not
19 good engineering. I don't know if you remember
20 making that statement. But the point I took from
21 that, sir, is that when one is looking at
22 potential adverse events, in accordance with good
23 engineering principles, you should look at the
24 worst case scenario, you should look at the
25 reasonable scenario and then you should address

1 your mind to the costs and benefits associated
2 with addressing those problems?

3 MR. WOODFORD: That's what I would do
4 as an engineer in this situation, yes, indeed.

5 MR. WILLIAMS: Mr. Chairman, I thank
6 the panel for its time, and I certainly thank the
7 Bipole III witnesses as well. Thank you.

8 THE CHAIRMAN: Thank you, Mr.
9 Williams. Any other participants have any
10 questions? Any members of the public have any
11 questions? Members of the panel? Mr. Gibbons.

12 MR. GIBBONS: And I will beg
13 everyone's indulgence that I would like to start
14 with perhaps clarifying two assumptions before I
15 go to the question. One of the assumptions that
16 I'm working under in understanding the
17 presentations of, in this case Mr. Derry and Mr.
18 Woodford, is that the reason for incorporating a
19 cost for a 500 kV AC line, north/south line, for
20 alternates B and C is because you would have two
21 of the three Bipole lines running to Dorsey, hence
22 increasing the possibility of an outage that would
23 create a deficit and that you need to make up that
24 500 deficit for that reason? I'm trying to figure
25 out why there is a 500 kV AC line posed for those

1 two alternates but not for the D and E alternate?
2 Perhaps you could clarify that for me before I get
3 to my next question.

4 MR. WOODFORD: That is the 500 kV line
5 that you are talking about, the top where it says
6 500 kV AC line.

7 MR. GIBBONS: Okay.

8 MR. WOODFORD: This is the Hydro
9 alternative, okay, where they redo Riel -- Bipole
10 III is refurbished at Dorsey. This is the CEC
11 alternative actually. If you go to the top line,
12 you see 500 kV AC line.

13 MR. GIBBONS: This is a Hydro --

14 MR. WOODFORD: That's a Hydro figure
15 that we have put the different lines on, that's
16 been -- the red line and the extensions out to the
17 end of the graphs were done by us. We just
18 extended them out to show you where the deficit
19 becomes a problem. If you look at the -- if we
20 can get the light working. Okay. We extended
21 that out to show that there is a problem starting
22 in 2025, and that's with Bipoles I and II at
23 Dorsey. So you would have to do something to
24 increase the excess capacity to get into the
25 surplus position. And one of the things that you

1 could do is build that north/south AC transmission
2 line at 500 kV, which was one of the comparisons
3 made by Mr. Mazur with the HVDC line versus a 500
4 kV AC line from the north. And that's where I got
5 the 4.8 billion. So this assumes that you would
6 build a north/south 500 kV AC line to make it
7 comparable to the recommended one in our report,
8 which is having three different locations that
9 gives you the same result. In other words, you
10 could go to 2050 if you had three locations, and
11 you wouldn't need that 500 kV line. So we have to
12 have something that we can compare it to, and this
13 is a comparison that we are making.

14 MR. GIBBONS: What I'm missing and
15 perhaps it is because I'm not an engineer, I am
16 something of a statistician, so that's maybe
17 actually worse, I am not sure, is that the amount
18 of power, the number of megawatts produced and
19 distributed, it strikes me remain the same whether
20 you have Bipoles I and II going through Dorsey, as
21 Hydro proposes, and Bipole III going to Riel, or
22 in the CEC idea of one in three going to Dorsey
23 and two being rerouted to Riel, or in the proposal
24 that you are making it is still the same amount of
25 power, so where is the deficit coming from is I

1 guess what I'm asking?

2 MR. DERRY: If you look at that graph,
3 take that line again that goes down to 2025, with
4 that alternative of putting Bipole III at Riel,
5 then you are short of capacity.

6 MR. GIBBONS: I guess what I'm not
7 clear on is I'm interested in your idea about
8 having three terminals.

9 MR. DERRY: I think where the problem
10 is, this assumes that Dorsey is out of service, it
11 is not there.

12 MR. GIBBONS: So that was my point
13 then, the reason for that --

14 MR. DERRY: Dorsey is not there, and
15 you only have Bipole III at Riel.

16 MR. GIBBONS: That was my original
17 question, was it because those proposals had 2
18 lines --

19 MR. DERRY: For the Dorsey station we
20 are looking at, not the corridor.

21 MR. GIBBONS: That's what I was trying
22 to get at, because if they are knocked out, you
23 are knocking out two lines rather than one.

24 MR. DERRY: That's right.

25 MR. GIBBONS: Okay. The second

1 assumption is the window of opportunity that you
2 discussed regarding the moving of Bipole II, for
3 example, at Dorsey, does that run out before 2025?
4 In other words, are there significant changes
5 expected to be made in equipment before then or
6 could it be done then?

7 MR. DERRY: If -- well, go to E and D.
8 If you relocate Bipole II at Riel, then if you
9 lose Bipole I at Dorsey, you would have Bipole at
10 Dorsey, I'm sorry, then you could go to 2025,
11 okay, and then you would add Bipole III at
12 LaVerendrye, which would take you up to the top
13 line. You could only lose one. We are only
14 assuming the outage of one Bipole in this one.

15 MR. GIBBONS: The reason I'm asking
16 this, or trying to sort out these assumptions --

17 MR. DERRY: I think I'm not explaining
18 it right to you. If you relocate Bipole II to
19 Riel, and you still have got Dorsey, Bipoles I and
20 are still there, okay?

21 MR. GIBBONS: Okay. Let me do this a
22 different way, and I will come to what is really
23 my main question. What if the chronology were
24 changed, and what you had instead was a situation
25 where, for the sake of argument only, this is just

1 off the top of my head, Bipole III was completed
2 perhaps to LaVerendrye or thereabouts, and you
3 then took Bipole II after Bipole III was completed
4 and moved it to Riel?

5 MR. DERRY: According to when they
6 want to start refurbishing Bipole II in 2019, so
7 you lose that window of opportunity, they are
8 going to continue to refurbishing it, you no
9 longer have the chance to do that.

10 MR. GIBBONS: That was part of my
11 earlier question, does the window of opportunity
12 close before 2025? And you are saying from their
13 own information it does, because they are going to
14 start the refurbishing by that point?

15 MR. DERRY: Right.

16 MR. GIBBONS: The difficulty then of
17 doing Bipole III first and then moving Bipole II
18 is that they will have already then spent an
19 exceptional amount of money on it.

20 MR. DERRY: Yes. They are still
21 spending money on it, a couple of million dollars
22 for the valves, and then they have to replace the
23 transformers, they are getting older. They have
24 to replace the smoothing rackets, controls,
25 auxiliary equipment. So you have lost that window

1 of opportunity. So the logical way of doing it is
2 to move Bipole II first and then follow it by
3 Bipole III.

4 MR. GIBBONS: I just wanted to get
5 that logic sorted out. So 2019 is sort of the
6 critical year.

7 MR. DERRY: Have I helped you?

8 MR. GIBBONS: Yes. I think the blame
9 is more on me than you, but that's okay.

10 THE CHAIRMAN: You are done?

11 MR. GIBBONS: Yes.

12 THE CHAIRMAN: Ms. MacKay.

13 MS. MACKAY: Yes. I have a couple of
14 questions related to the questions that Mr.
15 Gibbons was just asking. I would like to go to
16 the first slide of Mr. Woodford's presentation.
17 The first slide, first of all, could you just
18 remind me when Bipole II came into service,
19 roughly?

20 MR. WOODFORD: Well, the first part of
21 it came in -- I have got it written down
22 somewhere. These guys could tell us -- it was '78
23 was the first pull.

24 MS. MACKAY: Okay. Then looking at
25 this figure, if we look at the percentages over

1 the period of time, you very quickly get up over
2 100 per cent. Could you just confirm for me that
3 the percentage of replacement of equipment is not
4 cumulative? That, for example, there is some
5 pieces that get replaced say in ten years, and the
6 same thing might be replaced again in 20 years?

7 MR. WOODFORD: The life time of
8 components varies in a DC converter station.
9 Okay. Some are short periods of time relatively,
10 some are long. And in that 30 or 40 or 50 years,
11 there will be a number of components that will be
12 replaced several times.

13 MS. MACKAY: Okay.

14 MR. WOODFORD: And that's just what
15 happens.

16 MS. MACKAY: Okay. I thought that was
17 the case but I just wanted to make sure. For Mr.
18 Derry or Mr. Woodford, in your consideration of
19 your proposal, have you considered at all the
20 impact of delaying Bipole III on issues around
21 construction of Keewatinoow and Keeyask?

22 MR. DERRY: Yes, I can comment on
23 that. If I guess the NFAT that's approved on
24 Keeyask and Conawapa, and we are suggesting that
25 Bipole III can be delayed until 2025, then Bipole

1 III NFAT should become part of the Keeyask and
2 Conawapa NFAT, because it is required by those two
3 stations. So if they want to do that, and you
4 would accept the conditions for reliability that
5 we have put forth of having Bipole III come in in
6 2025, then they are going to have to put that into
7 their NFAT because it is a cost against the sale.

8 MS. MACKAY: Thank you. Just one more
9 question, this is of Mr. Lawson. In terms of
10 underground cables as opposed to underwater
11 cables, it seems to me they are still in a
12 relatively early stage of development particularly
13 for the high kV, such as 500 kV DC cables. If
14 Bipole III were to go ahead on the Coalition's
15 suggested routing, were to go ahead immediately
16 rather than be delayed as the Coalition's proposal
17 suggests, would you consider, and maybe other
18 panel members would like to answer as well, would
19 you consider that the state of advancement of
20 underground cables is far enough along that it
21 would be reasonable for Bipole III going ahead
22 immediately?

23 MR. LAWSON: In my opinion there is
24 really no difference between an underground cable
25 and a submarine cable. So the fact that the

1 particular cable that we are interested in, the
2 500 kV mass-impregnated cable has not been used
3 very significantly in underground applications.
4 The only difference that I can see is that whereas
5 for submarine cables you are delivering -- you can
6 deliver your cables and install them in lengths of
7 up to say 120 kilometres without any splices,
8 although there are splices which are made in the
9 factory, and then if you have a longer length than
10 that, then you have a submarine cable splice made
11 at sea. The only difference in my opinion is the
12 number of splices and you are able to -- well,
13 that is a significant difference, splices are
14 always considered to be a weak point. In fact, we
15 have no indication that these splices are any
16 different to the cable itself, because they are
17 actually reconstituted and they are made like the
18 cable, so the design is not different to the cable
19 itself. So there is no reason for splices to be
20 any different from the cable, and in practice we
21 don't find that any of these installed splices
22 have ever failed in the submarine situation.
23 Although, there are rather few that you use on
24 land. So I think the only difference is the
25 number of splices. The quality of the cable is

1 identical.

2 MS. MACKAY: In fact, there aren't
3 that many of these underground splices in
4 operation at this point?

5 MR. LAWSON: Correct. Yes.

6 MS. MACKAY: Thank you.

7 THE CHAIRMAN: Thank you. I just have
8 a couple of very short questions and I think,
9 Dr. Lawson, you may have answered the one question
10 I had just now in response to Ms. MacKay. I
11 thought when you made your presentation, and you
12 were referring to the slide that showed the
13 Europacable 320 kV, I thought you said that the
14 technology for 500 kV was a few years away. Did I
15 hear you correctly or --

16 MR. LAWSON: Well, the technology is
17 there. And I have no doubt that in three or five
18 years we will have 500 kV, XLDC cables. The
19 problem is that in order to commercialize the
20 standards, say that you have to undergo at least a
21 one year pre-qualification test. And since there
22 is a lot of business at the moment, even at 320
23 kV, the industry is not rushing to carry out this
24 one year test in order to fully qualify the cables
25 before commercializing them. So that's the delay

1 really. I think the material and the technology
2 is already there. We just have to prove them in a
3 long term test, and this will take, according to
4 at least one supplier, between three and five
5 years.

6 THE CHAIRMAN: Thank you. And, Mr.
7 Woodford, one of the examples you gave was the
8 Murray link in southern Australia. That's 320,
9 isn't it?

10 MR. WOODFORD: No, I think it is 150.

11 THE CHAIRMAN: 150, okay.

12 MR. WOODFORD: Plus or minus.

13 THE CHAIRMAN: And it runs 70 or so K?

14 MR. WOODFORD: From northwestern --
15 state of Victoria, northwestern Victoria, parallel
16 to the Murray River into south Australia. It is
17 the link between the two states.

18 THE CHAIRMAN: Okay.

19 MR. WOODFORD: The point I wanted to
20 make there is the reason they put it in and spent
21 the extra money, capital cost upfront, was they
22 made that up by the fact that they didn't have to
23 spend about five years permitting and were able to
24 make sales in those five years that they wouldn't
25 have been able to do if they had to wait until

1 they got DC or AC lines overhead.

2 THE CHAIRMAN: Thank you.

3 MR. LAWSON: There is a similar
4 project at 320 kV going in now in Sweden. That's
5 a 2,000-megawatt again. And the length is
6 something like 200 kilometres, the route length.
7 There are four cables, so that's 800 kilometres of
8 cable going in Sweden.

9 THE CHAIRMAN: Still 320?

10 MR. LAWSON: 320, yes.

11 THE CHAIRMAN: Thank you.

12 Mr. Meronek, before we close for the day, do you
13 have any final comments or questions you wish to
14 ask of your witnesses?

15 MR. MERONEK: I was going to ask about
16 garden hoses, but I think I will defer. Thank
17 you.

18 THE CHAIRMAN: Garden hoses late in
19 winter or --

20 MR. MERONEK: Probably in the
21 summertime.

22 THE CHAIRMAN: Thank you. Well, thank
23 you all for your presentations today and for your
24 written presentations earlier. Are there any
25 administrative matters to deal with? Yes, there

1 are. So, Madam secretary.

2 MS. JOHNSON: We have another pile of
3 documents that we have collected up today. I
4 would like to put on the record for the Bipole
5 Coalition notice of motion, BPC, number 7.
6 Outline of Mr. Derry's presentation is BCP number
7 8. That of Mr. Woodford is BCP number 9. That of
8 Mr. Lawson is number 10.

9 The actual report by Mr. Derry is
10 BP11. That of Mr. Woodford is BP12, BPC12.
11 Mr. Lawson's is BCP13. And Mr. Derry's
12 presentation is 14. Mr. Woodford's presentation
13 is BCP15. And Mr. Lawson's is 16 -- oops, I
14 missed Mr. Lawson's here. Sorry, no, number 16 is
15 the letter from Mr. Meronek to the Commission
16 regarding these reports. And I missed -- so
17 Mr. Lawson's will be 17. I also have a leftover
18 one here from CAC that I missed yesterday or this
19 morning, it is the vegetation report, CAC 11. And
20 two more documents from Manitoba Hydro, the
21 rebuttal to the parts one and two, is MH-115, and
22 to Mr. Lawson's report is 116.

23 (EXHIBIT BPC-7: Bipole Coalition
24 notice of motion)

25 (EXHIBIT BCP-8: Outline of Mr.

1 Derry's presentation)
2 (EXHIBIT BCP-9: Outline of Mr.
3 Woodford's presentation)
4 (EXHIBIT BCP-10: Outline of Mr.
5 Lawson's presentation)
6 (EXHIBIT BCP-11: Report by Mr. Derry)
7
8 (EXHIBIT BCP-12: Report by Mr.
9 Woodford)
10 (EXHIBIT BCP-13: Report by Mr.
11 Lawson)
12 (EXHIBIT BCP-14: Mr. Derry's
13 presentation)
14 (EXHIBIT BCP-15: Mr. Woodford's
15 presentation)
16 (EXHIBIT BCP-16: Letter from Mr.
17 Meronek to the Commission regarding
18 reports)
19 (EXHIBIT BCP-17: Mr. Lawson's
20 presentation)
21 (EXHIBIT CAC-11: Vegetation report)
22 (EXHIBIT MH-115: Manitoba Hydro
23 rebuttal to parts one and two)
24
25 (EXHIBIT MH-116: Manitoba Hydro

1 rebuttal to Mr. Lawson's report)

2 THE CHAIRMAN: Thank you. While we
3 are talking about reports, I would hope that by
4 the end of the day tomorrow, from whatever source,
5 whether it is Manitoba Hydro or Mr. Derry, we have
6 a copy of the Ultimate HVDC Development in
7 Manitoba. It would be helpful to be able to read
8 it before Thursday morning's presentation and
9 questioning.

10 If there is no other business, then we
11 have a little bit of bonus time and we will
12 adjourn for the day. See you tomorrow morning at
13 9:00 a.m. Thank you.

14 (Adjourned at 4:08 p.m.)

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OFFICIAL EXAMINER'S CERTIFICATE

Cecelia Reid and Debra Kot, duly appointed
Official Examiners in the Province of Manitoba, do
hereby certify the foregoing pages are a true and
correct transcript of my Stenotype notes as taken
by us at the time and place hereinbefore stated to
the best of our skill and ability.

Cecelia Reid
Official Examiner, Q.B.

Debra Kot
Official Examiner Q.B.

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