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<p>1 February 13, 2012</p> <p>2 CHAIRMAN:</p> <p>3 Q. Good morning, everybody. I want to welcome</p> <p>4 you all here for these sessions. The word in</p> <p>5 French is "seance" by the way. My name is</p> <p>6 Andy Wells, and I'm CEO of the Board. On my</p> <p>7 left is Darlene Whelan, who is our Vice-Chair.</p> <p>8 On my far right is Dwanda Newman, a</p> <p>9 Commissioner, and on my right is Jim Oxford,</p> <p>10 also a Commissioner. I welcome everybody here</p> <p>11 this morning. I understand others will join</p> <p>12 us over the course of the next ten days or two</p> <p>13 weeks, and I understand also that we are being</p> <p>14 webcast, which is an interesting development,</p> <p>15 so welcome to - I'm sure there's a numerous</p> <p>16 viewing audience out there, a major viewing</p> <p>17 audience out there, and we hope the webcast</p> <p>18 will assist us in shedding some light on this</p> <p>19 issue.</p> <p>20 The matter before us is a reference from</p> <p>21 the Government of Newfoundland and Labrador,</p> <p>22 which directed the board to review and report</p> <p>23 on whether the proposed development of the</p> <p>24 Muskrat Falls Generation Facility and the</p> <p>25 Labrador-Island Transmission Line represents a</p>	<p>1 least cost option for the supply of power to</p> <p>2 Hydro's Island interconnected customers over</p> <p>3 the period 2011 to 2067. I hope to be around</p> <p>4 for 2067. As compared to a specific isolated</p> <p>5 Island development. The Board's review is</p> <p>6 limited to examination of these two options;</p> <p>7 the Muskrat Falls Project, and the Isolated</p> <p>8 Island Development scenario. Upon receiving</p> <p>9 the reference from the Government in June,</p> <p>10 2011, the Board started the process of</p> <p>11 gathering information in the form of our</p> <p>12 advise information request. Mr. Thomas</p> <p>13 Johnson was also appointed at the time as</p> <p>14 Consumer Representative, and also has been</p> <p>15 involved in directing questions to Nalcor and</p> <p>16 in seeking public input. Mr. Johnson, I'm</p> <p>17 sure there's not anybody who does not know who</p> <p>18 he is, but Mr. Johnson is here straight ahead</p> <p>19 of me, or slightly to the left, I should say.</p> <p>20 We have asked totally all the parties - over</p> <p>21 500 questions have been asked of Nalcor, and</p> <p>22 these questions and replies to these questions</p> <p>23 can be viewed on the Board's website. Nalcor</p> <p>24 filed its required submission with the Board</p> <p>25 on November 10th, 2011.</p>
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<p>1 In June, the Board also hired an</p> <p>2 independent expert consultant, Manitoba Hydro</p> <p>3 International, MHI, to assist us in our review</p> <p>4 and they were asked to review the technical</p> <p>5 feasibility and the cumulative present</p> <p>6 analysis for the two power supply options</p> <p>7 identified in the referenced question, and, of</p> <p>8 course, to do their work, MHI assembled a team</p> <p>9 of specialists with expertise in load</p> <p>10 forecasting, risk analysis, project</p> <p>11 management, utility resource planning, hydro</p> <p>12 electric and thermal generation, HDCDC</p> <p>13 engineering, hydrology, submarine cable</p> <p>14 crossings, wind power, and financial analysis,</p> <p>15 and their report was filed on January 31st,</p> <p>16 2012, and, of course, was released publicly at</p> <p>17 that time. The Board has set aside the next</p> <p>18 two weeks for presentations and questions</p> <p>19 related to its review, and starting today, of</p> <p>20 course, Nalcor will make a presentation to the</p> <p>21 Board. Following the presentation, the</p> <p>22 Consumer Advocate will have an opportunity to</p> <p>23 ask questions, and thereafter Board Councillor</p> <p>24 and Commissioners will have an opportunity to</p> <p>25 ask questions of Nalcor. At the conclusion of</p>	<p>1 questions of Nalcor, MHI will make a</p> <p>2 presentation, and we expect this presentation</p> <p>3 will begin on Wednesday morning subject to how</p> <p>4 things proceed. As I said, that will depend</p> <p>5 on the timing of Nalcor's presentation and</p> <p>6 questions. Interested persons wishing to</p> <p>7 place a relevant question on the record may so</p> <p>8 do through the Consumer Advocate. Next week</p> <p>9 presentations from other interested parties</p> <p>10 will be heard by the Board and individuals</p> <p>11 wishing to make a presentation next week</p> <p>12 should register in writing no later than</p> <p>13 Wednesday, February 15th, 2012, directly to</p> <p>14 the Board's website. For further information</p> <p>15 on the process to be followed, and the</p> <p>16 requirements for making presentations, we'll</p> <p>17 post a schedule of the presentations on</p> <p>18 Friday, February 17th, on our website. As I</p> <p>19 say, the presentations will be webcast and</p> <p>20 will be available for viewing through the</p> <p>21 Board's website, and we will have transcripts</p> <p>22 of our proceedings posted on the Board's</p> <p>23 website daily. Nalcor and the Consumer</p> <p>24 Advocate will provide final submissions on</p> <p>25 Friday, March 2nd, 2012, and of course the</p>

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<p>1 Board will submit its final report to 2 Government by March 31st, as dictated by the 3 reference. 4 I would like to now introduce those who 5 will be working and supporting the efforts of 6 the Board over the next two weeks. Board 7 Legal Counsel, Maureen Greene; Director of 8 Corporate Services and Board Secretary, Cheryl 9 Blundon; and Mike McNiven is our Technical 10 Analyst on my right. If there's anyone who 11 has questions or requires any particular 12 assistance over the course of the review, you 13 may direct your inquiries to Cheryl, and we 14 will do everything we can to assist you. If 15 you do not wish to make a presentation, you 16 may wish to submit a letter of comment by 17 email, mail, or on the feedback forum on the 18 Board's webpage. The Board will continue to 19 receive letters of comments and additional 20 information until February 29th. It's a leap 21 year, oh, okay. Upon receipt of all 22 information, it will be our task as 23 Commissioners to review the report and report 24 by March 31st, as we said on the reference 25 questions set out in the Terms of Reference.</p>	<p>1 That concludes my general remarks. There are 2 a number of other items, including some 3 housekeeping matters which I should also like 4 to cover. We will start each day at 9:30, 5 except for today, I guess. The time for 6 breaks during the day will depend on the 7 presentations and timings. We're not hard and 8 fast on that, so we will probably decide that 9 collectively. There will be days when the 10 Board will convene an evening session if 11 necessary. Mike McNiven, who I introduced 12 earlier is available to assist with any 13 presentation on any electronic setup, any 14 technical matters you may refer to Mike and he 15 will certainly assist you. He knows precisely 16 and exactly what he's doing at all times. The 17 proceedings are being recorded by Discoveries 18 Unlimited, Glenda Gibbons, under the 19 supervision of the Board Secretary, Ms. 20 Blundon, and will be transcribed overnight and 21 posted on the Board's webpage for the next 22 day. Persons addressing the panel may for the 23 benefit of transcription services refer to 24 Commissioner Whelan, Newman, or Oxford, by 25 name, and myself as Chair. I was told to put</p>
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<p>1 that in there. Mrs. Blundon maintains the 2 official record for this review with all 3 documents format, including transmissions, and 4 as I say, all documents and information are 5 posted on the Board's website. The last 6 important matter, of course, is with respect 7 to fire safety. There are two exits in the 8 room; at the front where you came in, and 9 another here at the back, which leads to the 10 Board's office corridor. In the event of any 11 emergency, I ask you to proceed to the nearest 12 exit and follow the signs. In closing, I 13 would like to acknowledge the work of all 14 participants in preparing for this proceeding. 15 I fully realize the time frames, and I 16 appreciate your cooperation in this matter. I 17 think now I should perhaps turn it over to 18 Nalcor. Mr. Thomas O'Reilly is the Board 19 Counsel for Nalcor, and I understand he's 20 assisted by Denis Fleming. Mr. O'Reilly, I'll 21 turn it over to you, sir. 22 O'REILLY, Q.C.: 23 Q. Thank you, Mr. Chairman, Mr. 24 Commissioners, this morning we're going to - 25 Nalcor will make its presentation. We have</p>	<p>1 making the presentation first, Mr. Ed Martin, 2 President and CEO of Nalcor Energy Inc., and 3 Mr. Gilbert Bennett, who is the Vice-President 4 responsible for the Lower Churchill Project 5 with Nalcor. The presentation by Nalcor will 6 be divided essentially into two sections. 7 What we will do is there will be a 8 presentation, Mr. Martin and Mr. Bennett will 9 deliver the presentation, and then in 10 anticipation that there will be questions that 11 may be directed from either the Consumer 12 Advocate and/or Board Council. We will 13 proceed to impanel a panel of people from 14 Nalcor who will be in a position to respond to 15 the questions. So it will take the form of 16 actually two panels; one will follow the other 17 after the presentation is submitted. So 18 unless there's any further direction - oh, I 19 should add, I guess, as well that the 20 presentation that you have before you, it's 21 undergoing a few editing changes. We expect 22 to have hard copies of those available within 23 the hour for circulation and delivery to the 24 Board and for those that are in the room. So 25 without any further ado, probably I could ask</p>

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<p>1 Mr. Martin, please.</p> <p>2 MR. MARTIN:</p> <p>3 A. Thanks, Tom. Mr. Chair, Commissioners,</p> <p>4 I'd like to take a few moments before I turn</p> <p>5 it over to Gilbert, Mr. Bennett, for the more</p> <p>6 detailed presentation, to offer, you know,</p> <p>7 some opening comments for your consideration.</p> <p>8 Primarily, I'd like to start out and address</p> <p>9 the question as to why do I believe this is</p> <p>10 the right time to build Muskrat Falls and a</p> <p>11 Labrador-Island link.</p> <p>12 The first point really is if you look at</p> <p>13 the process we've followed, we have identified</p> <p>14 a need, and Gilbert will talk more about our</p> <p>15 demand needs for the province in the future,</p> <p>16 but we have identified a need. It's clearly</p> <p>17 there and we have to make a decision.</p> <p>18 Point number two is we've done some</p> <p>19 extensive analysis of the options and we've</p> <p>20 come up with a recommendation that Muskrat</p> <p>21 Falls and a Labrador-Island link is the best</p> <p>22 option, it's the lowest cost option to meet</p> <p>23 this need over time by a number of 2.2 billion</p> <p>24 dollars, which is the cumulative present worth</p> <p>25 difference between the alternatives being</p>	<p>1 considered. So this is not a trivial amount,</p> <p>2 obviously. There's a 30 to 35 present</p> <p>3 difference between the two options, and over</p> <p>4 time - as I mentioned, this is a present value</p> <p>5 number. Over time from a nominal perspective,</p> <p>6 this number will be even larger. So that's</p> <p>7 the basic primary simple fact of the matter is</p> <p>8 that there's a need and we have come up with a</p> <p>9 recommendation for the lowest cost option.</p> <p>10 I'd like to add to that some additional</p> <p>11 factors. So we have a project that is the</p> <p>12 most economic to do at this particular time to</p> <p>13 meet our needs, but there are several other</p> <p>14 key points. With that decision made, I'd just</p> <p>15 like to add a few extra thoughts as to why I</p> <p>16 believe the timing is good and solid for now.</p> <p>17 First, in the analysis we have assumed in</p> <p>18 those numbers that we would only be using the</p> <p>19 power that the province needs. The additional</p> <p>20 power that would be surplus in the early days</p> <p>21 would not actually be valued for the purpose</p> <p>22 of the economic analysis. So there's</p> <p>23 additional power that's available, there's no</p> <p>24 use specified in the analysis, but it's there,</p> <p>25 and that obviously creates an opportunity -</p>
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<p>1 this surplus power creates an opportunity to</p> <p>2 meet potential demands in Labrador</p> <p>3 particularly with development of the potential</p> <p>4 mining opportunities there, as well as</p> <p>5 additional power to be used for other</p> <p>6 developments throughout the Island of</p> <p>7 Newfoundland if necessary. So the option</p> <p>8 creates additional power, creates surplus</p> <p>9 power for the province.</p> <p>10 The second point is that an investment</p> <p>11 like this, if you look at the isolated island</p> <p>12 alternative, essentially the alternative where</p> <p>13 we head into a situation where we keep</p> <p>14 Holyrood open and we add additional thermal</p> <p>15 generation, in that particular scenario over</p> <p>16 the next period of time, many, many years, we</p> <p>17 are going to be spending a substantial amount</p> <p>18 of cash on oil and/or gas to be able to fire</p> <p>19 the thermal generation. So that's a huge</p> <p>20 amount of the isolated island cost</p> <p>21 expenditures will actually be expended outside</p> <p>22 the province, will not be here for the benefit</p> <p>23 of the province. You compare that to a</p> <p>24 Muskrat Falls Labrador-Island link, not only</p> <p>25 is it the cheaper alternative, but in addition</p>	<p>1 to that the cash that is being spent over the</p> <p>2 next 50 years will actually be invested in an</p> <p>3 asset that belongs to Newfoundlanders and</p> <p>4 Labradorians and it will be there for a</p> <p>5 lifetime as generational asset, and I like to</p> <p>6 use the analogy sometimes that it's a rent</p> <p>7 versus buy decision. We have a situation here</p> <p>8 where we have an opportunity to rent that is</p> <p>9 more expensive than an opportunity to buy and</p> <p>10 own the asset forever.</p> <p>11 The third thing is these benefits for a</p> <p>12 hydro project, I mean, hydro projects are</p> <p>13 inter-generational projects. I mean, these</p> <p>14 are lifetime projects, many lifetime projects.</p> <p>15 I think we like to think in terms of 100 year</p> <p>16 assets, but these are assets that last many,</p> <p>17 many, many years. They're the gift that keeps</p> <p>18 on giving when it's constructed, it's a</p> <p>19 renewable resource, and obviously will not</p> <p>20 only benefit this generation, but many</p> <p>21 generations into the future. It's clean power</p> <p>22 and what we'll see with the Muskrat Falls</p> <p>23 Labrador-Island link option and service is</p> <p>24 that Newfoundland and Labrador will be</p> <p>25 essentially 98 percent free of greenhouse gas</p>

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<p>1 emissions. We would have also addressed some 2 of the concerns and issues that come with the 3 nitrous oxide and other emissions at Holyrood, 4 and we'll be in a situation where in this 5 country and in this continent we'll be one of 6 the leaders from a clean energy perspective 7 with respect to electrical generation. In 8 addition to that, I think we're fortunate at 9 this particular time the interest rates are 10 low. They're low for a variety of reasons 11 with the worldwide economy in a situation 12 where there's significant recession throughout 13 the world. Newfoundland and Labrador, it's a 14 bit of a turnaround for us, I think, for once 15 in our history we're probably in the driver's 16 seat more so than many other jurisdictions, 17 but in any event, the culmination of a lot of 18 what's happening worldwide has resulted in 19 significantly low interest rates, which is a 20 very significant component of the cost of 21 building something like this. So we're in 22 that low interest rate environment. How long 23 will it last; well, indications are it's going 24 to be several years into the future, but no 25 one is ever sure, but we do know we're in a</p>	<p>1 low interest rate period of time, and that's 2 going to last - in the context of this 3 project, it's going to be available to us at 4 this particular time, and as the future moves 5 on, we've seen it over time that as interest 6 rates rise, and certainly they will at some 7 point, it would have a very negative impact on 8 a project like this and I think it's a good to 9 be able to take advantage of the interest rate 10 situation. Further comment on the interest 11 rate situation, we have, you know - the 12 province has actually come to an agreement 13 with the Federal Government with respect to in 14 addition to low interest rates, the Federal 15 Government has also agreed for this option for 16 the Muskrat Falls Labrador-Island link option, 17 for the green option, they've also agreed to 18 provide a federal loan guarantee on top of 19 that. So not only do we have lower interest 20 rates in general, on top of that we are going 21 to be able to apply a federal loan guarantee 22 which will lower the interest rates even 23 lower, and that federal loan guarantee is tied 24 to the Muskrat Falls Labrador-Island link 25 green option, it's not tied to any other</p>
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<p>1 option. 2 In addition, from a provincial 3 perspective, and fortunately things have - 4 particularly with the oil revenues, things 5 have changed in Newfoundland and Labrador, and 6 for the first time essentially in our history 7 we are in a situation where we have a strong 8 revenue base driven by oil. It's a non- 9 renewable resource. Over time, obviously, 10 non-renewable resources go away and do not 11 come back, but at this particular period in 12 time we have that boost in revenue at a time 13 when we'll be building a project of this 14 nature. If you look at what's happened over 15 the past four to five years, in particular, 16 there's been three incremental oil projects; 17 Hibernia South, Hebron, and West White Rose. 18 Those are three incremental projects which 19 have been agreed and put in place over the 20 past five years, which are estimated to bring 21 an additional revenue base of 38 billion 22 dollars into the Province's coffers. So the 23 timing once again is good from this project's 24 perspective. It's happened over the past four 25 or five years. Thirty-eight billion</p>	<p>1 incremental dollars, and at a time when we're 2 moving into a project of this nature, the 3 timing once again suits the project. In 4 addition to that, and not included in any of 5 the economics, there are significant 6 construction benefits for a project of this 7 size. Particularly in Labrador, they're going 8 to see a tremendous boost in activity, and 9 from the province's perspective, I go back and 10 make the earlier point, we need the power, so 11 the cost options there's a series of benefits 12 here, but on top of that, you know, the 13 significant job opportunities for 14 Newfoundlanders and Labradorians, particularly 15 Labradorians. If you look at the tax revenue 16 that will be generated by this project that 17 will go directly into the province's treasury, 18 all these benefits will accrue to the 19 population, primarily to the population of 20 Newfoundland and Labrador. We have in place 21 for the first time a Water Management 22 Agreement, and Water Management Legislation 23 that the Province has passed, which requires 24 any operators - any two or more operators on a 25 single river throughout the province to come</p>

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<p>1 to a Water Management Agreement to make sure 2 we maximize the resource availability to the 3 benefit of the province, and that Water 4 Management Agreement Legislation is in place 5 and there's been a Water Management Agreement 6 negotiated and in place between the Lower 7 Churchill Project and Churchill Falls Labrador 8 Corporation, which gives this particular 9 project full access to the benefits of the 10 very large reservoir up river, Churchill 11 Falls, and that is a key element in making 12 this project very viable.</p> <p>13 We've also completed an agreement with 14 the Innu Nation, and that agreement has been 15 ratified by the Innu Nation, it's in place, 16 it's there, and we're ready to go. Additional 17 to that, if you look at a hydro plant and a 18 Labrador-Island transmission link, these are 19 large assets and they require expertise to 20 build these assets, but from a technology 21 perspective this is known technology. So 22 we're taking on construction of a large 23 project, but it is a hydro asset, and we 24 understand hydro assets, this is technology 25 that's been around for many, many, many</p>	<p>1 decades. Similar to that, from the 2 transmission side of things, transmission 3 construction, it's big, it's long, but it is 4 not complex. So this a technology we 5 understand. In the province, you know, we 6 have a strong workforce. I refer back to some 7 of the large projects that have been occurring 8 here, and we are one of the few jurisdictions 9 in the country and in North America, again who 10 has had a steady stream of large projects and 11 it goes from Hibernia, to Terra Nova, to White 12 Rose, to Voisey's Bay, to the Vale Plant, and 13 what we've seen is the development of a labour 14 force that's skilled in large projects, we 15 know they're available, we know that the 16 workforce is skilled and has the ability to 17 produce these projects. In addition, we've 18 developed the expertise and the management 19 resources throughout the province that are 20 available to us at Nalcor to be able to move 21 into this next project.</p> <p>22 From a base business perspective, this is 23 a large project that's going to take 24 significant resources, but we've also laid the 25 groundwork and the base business at Nalcor,</p>
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<p>1 and if you look at our operating businesses 2 with certainly Newfoundland and Labrador 3 Hydro, Churchill Falls Labrador Corporation, 4 our oil business, we have in all cases over 5 the past five years we put - you know, we've 6 prepared our processes to be able to take on a 7 project of this nature and be confident that 8 the base operating businesses will still be 9 effectively run over this period of time. 10 We've put in an improved safety program, we've 11 improved our safety performance by over 65 12 percent statistically over the past five 13 years. We've improved our environmental 14 performance KPIs, we've moved from an average 15 of 75 percent of our annual targets to 16 consistently over 95 percent of our annual 17 targets. Our up time measures have stabilized 18 with respect to our transmission up time, our 19 generation plant up times. We've put in an 20 asset management program, an in depth program 21 which - and reorganized the company to be able 22 to accommodate the significant - you know, 23 essentially a rebuild of the base system that 24 has occurred after 30 or 40 years. So we're 25 confident that we've put the processes in</p>	<p>1 place as well, and have the people in place to 2 maintain a clear focus on the base operating 3 business in addition to being able to execute 4 this project. So that's really what I wanted 5 to say from the perspective of this the right 6 time, and I believe it is. We have the need, 7 it is the low cost option, and for the other 8 points I mentioned, additional points as to 9 why the timing is good for this particular 10 project. On the flip side of that, the 11 obvious question is are there risks associated 12 with this decision, and absolutely there are 13 risks associated with this decision, there's 14 no question about that. There's risk 15 associated with any decision naturally. When 16 I sit back and look at a couple of points with 17 respect to that, if I look at Muskrat Falls 18 Labrador-Island link, it's a large 19 construction project, and I think the key risk 20 that we focus on there is primarily a cost 21 risk, you know, will be have the ability to 22 control the cost expenditures and the schedule 23 associated with Muskrat Falls and LIL.</p> <p>24 On the flip side, if you look at the 25 alternative, an isolated island option,</p>

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<p>1 there's also risk there. There's also cost 2 risks with respect to construction required in 3 that side of the coin, but in addition to 4 that, there's fuel cost risk in terms of 5 what's going to happen to the thermal cost of 6 fuel over the next several decades. So when I 7 look at that, I believe we have the ability, 8 more of an ability to control the cost of 9 construction under either option, and granted 10 Muskrat Falls LIL has a higher up front 11 capital, and the alternative isolated case we 12 looked at, there's significant capital, but it 13 is spread out further, but nonetheless, there 14 is construction and a cost risk associated 15 with both, but that's cost risk - that's risk 16 we can get our arms around, we can work on, we 17 can mitigate, and we can minimize. You can 18 never get rid of all the risk, but we can 19 certainly identify, work on it, and have some 20 ability to control and mitigate that risk. If 21 you look at the fuel cost risk, we essentially 22 have no control over that particular risk. 23 It's a globally driven commodity. Our demands 24 certainly is nowhere anywhere near any place 25 that we could impact that demand, and on the</p>	<p>1 isolated island side of the coin, we are 2 totally at the mercy of the global markets 3 with respect to fuel costs in the long term. 4 So from that perspective, I say, yes, there 5 are risks attached, but, yes, we can manage 6 them. So what we need to do is identify these 7 risks early, we need to respect these risks, 8 know they're there, and we need to work to 9 mitigate each risk to the extent possible so 10 we minimize that risk and give ourselves the 11 opportunity, the highest opportunity, the 12 highest probability to deliver a project like 13 this on time and on schedule. 14 So that really concludes my opening 15 comments. We have a need, we have a low cost 16 option, there's a lot of benefits that I 17 believe are driving us to the timing is right 18 now. There's risks associated with this 19 project, there's risk associated with the 20 alternative. We believe that we have the 21 processes in place to manage those, and what 22 I'd like to do now is turn the discussion over 23 to Gilbert and he's going to expand on some of 24 those and take us through a more extensive 25 process that you'll be able to point to some</p>
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<p>1 specifics in terms of what I've already 2 discussed. Thank you. 3 MR. BENNETT: 4 Q. Good morning, Mr. Chairman, 5 Commissioners. It's a pleasure to be here, 6 and as Ed pointed out, I'm going to build on 7 material that Ed has covered in his opening 8 remarks. This presentation is basically going 9 to follow an overview of the material in our 10 submission. So the same structure and order 11 in this presentation will basically mirror 12 what we have in the submission that we have 13 filed with the Board. 14 Before I get into the presentation, 15 however, I'd just like to briefly look at 16 Nalcor's corporate structure. We have five 17 lines of business. I think the important 18 point here is that we are a Crown corporation 19 owned by the Province of Newfoundland and 20 Labrador on behalf of the people of the 21 province, and our single focus is building a 22 strong economic future for successive 23 generations of Newfoundlanders and 24 Labradorians. The team that will be 25 presenting over the course of this proceeding</p>	<p>1 includes myself, as Vice-President Lower 2 Churchill Project, and in addition to myself, 3 we also have Mr. Paul Humphries, our Manager 4 of Systems Planning for Hydro; Mr. Paul 5 Harrington, Project Director for the Lower 6 Churchill Project; and Mr. Steve Goudie, our 7 Manager of Economic Analysis; Jason Kean, 8 Deputy Project Manager for the Lower Churchill 9 Project, and Mr. Paul Stratton, Senior Market 10 Analyst for Newfoundland and Labrador Hydro. 11 So we assembled our panel to bring these 12 representatives into the proceeding to assist 13 in addressing any questions that may be 14 raised. The presentation outline, as I 15 mentioned, basically covers the submission 16 format. At the end, we do have some comments 17 on the MHI Report that was filed. However, 18 the ten items cover the load forecasting 19 process, our assistant planning criteria and 20 need identification, identification of options 21 and how we screen those, the description of 22 the isolated island alternative, the 23 interconnected island alternative, and how 24 those two alternatives were developed as an 25 optimized set of generation options from the</p>

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<p>1 initial group of alternatives that were 2 created in the screening process. I'll run 3 through the cumulative present worth or CPW 4 analysis, a brief description of Muskrat Falls 5 and the Labrador island link which are 6 important parts of the interconnected island 7 alternative, a brief overview of our decision 8 gate process which we're using for our project 9 planning, and update on project execution, as 10 I mentioned earlier, some brief comments on 11 the MHI Report.</p> <p>12 Load forecasting is the foundation of all 13 of our generation planning and our generation 14 expansion process, and certainly we look at 15 the processes that are within Newfoundland and 16 Labrador Hydro, those processes have been 17 established for many years and the process of 18 assessing supply and demand for electricity 19 within the province, and then making 20 recommendations to ensure the system can meet 21 that demand. It's a fundamental process 22 that's embedded within our system's planning 23 group. We recognize that there are long lead 24 times for developing new generation and the 25 associated transmission infrastructure that</p>	<p>1 goes with that, so it necessitates that we 2 have a long term planning process. This 3 process ultimately delivers a Generation 4 Planning Issues Report. That report is issued 5 on a regular basis and identifies future work 6 that would be required to expand the system. 7 In 2010, our load forecast indicated that new 8 generation would be required by 2015 in order 9 to meet the capacity deficit on the island 10 interconnected system. Our next release of 11 this report will either be with decision gate 12 3 in our planning process and/or with the 2013 13 capital budget process for Newfoundland and 14 Labrador Hydro. Our forecasting model is a 15 comprehensive one. It's an econometric demand 16 model. It's built on a 20 year forecast 17 period for island interconnected load, and 18 that load includes Newfoundland Power and our 19 hydro rural load. The main drivers in that 20 forecast include an econometric forecast from 21 the Provincial Government, a fuel price 22 forecast, as well as our own hydro rate 23 projections which, of course, have impacts on 24 consumer demand and, therefore, feedback into 25 the process. Our industrial load requirements</p>
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<p>1 are captured through direct contact with our 2 industrial customers.</p> <p>3 Beyond 2029, given that I mentioned we 4 had a 20 year forecast period, our forecast is 5 completed by trend with growth adjustments for 6 the penetration in electric heat that will be 7 expected at the time. So here's a view of the 8 20 year forecast that was the beginning of 9 2010, Decision Gate 2 decision making. There 10 are couple of important points here. First of 11 all, if we look back over our historical view 12 here from a utility load perspective, while 13 our population during the 90s declined by 14 almost 12 percent, the electricity use 15 continued to rise during this period. You see 16 in the middle part of the last decade, in 2005 17 and later in that decade, we can see the 18 impact of the two paper mill shutdowns and a 19 decrease in industry in industrial load over 20 that period, and that looking forward into the 21 future, we see the impact of the Vale facility 22 at Long Harbour coming on line. In the long 23 term, notwithstanding the issues associated 24 with the fishery and other economic impacts 25 that have happened during the 90s, we see over</p>	<p>1 that period a continued increase in utility 2 load on the system.</p> <p>3 Looking forward into the future, we see 4 that expected penetration and use of electric 5 heat for space heating will continue to 6 increase as that's a preferable alternative to 7 oil heating. One question that has come up 8 throughout the course of this proceeding in 9 many of our public consultations is the 10 question of meeting industrial load in 11 Labrador, and I think it's important to point 12 out that we are in continued and ongoing 13 contact with proponents and developers in 14 Labrador. At this point in time, we have no 15 firm commitments from additional development 16 opportunities in Labrador. Initially we will 17 have surplus energy from Muskrat Falls, as 18 well as additional resources to meet the needs 19 of industrial development both in Labrador and 20 elsewhere in the province, and those would 21 include island hydro resources, other 22 developments in Labrador, wind, recall power 23 that we currently export into the market, as 24 well as imports from the broader North 25 American market. So those are all available</p>

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<p>1 options in a portfolio that we can use to meet 2 those needs.</p> <p>3 Having identified a requirement to meet 4 additional demand on the system; in other 5 words, an increasing load forecast, now we 6 turn to our system planning criteria and the 7 identification of the needs that fall from 8 that. So if we look at generation and 9 transmission planning within Hydro, Hydro has 10 an existing set of generation planning 11 criteria and those are designed to meet both 12 capacity and energy requirements on the 13 system. The transmission planning criteria 14 focus on the bulk transmission system, our 15 terminal and substations, and they consider 16 contingencies, back up requirements, as well 17 as emergencies on the system, and those 18 existing criteria are optimized with minimal 19 adaptations for our isolated system. So in 20 general terms, our transmission and generation 21 planning criteria are generally aligned with 22 those of the North American industry. 23 However, we do note that we have had to make 24 some adaptations to reflect the realities of 25 our isolated system.</p>	<p>1 Strategist is a software application that 2 we use for decision support and decision 3 making during this process. It's an 4 application that's used by many utilities in 5 North America to enable decision making with 6 respect to planning. It performs our 7 generation system reliability analysis, we use 8 it to project costs and generation expansion 9 analysis, and it is a tool that we use to 10 produce the least cost generation expansion 11 plans, as well as our cumulative present 12 worth, or CPW. The CPW is an important 13 parameter in this proceeding and this analysis 14 that we're undertaking. It's the present 15 value of all incremental utility capital and 16 operating costs that would be incurred to 17 reliably meet the specified load forecast, 18 given a prescribed set of reliability 19 criteria. So criteria established, our 20 analysis would look at the two generation 21 expansion plans that have been developed with 22 and without the interconnection, and then we 23 calculate and compare the cost of both 24 alternatives, so we can identify which one is 25 the lower cost alternative. There's a broad</p>
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<p>1 set of inputs that go into this model. It 2 includes all of the key functions that we used 3 in the business. So we have our planning load 4 forecast, we have a forecast period, we have 5 an assessment of the shape of the load on the 6 system, our escalation parameters, forecasted 7 fuel prices, cost of capital and our discount 8 rate, capital cost estimates for the various 9 projects and developments that are used in the 10 planning horizon, the terms of our power 11 purchase agreements, information with respect 12 to service life, potential retirements of 13 components of the system, operating 14 maintenance costs, heat rates for our thermal 15 facilities, the generation capacity and energy 16 capability of each of those potential 17 resources, asset maintenance schedules, as 18 well as forced outage rates. So you can see 19 here that there's a comprehensive set of 20 inputs that go into the Strategist model and 21 evaluation.</p> <p>22 Having established a load forecast and 23 now having a framework for doing the analysis, 24 it's important now to look at the alternatives 25 and our screening process to see which</p>	<p>1 developments and which projects and which 2 alternatives and opportunities can go into the 3 analysis. So we've looked at a broad 4 portfolio of supply options to meet future 5 needs. They include indigenous resources here 6 in the province, facilities that are driven by 7 imported fuel, as well as potential for 8 importing energy from outside the province. 9 The key point, however, is that the proper 10 planning of the province's electricity system 11 has to be based on proven technologies that 12 are used in the utility sector where risks are 13 reasonable and the probability of success is 14 high. So there's a clear expectation that 15 alternatives and options that are being 16 considered are viable, are reliable, and will 17 continue to keep the lights on here in the 18 province. So we've developed a set of 19 alternatives and we've taken those 20 alternatives and run them through an initial 21 screening process, and that screening is 22 intended to identify and make sure that we 23 focus on options that have the highest 24 potential to ensure effective expenditure of 25 rate payer's money. With those initial</p>

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<p>1 screened options prepared, we then develop an</p> <p>2 optimized least cost generation expansion plan</p> <p>3 using Strategist for the supply options that</p> <p>4 have advanced through our initial screening.</p> <p>5 So the important point here is that we look at</p> <p>6 that broad set of initial options, screen them</p> <p>7 down to a set that is technically and</p> <p>8 economically feasible, and then develop an</p> <p>9 optimized expansion plan using those in</p> <p>10 Strategist.</p> <p>11 There's some important screening</p> <p>12 principles that are applied on that broad set</p> <p>13 of options. First, security of supply,</p> <p>14 reliability, technical feasibility, is first</p> <p>15 and foremost a consideration for us. Cost to</p> <p>16 rate payers is important. Environmental</p> <p>17 considerations associated with some of those</p> <p>18 options, as well as the inherent risks and</p> <p>19 uncertainties, as well as the financial</p> <p>20 viability of some aspects of the expansion</p> <p>21 plan that would be non-regulated. So with</p> <p>22 that screening process undertaken, the</p> <p>23 alternatives now group into two broad</p> <p>24 categories. We have a set of options that are</p> <p>25 applicable in an isolated scenario where the</p>	<p>1 electrical system on the island continues to</p> <p>2 operate in isolation of the North American</p> <p>3 grid, and in this case new generation capacity</p> <p>4 is limited to what can be developed on the</p> <p>5 island. So if we don't have an</p> <p>6 interconnection to the rest of North American,</p> <p>7 we can't import, we can't get energy from</p> <p>8 other locations because we don't have the</p> <p>9 interconnection, which leads us to the second</p> <p>10 broad set of alternatives which looks at it on</p> <p>11 an interconnected basis, and now we're able to</p> <p>12 use generation sources that are off the</p> <p>13 island. So generation resources in Labrador,</p> <p>14 for example, now are available to the</p> <p>15 Strategist analysis. So we're using</p> <p>16 generation sources that depend on at least one</p> <p>17 transmission interconnection to the system.</p> <p>18 So the results screen down to in the isolated</p> <p>19 island case, our thermal alternatives are</p> <p>20 simple cycle and combined cycle combustion</p> <p>21 turbines, wind is a resource that we can</p> <p>22 develop, as well as the island hydro-electric</p> <p>23 alternatives. In the interconnected case, we</p> <p>24 have that group of options as well as the</p> <p>25 Labrador hydro-electric resources which could</p>
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<p>1 be brought to the island using a transmission</p> <p>2 interconnection. So the Labrador resources</p> <p>3 and the transmission interconnection are added</p> <p>4 to the set that's available, the isolated</p> <p>5 alternative. So at this point we have a set</p> <p>6 of supply options, and we're going to use</p> <p>7 Strategist to optimize that set into a least</p> <p>8 cost expansion plan for an isolated case, and</p> <p>9 a least cost expansion plan for the</p> <p>10 interconnected case. In other words, we have</p> <p>11 the best isolated alternative, we have the</p> <p>12 best interconnected island alternative, and</p> <p>13 then we're going to compare the costs in those</p> <p>14 two optimized alternatives. I think it's</p> <p>15 important to point out here that each of those</p> <p>16 alternatives is assembled with a set of</p> <p>17 generation options. So the isolated island</p> <p>18 alternative is not simply one plan, it's the</p> <p>19 best plan of a combination of wind and hydro</p> <p>20 and thermal resources that we can put together</p> <p>21 to meet our reliability criteria, and if it's</p> <p>22 also the least cost of all the potential</p> <p>23 configurations that you could build with those</p> <p>24 generation options. The same is true for the</p> <p>25 interconnected island alternative, that it is</p>	<p>1 the least cost scenario that can be put</p> <p>2 together with the generation options available</p> <p>3 in that plan.</p> <p>4 I think it's important to reflect on</p> <p>5 conservation and demand management. This is a</p> <p>6 topic that has come up on many occasions and</p> <p>7 our view, first of all, with respect to</p> <p>8 conservation and demand management is that our</p> <p>9 electricity supply sources, all of them are</p> <p>10 important resources, they're valuable</p> <p>11 resources, and we all need to use those</p> <p>12 resources effectively. We need to conserve</p> <p>13 these valuable resources. That being said,</p> <p>14 however, our response to date for CDM programs</p> <p>15 and initiatives has been modest, and it has</p> <p>16 lagged targets that we have established both</p> <p>17 between us and Newfoundland Power. We'll</p> <p>18 continue to pursue conservation and energy</p> <p>19 efficiency measures, but because of the</p> <p>20 uncertainty of the outcomes with respect to</p> <p>21 conservation and demand management, we have</p> <p>22 not incorporated specific targets into our</p> <p>23 load forecast, and we have not considered as</p> <p>24 an alternative to new generation. However, we</p> <p>25 have completed sensitivity analyses within our</p>

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<p>1 financial analysis to study and to indicate 2 the effect of conservation and demand 3 management programs in our analysis. So with 4 the process now where we have the load 5 forecast, we have a set of alternatives, and 6 we've completed an optimization, I'd like to 7 take some time now and talk about the isolated 8 alternative and look at the optimized set of 9 generation expansion options that falls out of 10 our analysis.</p> <p>11 So at the outset, the alternative 12 includes proven technologies and supply 13 options that have passed our initial 14 screening, and secondly, have been 15 sufficiently engineered to ensure that they 16 can meet reliability, environmental, and 17 operational requirements. So we have to set 18 that as the initial test before we can move 19 any further. It's also important to note that 20 this alternative is heavily dependent on 21 thermal generation, and with those two points 22 in mind, there is at the end a high level of 23 certainty that the elements in this plan can 24 be permitted, constructed, and integrated 25 successfully with existing operations. So the</p>	<p>1 optimized isolated alternative sees a 2 combination of wind and hydro, as well as 3 thermal generation being added to the system. 4 In this scenario, one of the first things we 5 would do is put another 25 megawatts of wind 6 on the system, followed quickly by 7 construction of the small hydro resources that 8 we've identified in our submission, that being 9 Island Pond, Portland Creek, and Brown Pond. 10 It's important to note that we would also - 11 consistent with direction that's been provided 12 by Government of the energy plan, install and 13 commission pollution control technology on the 14 existing Holyrood facility. That would 15 consist of electrostatic precipitators and 16 scrubbers for sulphur emissions, as well as 17 low NOx burners for nitrogen oxide emissions. 18 Beyond this initial work in the next decade, 19 we see the first combine cycle unit being 20 installed on the system for 170 megawatts, 21 simple cycle combustion turbines for capacity, 22 two of those are added, and the wind PPAs that 23 we have would be renewed in the latter part of 24 the next decade, and then post 2030, we would 25 see the replacement of the Holyrood facility</p>
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<p>1 and additional thermal generation being added 2 to the system.</p> <p>3 As Ed pointed out earlier, the most 4 significant consideration in this isolated 5 plan is the considerable expense associated 6 with fuel. So if we look at the cumulative 7 present worth of this expansion plan at just 8 over 8.8 billion dollars, almost 70 percent of 9 that CPW is going towards fuel, imported oil 10 onto the system. So when we look at the risk 11 in this plan, the risk here is fuel prices, 12 the risk here is fuel price volatility, and 13 there's also a risk associated with greenhouse 14 gases that we have not included in our model, 15 but all of those considerations associated 16 with thermal generation are inherent in this 17 plan. So when somebody says that there's a 18 risk in the construction associated with 19 Muskrat Falls and the link, there is also a 20 significant risk in this alternative as well.</p> <p>21 In terms of fuel forecasting, we obtain 22 our fuel price forecast from PIRA. PIRA is an 23 international company whose business it is to 24 provide fuel forecasts. Their work and their 25 products are widely used in the industry, both</p>	<p>1 in the utility sector, as well as in other 2 parts of the oil and gas industry. So we have 3 a 20 year fuel price forecast from PIRA, and 4 beyond that forecast period, we held the fuel 5 price constant in real terms. So the 6 escalation of fuel prices beyond our 20 year 7 forecast period is simply escalated at the 8 same rate we're escalating our CPI escalation 9 through the remainder of the study term. I 10 think it's important to look at the expected 11 escalation during the forecast period from 12 PIRA. So from 2010 to 2025, the compound 13 annual growth rate ranges from 3.5 to 4.5 14 percent, depending on the fuel source. So 15 whether it's #6 or #2 fuel in the forecast, 16 the escalation rate averages around 4 percent. 17 So beyond our 20 year forecast period, we're 18 actually escalating beyond that at about 2 19 percent. We've included forecasts from the 20 National Energy Board and the Energy 21 Information Administration from the US, based 22 on a request for information, and those 23 forecasts extend to 2035, and the numbers in 24 those forecasts are consistent with the 25 forecast that we're using in our analysis.</p>

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<p>1 MHI tested the fuel forecast to 1 percent 2 below our escalation rate, and we didn't see a 3 material change in the CPW. 4 Given the reliance on thermal generation, 5 it's important to reflect on the Holyrood 6 Thermal Generating Facility. Of course, this 7 facility is 40 years old, it's an oil-fired 8 facility without environmental controls. As I 9 mentioned earlier, the energy plan contains 10 commitments for electrostatic precipitators 11 and scrubbers for sulphur dioxide, and 12 particularly the emissions at that facility at 13 a cost of almost 600 million dollars, and to 14 address nitrogen oxide emissions, low NOx 15 burners have been included in the expansion 16 plan. So these measures with a total cost of 17 approximately 600 million dollars will not 18 address GHG emissions at that facility. So 19 while we haven't included any cost for carbon 20 and GHG emissions in our analysis, we would 21 note that that is a risk. The other 22 consideration with respect to Holyrood is that 23 we have identified an added life extension 24 costs for the period between 2016 and 2029 to 25 the tune of approximately 230 million dollars.</p>	<p>1 So at the end of our study, the Holyrood 2 facility will be approximately 70 years old; 3 however, we have taken it out to that period, 4 I think, as a reasonable and conservative view 5 of that facility. Someone could debate that. 6 Another risk here is the possibility of the 7 imposition of greenhouse gas regulation. 8 Those are potential issues that we've not 9 included in our analysis, and probably are 10 best handled as a sensitivity analysis as 11 we've done at the end of the analysis. 12 If we look at the interconnected island 13 alternative, now we have an alternative that's 14 basically founded on an interconnection to 15 Labrador, and then the availability of 16 generation resources from Labrador. I think 17 we see we have a scenario that's now to a 18 large extent driven by the Muskrat Falls 19 facility. Muskrat Falls Hydro Facility at 124 20 megawatts, a 900 megawatt Labrador-Island 21 transmission link to deliver that production 22 to the island. The average annual production 23 for Muskrat Falls is 4.9 terawatt hours, and 24 Holyrood in this scenario would be displaced 25 by approximately 2021, and generators at that</p>
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<p>1 point in time at the facility will operate as 2 synchronous condensers, and they'll provide 3 voltage support on the eastern Avalon 4 Peninsula. As with the isolated island 5 alternative, of course, we're using proven 6 technologies and supply options, but this 7 scenario is predominantly driven by renewable 8 energy. It does include some elements of 9 thermal generation post 2033, and that's 10 driven by capacity shortfalls in the system, 11 and not energy shortfalls. So in our analysis 12 we identified short periods where we would 13 need additional capacity of the system, but we 14 did note that the renewable resources had 15 sufficient capability to meet our firm energy 16 demands. This is a situation where we have 17 very small fuel exposure, but a requirement to 18 have capacity for short periods of time on 19 peak. This scenario practically eliminates 20 our dependence on fuel and the volatility of 21 fuel pricing for energy supply and removes the 22 exposure to GHG emissions and carbon costs. 23 Now if we look at the expansion plan, 24 this expansion plan is primarily driven by 25 Muskrat Falls and the link which will be in</p>	<p>1 service 2016/2017 time frame. So we see it 2 coming in service here, Muskrat at 824, the 3 link at the same time in 2017. We have a 4 short term capacity shortfall just before 5 2015, and we would see adding a single simple 6 cycle combustion turbine in order to get by 7 that capacity shortfall. Holyrood will go 8 into standby with the commissioning of the 9 link and would be taken out of service as a 10 generating facility approximately 2021. At 11 the latter part of the study period, as I 12 mentioned, we do have some capacity issues and 13 post 2030, we will see the addition of 14 additional hydro and thermal resources on the 15 system in order to maintain that capacity 16 margin. So the transmission facilities that 17 are associated with this plan include the 18 construction of the 900 megawatt HVDC 19 transmission line from Labrador to the Island, 20 the installation of a converter station at 21 Soldiers Pond, avoids a construction of 230 Kv 22 transmission across the province if the 23 transmission line were to be shorter and 24 located elsewhere. We see the conversion of 25 the Holyrood generators to synchronous</p>

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<p>1 condensers, and as well in our analysis we</p> <p>2 find that we need to replace circuit breakers</p> <p>3 at a number of facilities on the island</p> <p>4 system. Those are included in our cost</p> <p>5 estimates as well.</p> <p>6 The interconnected island CPW at 6652 is</p> <p>7 the basis for the 2.2 billion dollar</p> <p>8 difference in CPW from the isolated</p> <p>9 alternative, and in this case the dependence</p> <p>10 on fuel and fuel cost is fairly dramatically</p> <p>11 reduced and we replace that fuel cost with</p> <p>12 imported energy from Muskrat Falls. So I</p> <p>13 think an important point here is that the 17</p> <p>14 percent fuel allocation is primarily between</p> <p>15 2010 and 2016. Post in-service of Muskrat</p> <p>16 Falls and the link, the amount of fuel used on</p> <p>17 the system is a very small number, it's about</p> <p>18 .4 percent of the total CPW.</p> <p>19 A. So with those two alternatives established,</p> <p>20 now it's important to compare the cumulative</p> <p>21 present worth of both alternatives to explore</p> <p>22 which one is ultimately the least cost</p> <p>23 alternative. So, aligning the CPW components</p> <p>24 of the two alternatives, the key point here is</p> <p>25 that we see the fossil fuel expenditure in the</p>	<p>1 isolated plant, just over six billion dollars,</p> <p>2 and the interconnected plant, just over a</p> <p>3 billion. Of course, the Muskrat Falls power</p> <p>4 purchases have CPW of approximately 2.7</p> <p>5 billion dollars and when we compare the sum of</p> <p>6 the two alternatives, there's a 2.158 billion</p> <p>7 dollar preference for the interconnected</p> <p>8 island alternative.</p> <p>9 Some sensitivity analysis. I think it's</p> <p>10 important to explore the risks of the two</p> <p>11 expansion plants. So if you look at the</p> <p>12 scenario where, you know, we go to a high fuel</p> <p>13 price scenario, so PIRA's high fuel price</p> <p>14 forecast and CPW, the difference between the</p> <p>15 two alternatives is over five billion dollars.</p> <p>16 You can see the exposure in the isolated plant</p> <p>17 to fuel costs and we've updated this analysis</p> <p>18 for a new PIRA forecast in May 2011. So if we</p> <p>19 look at the reference case, 2.158 billion</p> <p>20 compared to a new forecast from the middle of</p> <p>21 2011, the preference for the interconnected</p> <p>22 alternative is over 2.8 billion dollars. The</p> <p>23 effect of the Federal loan guarantee over the</p> <p>24 reference case is approximately 600 million</p> <p>25 dollars and if we include the cost of carbon,</p>
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<p>1 we can increase that CPW preference by</p> <p>2 approximately 500 million dollars.</p> <p>3 Now, looking the other way, if we added -</p> <p>4 - if we can find that we can add additional</p> <p>5 wind to the island system, the CPW preference</p> <p>6 is reduced from 2.1 down to 1.7 billion and</p> <p>7 here we can see the impact of substantial CDM</p> <p>8 savings. So we did two analyses for</p> <p>9 conservation and demand management, one at 375</p> <p>10 gigawatt hours in 2031 and one at 750 gigawatt</p> <p>11 hours in 2031 and they also reduced the CPW</p> <p>12 preference. If the Muskrat Falls and little</p> <p>13 capital expenditure were to go over our</p> <p>14 current estimate by 25 percent, the CPW</p> <p>15 preference would be reduced by approximately</p> <p>16 one billion dollars. A low load growth</p> <p>17 scenario would see it further reduced and the</p> <p>18 PIRA -- finally, the PIRA low fuel price</p> <p>19 forecast sets the CPWs of both alternatives to</p> <p>20 be very similar.</p> <p>21 So, I guess a key point here is that we</p> <p>22 look at these situations, and some of these</p> <p>23 are fairly high probability events. We're</p> <p>24 confident with the Federal loan guarantee. We</p> <p>25 think at some point in time carbon pricing</p>	<p>1 could become a reality. So, we look at sort</p> <p>2 of the scenarios in either direction. We need</p> <p>3 to be careful that we balance these and that</p> <p>4 there's -- you know, when you look through</p> <p>5 them, there are both positive opportunities</p> <p>6 and there are both negative opportunities, but</p> <p>7 in each case in these scenarios, we find that</p> <p>8 there is preference for the interconnected</p> <p>9 island alternative.</p> <p>10 Now as we move forward through our</p> <p>11 decision process, we will have further clarity</p> <p>12 on many of these components and we'll be in a</p> <p>13 better position to address those risks as the</p> <p>14 project definition and as the financial and</p> <p>15 economic situation becomes clearer as we get</p> <p>16 closer to a project sanction decision.</p> <p>17 At this point, I'd like to take some time</p> <p>18 to just briefly look over the Muskrat Falls</p> <p>19 Project. The facilities that are included in</p> <p>20 this alternative, primary facilities, include</p> <p>21 both the Muskrat Falls generation facility</p> <p>22 with a capacity of 824 megawatts, 4.9 terawatt</p> <p>23 hours per year; we have two dams at the site,</p> <p>24 one powerhouse between the two dam locations;</p> <p>25 a reservoir, 60 kilometres long. We see</p>

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<p>1 construction starting in 2012; in service late 2 2016. The cost of the Muskrat Falls facility 3 also includes provision for two transmission 4 lines back to Churchill Falls and the 5 construction cost of all of that work in 6 Labrador is 2.9 billion dollars.</p> <p>7 The Labrador-Island transmission link is 8 the means by which we move that energy from 9 Labrador to the island. It's a nominal 900 10 megawatt capacity line. It extends from 11 Muskrat Falls to Soldier's Pond, which is near 12 Holyrood. It's approximately 1100 kilometres 13 long and includes 30 kilometres underneath the 14 Strait of Belle Isle. Construction is aligned 15 with that for Muskrat Falls, so start up in 16 2012, in service late '16 and the construction 17 cost of this facility is 2.1 billion dollars. 18 So those are the basic elements that are the 19 major part of the interconnected plan.</p> <p>20 The planning process that we've 21 undertaken is what we call a decision gate or 22 gateway process and there are some important 23 elements in that plan. First, we provide 24 checks and balances throughout the process 25 that decision makers require in order to</p>	<p>1 demonstrate that we have an acceptable level 2 of readiness at each stage in the process. 3 So, as we move through this process, we can 4 make two general observations. First of all, 5 the magnitude of expenditures increases as we 6 move through each gate. So preliminary 7 expenditures, you know, for initial screening 8 and additional identification of opportunities 9 is in the order of a million dollars per year. 10 As we move through phase two and phase three, 11 we're moving through tens of millions of 12 dollars per year to hundreds and ultimately in 13 construction, we'll be spending billions. So 14 the significance of decisions as we move 15 forward increases.</p> <p>16 So it's important that we have steps in 17 this process where we have a rigorous review 18 of the work that's been completed and also a 19 rigorous review of our preparation to take on 20 the next step of work and that's what happens: 21 at each gate in this process, we stop and take 22 stock of where we are, what we've done and 23 what we need to be able to do in the next 24 stage. So the gateway process provides us 25 with a systematic control process for managing</p>
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<p>1 the evolution of the project, and at each 2 decision gate, we have a series of steps in 3 the decision making process. So we move from 4 the project team through an independent 5 project review to a group of the Nalcor 6 leadership team, which sits as executive 7 committee, reviews the reports that come 8 forward and ultimately we make a 9 recommendation to our CEO who takes that 10 recommendation ultimately to Nalcor's board 11 and Nalcor's shareholder. At that point in 12 time, a decision has been made to clear a 13 particular decision gate.</p> <p>14 So this process will be repeated at key 15 points throughout our planning process as 16 ultimately we would -- we've made a decision 17 at Decision Gate 2 to undertake our phase 18 three engineering work and our phase three 19 preparation. At Decision Gate 3, a decision 20 will be made to sanction. At Decision Gate 4, 21 a decision will be made to put the plan into 22 service and start operations. So each of 23 those processes has a rigorous set of 24 evaluations and approvals before we get 25 through the gate.</p>	<p>1 So, the project readiness, we look at all 2 of the work that needs to be done, includes 3 several key areas. First, from a business 4 prospective, we have a series of formal 5 agreements, include financing, governance, 6 acquisition of funding and a cumulative 7 present worth analysis or system planning and 8 integration considerations, as well as our 9 facility operations considerations.</p> <p>10 From a project execution and construction 11 perspective, have to look at project 12 management controls, technical engineering and 13 design work, construction execution, 14 contracting and procurement work, health 15 safety and environmental plans and 16 considerations, as well as our operations and 17 maintenance strategy.</p> <p>18 And then finally, there are external 19 factors that include regulatory, environmental 20 and other authorizations, as well as our 21 aboriginal and reviews that are undertaken as 22 part of the process. So some of these 23 processes are within our own control and we 24 would prepare for those and others are 25 external factors that we ultimately have to</p>

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<p>1 have clearance and approval before we can 2 through.</p> <p>3 Some of the major activities that are 4 leading to Decision Gate 3 include our 5 continued engineering efforts to increase the 6 project definition and to obtain a class three 7 capital cost estimate. The procurement and 8 contracting of long lead items is important to 9 us in order to maintain a project schedule, 10 but it's also important to set aside risk. 11 So, if we look at some of the major components 12 in the capital cost estimate, for example, 13 turbine generator sets and submarine cables, 14 it's important for us to have certainty on 15 those so we would start the procurement 16 process in order to have accurate pricing to 17 include in our new capital cost estimate.</p> <p>18 Aboriginal consultation and the 19 agreements that flow from that. So that 20 consultation is an essential consideration in 21 our project planning and it's an important 22 factor in the environmental assessment as well 23 that the environmental release is dependent on 24 clearing and making sure that aboriginal 25 consultation has been undertaken effectively.</p>	<p>1 Commercial financing terms, system 2 integration planning and the operations 3 reliability, regulatory compliance are all 4 steps that are currently under way that would 5 lead us to preparation for Decision Gate 3.</p> <p>6 Take some time to talk about project 7 execution for a second. We come into this 8 project from an execution perspective with an 9 experienced team. The team that we've 10 assembled includes both substantial operations 11 experience within our Nalcor team, as well 12 from a construction perspective, significant 13 Canadian and international project execution 14 experience. So we've assembled both of those 15 competencies within our team and we now have 16 over a hundred people working on project 17 execution for the Lower Churchill. That 18 internal capacity and capability is 19 supplemented by an experienced international 20 engineering, procurement and construction 21 management contractor, that being SNC Lavalin. 22 So between our own core competencies, 23 capabilities that we've brought into the team 24 from a construction perspective, as well as 25 the assistance, advice and expertise that</p>
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<p>1 comes in from SNC Lavalin, I think we're well 2 able to take on the project.</p> <p>3 A fundamental part of our approach is 4 that we're using proven practices here. 5 Project execution approaches and practices, an 6 important one being the notion of front end 7 loading, is improving our cost and schedule 8 predictability in our project planning and the 9 independent reviews that have been undertaken 10 by IPA, IPR, Navigant, as well as by MHI, 11 confirm the use of best practices in our 12 project planning approach. Some important 13 success factors we look at from a project 14 execution perspective include having a clear 15 scope definition of the project, having a 16 solid project execution plan, a realistic cost 17 estimate basis, a straightforward optimal 18 contracting strategy, use of proven 19 technology, as well as a strong owner team 20 that's applying controls to the execution of 21 the project.</p> <p>22 We look at our project planning, it's 23 important that we undertake the work early in 24 the project evolution to set the game or set 25 the stage for project success; that the focus</p>	<p>1 in the early stages of the project is on 2 having an optimum strategy and an optimum 3 project definition. Once we've defined the 4 project and have started construction, we are 5 going to build what we started out with the 6 plan. So the value in project planning is in 7 the early stages where we have the ability to 8 influence and set the stage for project 9 success. Once we've sanctioned, we're going 10 to build what we had planned to build at that 11 point and if that planning is ineffective, 12 we're not going to have a satisfactory 13 outcome.</p> <p>14 So we are putting a significant amount of 15 effort in our early project planning and the 16 process is called front end loading. You have 17 an opportunity to increase the definition of 18 the project, to do field investigations and 19 studies and engineering studies in order to 20 increase the level of definition, you should 21 do it early, so you don't have surprises when 22 you're actually building what you're setting 23 out to do and it's one of the key reasons why 24 our expenditures in the early stages of the 25 project are significant, but when we look at</p>

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<p>1 the total value that's being spent early in 2 the project, that amount, that percentage, is 3 consistent with what we see on other mega 4 projects. Some well executed mega projects 5 have substantial expenditures upfront to make 6 sure the project is well defined and there's a 7 good strategy in place for construction.</p> <p>8 The capital cost on Muskrat Falls first 9 is driven by favourable construction 10 characteristics at the site. So we look at 11 the physical characteristics of Muskrat Falls, 12 the geotechnical conditions are favourable. 13 We're on competent bedrock. We have minimal 14 overburden to move out of the way and those 15 conditions have been validated by a 16 comprehensive set of site investigations on 17 site. So we expect limited exposure with 18 respect to quantity growth on the site. The 19 site is constructible. The construction 20 materials are primarily sourced from 21 excavations on site. There's a good material 22 balance. We have minimal excess material and 23 spoils at the site, and we're using mostly 24 conventional concreting methods and equipment 25 in dry conditions.</p>	<p>1 So other sites, you know, may not have 2 the same characteristics. Certainly, if you 3 look at some other hydro projects, Karahnjukar 4 in Iceland comes to mind, which was a facility 5 that has an extensive system of tunnels to get 6 the water into the powerhouse. So the 7 complexity and risk associated with that 8 construction are different than what we see at 9 Muskrat Falls. We're in a good situation in 10 Muskrat Falls having access to the 11 construction site from the Trans Labrador 12 Highway on the south side of the river and 13 that is actually a major improvement to the 14 site that happened since early work was done 15 on the site back in the late '90s where the 16 project required three diversion tunnels in 17 order to keep the water out of the powerhouse 18 development area. So, when we look at the 19 site specifics of Muskrat Falls, it's a very 20 favourable site to develop.</p> <p>21 Look at the physical layout. We have a 22 relatively compact location. We don't have an 23 extensive series of dikes and dams like you 24 see at Churchill Falls, for example. The site 25 is contained within a relatively small area.</p>
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<p>1 The flow on the Churchill River is reliable 2 and predictable. We have a long record of 3 hydrology for the site. We have a long 4 operating history for Churchill Falls. We 5 have the regulation from the Churchill Falls 6 reservoir upstream on the facility. Power 7 structures are located on one main site, 8 robust and conventional designs for most of 9 the components. As I mentioned earlier, 10 there's no underground works on the site. So, 11 when we look at the characteristics of the 12 site, they're generally favourable.</p> <p>13 From a project execution perspective, 14 it's great to have a good site, but now we 15 need to make sure that we have an approach 16 that eliminates risks along the way as well. 17 So technology decisions become important. We 18 look at the elimination of VSC technology at 19 this point in time in our basis of design that 20 we're using robust, conventional line 21 commutated converter, HVDC technology. We 22 have included a spare cable on the Strait of 23 Belle Isle, recognizing that that is a risk to 24 be considered carefully. We've brought in SNC 25 Lavalin as our EPCM contractor. Geotechnical</p>	<p>1 baseline, the impacts and benefits agreement 2 with Innu Nation have eliminated risks in the 3 program as well. Our preliminary work in our 4 pilot programs on the Strait of Belle Isle, 5 undertaking horizontal direction drilling on 6 the site have de-risked that because we now 7 have, you know, hands-on familiarity with the 8 conditions on the site, both the rock 9 conditions as well as the subsea conditions in 10 the Strait. Our turbine efficiency program 11 and the preliminary turbine model RFV that's 12 been undertaken is done early so that we 13 understand the characteristics of the 14 generating units at the facility.</p> <p>15 So going forward we'll be using similar 16 approaches to make sure that we can identify 17 and mitigate some of the major risks that fall 18 out in execution. So, again, it'll be, you 19 know, early work for major RFPs. So 20 contracting strategies that optimize 21 competition and synergies in the work skill. 22 Early award of bulk excavation contracts so we 23 can maintain the schedule, these are all 24 factors, approaches that we're using in order 25 to mitigate risk associated with the</p>

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1 construction of the Project.
 2 CHAIRMAN:
 3 Q. Can I just stop you there, Mr. Bennett? I
 4 think we need to take a break. Is that
 5 correct?
 6 MS. BLUNDON:
 7 Q. Yes.
 8 CHAIRMAN:
 9 Q. You're looking at me, so -
 10 MS. BLUNDON:
 11 Q. Yes.
 12 CHAIRMAN:
 13 Q. I'm listening to you. She's the real boss
 14 here, you know. So we'll take what? What do
 15 you -- how long would you like? Ten minutes?
 16 MS. BLUNDON:
 17 Q. Ten minutes.
 18 CHAIRMAN:
 19 Q. Ten minutes or so.
 20 MS. BLUNDON:
 21 Q. Ten minutes or so.
 22 CHAIRMAN:
 23 Q. Is that acceptable to everybody?
 24 MR. BENNETT:
 25 Q. Absolutely, great.

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1 looked at all of the components of the project
 2 and all of them have analogs and approaches
 3 and techniques and technologies that have been
 4 used elsewhere in the industry.
 5 So if we look at the Muskrat Falls site,
 6 it is a generally conventional site. We're
 7 not stretching the limits of the state of the
 8 art, you know, across this project. It's a
 9 low head facility. It's a close coupled
 10 powerhouse, founded on rock. The Kapline
 11 turbines are well within their flow and head
 12 range that we see used on a global basis. The
 13 design philosophies are based on four decades
 14 of hydroelectric transmission engineering
 15 construction and operations. We have
 16 conservative efficiency targets for the
 17 equipment and that's supported by equipment
 18 redundancy and the operation of the facility,
 19 that's a core competency and a core capability
 20 of the Nalcor team.
 21 On the transmission side, the
 22 conventional HVDC technology has been used in
 23 Canada for 40 years. The mass impregnated
 24 submarine cables have a demonstrated long term
 25 operating life and they've been used

1 CHAIRMAN:
 2 Q. Okay.
 3 (BREAK)
 4 CHAIRMAN:
 5 Q. I guess we're back to Mr. Bennett.
 6 MR. BENNETT:
 7 A. Thank you, Mr. Chair. So the question of
 8 strategic de-risk, this is a fundamental part
 9 of our project planning. The effort to
 10 identify areas where, you know, we can
 11 mitigate risks has taken up a considerable
 12 amount of thinking on the project team. So,
 13 you'll see here that there are a variety of
 14 strategies and approaches that we're using to
 15 lay down and to mitigate risks that have been
 16 identified in our project planning. So, it's
 17 a point I think I need to reenforce that we
 18 have a good site, but we also need to have
 19 good practice and good strategy to minimize
 20 our project risk.
 21 Another important consideration is using
 22 proven technology, that we don't want to have
 23 serial number one or first-of applications of
 24 new technologies in our project execution.
 25 That, you know, at the end of the day we've

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1 extensively in Europe and elsewhere. The
 2 cable protection methods that we're using for
 3 the Strait of Belle Isle crossing are proven
 4 and have been used in other applications here
 5 in the province, primarily in the east coast
 6 offshore. The overhead HVDC transmission line
 7 is a typical and commonly used arrangement.
 8 The horizontal directional drilling technology
 9 that we've selected for the Strait of Belle
 10 Isle crossing is well within the boundary of
 11 the state of the art, both for size of the
 12 bore hole, as well as the distance that we're
 13 drilling. We're using conventional AC
 14 technology and it's an extension of the
 15 existing Labrador transmission system.
 16 So, it's important that we don't
 17 introduce two risks into the project planning
 18 by finding ways to bring in new technology
 19 unless we can clearly demonstrate that we've
 20 mitigated those risks and that the
 21 introduction adds value to the project. So,
 22 you may have seen in some of the material, for
 23 example, that the volt of source converter was
 24 excluded at this point in time because at this
 25 point in time, we don't see an advantage to

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<p>1 bring that in and we don't need to introduce 2 that risk. So, in all aspects of our 3 planning, conventional, proven approaches, a 4 fundamental part of our project philosophy. 5 The Strait of Belle Isle crossing is one 6 that over the years, I guess, has taken -- has 7 captured a lot of people's interest. We look 8 at, you know, the northern portion of the 9 island, the sea crossing there, the Labrador 10 current, the extensive icebergs that come down 11 the coast of Labrador through Iceberg Alley, I 12 guess, is one area where people have looked at 13 it and said "well, this is a significant risk" 14 and I thought it would be helpful just to take 15 some time and explore that crossing because it 16 has, I guess, a number of unique features, but 17 the crossing itself builds on our team's 18 extensive experience in design and 19 installation of subsea infrastructure in harsh 20 environments and we've learned from other 21 projects that have been completed globally. 22 So the team that's involved in this 23 crossing has experience directly in the 24 Newfoundland offshore. So, the techniques 25 that are used on the Grand Banks for</p>	<p>1 protecting subsea structures we've applied to 2 our project planning. So, each of the three 3 submarine cables on the crossing will have 4 their own dedicated horizontally directionally 5 drilled or HDD conduit that protects the cable 6 on the shore. So, the shore approaches, we 7 have the potential to experience pack ice. 8 Pack ice pushing up against the shore would 9 have the potential to damage a cable on the 10 seabed. So our approach here is to use this 11 drilling technology to get the cable out in 12 deep water, so we avoid that failure approach. 13 The conduit that's drilled from the 14 shoreline takes the cable out to a depth of 15 between 60 and 80 metres and therefore we 16 avoid the potential for iceberg scour and 17 damage to the cable. So once the cable is out 18 on the seabed under 60 to 80 metres of water, 19 the cable is laid on the seabed and then each 20 of the cables will be protected with its own 21 rock berm which will protect against fishing 22 gear and dropped objects on the seabed. 23 So these approaches are new for Nalcor, 24 but are certainly commonly deployed on the 25 Grand Banks. They're used by the offshore</p>
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<p>1 operators on the Grand Banks and the people 2 that have designed and constructed those 3 facilities on the Grand Banks are part of our 4 team. So we're bringing that learning and 5 that capability in to mitigate that risk. 6 We look at the Strait of Belle Isle 7 itself, there's some important features 8 associated with that part of the island and 9 the province that afford protection to the 10 cable as well. So northeast of our Strait of 11 Belle Isle crossing, there's an area of 12 shallow water. The water depth is about 60 13 metres. So if a large iceberg crosses that 14 area, it will ground on that shallow water and 15 it'll stay there until it either melts or 16 breaks up. So by getting our cable into water 17 depth that's below the depth of that shield, 18 we'll protect the cable on the seabed and 19 really the only failure mechanism that we're 20 worried about at that point in time would be 21 fishing gear and fishing activity that may 22 damage the cable in deeper water. But the 23 whole question of iceberg risk and the 24 question of damage to the cable has been 25 valued. It's been analyzed and considered</p>	<p>1 and mitigated so that we can remove that issue 2 as a major risk factor for the project. 3 Procedurally, I guess, in terms of 4 developing the DG2 cost estimate summary and 5 the cost estimate that we have, I think it's 6 helpful to look at the process that we used to 7 develop that cost estimate. First of all, it 8 was a detailed bottom of cost estimate. So in 9 earlier work, we had taken previous estimates 10 and scaled them up. This wasn't the case 11 here. This estimate was built from the bottom 12 up, line item by line item. Of course, that 13 capital cost estimate report was issued at DG2 14 and that's been available to the Board and to 15 the Board's consultant as a confidential 16 exhibit and that report documents our 17 assumptions, our pricing considerations, the 18 risks associated with the capital cost 19 estimate, as well as a contingency that's been 20 developed. In places that -- and for key 21 items, that estimate also included quotes from 22 suppliers and equipment manufacturers. So we 23 were able to supplement the knowledge and 24 insight that the team had in developing that 25 estimate along with specific information from</p>

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<p>1 our vendors in the form of budgetary 2 quotations for major pieces of equipment in 3 the project.</p> <p>4 The estimate has been validated by 5 independent expert external consultants who 6 have been retained specifically to review the 7 capital cost estimate. The escalation factors 8 that are used in the estimate have been 9 validated by external consultants as well and 10 the whole effort of our detailed engineering 11 activities that are being undertaken now is to 12 take those base estimates, the escalation and 13 contingency factors and then update them for 14 DG3. So that we'll take all that work, 15 undertake detailed engineering, update the 16 quantities, materials and so on, and then 17 build a new estimate for our Decision Gate 3.</p> <p>18 So, the whole objective, the objective of 19 this process is to continue to improve the 20 accuracy of the capital cost estimate by 21 completing our detailed engineering design and 22 improving our level of project definition. So 23 on this graph, we have our project at-cost 24 estimate accuracy on the vertical axis and our 25 investment in time and effort on the</p>	<p>1 horizontal axis. So as we continue through 2 our process, at Decision Gate 1, we would have 3 had a class five estimate. At Decision Gate 4 2, we have a class four estimate that has a 5 greater level of definition, that has improved 6 cost estimates in the form of quotations and a 7 more detailed capital cost estimate and 8 therefore, we reduce the level of -- we 9 improve, rather, the level of accuracy in that 10 estimate. Decision Gate 3, we'll have more 11 further engineering work done, quantities will 12 be better defined. The execution strategy 13 will be better defined and we can continue to 14 reduce the level of error inherent in the 15 capital cost estimate as we move through each 16 decision gate. Ultimately, the objective is 17 to predict the final cost of project closeout.</p> <p>18 I won't go through all the detail on this 19 slide because there are many factors here, but 20 the point that I wanted to make was that there 21 is a lot of information, a lot of material, a 22 lot of analysis that goes into the work steps 23 and the work process that takes us from the 24 initial input, the scope of the capital cost 25 estimate, all the way over to a base estimate</p>
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<p>1 at Decision Gate 3. So there are four key 2 factors and a long list of individual 3 components that go into those factors that are 4 used to develop the DG3 capital cost estimate. 5 So we have to define the scope of the project, 6 the scope of the work. We have to identify 7 and define the construction methodology and 8 the schedule or time line factors associated 9 with constructing the facility. Our price 10 factors include the cost inputs into the 11 analysis as well as then performance factors, 12 where we start looking at productivity on 13 site. So we have to have a complete view of 14 those four categories of factors in order to 15 ultimately determine what our base estimate 16 will look like. So we've been undertaking 17 this work as part of our phase three effort. 18 There is a lot of analysis, a lot of detail, a 19 lot of effort that has to be expended before 20 we can create that new capital cost estimate.</p> <p>21 And I should point out, before I step 22 beyond that, that once we have the base 23 estimate, then there is a series of work that 24 has to be taken to evaluate the risks and 25 contingencies associated with that base</p>	<p>1 estimate. So the base estimate is actually an 2 intermediate step in completing the final 3 capital cost estimate with the contingency, 4 with the escalation, with the probabilistic 5 risk analysis assessing the accuracy of that 6 estimate once the base estimate has been 7 created.</p> <p>8 The final topic that I'd like to talk 9 about this morning is the MHI report and I 10 think at the outset, you know, it's important 11 for us to say that, you know, we respect and 12 value MHI's assessment and expertise in this 13 process. From a perspective of a project 14 planner, having additional input, having an 15 opportunity to have an evaluation of the work 16 that we've undertaken is extremely valuable to 17 us and we look at this in the same light as 18 the external and third party reviews that 19 we've done as part of our own internal 20 planning process. Getting feedback from 21 somebody who knows the business is very 22 valuable and helpful for us because it always 23 improves our project planning and our approach 24 and we value that input and we actively seek 25 issues and risks that we need to consider.</p>

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<p>1 We're not interested in spending a whole lot 2 of time looking at what went well. We are 3 really looking for opportunities for 4 improvement and that's a fundamental part of 5 our process as well.</p> <p>6 But in summary, though, we're pleased 7 that MHI concludes that Nalcor's analysis was 8 reasonable, was appropriate and was performed 9 largely in accordance with industry best 10 practices. But that was our objective at the 11 outset and we're glad to have validation that, 12 in general, that those objectives were 13 achieved.</p> <p>14 There were some areas that were 15 identified by MHI. I'll just take a few 16 moments this morning and just review where we 17 are with those. Those four items were the 18 matter of transmission line design criteria, 19 system reliability, AC integration and the 20 application of NERC standards.</p> <p>21 So with respect to transmission line 22 design and the criteria that go into that, of 23 course our objective at the outset is to 24 ensure that the reliability of the 25 Interconnected Island System remains, at a</p>	<p>1 minimum, consistent with our historical 2 experience and a fundamental principle is that 3 we will not advance an alternative that does 4 not meet an acceptable level of reliability. 5 We complied with the CSA standard respecting 6 design criteria of overhead transmission line 7 and I think in terms of our approach to this, 8 the Labrador-Island link was designed to a one 9 in 50 year return period and that reliability 10 is consistent with the current island system, 11 and the reliability of that line was tested 12 for compliance against our current generation 13 and transmission planning criteria.</p> <p>14 We've looked at increase in the return 15 period of the Labrador-Island link. Certainly 16 we could increase it beyond a target of 50 17 years to one in 150 years and beyond and that 18 certainly does reduce the probability of a 19 failure of that transmission line. But our 20 observation here is that in the event that 21 that failure occurs, the same number of 22 customers will have unserved demand when it 23 happens. So in addition to considering the 24 impact of increasing the return period, an 25 important part of our thinking was to look at</p>
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<p>1 the impact of the outage when it takes place. 2 So the probability of the event is one 3 consideration and it's a very important 4 consideration. But the second important 5 consideration, in our view, is looking at ways 6 to reduce the impact of the outage. We think 7 in this case that reducing the impact would 8 have a greater customer benefit than reducing 9 the probability of the outage in the first 10 place.</p> <p>11 So, if you look at, you know, a situation 12 where enhancements to the transmission line 13 were deemed to be necessary or enhancements 14 rather to the Island Interconnected System 15 were deemed to be necessary, we think that a 16 better cost benefit option for ratepayers is 17 the addition of standby generation on the 18 island. This has a greater customer benefit 19 than increasing the return period on the 20 transmission line. We also note that the 21 reliability of the system will improve with 22 the construction of the new 230 kV line 23 between Bay D'Espoir and Western Avalon and 24 that line is required in both alternatives. 25 And another important point for us is</p>	<p>1 that the addition of the Maritime link to the 2 system further enhances the system 3 reliability, that with the availability of 4 import capability from the Maritime Provinces, 5 we reduce our dependency on the transmission 6 link from Labrador. So the Island system has 7 the ability to obtain power from the Maritimes 8 in the event of a structural failure. So our 9 approach here is to minimize and reduce the 10 impact of the failure by making additional 11 supply available.</p> <p>12 From a reliability perspective, our 13 transmission planning criteria are evaluated 14 based on a deterministic approach to 15 modelling. Now our generation planning is 16 evaluated based on a probabilistic model. So 17 I guess to look at that in some more detail, 18 everyone of our generation alternatives has a 19 forced outage rate associated with it. There 20 is a probability that it will not be available 21 for service because of some unplanned event 22 when it's called to. So we have to deal with 23 that contingency. In terms of our planning 24 here, we looked at the Labrador-Island link as 25 being part of that generation analysis because</p>

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<p>1 it enables the delivery of Muskrat Falls 2 power. The primary purpose of that link is to 3 make Muskrat Falls energy and power available 4 to the Island system from the generation 5 source at Muskrat Falls. So we incorporate 6 the availability of the Labrador-Island link 7 in our probabilistic analysis for generation 8 supply and in that analysis, we assume that 9 the forced outage rate for the link would be 10 0.89 percent per pole. We're of the view that 11 that was an appropriate number and I think MHI 12 concluded that this was a number that was 13 within the range of what they had seen and 14 what they've used themselves, but building on 15 that, beyond DG2, we are implementing a more 16 advanced model and a more comprehensive 17 reliability model that would incorporate all 18 components of that link and that work will be 19 done in contemplation of Decision Gate 3. 20 So this is an ongoing process. It's 21 exactly the same process that we're using for 22 our project construction. As we move forward 23 with greater levels of project definition, we 24 continue to tighten down the criteria and the 25 modelling approaches that we're using in our</p>	<p>1 planning. 2 And that probabilistic model will 3 incorporate our transmission line design 4 criteria, the continuous overload capability 5 that we have in the Labrador-Island 6 transmission link design, the installation of 7 the spare cable in the Strait of Belle Isle 8 crossing, as well as the availability of spare 9 converter transformers and spare smoothing 10 reactors at each converter station. So we are 11 looking at the components that have 12 significant probability for an extended outage 13 and making sure that the spare parts are 14 available to deal with that outage. Those 15 factors will all be incorporated in our 16 probabilistic model. 17 In so far as AC integration studies are 18 concerned, we would agree that it's important 19 that the system be modelled both in Labrador 20 and on the island so that we're confident that 21 the new DC link can be effectively integrated 22 into the AC systems and for Decision Gate 2, 23 we analyzed Teshmont's 1998 Integration Study. 24 That report is filed as Exhibit CE-31 and that 25 integration study evaluates an 800 megawatt</p>
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<p>1 point-to-point HVDC link from Gull Island to 2 Soldier's Pond. 3 The Maritime connection is not included 4 in that study, but that work was added as a 5 later study and we built on the 1998 work with 6 a 2007 study that did study Gull Island and a 7 1600 megawatt three-terminal HVDC system that 8 included terminations at Gull Island, 9 Soldier's Pond and New Brunswick. The 10 analysis indicated or determined that the 11 point-to-point link will have similar 12 characteristics regardless of the change in 13 generation source from Gull Island to Muskrat 14 Falls provided we have transmission capability 15 between the new generating site and the 16 existing Churchill Falls facility, and as a 17 result, Nalcor did have sufficient input data 18 to move through Decision Gate 2 on the 19 understanding and with the intention that the 20 full integration studies for the HVDC system 21 would be completed at Decision Gate 3. 22 NERC or the North American Electricity 23 Reliability Corporation establishes 24 reliability standards for the majority of 25 electric utilities in North America and</p>	<p>1 certainly it is a reliability organization or 2 ERO that was certified by FERC, the Federal 3 Energy Regulatory Commission out of the United 4 States, to establish and enforce reliability 5 standards for the US bulk power system and 6 NERC has developed and enforces reliability 7 standards under the definition of good utility 8 practice. In many Canadian jurisdictions, 9 government policy, government legislation and 10 regulation have provided for reliability 11 oversight by utilities boards in those 12 provinces using the NERC reliability criteria. 13 So that's the use of the regulatory 14 legislative framework. It establishes a role 15 for NERC in those utilities. 16 To date, that hasn't taken place here in 17 the Province, but from our perspective, you 18 know, we look at the situation in -- I guess 19 in looking ahead of that expected regulatory 20 oversight, we have established and instituted 21 a system integration team to investigate the 22 technical system operations reliability 23 regulatory implications for the integration of 24 Muskrat Falls, the link and the Maritime link 25 into the North American system. We do know</p>

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<p>1 that our neighbours, both in Quebec, as well 2 as in Nova Scotia, have regulatory oversight, 3 have provisions for reliability standards and 4 criteria within their respective systems and 5 that both NERC and NPCC, the Northeast Power 6 Coordinating Council, have a role in 7 reliability standards in those neighbouring 8 systems and it will be important for us to 9 ensure that our planning and our operations 10 don't affect the operations of those 11 neighbouring systems and don't compromise the 12 bulk grid in eastern North America.</p> <p>13 So, we're engaging with those 14 jurisdictions. We're also engaging with NPCC 15 to understand how we fit into that regulatory 16 framework and our objective here is to balance 17 the requirements of those neighbouring systems 18 with ratepayer interests here in Newfoundland 19 and Labrador. So, as regulatory oversight, 20 for reliability advances within our province, 21 and understand that's a commitment of the 22 Energy Plan as well, that that oversight will 23 be evaluated and brought forward. We'll be 24 participating in that process, but the most 25 important question for us at this point in</p>	<p>1 time is to absolutely assure that our 2 interconnections with our neighbours don't 3 result in a reliability problem or concern in 4 those jurisdictions while at the same time 5 making sure that our system here operates 6 reliably and operates at a level of 7 performance that we have used and has been 8 implemented over the past number of years here 9 in Newfoundland and Labrador.</p> <p>10 Those are the key points that I wanted to 11 address this morning in the presentation. So 12 just to very briefly summarize.</p> <p>13 Our analysis has indicated and concluded 14 that new generation is required to meet load 15 growth here on the Island system and that 16 Muskrat Falls, the Labrador-Island 17 transmission link, is our least cost solution. 18 It's the most economic least cost option. It 19 takes the Holyrood thermal plant off line and 20 avoids the replacement of that facility with 21 further thermal generation. It enhances our 22 system reliability and security of supply by 23 enabling interconnections both to Labrador, as 24 well as to the Maritime Provinces, and in the 25 long term provides rate stability for our</p>
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<p>1 customers and rates that ultimately will be 2 lower than we would see in an isolated 3 alternative.</p> <p>4 I think that's my last slide. Thank you.</p> <p>5 Thank you, Mr. Chair.</p> <p>6 CHAIRMAN:</p> <p>7 Q. Who's next, Madame? Mr. Johnson or does Mr. 8 O'Reilly have some -</p> <p>9 O'REILLY, Q.C.:</p> <p>10 Q. Mr. Chairman, what we propose to do now, the 11 second part of the -- that's the -</p> <p>12 CHAIRMAN:</p> <p>13 Q. Oh, okay, I'm sorry.</p> <p>14 O'REILLY, Q.C.:</p> <p>15 Q. The formal part of the presentation is 16 concluded. What we're going to do now is 17 we're going to add the panel, a five-person 18 panel -</p> <p>19 CHAIRMAN:</p> <p>20 Q. Oh, okay.</p> <p>21 O'REILLY, Q.C.:</p> <p>22 Q. - which will include Mr. Bennett, but not Mr. 23 Martin, and they'll come in and take their 24 places here and then they're available to be - 25 - to answer questions from the Consumer</p>	<p>1 Advocate and counsel for the Public Utilities 2 Board. So we'll need probably two or three 3 minutes just for them to move in and then 4 we're ready to go. And I also have some -- I 5 have filed, given to counsel, some CV 6 information about the panelists, so those 7 would be available to the Commissioners as 8 they go through, just for their information so 9 they'll know sort of the areas of expertise 10 and what they can expect. The areas of 11 questioning, I assume, will come out of that. 12 So, if we can have another few minutes, we're 13 ready to roll.</p> <p>14 CHAIRMAN:</p> <p>15 Q. All right.</p> <p>16 (BREAK)</p> <p>17 CHAIRMAN:</p> <p>18 Q. Sir.</p> <p>19 O'REILLY, Q.C.:</p> <p>20 Q. Mr. Chairman, thank you. Mr. Commissioners, 21 we had gone through the logistical exercise of 22 organizing the panel here and I'd like to 23 introduce them to you. We've taken the 24 liberty of filing a brief file on each of 25 them, but starting at the table closest to me</p>

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1 at my left is--and moving towards the
2 Commission bench, Mr. Steve Goudie who is the
3 manager of economic analysis investment
4 valuation with Nalcor Energy and next to Mr.
5 Goudie is Mr. Paul Humphries, P.Eng, who is
6 the manger of systems planning, project
7 execution and technical services, Newfoundland
8 and Labrador Hydro. Mr. Bennett, you've met
9 and next to Mr. Bennett's left is Mr. Jason
10 Kean, P.Eng, MBA, who is the deputy project
11 manager for the local, the Lower Churchill
12 Project, Nalcor Energy; and last, Mr. Paul
13 Harrington who is the project director of the
14 Lower Churchill Project for Nalcor Energy.
15 And not to be outdone, we have one more in
16 reserve and sitting to my left is Mr. Paul
17 Stratton who is the senior market analyst with
18 the project execution and technical services
19 with Newfoundland and Labrador Hydro. He's
20 sitting here because we don't think we're
21 going to get very--a volume of questions for
22 him, but if so, we'll have to do a quick
23 changeover and put him over there. So subject
24 to that, Commissioners and Mr. Chairman, the
25 panel is available to entertain any questions

1 from the Consumer Advocate and counsel for the
2 Board.
3 CHAIRMAN:
4 Q. Okay, it's Mr. Johnson, to you, is it?
5 MR. JOHNSON:
6 Q. Yes, it is. Thank you, Mr. Chairman,
7 Commissioners, gentlemen. I should start
8 today by introducing our advisors from the
9 engineering consulting firm, Knight Piesold,
10 who've assisted the Consumer Advocate in
11 relation to this reference. Seated to my
12 immediate right is Mr. Mike Robertson and to
13 his right, Mr. Boris Fichot who is part of the
14 people at that firm who have been advising us
15 and they are joining us from the Vancouver
16 offices, so they got used to some of the rain
17 down here, as opposed to home for a bit. Mr.
18 Chairman, just by way of brief introduction,
19 as you've noted this review or reference is
20 aimed at determining whether the proposed
21 Muskrat Falls generation station and Labrador-
22 Island link HVDC projects are the least cost
23 option for the supply of power and energy to
24 the island of Newfoundland, as compared to the
25 isolated island option over the study period

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1 of 2011 to 2067. And as anybody, I think, who
2 has joined in with the webcast thus far, would
3 now be acquainted with, there are certainly
4 technical issues involved in answering that
5 reference question. There's concepts of
6 cumulative present worth or CPW, there's load
7 forecasting, hydrology, reliability studies,
8 thermal generation, oil price forecasts, base
9 cost estimates, contingencies, escalation
10 allowances, then there's sensitivity testing
11 and many of these topics, of course, were
12 addressed in Nalcor's submission and in the
13 Board's independent consultant's report,
14 Manitoba Hydro International's recent report.
15 And I suppose an observation at the outset is
16 that you couldn't blame a customer for perhaps
17 finding the concepts a bit mystifying, but we
18 should assure them that these are indeed
19 issues that relate to the Board's
20 determination of what is the least cost option
21 as set out in the reference. So hopefully my
22 questions will try to shed some light on the
23 project and why it is being put forward as the
24 least cost option.
25 I guess I would start, gentlemen, with

1 November of 2010, that was when Nalcor passed
2 through decision gate 2 and recommended to its
3 shareholder, being the Government of the
4 Province of Newfoundland and Labrador, that
5 indeed it would be the Muskrat Falls option
6 that would be pursued over the Isolated option
7 and as we've been told this morning and as
8 outlined in the documentation, as of that
9 point, Nalcor's best assessment was that based
10 on the work they had done, this was showing a
11 cumulative present worth preference over 2.2
12 billion dollars or approximately 2.2 billion
13 dollars over the Isolated Island Alternative
14 that was studied, so we're correct so far.
15 And for the people in the room, for people who
16 might be joining us, how did you, in general
17 terms, come to put a 2.2 billion dollar
18 advantage on the option at the time you
19 recommended to government that this was the
20 one?
21 MR. HUMPHRIES:
22 Q. Thank you, I'll address that question.
23 O'REILLY, Q.C.:
24 Q. Might be helpful if Mr. Humphries could
25 identify himself for the purpose of the

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<p>1 record, would that be helpful?</p> <p>2 MR. HUMPHRIES:</p> <p>3 Q. Okay, I'm Paul Humphries, manager of system</p> <p>4 planning and ultimately the decision on the</p> <p>5 requirement to move forward and the</p> <p>6 determination of the best alternative and the</p> <p>7 determination of the cumulative present worth</p> <p>8 between those alternatives is the</p> <p>9 responsibility of my department in system</p> <p>10 planning and based on the inputs to that</p> <p>11 analysis, coming out of the cost estimates and</p> <p>12 work as described by Mr. Bennett in the</p> <p>13 presentation this morning, we took those</p> <p>14 inputs, put them through the strategist</p> <p>15 analysis program and came up with the</p> <p>16 cumulative present worth difference stating</p> <p>17 that the Island Interconnective Alternative</p> <p>18 would be the preference by 2.2 billion.</p> <p>19 MR. JOHNSON:</p> <p>20 Q. And as between the two options compared, you--</p> <p>21 Nalcor made the determination that Muskrat was</p> <p>22 to be pursued, and how did you ensure that as</p> <p>23 between the two options you were comparing</p> <p>24 that you were dealing with the optimal, I</p> <p>25 think as your presentation put it, the optimal</p>	<p>1 scenario under each one?</p> <p>2 MR. HUMPHRIES:</p> <p>3 A. Okay, as explained in the presentation this</p> <p>4 morning, within each of those, the Basic</p> <p>5 Interconnected Alternative and the Isolated</p> <p>6 Island, we had a number of scenarios and</p> <p>7 generation sources that fit into those, that</p> <p>8 were fed into the input and the strategist</p> <p>9 program then did an optimization to ensure</p> <p>10 that within each of these alternatives that</p> <p>11 the least cost scenario was developed for the</p> <p>12 Isolated Island, as well as the Interconnected</p> <p>13 case.</p> <p>14 MR. JOHNSON:</p> <p>15 Q. And this strategist program that is mentioned</p> <p>16 in the materials and which you referred to in</p> <p>17 your answer, Mr. Humphries, what is that?</p> <p>18 MR. HUMPHRIES:</p> <p>19 A. Well it's an industry accepted piece of</p> <p>20 software used to determine this exact</p> <p>21 question, to evaluate generation expansion</p> <p>22 alternatives on a probabilistic basis.</p> <p>23 MR. JOHNSON:</p> <p>24 Q. And just on the point for a moment, when Mr.</p> <p>25 Bennett was going through the presentation</p>
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<p>1 this morning, he referred to a sensitivity</p> <p>2 test where he said well, what would happen if</p> <p>3 we put on more wind, for instance, in the</p> <p>4 Isolated Option and would I understand by</p> <p>5 having that added to a sensitivity that that</p> <p>6 extra wind had been screened out, I take it,</p> <p>7 and wasn't found to be optimal through</p> <p>8 strategists in your analysis?</p> <p>9 MR. HUMPHRIES:</p> <p>10 A. Well in the particular case of wind, yes, it</p> <p>11 was screened out, but the initial screening</p> <p>12 was based on a technical--there are technical</p> <p>13 issues with wind as well in the Isolated</p> <p>14 Island Alternative, given the fact that we are</p> <p>15 isolated from the North American grid and the</p> <p>16 ultimate amount of wind that we could</p> <p>17 integrate into the system is limited. So that</p> <p>18 was also a factor that came into that</p> <p>19 evaluation.</p> <p>20 MR. JOHNSON:</p> <p>21 Q. And why would it be limited, given our</p> <p>22 configuration?</p> <p>23 MR. HUMPHRIES:</p> <p>24 A. Well the fact that we are isolated and the</p> <p>25 fact that wind generation is variable in</p>	<p>1 nature, it only operates when the wind is</p> <p>2 blowing and the fact that when we look at our</p> <p>3 system, and our load is quite variable, it can</p> <p>4 be quite high on a cold winter day, but you</p> <p>5 know, a warm summer night, it is quite low,</p> <p>6 and so to be able to economically integrate</p> <p>7 the wind into the system, we do run the risk</p> <p>8 of, at times of the year, actually spilling</p> <p>9 water to take the wind or we would have to</p> <p>10 curtail the wind.</p> <p>11 MR. JOHNSON:</p> <p>12 Q. And what would be the issue for a customer out</p> <p>13 there about spilling the water?</p> <p>14 MR. HUMPHRIES:</p> <p>15 A. Well once the water is spilled, that's money</p> <p>16 gone over the dam and it will eventually</p> <p>17 correlate into additional oil production at</p> <p>18 Holyrood.</p> <p>19 MR. JOHNSON:</p> <p>20 Q. Okay. Now the 2.2 billion dollar preference</p> <p>21 that had--or approximately 2.2 billion dollar</p> <p>22 preference that you had landed on in November</p> <p>23 of 2010, that seems obviously like a fairly</p> <p>24 large figure and that's in 2010 dollars, I</p> <p>25 take it?</p>

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1 MR. HUMPHRIES:

2 A. That's a cumulative present worth to 2010,
3 yes.

4 MR. JOHNSON:

5 Q. Okay, but at that stage it wasn't sufficient
6 to say well now let's proceed to sanction the
7 project and why would that be? There just
8 wasn't enough work done at that stage?

9 MR. HUMPHRIES:

10 A. Yes, I think that was evident from Mr.
11 Bennett's presentation this morning.

12 MR. JOHNSON:

13 Q. So, tell me then when the decision is made in
14 November of 2010 to tell the government that
15 Muskrat Falls is the option over this Isolated
16 option and you passed through decision gate 2,
17 okay, what did that mean on the ground, as it
18 were, over at Nalcor once that gate had been
19 closed?

20 MR. HUMPHRIES:

21 A. Well, from the project perspective it meant
22 that there was a lot of additional work that
23 we had to do to close the loop. From my
24 perspective in system planning, it didn't mean
25 anything. I still had to continue to plan the

1 system and it looked like that the Muskrat
2 Falls alternative was the way we were going,
3 but I wasn't confident yet, we had to do
4 further work to ensure.

5 MR. JOHNSON:

6 Q. Okay, and the new gateway phase, this phase 3,
7 this is as I understand it, the phase 3
8 engineering and procurement and contracting
9 phase, that's the phase that--that would be
10 descriptor. And when officially did that
11 phase start?

12 MR. HUMPHRIES:

13 A. I think I would refer that question to Mr.
14 Harrington.

15 MR. HARRINGTON:

16 A. This is Paul Harrington, I'll take that
17 question. The engineering, as you said the
18 phase 3 or the engineering and procurement
19 contracting phase which takes us up to gate 3,
20 decision gate 3, that commenced shortly after
21 the decision gate 2 decision was made.
22 Certain number of things triggered into action
23 at that point in time. One of them was the
24 fact that we needed to engage an engineering
25 procurement and construction management

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1 contractor, so we did that, we went out and--
2 went out with a Request for Proposal, we
3 obtained bids in from various engineering
4 contractors, we went through the process of
5 evaluation and we landed on SNC Lavalin as
6 being the group that would--that actually won
7 that contract and we could start then to
8 negotiate with SNC Lavalin for a final
9 contract. That took the period between
10 November and February of--November of 2011 to
11 February--sorry, '10, to February of 2011. So
12 then we were in a position, we signed the
13 contract with SNC Lavalin and then we started
14 to mobilize the resources and put an office in
15 place. The office is, in fact, on Torbay
16 Road. So that was one of the big steps that
17 we took, we brought on that additional help
18 because, you know, we got a good team in
19 place, but we needed the additional horsepower
20 that SNC Lavalin could provide to us on the
21 engineering procurement construction
22 management aspects. They then started the
23 work.

24 MR. JOHNSON:

25 Q. And was there a ramping up of SNC Lavalin over

1 a period of time?

2 MR. HARRINGTON:

3 A. That is correct.

4 MR. JOHNSON:

5 Q. Okay. And as we sit here, how many people in
6 house are engaged in phase 3 activities, how
7 many people are engaged at SNC?

8 MR. HARRINGTON:

9 A. I might have to consult with my colleague for
10 an exact number.

11 MR. KEAN:

12 A. Yes, this is Jason Kean, I'm the deputy
13 project manager for Muskrat Falls and the
14 Labrador-Island Transmission Link. To answer
15 your question, SNC Lavalin has approximately
16 220 persons in the office here on Torbay Road,
17 further, Nalcor has approximately 130 persons.
18 I might add to date that approximately 99
19 percent of the effort that has been expended,
20 the engineering effort by SNC Lavalin, has
21 been done here in St. John's.

22 MR. JOHNSON:

23 Q. And whereabouts is Nalcor in phase 3?

24 MR. HARRINGTON:

25 A. This is Paul Harrington again answering the

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1 question. Phase 3, well we're working hard to
2 get all of the information together to be able
3 to make that decision gate decision and
4 within, within this kind of phase, we're
5 trying to get what is called a class 3
6 estimate and a class 3 estimate has a range of
7 between 10 and 40 percent of project
8 definition. So obviously the more project
9 definition you can get, the more accurate or
10 narrower the range on your accuracy for
11 estimate that you will get. So currently all
12 of those folks are working towards to get all
13 of the information together to be able to come
14 up with a capital cost estimate for DG3 of
15 class 3.

16 MR. JOHNSON:

17 Q. Once the current assessment as to when all of
18 the studies and investigations will be
19 complete for the purposes of phase 3, so that
20 you have reached your goal on project
21 definition and your goal as regards to DG 3
22 cost estimates.

23 MR. HARRINGTON:

24 A. This is Paul Harrington again. We are, you
25 know, striving towards achieving all of that

1 information to give us a quality estimate of a
2 level 3 in accordance with the association of
3 the advancement of cost engineers, and that--
4 our current target is we should have all of
5 the information together by June of this year
6 to be able to make that decision.

7 MR. JOHNSON:

8 Q. As I understand it with the gateway model and
9 in particular the gateway model employed by
10 Nalcor, that the decision gate 3 cost in
11 schedule estimates having been described in
12 Nalcor's submission, as being a key input to
13 verify the financial viability established at
14 decision gate 2, and the materials would
15 indicate that the intended purpose of DG3 is
16 to verify the decision gate estimate in the
17 schedule, to provide an increased level of
18 confidence in outcomes required to facilitate
19 the approval to move forward with project
20 approval or sanction, and to establish the
21 project budget, am I right so far?

22 MR. HARRINGTON:

23 A. That is a good summary.

24 MR. JOHNSON:

25 Q. Okay. Could you expand then on the notion of

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1 gaining an increased level of confidence in
2 outcomes to facilitate approval and in
3 particular, the outcome part first, what are
4 we talking about?

5 MR. HARRINGTON:

6 A. Could you repeat the last bit, I missed it.

7 MR. JOHNSON:

8 Q. Part of the purpose of the DG3 work is to
9 provide an increased level of confidence in
10 the outcomes required to facilitate approval
11 or sanction, and I'm interested in what are
12 those outcomes that we're talking about.

13 MR. KEAN:

14 A. Okay. Again, this is Jason King, the outcomes
15 that are certainly of importance to us are
16 certainly linked to cost in schedule, as well
17 as overall safety and environmental
18 performance, and further, the reliability of
19 the plant. So the work during this gateway
20 phase 3, provides us with a level of
21 confidence that we have fully understood the
22 characteristics of the plant, how it will be
23 built and how it can be delivered on time and
24 on budget, and of course, maintain Nalcor's
25 target safety excellence. So those are the

1 outcomes that we refer to.

2 MR. JOHNSON:

3 Q. On the confidence piece, how much confidence
4 do you require? How do you measure that
5 confidence?

6 MR. KEAN:

7 A. The level of confidence required, you know,
8 it's a bit subjective, you know, we have been
9 focused on front-end loading the project such
10 that the outcomes are very predictable, there
11 is minimal uncertainty as to what the cost,
12 the out turn cost will be, what the out turn
13 schedule will be. So the final decision at DG
14 3 is somewhat subjective, but what we are
15 doing is following a solid and sound process,
16 best practice in terms of establishing a cost
17 in schedule basis. You know, we are
18 collecting significant amounts of engineering
19 data, construction planning data and so on to
20 facilitate the culmination of a project cost
21 estimate. That is an extensive process, it
22 takes a lot of time, a lot of effort and
23 through that process we will identify certain
24 uncertainties, certain risk, we will have
25 taken steps to de-risk the project, to further

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1 understand the project. And as we approach
 2 decision gate 3, we will have gone through a
 3 risk assessment process and understood what
 4 the implications of those uncertainties could
 5 be on the project. And when I refer to
 6 implications, I mean cost in schedule
 7 implications, so we're able to make a, what I
 8 refer to as a risk-informed decision, we're
 9 able to state with confidence what we believe
 10 the likelihood of achieving a target cost in
 11 schedule is and we are able to make, you know,
 12 an informed decision as to whether we need to
 13 have certain contingencies, be it cost or
 14 schedule included there. So that's really how
 15 the decision will be made at that point.

16 MR. JOHNSON:

17 Q. And in terms of the project definition output,
 18 what's the goal of DG3, somewhere between 10
 19 and 40 percent?

20 MR. KEAN:

21 A. Yes, that is correct, we are striving for the
 22 upper end of that.

23 MR. JOHNSON:

24 Q. Okay, and as regards the accuracy of the
 25 costing at DG3, what are we aiming for?

1 MR. KEAN:

2 A. Our target, as indicated by Mr. Harrington, is
 3 to product a class 3 estimate. A class 3
 4 estimate is a control level estimate. It is
 5 an estimate that you manage the execution of
 6 the project against. It's the estimate that
 7 you do your reporting against. The accuracy
 8 of the estimate is certainly, will be much
 9 tighter than what we have at DG2, very tight,
 10 and that will be influenced by the amount of
 11 front-end loading we are undertaking. As for
 12 the actual accuracy of that estimate, that can
 13 only be determined as we work through our
 14 process and undertake a review of those
 15 uncertainties through risk analysis
 16 techniques. So a process of Monte Carol
 17 simulation will be undertaken to facilitate,
 18 providing clarity as to what the actual range
 19 of that estimate would be.

20 MR. JOHNSON:

21 Q. So, in other words, if one were to read in the
 22 AACE that a class 2 estimate or a class 4
 23 estimate has a certain range, you know, in the
 24 textbooks, you are trying to narrow in on the-
 25 on what the true probability is.

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1 MR. KEAN:

2 A. Yes, that is correct.

3 MR. JOHNSON:

4 Q. Okay, and what would be the textbook range for
 5 DG2 verses DG3?

6 MR. KEAN:

7 A. I guess from a textbook perspective, we've
 8 stated that the DG2 estimate would have
 9 generally a range of minus 30 to plus 50,
 10 whilst a DG3 estimate should be in the range
 11 of minus 10 to plus 20. The actual
 12 variability would be confirmed at the point of
 13 when we've concluded our process and assessed
 14 the quality of the base estimate.

15 MR. JOHNSON:

16 Q. Okay, and DC4, then you're back to--you're
 17 commissioning then, right, okay. Now let me
 18 try a report as you're familiar with, related
 19 to the project components and costs as of DG2,
 20 because they indicate that they did not have
 21 access generally to information on the
 22 detailed engineering or financial work
 23 completed after DG2. Can Nalcor explain why
 24 information post DG2 couldn't be made
 25 available?

1 MR. HARRINGTON:

2 A. You know, we made every effort to respond to
 3 all of the information requests to provide the
 4 information that we had available, but as you
 5 can appreciate, you know, the large amount of
 6 work sometimes just doesn't end up with a
 7 final report. There is ongoing activity where
 8 multiple disciplines are involved as well, so
 9 we are not in a position, even now, to
 10 actually provide you with a nice bound set of
 11 there are some final reports. It's ongoing
 12 work and just as an example of the complexity
 13 of the estimate that's being put together,
 14 there are approximately 50,000 line items with
 15 over 100,000 date points, so all of that
 16 information is coming together. So, you know,
 17 we've provided as much information as was
 18 available to us.

19 MR. JOHNSON:

20 Q. At DG3, I understand all inputs done to the
 21 CPW analysis are going to be updated with the
 22 latest available information, sometime in June
 23 or, I think would be the prediction, would
 24 that be right?

25 MR. HARRINGTON:

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<p>1 A. Yes, we're targeting to get, well the capital 2 cost estimate and the work that we are doing 3 is just one element of the CPW analysis. 4 MR. JOHNSON: 5 Q. True, true, which leads to, I think where I 6 was going, because up to that point, you're 7 going to be updating your capital cost 8 estimates, including your base costs, your 9 contingency, your escalation allowance, you'll 10 be updating where you think you will be on 11 scheduling, update of fuel prices, updated 12 demand forecasts, interest rates, exchange 13 rates, and Power Purchase Agreement, all of 14 those get updated at that point. And in terms 15 of, there was some reference in the 16 presentation this morning about the ability to 17 incorporate responses to requests for 18 proposals for major equipment deliverables, 19 and I understand that will be taking place in 20 DG3, but did it also take place in DG2 in 21 terms of the cost estimates? 22 MR. KEAN: 23 A. No, it did not in terms of DG2. We did not 24 have a sufficient level of engineering 25 complete to be able to issue request for</p>	<p>1 proposals, rather we did issue inquiries for 2 budgetary quotes for major items, including 3 our turbine and generators, submarine cable, 4 convertor stations, key transformers, really 5 the bigger pieces of hardware that would be 6 required to construct the facility and for 7 which there could be cost variability. 8 MR. JOHNSON: 9 Q. I guess the question would be whether there 10 could be significant changes between inputs 11 used at DG2 and inputs used at DG3? I presume 12 that there could be. 13 MR. KEAN: 14 A. Yes, that is correct. 15 MR. JOHNSON: 16 Q. And is it possible to give us any insights as 17 to where, you know, those changes might be 18 found or what might be anticipated in that 19 regard? 20 MR. HARRINGTON: 21 A. As I mentioned, you know, it's difficult to 22 predict the outcome based upon incomplete 23 activities, with you know, I wouldn't be doing 24 my job if I were to second guess the work 25 that's being carried out right now by a team</p>
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<p>1 of estimators and engineers to develop all of 2 those data points, over a hundred thousand, as 3 I mentioned earlier, to be able to guess or 4 second guess what the capital cost outcome 5 might be. I have to have faith in the process 6 to get us to that point, so I have no 7 indications either way at the moment. 8 MR. JOHNSON: 9 Q. At this stage we know from the record that 10 there are some additional information to 11 consider, there's an additional oil price 12 forecast for May of 2011 and since DG2, there 13 was also a commitment to provide a loan 14 guarantee, and I guess in connection with the 15 reference question that the Board has before 16 it, what use should we make, the Board make, 17 of this updated information, if any in the 18 context of the review question? 19 MR. HARRINGTON: 20 A. I think that might be--not for me. 21 MR. HUMPHRIES: 22 A. Yes, this is Paul Humphries, there are a 23 number of inputs, besides the capital cost 24 that are going to go into this evaluation, 25 there is the effect of the loan guarantee,</p>	<p>1 there is the effect of a new fuel forecast and 2 load forecast and there may be puts and takes 3 on all, and to say with any level of 4 confidence what that would have in the 5 ultimate outcome, we're not in a position to 6 do that now because we don't have all the 7 inputs, but if you look at the sensitivity 8 analysis that we did complete, that will give 9 you an indication of the directions in those 10 independent variables, good point. 11 MR. JOHNSON: 12 Q. What, as at DG2 there had not been a 13 commission from Canada to provide the 14 guarantee, so what use was made of the 15 prospects of receiving the guarantee in 16 relation to the Muskrat Falls Labrador-Island 17 Link Project for DG2, from the DG 2 18 recommendation? 19 MR. BENNETT: 20 A. Yes, this is Gilbert Bennett, the DG 2 21 analysis did not assume that the federal load 22 guarantee was in place and that we would be 23 financing the project using a conventional 24 project financing approach for the 25 transmission assets and a hundred percent</p>

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<p>1 equity for the generation assets.</p> <p>2 MR. JOHNSON:</p> <p>3 Q. I want to zero in a little bit more on the</p> <p>4 cost estimate input, in particular in relation</p> <p>5 to the Muskrat Falls Labrador-Island Link, and</p> <p>6 just start with the general observation that</p> <p>7 was made in Nalcor's submission that it is</p> <p>8 typical for the capital cost estimate to</p> <p>9 evolve as the project definition matures, and</p> <p>10 of course, we know that the cost estimates are</p> <p>11 broken down into base cost, contingencies and</p> <p>12 escalation allowances. In terms of the</p> <p>13 contingency part, explain what we mean by</p> <p>14 "contingency" because I understand we have a</p> <p>15 15 percent contingency on a big project and</p> <p>16 what would be captured by that contingency?</p> <p>17 MR. BENNETT:</p> <p>18 A. The contingency, the estimate of contingency</p> <p>19 is designed to address for unknowns in the</p> <p>20 estimate elements, basically. We talked about</p> <p>21 in the presentation the estimate having four</p> <p>22 major inputs, the base estimate, so as you can</p> <p>23 appreciate there is variability in each of</p> <p>24 those main elements. So in order to capture</p> <p>25 the variability we try to understand certainly</p>	<p>1 the--try to quantify that variability and make</p> <p>2 an assessment of that through a process of</p> <p>3 Monte Carlo simulation. Now we have and</p> <p>4 continue to use an industry recommended</p> <p>5 practices for that process, further we have</p> <p>6 engaged our consultant, Westney Consulting out</p> <p>7 of Houston to support that assessment. So</p> <p>8 it's a fairly thorough assessment. In the</p> <p>9 case of DG2, our recommended contingency was</p> <p>10 validated by an independent project analyst</p> <p>11 during our decision gate 2 analysis and they</p> <p>12 indicated that we were where we need to be for</p> <p>13 the review and the level of maturity of the</p> <p>14 project.</p> <p>15 CHAIRMAN:</p> <p>16 Q. What do you mean by "Monte Carlo", I mean,</p> <p>17 that's not a--do you know what that means Mr.</p> <p>18 Johnson?</p> <p>19 MR. JOHNSON:</p> <p>20 Q. I think it has to do with dots being put on a</p> <p>21 page to give you a sense of the probability of</p> <p>22 where you're going to end up between ranges,</p> <p>23 would that be accurate or somewhat accurate?</p> <p>24 MR. BENNETT:</p> <p>25 A. Somewhat accurate, I think there are -</p>
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<p>1 MR. JOHNSON:</p> <p>2 Q. I shouldn't have fallen (phonetic) it.</p> <p>3 O'REILLY, Q.C.:</p> <p>4 Q. Somewhat accurate means you're not completely</p> <p>5 wrong.</p> <p>6 CHAIRMAN:</p> <p>7 Q. You know what we all think of when we think of</p> <p>8 Monte Carlo, we think we're rolling dice or</p> <p>9 something else equally as -</p> <p>10 MR. BENNETT:</p> <p>11 Q. Well I can't speak to all of the origins of</p> <p>12 the technique, but it is a sampling technique</p> <p>13 whereby, you know, probability of events are</p> <p>14 evaluated and the culminated effect of</p> <p>15 potential events that occur, come up with a</p> <p>16 recommendation or a distribution of outcomes</p> <p>17 and you choose from an outcome based upon the</p> <p>18 level of confidence that one would wish to</p> <p>19 have.</p> <p>20 CHAIRMAN:</p> <p>21 Q. So it's a question type, probability, I guess,</p> <p>22 is it?</p> <p>23 MR. BENNETT:</p> <p>24 A. It is, P10, P90, those things.</p> <p>25 CHAIRMAN:</p>	<p>1 Q. Okay, that makes sense, I understand that.</p> <p>2 MR. JOHNSON:</p> <p>3 Q. This concept of capital costs evolving as the</p> <p>4 project definition matures, would--does that</p> <p>5 generally mean that the estimate typically</p> <p>6 increases as a project definition matures,</p> <p>7 albeit in a narrower range of accuracy?</p> <p>8 MR. BENNETT:</p> <p>9 A. No, it doesn't mean that the estimate</p> <p>10 increases, it means that as the estimate</p> <p>11 matures, there is less variability in each of</p> <p>12 the inputs, you have greater certainty on all</p> <p>13 aspects of the estimate, be it major</p> <p>14 quantities, you know, wage rates and so on,</p> <p>15 you've done the investigation to verify that.</p> <p>16 CHAIRMAN:</p> <p>17 Q. So, it's a rising P.</p> <p>18 MR. BENNETT:</p> <p>19 A. Yes. So it's an extensive process, and only</p> <p>20 by the process of front-end loading and</p> <p>21 undertaking necessary engineering</p> <p>22 investigations can you get to a point of</p> <p>23 having confidence in the inputs to your</p> <p>24 estimate.</p> <p>25 MR. JOHNSON:</p>

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<p>1 Q. Could we turn up, Mike, page 71 of 92 of the</p> <p>2 Nalcor submission? In particular, it's Table</p> <p>3 2. It's volume 2. And here we have a summary</p> <p>4 of the Muskrat Falls and Labrador-Island Link</p> <p>5 capital cost estimates for DG2, which would</p> <p>6 indicate, as we can see on the screen, a base</p> <p>7 estimate for the Muskrat Falls generating</p> <p>8 facility of 2.2 billion, there was historical</p> <p>9 costs of 20 million pre to 2010 and then you</p> <p>10 minus those historical costs to come up with</p> <p>11 your adjusted base costs, you add your</p> <p>12 contingency and escalation allowance and we</p> <p>13 see similarly in the next line down, the</p> <p>14 Labrador-Island Transmission Link costs, which</p> <p>15 totalled to 2.06, but of course, that summary</p> <p>16 does not include the contingency or the</p> <p>17 escalation allowance and--no, I'm sorry, it</p> <p>18 does, it includes the 670 million combined</p> <p>19 estimate contingency and escalation allowance</p> <p>20 for Muskrat Falls in generating, and about 444</p> <p>21 million in combined estimate, contingency and</p> <p>22 escalation allowance for Labrador-Island</p> <p>23 Transmission Link, so that's sort of the big</p> <p>24 picture of the costs and I want to drill down</p> <p>25 a little bit further now and a convenient</p>	<p>1 place to do that is actually Exhibit 101,</p> <p>2 which is the Navigant Report on page 38, which</p> <p>3 gives a breakdown of the components of each of</p> <p>4 the projects or of the Muskrat Falls and</p> <p>5 Labrador-Island Link Project. In particular</p> <p>6 I'm looking at Table 4 on page 38 of the</p> <p>7 Navigant Report.</p> <p>8 MR. HARRINGTON:</p> <p>9 A. Excuse me, we don't seem to have that table.</p> <p>10 Is the reference correct?</p> <p>11 GREENE, Q.C.:</p> <p>12 Q. There may be a difference with the page</p> <p>13 reference on the exhibit, verses the page</p> <p>14 number in the actual report.</p> <p>15 MR. JOHNSON:</p> <p>16 Q. Okay. Oh, I'm sorry, so it would be page 38</p> <p>17 of the exhibit then--no, page 31 of the</p> <p>18 report.</p> <p>19 GREENE, Q.C.:</p> <p>20 Q. You're looking for Table 4, keep going.</p> <p>21 There.</p> <p>22 MR. JOHNSON:</p> <p>23 Q. Thank you, so these would be the components of</p> <p>24 that cost estimate for Muskrat Falls and the</p> <p>25 Labrador-Island Link. Now, as we look at</p>
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<p>1 these, we can leave these on the screen for a</p> <p>2 moment and we'll get back to them, but I take</p> <p>3 it that it's true that as the project</p> <p>4 definition increases, so does the accuracy</p> <p>5 around the costs, I think we've established</p> <p>6 that. And I take it that there is a consensus</p> <p>7 that there were varying degrees of project</p> <p>8 definition as amongst the various components</p> <p>9 of the Muskrat Falls Labrador-Island Link</p> <p>10 Project at the time of DG2, would that be</p> <p>11 fair?</p> <p>12 MR. KEAN:</p> <p>13 A. Yes, that is correct.</p> <p>14 MR. JOHNSON:</p> <p>15 Q. Okay, and as a matter of fact, that's a point</p> <p>16 confirmed by Manitoba Hydro International's</p> <p>17 report at page 35, because they make the</p> <p>18 observation that DG2 used a class 4 accuracy</p> <p>19 level at the study or feasibility stage. At</p> <p>20 GD3, Nalcor proposes to use a class 3 accuracy</p> <p>21 level for the budget authorization or project</p> <p>22 sanction stage and they say "Typically in the</p> <p>23 early steps of a project's development, a mix</p> <p>24 of cost estimate classes would be used as</p> <p>25 evidenced by what MHI has seen in the case of</p>	<p>1 Muskrat Falls generating station and the</p> <p>2 Strait of Belle Isle marine crossing which</p> <p>3 were studied more extensively than the other</p> <p>4 components." So would you agree with their</p> <p>5 characterization that these were studied in</p> <p>6 fact more closely than the other components?</p> <p>7 MR. HARRINGTON:</p> <p>8 A. I mean, studies are very difficult to compare,</p> <p>9 but I mean, I think it's fair to say that</p> <p>10 there's been different effort put into</p> <p>11 different areas.</p> <p>12 MR. JOHNSON:</p> <p>13 Q. And there's no disagreement, I was just--if we</p> <p>14 could turn up page 75 of 92 of the Nalcor</p> <p>15 submission for a second, there's reference</p> <p>16 made to, in the case of Muskrat Falls</p> <p>17 Generating Facility, Nalcor says that "In the</p> <p>18 case of the Muskrat Falls Generating Facility,</p> <p>19 where detailed definition exists, significant</p> <p>20 portions of the base estimate have been</p> <p>21 developed using a comprehensive and detailed</p> <p>22 approach working from the lowest level of</p> <p>23 detail and building the estimate up, using</p> <p>24 available information on quantities; unit</p> <p>25 cost; wage rates; bulk construction;</p>

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1 consumables, example: Portland Cement; diesel
 2 fuel; rebar, et cetera; construction fleet
 3 cost; major permanent quotations and
 4 historical production rates. In some areas,
 5 such as the balance of plant and spillway
 6 gates, third party benchmarks from as-built
 7 plants combined with current unit costs have
 8 formed the basis of the estimate." And I
 9 guess the question that I would have is what
 10 degree of project definition would Nalcor
 11 ascribe to the Muskrat Falls Generating
 12 Facility, having regard to how you've
 13 described it in your submission?
 14 MR. HARRINGTON:
 15 A. So just repeat the question because we were
 16 just kind of bouncing--so what degree of
 17 completion at DG2?
 18 MR. JOHNSON:
 19 Q. At what degree of project definition.
 20 MR. HARRINGTON:
 21 A. At DG2?
 22 MR. JOHNSON:
 23 Q. At DG2.
 24 MR. HARRINGTON:
 25 A. Okay, at DG2, you know, I think we were

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1 read it from that, but it's a little bit
 2 difficult. So in the middle of class 4, I see
 3 10 percent, right?
 4 MR. JOHNSON:
 5 Q. Okay, yes. And so I guess what I'm trying to
 6 get at is that it seemed to me, based upon
 7 Nalcor's submission, where the submission
 8 spoke about detailed definition existing for
 9 significant portions of the base estimate, et
 10 cetera, I invite your comment on where you
 11 would find your Muskrat Falls Generating
 12 Project fitting on that degree of project
 13 definition as at DG2?
 14 MR. KEAN:
 15 A. Just from a degree of definition certainly
 16 suitable for a class 4 estimate in accordance
 17 to AACE international recommended practices.
 18 The graphic that's displayed there is
 19 representative of projects in the process
 20 industry and going back to Mr. Bennett's
 21 presentation this morning, many of the
 22 characteristics of our Muskrat Falls' site
 23 lend itself to much more predictable costs
 24 because of its--I guess it's not lending as
 25 much new technology and so on, so what you

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1 consistent with a class 4 estimate and the
 2 class 4 estimate--if I have my papers
 3 together, is in the region of up to 5 percent
 4 of project definition.
 5 MR. JOHNSON:
 6 Q. If I could address your attention to figure 7
 7 at MHI's report, which occurs on page 35 of
 8 their report.
 9 MR. HARRINGTON:
 10 A. All right.
 11 MR. JOHNSON:
 12 Q. Volume one. Right here at figure 7, we have a
 13 graphic representation of the AACE cost
 14 estimating accuracy classes.
 15 MR. HARRINGTON:
 16 A. That's correct.
 17 MR. JOHNSON:
 18 Q. And the way I read that graph along the
 19 horizontal axis, is that a project that has
 20 somewhere between 3 to 15 to 18 percent degree
 21 of project definition would be considered
 22 class 4, would you read it the same way as I
 23 do?
 24 MR. HARRINGTON:
 25 A. I can't read it from this--okay, I'm trying to

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1 would see, you would see--if this graph was
 2 designed directly for Hydro projects, you
 3 would see this shrinking considerably and
 4 conveying that there is more certainty in the
 5 costs of a class 4 estimate than what this
 6 graph actually indicates.
 7 MR. JOHNSON:
 8 Q. I guess in relation then to the comment about
 9 the Strait of Belle Isle Marine crossing, as
 10 MHI referred to that as another example of use
 11 of mix classes of costing accuracy, and I
 12 think Nalcor's submission refers to the fact
 13 that there was extensive field work and
 14 studies completed for the Strait of Belle Isle
 15 cable crossing, a similar question would be
 16 what degree of project definition would Nalcor
 17 ascribe to the Strait of Belle Isle marine
 18 crossing as a DG2?
 19 MR. HARRINGTON:
 20 A. Okay, so with regards to the Strait of Belle
 21 Isle, you know, MHI were quite correct, you
 22 know, we did feasibility type work to arrive
 23 at the DG2 study--the DG2 estimate, so that
 24 included some site investigation work, but
 25 just to illustrate how we're moving from that

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<p>1 DG2 to DG3, we're currently or we have carried</p> <p>2 out this year a marine survey work of the</p> <p>3 actual Strait of Belle Isle, which has allowed</p> <p>4 the feasibility engineering work to start</p> <p>5 moving into that detailed engineering work.</p> <p>6 We're also carrying out a, a pilot call for</p> <p>7 the horizontal directionally drilled holes</p> <p>8 that Mr. Bennett referred to in his</p> <p>9 presentation, which will get the cables down</p> <p>10 to a deep point in the Strait of Belle Isle</p> <p>11 which will then avoid iceberg contact and pack</p> <p>12 ice contact. So to give you an illustration</p> <p>13 of that, is that more than five, ten percent?</p> <p>14 That's--it's very subjective in that regard.</p> <p>15 MR. JOHNSON:</p> <p>16 Q. But certainly, you would have a lower -- to</p> <p>17 the left of the horizontal line, to the left</p> <p>18 side more to -- than to the right?</p> <p>19 MR. HARRINGTON:</p> <p>20 A. I think this one, you know, I think MHI also</p> <p>21 identified that, you know, we were pretty much</p> <p>22 on the class four estimate. So, I'm</p> <p>23 comfortable with the fact that with all of the</p> <p>24 puts and takes, you know, some areas may be a</p> <p>25 little bit more advanced than others, but</p>	<p>1 overall, in the aggregate, I think we meet the</p> <p>2 class four estimate.</p> <p>3 MR. JOHNSON:</p> <p>4 Q. Okay, okay. Looking at PUB-Nalcor 42, and</p> <p>5 this is again a question that was asked from</p> <p>6 the Board having to do with degree of</p> <p>7 accuracy, if we could turn that up for a</p> <p>8 second? The question indicates that -- at</p> <p>9 page six of Exhibit 31, it stated that "the</p> <p>10 current capital cost estimates for the Muskrat</p> <p>11 Falls Project Labrador-Island transmission</p> <p>12 link were prepared for the purpose of Decision</p> <p>13 Gate 2" and on page seven it stated "this cost</p> <p>14 estimate is commensurate with an AACE</p> <p>15 international class four estimate." Then it</p> <p>16 just asks "what degree of accuracy is usually</p> <p>17 attached to the class four estimate?" and the</p> <p>18 answer goes on to indicate that according to</p> <p>19 AACE, you can have the recommended practice</p> <p>20 which is referenced there "a class four</p> <p>21 estimate can be minus 15 to minus 30 on the</p> <p>22 low side to plus 20 to plus 50 on the high</p> <p>23 side, depending upon the technical complexity</p> <p>24 of the project, degree of project definition,</p> <p>25 percentage of design complete, appropriate</p>
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<p>1 reference information," and then the answer</p> <p>2 goes on to indicate further down that "these</p> <p>3 ranges are not absolute and are not industry</p> <p>4 or project specific" and if you could go</p> <p>5 further down again, Mike, it says "in summary,</p> <p>6 the estimate accuracy will be generally</p> <p>7 correlated with estimate classification and</p> <p>8 therefore the level of project definition, all</p> <p>9 else being equal. However, specific accuracy</p> <p>10 ranges will typically vary by industry. Also,</p> <p>11 the accuracy of any given estimate is not</p> <p>12 fixed or determined by its classification</p> <p>13 category. Significant variations in accuracy</p> <p>14 from estimate to estimate are possible if any</p> <p>15 of the determinants of accuracy, such as</p> <p>16 technology, quality of reference cost data,</p> <p>17 quality of the estimating process and skill</p> <p>18 and knowledge of the estimator vary" and</p> <p>19 continuing on, "accuracy is also not</p> <p>20 necessarily determined by the methodology used</p> <p>21 or the effort expended. Estimate accuracy</p> <p>22 must be evaluated on an estimate by estimate</p> <p>23 basis, emphasis added, usually in conjunction</p> <p>24 with some form of risk analysis process."</p> <p>25 And I guess, having regard to all that,</p>	<p>1 because Nalcor went at some pains to explain</p> <p>2 that you must take an estimate-by-estimate</p> <p>3 approach and I understand that. Having regard</p> <p>4 to that, can you give us the degree or range</p> <p>5 of accuracy used by Nalcor with respect to its</p> <p>6 DG2 estimates for the Muskrat Falls Project</p> <p>7 Labrador-Island link that have been provided</p> <p>8 in this review on some sort of overall basis?</p> <p>9 Because you've said it's sort of an estimate</p> <p>10 by estimate, case by case, so can you assist</p> <p>11 us in trying to narrow in on that range of</p> <p>12 accuracy?</p> <p>13 MR. HARRINGTON:</p> <p>14 A. As you point out, the class four estimate</p> <p>15 range can go from a wide range of minus 30 to</p> <p>16 plus 50. So there's an equal probability of</p> <p>17 it being over 50 percent as it is to being</p> <p>18 under by 30 percent. In the narrower range</p> <p>19 because -- and again, this is the standard</p> <p>20 that's out there -- the narrower range is plus</p> <p>21 20 percent to minus 15 percent. So there's</p> <p>22 equal probability. It's a distribution curve</p> <p>23 around that point. We carry out a risk</p> <p>24 analysis, as is recommended by the practice</p> <p>25 here, to be able to set -- and that's why we</p>

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<p>1 landed on our contingency amount of 15</p> <p>2 percent. So, you know, we feel, based upon</p> <p>3 the industry and the amount of work that's</p> <p>4 being carried out, that we're, you know,</p> <p>5 within the class four estimate ranges of</p> <p>6 estimate.</p> <p>7 MR. JOHNSON:</p> <p>8 Q. So, I guess to zero in, your best assessment</p> <p>9 as at DG2 would be you'd be more in the middle</p> <p>10 of -</p> <p>11 MR. HARRINGTON:</p> <p>12 A. Not in the extremes. We're not at the -</p> <p>13 MR. JOHNSON:</p> <p>14 Q. Not at the extremes?</p> <p>15 MR. HARRINGTON:</p> <p>16 A. No, not at extremes.</p> <p>17 MR. JOHNSON:</p> <p>18 Q. Okay. And more around the plus 20 to minus 15</p> <p>19 in your assessment?</p> <p>20 MR. HARRINGTON:</p> <p>21 A. You're pushing me a little one on that one, to</p> <p>22 be absolutely, you know, precise upon a DG2</p> <p>23 estimate where it admits there's a range of</p> <p>24 things.</p> <p>25 MR. JOHNSON:</p>	<p>1 Q. I understand, and was the Monte Carlo type</p> <p>2 process -- at the risk of going into that</p> <p>3 again -- was that type of an analysis brought</p> <p>4 to bear on that particular issue?</p> <p>5 MR. KEAN:</p> <p>6 A. Yes, that is correct. In June 2010, we did</p> <p>7 undertake a risk analysis, full comprehensive</p> <p>8 analysis of tactical risk, i.e. those risks</p> <p>9 that the items of the estimate could be high</p> <p>10 or low, to understand the appropriate</p> <p>11 contingency to be used on the estimate.</p> <p>12 MR. JOHNSON:</p> <p>13 Q. And just to sort of circle back for a second,</p> <p>14 I take it you're getting your comfort level</p> <p>15 about that range not so much from the degree</p> <p>16 of project definition, because even at that</p> <p>17 time, you've indicated project definition,</p> <p>18 even on the things that you had most</p> <p>19 extensively studied, wasn't to the right too</p> <p>20 far on the graph. So you're getting that</p> <p>21 certainty or confidence from other issues and</p> <p>22 what are those other issues and considerations</p> <p>23 that are bending towards that middle of the</p> <p>24 road?</p> <p>25 MR. KEAN:</p>
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<p>1 A. Through, I guess, having a thorough</p> <p>2 understanding of the estimate and its input,</p> <p>3 the quality of the input into the estimate, we</p> <p>4 are -- you know, we are confident -- I guess</p> <p>5 you might say much more confident in the</p> <p>6 quality of the range, what the range or</p> <p>7 variability may be around that estimate. So,</p> <p>8 we went through a painstaking process of doing</p> <p>9 a bottom up estimate in many aspects of the</p> <p>10 project to have clarity on that, on those</p> <p>11 input factors and by doing that assess the</p> <p>12 uncertainties associated with those input</p> <p>13 factors.</p> <p>14 MR. JOHNSON:</p> <p>15 Q. Can you give us like a concrete example of</p> <p>16 something that was a factor or an indicator</p> <p>17 that made you conclude "you know what, I think</p> <p>18 we've got a bit more comfort level because of</p> <p>19 X"? Can you put it in those terms for us?</p> <p>20 MR. KEAN:</p> <p>21 A. One aspect of that would be the benchmarking</p> <p>22 we had done with other hydropower developers</p> <p>23 in Canada, as well as with other companies on</p> <p>24 equipment, construction equipment, fleet</p> <p>25 hourly run rates and so on, so the cost to run</p>	<p>1 an excavator every hour. We did a</p> <p>2 considerable amount of benchmarking on that</p> <p>3 with other developers in Canada. As well, in</p> <p>4 the context of productivity and performance,</p> <p>5 we engaged Caterpillar and did a fairly</p> <p>6 thorough modelling and assessment as to what</p> <p>7 productivities we may get for various</p> <p>8 excavation and backfill requirements. So</p> <p>9 activities such as that gave us good</p> <p>10 confidence in the base numbers that were</p> <p>11 provided in the estimate.</p> <p>12 Further, in the context of labour, which</p> <p>13 is a fairly significant portion of the cost</p> <p>14 estimate, when we did our DG2 analysis, we did</p> <p>15 have the Vale labour agreement. It was</p> <p>16 negotiated. It did serve as good input into</p> <p>17 the estimate and it's provided clarity as to</p> <p>18 labour demarcation that we may expect to see</p> <p>19 at the Muskrat Falls site. So that was</p> <p>20 another key input, and you know, through, I</p> <p>21 guess, the numerous inputs of that nature we</p> <p>22 went through one by one looking at what would</p> <p>23 be the base case premise for that input, how</p> <p>24 solid a foundation was that input and what</p> <p>25 variability could we see in that input.</p>

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<p>1 So, through a process of benchmarking, 2 engagement with third parties, third party 3 specialists, you know, cold eyes review and so 4 on, we came upon landing upon base inputs into 5 the estimate and we also came upon an 6 assessment of what the variability might be in 7 each of those inputs and that combined 8 variability gives us a view of what the 9 overall accuracy of the estimate would be at 10 DG2 and of course sets the work plan as we 11 move forward into gateway phase 3 and to get 12 the solid control level estimate in place for 13 sanction.</p> <p>14 MR. JOHNSON: 15 Q. This is probably a convenient time to break, 16 Mr. Chairman. 17 CHAIRMAN: 18 Q. Thank you. What time are we reconvening? 19 2:30. Okay. Alright, 2:30 then, ladies and 20 gentlemen. 21 (LUNCH BREAK) 22 (2:30 p.m.) 23 CHAIRMAN: 24 Q. Mr. Johnson, I think we back in your capable 25 hands.</p>	<p>1 MR. JOHNSON: 2 Q. Thank you, Mr. Chairman. To further develop 3 the discussion around risk, and we will talk 4 about the risk of the other option too, we 5 recognize that there's risks associated with 6 world oil prices and environmental costs 7 associated with electricity generation through 8 thermal means, and I want to have a discussion 9 for a second about construction project risks, 10 and tell us what are the elements of these 11 construction project risks, what are you 12 talking about? 13 MR. HARRINGTON: 14 A. The typical construction risks that we're 15 talking about are any construction project has 16 challenges. We like to look at Muskrat Falls, 17 in particular, and I think it was mentioned 18 in the presentation earlier that it has a lot 19 of positive attributes of the site. We know 20 that site very well from a geotechnical 21 perspective. We've carried out many, many 22 years of drilling and coring and finding out 23 what the bedrock is. So we have a good feel 24 for that construction risk because it is - 25 geotechnical is a construction risk. So by</p>
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<p>1 having a good knowledge of what the rock is 2 that you're dealing with and how much 3 overburden you have to remove, it mitigates 4 that risk. So we've been carrying out a lot 5 of work to be able to identify the rock that 6 we're building the dams upon. Another 7 construction risk is making sure that you've 8 got the right physical layout of the 9 facilities, making sure that the water flows 10 are going to be correct. That's a 11 construction risk. If you don't get that 12 right, it's not going to give you the right 13 amount of power output that you're predicting. 14 So what do we do there, and what have we been 15 doing over the last 12 months, is building a 16 physical model of the Muskrat Falls site, so 17 we can verify the mathematical modelling 18 that's being carried out on water flows. We 19 can actually see the physical flows using the 20 physical model. So there's another 21 construction risk that we've mitigated to that 22 degree. The other construction risk that we 23 are facing is having the labour force that we 24 require because obviously labour is a 25 commodity, is a resources that we're all</p>	<p>1 striving for with lots of projects on the go 2 in Newfoundland and Labrador, Atlantic Canada, 3 and indeed in Western Canada. So all of these 4 things we've looked at and we've mitigated 5 that risk by identifying it early. So when it 6 comes to labour, what we first identified is 7 what is our demand, what does the project 8 require with regards to form workers, truck 9 drivers, you name it, all of the different 10 national occupation codes. So we did that 11 very early in the process at DG2. We provided 12 that information to Government, so that they 13 could then implement training schemes within 14 their jurisdiction to try and meet the 15 requirements of not only Lower Churchill 16 Project, but indeed lots of other projects 17 that were on the go. So they all provided a 18 similar type of thing. These are the national 19 occupation codes that we need to carry out the 20 project over this period of time. They put 21 all of those things together, so we as a 22 project, by very clearly identifying our 23 labour requirements, we were able to 24 participate in that activity, skills gap 25 workforce was one of the outputs of that. We</p>

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<p>1 also have met with a large number of 2 educational facilities to give them prior 3 warning as to what type of skillsets that we 4 need, and again what we look at is what are 5 the other projects on the go. Our project is 6 primarily a civil project. So we don't 7 require the skillsets that lots of other 8 projects need when it comes to mechanical, 9 piping, electrical, and instrumentation. 10 Those are the ones that are more process 11 orientated. So, for example, if you were 12 doing an upgrader in Western Canada, you need 13 a completely different workforce than we need, 14 and that workforce normally requires four to 15 five years extensive training and previous 16 experience in that regard as well. So we 17 identified there may be a labour risk, so we 18 mitigated it by identifying our needs very 19 clearly, working with the educational and 20 government to try and address the training 21 gap. We went further than that. We also 22 realized that there were under-represented 23 groups in the workforce who don't usually get 24 the opportunity. In Labrador, for example, we 25 have actively participated in the Labrador</p>	<p>1 Aboriginal Training Partnership, LPTP, because 2 we realized there's an untapped workforce 3 there and we are pleased to say that over 350 4 people in Labrador are being trained to be 5 able to participate in not only our project, 6 but other projects as well. So we tried to 7 address all of the needs that we can by 8 participating in all of these activities I've 9 just described. So having the labour, having 10 a clearly defined plan, and using the fact 11 that we're on a good solid work site in one 12 place, we'll come up with a very attractive 13 camp, we have a decent working rotation, and 14 we'll have a competitive remuneration package 15 as well. So all of these things will 16 contribute and mitigate in construction risk 17 when it comes to labour. 18 MR. JOHNSON: 19 Q. There is mention, I think as well, of a 20 project agreement with labour unions. Was 21 that early enough in the works for DG 2 22 purposed? 23 MR. HARRINGTON: 24 A. In DG 2, we carried out a complete survey of 25 all of the special project agreements that</p>
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<p>1 have put in place across Canada, and by taking 2 all of that information, we've identified what 3 we believe to be a very positive and 4 constructive labour agreement strategy. We're 5 in the process of going to enter into those 6 negotiations with the appropriate union 7 bodies. 8 MR. JOHNSON: 9 Q. What are - how about risks in relation to the 10 so-called LIL, because we've - I'm sure labour 11 comes into that as well. 12 MR. HARRINGTON: 13 A. Yes. 14 MR. JOHNSON: 15 Q. But you spoke about the geotechnical aspects 16 of the dam site. How about those risks? 17 MR. HARRINGTON: 18 A. Okay, Labrador-Island Link, of course, one of 19 the early identification of risk was the 20 Strait of Belle Isle. So we established a 21 team specifically to look at the Strait of 22 Belle Isle to engineer our way around the pack 23 ice issues, to engineer our way around the 24 iceberg concerns that were in that, and we 25 believe we've done a pretty good job of doing</p>	<p>1 that, and I think MHI even recognized that in 2 their report. So that was one of the biggest 3 areas of risk. The other area of risk on the 4 Labrador-Island Link, I would say would be the 5 Long Range Mountains, and The Long Range 6 Mountains and its particular ice conditions 7 that it will be facing. So we looked at that 8 area and said, yeah, that's an area of risk, 9 so what did we do; we engaged some world class 10 individuals from both Iceland and Norway who 11 have got particular experience in the type of 12 ice that will form in those Long Range 13 Mountains. They've been extremely successful 14 in engineering their way around those types of 15 conditions. So we've taken that into account. 16 They're still participating in our activities. 17 We even put a couple of tests on in that area 18 so that we can monitor the success, the idea 19 of let's put a tower there, let's put a tower 20 there. So all of those things are coming into 21 mitigating the risk in The Long Range 22 Mountains. 23 MR. JOHNSON: 24 Q. You mentioned a test carried out in that area. 25 What did you refer to it as?</p>

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1 MR. HARRINGTON:

2 A. We built a tower with a conductor string
3 strung across it, so we're monitoring the ice
4 build-up on it, and over time we'll be able to
5 incorporate that into our future plans.

6 MR. JOHNSON:

7 Q. Because I - actually, it's funny you should
8 mention that. I had a call from a gentleman
9 from Carbonear and he wanted me to ask you
10 whether you have undertaken any stress tests
11 of, you know, the transmission line and
12 whether that data would be publicly available
13 and just some background on what you've done
14 in that regard. So that stress testing, is
15 that ongoing now?

16 MR. HARRINGTON:

17 A. It's ongoing every winter.

18 MR. JOHNSON:

19 Q. Yeah, okay, yeah.

20 MR. HARRINGTON:

21 A. Until we start building.

22 MR. JOHNSON:

23 Q. Okay. Let me ask you then what are the - what
24 are the elements of risk that fall under
25 construction project risks that are the most

1 difficult to mitigate?

2 MR. HARRINGTON:

3 A. I might throw that one to - have you got any
4 particular ideas, or have I covered all of
5 them. I don't know.

6 MR. KEAN:

7 A. From my view, probably the greatest aspect
8 deals with labour and labour productivity.
9 You don't always know on a construction site
10 the quality of the labour that you're going to
11 attract and their capabilities and so on.
12 Labour productivity is influenced by a lot of
13 aspects. A lot of things that can be done in
14 the office during the engineering phase, for
15 instance, to enhance labour productivity, or
16 the way we organize the site. You know,
17 everything from winterization provisions or
18 the way the site is laid out, the site
19 services and so on. So we recognized early
20 that labour productivity or the productivity
21 of the worker can negatively impact the job
22 unless we take proactive measures. So going
23 back in actually 2008, we engaged a consultant
24 out of University of Calgary to work with us
25 to develop a productivity action plan.

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1 Through that and through evaluation of various
2 work sites and lessons learned, we determined
3 what are the key drivers of construction
4 productivity, and how can we look at those in
5 the context of our site, what can we do to
6 mitigate those. So we're trying to get out
7 ahead of the issue to understand, first, is it
8 going to be an issue for us, and how can we
9 knowing the issue, try to understand the
10 implications of that, and then how can we
11 mitigate it. Mr. Harrington spoke about some
12 of the things on the mitigation perspective in
13 terms of understanding labour supply and
14 demand, training of individuals and so on, but
15 there's a lot of things that we're doing in
16 the engineering phase that will also mitigate
17 that key risk.

18 MR. JOHNSON:

19 Q. Are there any others that fall under the
20 category of difficult to mitigate?

21 MR. KEAN:

22 A. Probably, you know, you could classify weather
23 type related issues in there. So, of course,
24 from a planning basis, you know, such as in
25 the Strait of Belle Isle, weather from a

1 seasonality of construction installation is
2 important. So that drives us to collect as
3 much data as we can. This past year, for
4 instance, we had undertaken a marine seismic
5 program and it was the first time that what we
6 refer to as work class ROV, remotely operated
7 vehicle, was used in that area. It's very
8 similar to the ones that you see downtown on
9 back of the orange supply vessels. So we
10 actually used one of those vessels in the
11 area. So understanding the limitations of
12 that machine in that terrain is very
13 important, so we can plan our installation
14 program very effectively. We can look at what
15 the hours of work is going to be. You know,
16 there's been concerns or there have been, I
17 guess, concerns about currents in the past, so
18 we've done a thorough understanding - thorough
19 assessment of that. So we understand that
20 very thoroughly what the limitations are.

21 MR. JOHNSON:

22 Q. In terms of, you know, if you see the Class 4
23 estimate and the textbook says, you know, it
24 could be -30, +50, customers wouldn't really
25 be worried about -30, but they would probably

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<p>1 be quite concerned about a +50, and I'd like</p> <p>2 some - a bit more insight as to, look, what's</p> <p>3 the likelihood that this is +50 from DG 2</p> <p>4 estimates, what's the likelihood of +25, you</p> <p>5 know, and, I guess, two neighbours on the same</p> <p>6 street could build the identical on identical</p> <p>7 land, and one fellow having a 50 percent</p> <p>8 overrun and the other fellow comes right in on</p> <p>9 target, and I'd like to know what are those</p> <p>10 probabilities, what are those likelihoods</p> <p>11 within that range?</p> <p>12 MR. HARRINGTON:</p> <p>13 A. Well, I would say that +50 percent, - 30</p> <p>14 percent, are on the extreme edge. I don't</p> <p>15 believe that we will be there, I don't</p> <p>16 believe. I think we'll be closer to the</p> <p>17 narrower range, which is -15 to +20.</p> <p>18 MR. BENNETT:</p> <p>19 A. This is Gilbert Bennett. I just might add some</p> <p>20 broader context to that. I think at the end of</p> <p>21 the day if you look at the techniques and</p> <p>22 approaches that are used in the industry for</p> <p>23 estimating, there is a level of uncertainty,</p> <p>24 but there is a set of best practices, and the</p> <p>25 intent of those best practices is to pull</p>	<p>1 yourself from the extremes of the range closer</p> <p>2 in, and as we progress with engineering</p> <p>3 definition, we reduce that uncertainty. As we</p> <p>4 continue to focus on issues that have been</p> <p>5 identified as risks early in the work program,</p> <p>6 and understand them better, the whole concept</p> <p>7 of front end loading, that serves to reduce</p> <p>8 that risk, but the establishment of what those</p> <p>9 risk ranges are, that comes from a</p> <p>10 probabilistic analysis and that's something</p> <p>11 that will continue to be done as we continue</p> <p>12 through the design progression. So it's not</p> <p>13 really appropriate for us to say, well, we</p> <p>14 think the range is this or that at this point</p> <p>15 in time, but to continue with the process that</p> <p>16 we're following and to continue to define the</p> <p>17 project, with a view to minimizing that range.</p> <p>18 MR. JOHNSON:</p> <p>19 Q. I guess what I'm trying to focus in on is as</p> <p>20 of DG 2, how likely is it in your assessment</p> <p>21 that we're going to pitch somewhere between</p> <p>22 the narrower range that Mr. Harrington spoke</p> <p>23 about?</p> <p>24 MR. BENNETT:</p> <p>25 A. We think there's a much higher probability of</p>
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<p>1 being at that point than being at the extreme</p> <p>2 edges using the techniques that we've</p> <p>3 identified and the practices that are being</p> <p>4 followed.</p> <p>5 MR. JOHNSON:</p> <p>6 Q. Okay. In terms of the risks of the isolated</p> <p>7 option, there is world oil prices and risk is</p> <p>8 not necessarily a bad thing because oil prices</p> <p>9 could drop, risk goes both ways, but I want to</p> <p>10 focus first on the environmental cost risks</p> <p>11 associated with the isolated option, and in</p> <p>12 relation to this greenhouse gas business that</p> <p>13 was raised in the MHI Report, I think MHI</p> <p>14 spoke about a likelihood of some greenhouse</p> <p>15 gas regulation that could impact upon</p> <p>16 Holyrood. What's Nalcor's assessment of that</p> <p>17 risk?</p> <p>18 MR. BENNETT:</p> <p>19 A. I think based on what we have seen, what we</p> <p>20 have heard from the Government of Canada, we</p> <p>21 agree that there's a risk. We've not</p> <p>22 quantified that risk in our analysis. Our</p> <p>23 analysis, our baseline CPW comparison did not</p> <p>24 include a cost for carbon, but the messages -</p> <p>25 I think there are fairly clear messages in my</p>	<p>1 mind from the Government of Canada, so the</p> <p>2 introduction of greenhouse gas regulation for</p> <p>3 coal fired generating facilities in this</p> <p>4 country is a sign for us, and I think that</p> <p>5 there is - and the establishment of the</p> <p>6 emission limit of those facilities at the same</p> <p>7 level as a gas fired facility is a clear</p> <p>8 indication that the Government intends to do</p> <p>9 something about GHG emissions across our</p> <p>10 economy. Now we don't have complete clarity</p> <p>11 as to when they would do that for other</p> <p>12 facilities, but we have noted that the</p> <p>13 emissions intensity from Holyrood is greater</p> <p>14 than that of a combined cycle plant. So we</p> <p>15 think there's a concern or a possibility that</p> <p>16 that could happen. It's not in our analysis,</p> <p>17 but we did identify that the possibility</p> <p>18 exists.</p> <p>19 MR. JOHNSON:</p> <p>20 Q. And you added it as a sensitivity, and that</p> <p>21 would be - your sensitivity involved if there</p> <p>22 was basically a tax on carbon?</p> <p>23 MR. BENNETT:</p> <p>24 A. A cost of carbon, that's right.</p> <p>25 MR. JOHNSON:</p>

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<p>1 Q. And when did you assume that that tax on 2 carbon would come about for the purpose of 3 your sensitivity? 4 MR. GOUDIE: 5 A. Steve Goudie here. I think it would have been 6 earlier rather than later. I'm not quite sure 7 of the exact date. It would not have been, 8 like, in 2020 beyond, it would have been - 9 MR. JOHNSON: 10 Q. Prior to that, okay. Maybe you could - Mr. 11 O'Reilly, if you could just see if Nalcor 12 could provide clarity on when that date is, 13 and I apologize if it's not on the record, or 14 if it's on the record and I overlooked when 15 that kicked in. 16 O'REILLY, Q.C.: 17 Q. Okay, we'll locate it. Thank you. 18 CHAIRMAN: 19 Q. When what kicked in? 20 MR. JOHNSON: 21 Q. When they are assuming that the carbon tax 22 would have been applicable because they added 23 their sensitivity - on their sensitivity, I 24 think they said a half a billion dollars, and 25 I'm just sort of interested when they were</p>	<p>1 anticipating that carbon tax would have kicked 2 in. 3 O'REILLY, Q.C.: 4 Q. So you want the date that they - for the 5 purpose of their sensitivity analysis, the 6 date that the thing went in? 7 MR. JOHNSON: 8 Q. Yes. 9 O'REILLY, Q.C.: 10 Q. We'll dig that out. 11 MR. JOHNSON: 12 Q. Thank you very much. 13 CHAIRMAN: 14 Q. And I guess you'd want it cost per ton too, 15 wouldn't you? 16 MR. JOHNSON: 17 Q. Yeah, I think there was a cost per ton 18 reference in the record, but might as well 19 provide that as well. In terms of - that's 20 the price risk, the obvious price risk is the 21 carbon tax on per ton, and I understand MHI's 22 Report made reference to the fact that over a 23 five year period from 2005 to 2009, the 24 Holyrood generating facility generated 866,000 25 tons per annum of carbon dioxide, and is that</p>
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<p>1 the number that your sensitivity test was 2 built around or was it built around the 3 projection going forward of the load that 4 Holyrood was going to carry? 5 MR. BENNETT: 6 A. That sensitivity would have been completed 7 based on the forecasted generation from 8 Holyrood. 9 MR. JOHNSON: 10 Q. Okay. MHI's Report stated that - and just for 11 the record, page 171, "The greenhouse gas 12 emission standards are likely to be set by the 13 Federal Government, and as such, pose a risk 14 to the ongoing operation of HTGS, Holyrood 15 Thermal Generating Station, as a generator". 16 So is that suggesting or as part of your risk 17 analysis is that there's a possibility that 18 the Federal Government could say that place 19 has got to shut down, and you can't be 20 generating electricity like that in the 21 future? Is that what we're talking about 22 there? Would it be that stark? 23 MR. BENNETT: 24 A. Well, that possibility exists and the Federal 25 Government has said that for coal fired</p>	<p>1 facilities. 2 MR. JOHNSON: 3 Q. And how much time did they give these coal 4 fired facilities to mend their ways? 5 MR. BENNETT: 6 A. They have - for facilities, as I recall now, 7 it was the facilities that have reached a 45 8 year design life, if they've been in operation 9 for 45 years, they're expected to shut down 10 after 2015. So there are several other 11 provisions in the regulations. If there's a 12 commitment to implement carbon capture 13 technology, they have some additional time, 14 but in the 2015 to 2025 time frame, coal fired 15 plant operators have to find a way to comply 16 with those regulations. Now I think it's 17 important to point out that those regulations 18 have not been finally implemented. They have 19 been gazetted, and they're open for comment, 20 but have not been absolutely finalized, but I 21 would agree with MHI that there is a fairly 22 clear signal from the Government of Canada 23 that it intends to do something with coal 24 fired facilities. 25 MR. JOHNSON:</p>

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<p>1 Q. And I guess it's hypothetical, but for the</p> <p>2 customer who is watching the proceeding,</p> <p>3 explain that risk to them, what does that mean</p> <p>4 to them?</p> <p>5 MR. BENNETT:</p> <p>6 A. Well, the -</p> <p>7 MR. JOHNSON:</p> <p>8 Q. What is the cost implication of this if that</p> <p>9 were to happen and that you had to do</p> <p>10 something else on Holyrood?</p> <p>11 MR. BENNETT:</p> <p>12 A. The potential at Holyrood would be to replace</p> <p>13 that plant with a more efficient and less</p> <p>14 intensity - lower intensity facility.</p> <p>15 MR. JOHNSON:</p> <p>16 Q. And I guess your suggestion is that that</p> <p>17 would, I take it, further add to the economic</p> <p>18 cost of this isolated model?</p> <p>19 MR. BENNETT:</p> <p>20 A. Yes.</p> <p>21 MR. JOHNSON:</p> <p>22 Q. Is that what they take away from that?</p> <p>23 MR. BENNETT:</p> <p>24 A. It would further improve the preference for</p> <p>25 the interconnected alternative for that risk,</p>	<p>1 as we talked -</p> <p>2 CHAIRMAN:</p> <p>3 Q. Excuse me, is that the two billion dollars you</p> <p>4 referenced, Mr. Bennett?</p> <p>5 MR. BENNETT:</p> <p>6 A. Yes. So if you imposed a cost for carbon or</p> <p>7 if you forced the early replacement of</p> <p>8 Holyrood, 2.2 billion dollars would increase -</p> <p>9 that preference for the interconnected</p> <p>10 scenario would increase.</p> <p>11 CHAIRMAN:</p> <p>12 Q. That's not the carbon price, that's what the</p> <p>13 cost would increase by?</p> <p>14 MR. BENNETT:</p> <p>15 A. It would increase over and above that amount.</p> <p>16 The 2.2 billion is the CPW difference between</p> <p>17 the two alternatives.</p> <p>18 CHAIRMAN:</p> <p>19 Q. So if I divide the number of tons into 2.655,</p> <p>20 I get the cost per ton?</p> <p>21 MR. BENNETT:</p> <p>22 A. No, sorry. The difference between the 2.2 and</p> <p>23 the 2.665 is the cost of carbon that's -</p> <p>24 CHAIRMAN:</p> <p>25 Q. Oh, yes, okay.</p>
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<p>1 MR. BENNETT:</p> <p>2 A. All right.</p> <p>3 MR. JOHNSON:</p> <p>4 Q. And that's the - the Chair raised the cost of</p> <p>5 the carbon, how that would change the CPW</p> <p>6 preference calculation, and I guess my</p> <p>7 question is an order of magnitude of if you</p> <p>8 were - if some regulation came in, and said,</p> <p>9 look, you've got to retire this facility by</p> <p>10 2025 or however, you know, what would that</p> <p>11 mean from a cost point of view?</p> <p>12 MR. BENNETT:</p> <p>13 A. We haven't specifically done the analysis to</p> <p>14 bring the replacement of Holyrood into 2025,</p> <p>15 but it would increase the cost of the isolated</p> <p>16 island scenario because you're forcing the</p> <p>17 replacement of Holyrood with a new facility</p> <p>18 and the number two fuel in that plant is more</p> <p>19 expensive than the number six fuel that's</p> <p>20 currently burned on a per megawatt basis.</p> <p>21 MR. JOHNSON:</p> <p>22 Q. And in relation to the isolated case, there is</p> <p>23 - in your isolated scenario there is spending</p> <p>24 a considerable sum of money on precipitators</p> <p>25 and scrubbers. When is it that you would</p>	<p>1 propose to do that in the event that Muskrat</p> <p>2 is not sanctioned?</p> <p>3 MR. BENNETT:</p> <p>4 A. Well, in the event that Muskrat is not</p> <p>5 sanctioned, the province has indicated that we</p> <p>6 are to proceed with that immediately.</p> <p>7 MR. JOHNSON:</p> <p>8 Q. Okay, and I take it that has a 500 million</p> <p>9 dollar cost?</p> <p>10 MR. BENNETT:</p> <p>11 A. That's right.</p> <p>12 MR. JOHNSON:</p> <p>13 Q. Or something in that vicinity.</p> <p>14 MR. BENNETT:</p> <p>15 A. Approximately 600 million.</p> <p>16 MR. JOHNSON:</p> <p>17 Q. And I guess the question I would have is, as I</p> <p>18 understand it, that - those precipitators and</p> <p>19 scrubbers wouldn't take the greenhouse gases</p> <p>20 out of the air, and there's some suggestion in</p> <p>21 the MHI Report that, well, you know, does that</p> <p>22 make a lot of sense spending that type of</p> <p>23 money if you could just switch to the cheaper</p> <p>24 or the more expensive oil, the lower sulphur</p> <p>25 content oil. So the question is why would you</p>

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<p>1 go with precipitators and scrubbers if you can</p> <p>2 just stick with the lower sulphur content oil?</p> <p>3 MR. BENNETT:</p> <p>4 A. Today we do burn 0.7 percent sulphur fuel at</p> <p>5 Holyrood. I think it's fair to say that the</p> <p>6 Holyrood facility, emissions in particular</p> <p>7 from that facility have been of significant</p> <p>8 concern in the communities on the North East</p> <p>9 Avalon, particularly the Holyrood, Seal Cove,</p> <p>10 and Conception Bay South area, and in response</p> <p>11 to those concerns - they have been ongoing and</p> <p>12 we've heard about those for many years. The</p> <p>13 province have said if we continue to use</p> <p>14 Holyrood, we are to put emission controls on</p> <p>15 that plant.</p> <p>16 MR. JOHNSON:</p> <p>17 Q. Do we know whether - I know there is a</p> <p>18 statement in the Energy Plan to that effect</p> <p>19 and that's, I guess, provincial policy. Do we</p> <p>20 know, you know, from a cost benefit point of</p> <p>21 view how that would compete with just going</p> <p>22 all out and buying a lower sulphur content</p> <p>23 fuel?</p> <p>24 MR. HUMPHRIES:</p> <p>25 Q. Paul Humphries. I'll take that. Yes, we do -</p>	<p>1 from the point of the analysis of the actual</p> <p>2 elimination or converting to a new technology</p> <p>3 earlier than the anticipated retirement of</p> <p>4 Holyrood, is it cost effective, barring any</p> <p>5 further sanctions on emissions, to continue to</p> <p>6 operate Holyrood until its normal retirement</p> <p>7 time.</p> <p>8 MR. JOHNSON:</p> <p>9 Q. Can I change gears a little bit and start</p> <p>10 talking about the HVDC overhead transmission</p> <p>11 line, and I understand from the record, MHI</p> <p>12 71, that this design, the detail design is</p> <p>13 underway by SNC Lavalin, is that correct?</p> <p>14 MR. HUMPHRIES:</p> <p>15 A. Yes.</p> <p>16 MR. JOHNSON:</p> <p>17 Q. And it was supposed to be completed before</p> <p>18 2012. What's the status of the design on that</p> <p>19 line?</p> <p>20 MR. HARRINGTON:</p> <p>21 A. The engineering is ongoing with regards to the</p> <p>22 design of that line. You know, there's a</p> <p>23 significant amount of work there to put it all</p> <p>24 together, and we are putting technical</p> <p>25 specifications together for converted stations</p>
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<p>1 and verifying that with our system planning</p> <p>2 group to make sure all of those design</p> <p>3 concepts are interlocked and we're going to</p> <p>4 get the best design possible.</p> <p>5 MR. JOHNSON:</p> <p>6 Q. How would you compare what you knew about the</p> <p>7 design of the overland transmission line, DG</p> <p>8 2, versus to what these designers know now in</p> <p>9 terms of project definition and scope,</p> <p>10 costing, and things like that?</p> <p>11 MR. KEAN:</p> <p>12 A. Yes, with the engagement of SNC Lavalin, and a</p> <p>13 focused experienced transmission group as part</p> <p>14 of that team, there's been a considerable</p> <p>15 amount of effort expended to define the</p> <p>16 structures, to confirm the meteorological</p> <p>17 loading and to look at designing the tower</p> <p>18 families that are required for the</p> <p>19 transmission line. So now we would have</p> <p>20 structural drawings for the transmission line</p> <p>21 in various states of revision. We would have</p> <p>22 looked at the overall tower locations through</p> <p>23 the right of way selection between Muskrat</p> <p>24 Falls and Soldiers Pond. So we've seen a</p> <p>25 considerable amount of advancement in defining</p>	<p>1 the number of towers, the tower foundation</p> <p>2 types, the size of those towers and the</p> <p>3 locations.</p> <p>4 MR. JOHNSON:</p> <p>5 Q. MHI has indicated that their assessment is</p> <p>6 that Nalcor's estimate of 400 million dollars</p> <p>7 to construct this overland transmission line -</p> <p>8 well, first of all, they say it's considered</p> <p>9 DG 2 capital cost estimate, falling inside a</p> <p>10 typical range of capital construction</p> <p>11 estimates for this type of length of</p> <p>12 transmission line, but as you're aware, they</p> <p>13 say that Nalcor's estimate appears to be at</p> <p>14 the low end of the range, and they say that</p> <p>15 they have - they make, I guess, this judgment</p> <p>16 by referring to industry benchmarks as a</p> <p>17 comparison. That's what they say that they</p> <p>18 looked at, and so before I get you to comment</p> <p>19 on what you think of that, the opening of it,</p> <p>20 I'd like to find out how is it that you guys</p> <p>21 at Nalcor established your DG 2 estimate for</p> <p>22 the overland transmission line?</p> <p>23 MR. KEAN:</p> <p>24 A. The process of establishing the DG 2 estimate</p> <p>25 for the transmission line is founded in the</p>

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1 work that we did for the line from Gull Island
2 to Soldiers Pond in terms of the overall
3 components of the estimate. There was a slide
4 shown earlier and perhaps we can - it talks
5 about the four inputs of the estimate. It's
6 used in the slide presentation. I don't know
7 the number. Maybe if you could pull up that
8 presentation. It's near the back end of the -
9 just so I could use that to speak to, DG 3
10 estimate preparation. 60 or 61 - go back, 58
11 maybe. 56, sorry. This is the correct slide.
12 Okay, have you got that?

13 MR. JOHNSON:

14 Q. Okay.

15 MR. KEAN:

16 A. So the process for establishing the DG 2
17 estimate for the overland transmission
18 basically followed the same process in the
19 context of there were four main inputs to the
20 estimate, and the information for those inputs
21 was collected over a period of time. It
22 involved, you know, some of the - it built
23 upon the work we had done for the Gull Island
24 to Soldiers Pond transmission line, in which
25 case we had done detailed field investigations

1 over the right of way for the line routing.
2 We had engaged a company called RSW to conduct
3 a number of detailed studies, as well as work
4 with us to develop a detailed cost estimate.
5 That base material was used along with various
6 pieces of market data for transmission steel
7 cost, dollars per kilogram, for instance, for
8 transmission towers, the cost for insulators,
9 the cost for conductors, and so on, so there
10 was a number of budgetary quotes sought from
11 the marketplace and we used the bottom up
12 estimate to work out an appropriate estimate
13 for the current line that we have for the 320
14 kilovolt line that extends from Muskrat Falls
15 through to Soldiers Pond. So it was somewhat
16 of a reverse engineering, and then going from
17 bottom up again to validate that it worked and
18 that the numbers were well founded.

19 MR. JOHNSON:

20 Q. Just explain bottom up for a second?

21 MR. KEAN:

22 A. Certainly. So when I use the word "bottom
23 up", I guess, or first principles, it is
24 looking at all the various elements that
25 factor into a cost estimate, i.e., what is it

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1 you have to build, the number of towers you
2 need to erect, what does it take to erect the
3 tower, and you have to prepare a foundation,
4 what goes into the foundation, what type of
5 equipment is required, what type of labour is
6 required. So you look at all the lowest level
7 of detail in terms of those elements to
8 understand how they come together to
9 facilitate the erection of that tower. So
10 that's a principle bottom up estimate versus a
11 top down where it would be more of a scaled.
12 So we worked with bottom up.

13 MR. JOHNSON:

14 Q. More of a scaled, what did you mean by that?

15 MR. KEAN:

16 A. I guess a term often used in industry at a
17 Class 5 estimate is a parametric based
18 estimate whereby transmission cost "x" number
19 of thousand dollars per kilometre, and you
20 say, well, based upon my line, I think it's
21 going to cost me "x" thousand dollars per
22 kilometre. You can do that as a good process
23 to benchmark, but it's always good to get
24 right down into the detail, you know, so that
25 gives you a sound foundation to understand

1 your uncertainties.

2 MR. JOHNSON:

3 Q. Do you - I guess you would be familiar with
4 industry benchmarks then regarding the cost of
5 such lines, but that's not what you used for
6 DG 2, I think is what you're saying me.

7 MR. KEAN:

8 A. Yes, that is correct.

9 MR. JOHNSON:

10 Q. Okay, and the - so in terms of MHI remarking
11 that you're at the low end of the range, are
12 you familiar with the range that they might be
13 referring to, or where that range comes from?

14 MR. KEAN:

15 A. No, I'm not particularly familiar with the
16 comment or the aspect of range in the context
17 of what range it is. I would assume it would
18 be a Class 5 range, if you would, that they're
19 referring to, that -50, +30 again, - 30, +50
20 again.

21 MR. JOHNSON:

22 Q. No, no, they - what they were indicating is
23 that in their view the Nalcor estimate
24 appeared to be at the low end of the range of
25 referring to the use of benchmarks that they

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1 had a look at.
 2 MR. KEAN:
 3 A. Okay, so it would be on the - I would assume
 4 in that regard, would be on the range of the
 5 benchmarks.
 6 MR. JOHNSON:
 7 Q. Okay, but you're not familiar with the -
 8 MR. KEAN:
 9 A. I'm not familiar with the particular
 10 benchmarks that Manitoba Hydro would have
 11 used, but we do appreciate their insights and
 12 we are undergoing a process now to confirm the
 13 design, to gather all the key data that is
 14 required in terms of pricing for tower steel.
 15 We just received a Request for Proposal
 16 Response for tower steel, for instance. So we
 17 will have the quality of information, and
 18 we've done extensive amount of work in the
 19 construction planning and execution in terms
 20 of how to best build the line, how much right
 21 of way clearing we need to do, and so on. So
 22 all that will come together in DG 3, as per
 23 Slide 56, to give us clarity as what
 24 constitutes a solid base estimate with great
 25 levels of confidence.

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1 get into the details of what's included and
 2 what's not included to have a true comparison.
 3 MR. JOHNSON:
 4 Q. Okay. Then we also have the issue, which I
 5 suppose is a cost issue as well, but it's a
 6 cost that falls out of design loading criteria
 7 or, you know, the 1 in 50, the 1 in 150, that
 8 type of thing, and the Board's independent
 9 consultants made a finding in a report, that
 10 Nalcor's aware of, that the 1 in 50 year
 11 reliability return period is inconsistent with
 12 a recommended 1 in 500 year reliability return
 13 period outlined in the international standard
 14 for this class of line without an alternate
 15 supply, and in the case where there is an
 16 alternate supply, they say that the 1 and 150
 17 reliability return period is acceptable. Now
 18 first of all, explain for us the 1 in 150,
 19 what does that mean to someone, a 2 percent
 20 chance per year that something happens?
 21 MR. KEAN:
 22 A. Well, 1 in 50 would be a 2 percent chance of
 23 failure; 1 in 150 is 1/150th, which would be
 24 .16 percent.
 25 MR. JOHNSON:

1 MR. JOHNSON:
 2 Q. So, I guess, just to make sure I understand
 3 it, you're aware of what MHI says about being
 4 at the low end of the range, but am I right
 5 that you really can't take disagreement with
 6 them because you don't know the range that
 7 they're referring to?
 8 MR. KEAN:
 9 A. Yes, that is correct.
 10 MR. JOHNSON:
 11 Q. Okay. If you took that top down thing - you
 12 know, they used to say asphalt was a million
 13 dollars a mile or something, you know. If you
 14 took it from a top down - and that's probably
 15 a good while ago, but from a top down point of
 16 view, if you said 1100 kilometres of HVDC
 17 transmission line all over there, do you have
 18 a sense of what we would be talking about on a
 19 per kilometre basis, you know, what these
 20 benchmarks out there might say?
 21 MR. KEAN:
 22 A. I can't - I really don't know. What I do know
 23 is that I spent a lot of my career looking at
 24 benchmarks for various facilities, and what I
 25 can say is that benchmarks, you need to really

1 Q. And failure would be caused by weather events,
 2 is that what we're talking about?
 3 MR. KEAN:
 4 A. Generally in our environment, yes, it would be
 5 a weather related event.
 6 MR. JOHNSON:
 7 Q. So they talk about, like, a 50 year storm, a
 8 100 year storm, that's a storm - a 50 year
 9 storm is a storm that has a 2 percent chance
 10 of occurring every year, would that be -
 11 MR. KEAN:
 12 A. Yes, there's a 2 percent probability.
 13 MR. JOHNSON:
 14 Q. So if it's a 1 in 50 year design, would it
 15 withstand that particular storm or would it
 16 falter under that type of storm?
 17 MR. KEAN:
 18 A. Under the 1 in 50 year?
 19 MR. JOHNSON:
 20 Q. Yeah.
 21 MR. KEAN:
 22 A. In theory, it should stand.
 23 MR. JOHNSON:
 24 Q. Okay, but if it's more intense and severe -
 25 MR. KEAN:

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1 A. It could fail.

2 MR. JOHNSON:

3 Q. It could fail, and you've got a long
4 transmission line of 1100 kilometres, and
5 Newfoundland is a big island and different
6 weather conditions and meteorological
7 conditions presumably all the way along, where
8 do - how do we assess what a 1 in 50 year
9 storm is? Like, is there one storm event or
10 weather related event that we're assuming that
11 would be applicable to the whole area, how
12 does that work?

13 MR. KEAN:

14 A. No, we would basically look at the
15 climatological patterns along the whole length
16 of the line and they are different in
17 different regions, you know, and the extreme
18 case as we spoke of earlier would probably be
19 on the Long Range Mountains. We know we have
20 an extreme ice load on the Avalon Peninsula.
21 There's other areas where icing is not as
22 significant. We would divide the line into
23 segments and the 1 in 50 year design, or the 1
24 in 150 year design, for those particular areas
25 would be different based on those anticipated

1 loadings.

2 MR. JOHNSON:

3 Q. Okay. So would that mean then in terms of
4 looking at the physical line for the course of
5 the 1100 kilometres, are we looking at
6 different configurations and strength as we go
7 in different areas?

8 MR. KEAN:

9 A. That's correct, we would.

10 MR. JOHNSON:

11 Q. So for Avalon ice loading, that's going to
12 look different than a place where the
13 meteorological conditions are not known to be
14 so severe based on - what is it, historical
15 records?

16 MR. KEAN:

17 A. Yes, that's correct.

18 MR. JOHNSON:

19 Q. And how far back do your records go? Do you
20 have equally quality data over the length of
21 this line or are some areas better than
22 others?

23 MR. KEAN:

24 A. Some areas are better than others, but we have
25 been monitoring the path, and also we have our

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1 experience of existing lines in areas that
2 would be common.

3 MR. JOHNSON:

4 Q. Who's right on the issue of whether or not an
5 international standard is being met, because,
6 you know, MHI seem to say, you know, this is
7 what the standard says, you know, 500, you
8 know, if you don't have alternate, you got to
9 be 500, and if you do have alternate available
10 power, you can be 150, but as I understand it,
11 you're saying, no, we meet the standard by
12 being 1 in 50, and I'm just wondering can both
13 of you be right?

14 MR. KEAN:

15 A. It's possible we both could be right. We have
16 assessed the standard and looked at the
17 recommendations that minimum design should be
18 1 in 50, and then there are conditions where
19 it's suggested it be a higher designer,
20 whether it be 1 in 150 or 1 in 500, and then
21 we've taken that and looked at that line and
22 looked at it in the situation of our system,
23 and looked at it from the perspective of
24 providing an acceptable level of reliability
25 to our customers, what is our best approach.

1 Reliability is very important to us, always
2 has been, but also cost is as well.

3 MR. JOHNSON:

4 Q. Yes.

5 MR. KEAN:

6 A. And we try to do and ensure that we are
7 placing our reliability dollars in the proper
8 place, so that we're not overcharging our
9 customers. From the perspective of the island
10 system and the loss of the link from Labrador,
11 we've come to the conclusion that we need to
12 make a balance between the reliability of the
13 line and the level of backup generation that's
14 available to support the load in the event the
15 line goes out of service.

16 MR. JOHNSON:

17 Q. As at DG 2, are you describing a line that for
18 the whole course is 1 in 50?

19 MR. KEAN:

20 A. 1 in 50, yes.

21 MR. JOHNSON:

22 Q. And if it's in Daniel's Harbour, that 1 in 50
23 could mean something - I'm making that up now,
24 but somewhere it could mean something else.

25 MR. KEAN:

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1 A. Yes.
 2 MR. JOHNSON:
 3 Q. So that's what we're talking about as of DG 2?
 4 MR. KEAN:
 5 A. That's what we're talking about.
 6 MR. JOHNSON:
 7 Q. Okay. Are you - is Nalcor fitting within some
 8 sort of tolerance within these international
 9 standards that allows you to add small pockets
 10 of thermal generation as a means of not having
 11 to comply with the 1 in 150 standard? Is that
 12 how it works?
 13 MR. KEAN:
 14 A. Well, it comes down to a balance of what is
 15 right and what limits the impact to your
 16 customer.
 17 MR. JOHNSON:
 18 Q. And, I guess -
 19 MR. KEAN:
 20 A. In our view and in our interpretation of the
 21 standard.
 22 MR. JOHNSON:
 23 Q. So there is a difference in interpretation in
 24 the standard?
 25 MR. KEAN:

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1 reliability is the most expensive part, I
 2 suppose, you know, to rule out all
 3 possibilities, but I want to try to understand
 4 for the customer how your approach to adding
 5 on some small generation where need be is to
 6 the customer's advantage as opposed to
 7 spending the money on beefing up the line to 1
 8 in 150?
 9 MR. KEAN:
 10 A. Well, in the event we beef the line up to 1 in
 11 150, that line can still fail. The
 12 probability is lower, but it can still fail.
 13 When the line goes out, it doesn't matter
 14 whether the design was 1 in 50, 1 in 150, or 1
 15 in 500, the line is out of service, and the
 16 customer is conceivably without power. So
 17 from the perspective of the balance between
 18 adding generation on the island, what the
 19 generation on the island does is basically
 20 reduce the reliance on the link for supply.
 21 So in the event the line fails, the customer
 22 left without the line is in a better position,
 23 we have more generation to serve the load, so
 24 the impact on the customer is less.
 25 MR. JOHNSON:

1 A. I'm not sure if there is.
 2 MR. JOHNSON:
 3 Q. I understand, in any event, that beefing up
 4 the line to 1 in 150 year return period adds
 5 150 million dollars to the cost of the
 6 transmission line. I think that's a figure
 7 that came out of an RFI. Are we on the same -
 8 MR. KEAN:
 9 A. Yes, that's right.
 10 MR. JOHNSON:
 11 Q. And if we went further and said, you know, 1
 12 in 500, what would be the incremental cost
 13 versus your existing DG 2 design?
 14 MR. KEAN:
 15 A. I don't have that number right now.
 16 MR. JOHNSON:
 17 Q. Okay. Is it a number that you would have
 18 available over at Nalcor or somewhere?
 19 MR. KEAN:
 20 A. I think we should be able to, yes.
 21 MR. JOHNSON:
 22 Q. I think it would be useful to have it for the
 23 record just to see what the number is. I
 24 understand the idea that extra reliability
 25 costs more money, and getting that last bit of

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1 Q. So just give us, if you could, like, a
 2 concrete illustration of where, for instance,
 3 you might put an extra small thermal
 4 generator? You know, it's hypothetical, but
 5 some insight in how that would be a benefit?
 6 MR. KEAN:
 7 A. More than likely we would establish it
 8 somewhere on the Avalon Peninsula because that
 9 is where our load centre is, but it could be
 10 anywhere on the island. We have them here in
 11 the St. John's area now, we have one at
 12 Stephenville, the Holyrood site, we might
 13 establish them there, they could be anywhere
 14 on the island actually, but more than likely
 15 we would choose a site on the Avalon
 16 Peninsula.
 17 MR. JOHNSON:
 18 Q. As I understand it as well, Nalcor --
 19 according to MHI's report, Nalcor has said if
 20 we spend the money and bring it up to one in
 21 150, if we have an event that knocks out the
 22 line, that line is gone and the rest of our
 23 system is not built to one and 150 anyhow and
 24 as I understand it, you know, you're saying
 25 what are we accomplishing by having the robust

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1 -- the more robust 1100 kilometre line when
 2 the rest of the line infrastructure would fail
 3 in any event under that type of circumstance?
 4 More or less have I got what your position is?
 5 MR. HUMPHRIES:
 6 A. Yeah, and that applies if the storm is in an
 7 area where we have common transmission, like
 8 on the Avalon Peninsula, for argument sake.
 9 If there were that level of an event on the
 10 Avalon Peninsula, there's a very high
 11 probability that the link would remain
 12 standing and the supporting 230 kV
 13 transmission that supplies the local load
 14 would be flat.
 15 MR. JOHNSON:
 16 Q. And so is there no -- there's no line on the
 17 island, I take it, that is in excess of the
 18 one and 50 year return at this point?
 19 MR. HUMPHRIES:
 20 A. That's correct.
 21 MR. JOHNSON:
 22 Q. And how old is the newest transmission line?
 23 MR. HUMPHRIES:
 24 A. The newest one would probably be seven years
 25 old.

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1 transmission lines out there that may be the
 2 sole source of supply and that if they come
 3 down, everyone is without power and it makes
 4 sense to invest more in these lines to
 5 increase reliability and reduce the
 6 probability of these risks. In lots of cases
 7 when these storms happen, the bulk
 8 transmission remains standing. There's still
 9 severe power outages because of downed under
 10 distribution lines and lower voltage supply
 11 lines. So, it's a mixed bag from that
 12 perspective.
 13 MR. JOHNSON:
 14 Q. Did they adopt a higher standard in Quebec
 15 after the storm?
 16 MR. HUMPHRIES:
 17 A. For their major lines, yes, they have.
 18 MR. JOHNSON:
 19 Q. To one in 500, was it? Is that -- did they go
 20 that far?
 21 MR. HUMPHRIES:
 22 A. I think they're at one in 500, yes.
 23 MR. JOHNSON:
 24 Q. I guess a question related to the Labrador-
 25 Island link is a question of a cable failure

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1 MR. JOHNSON:
 2 Q. How old?
 3 MR. HUMPHRIES:
 4 A. Seven years.
 5 MR. JOHNSON:
 6 Q. And where does that line run?
 7 MR. HUMPHRIES:
 8 A. That's the line that supplies -- it connects
 9 Granite Canal to the grid.
 10 MR. JOHNSON:
 11 Q. I had a question put to me by a gentleman here
 12 earlier who wanted me to raise with you, you
 13 know, the possibility of a Montreal ice storm
 14 and I think he was getting at, you know, the
 15 lessons from the Montreal ice storm where
 16 there was outages for a considerable period of
 17 time and my understanding is following that,
 18 they had a different look at, you know, what
 19 the return period should be and the design
 20 criteria, loading criteria, and can you
 21 comment on that aspect? It's a fairly recent
 22 example. Dramatic, but recent.
 23 MR. HUMPHRIES:
 24 A. Yeah, and they are -- that is an issue and
 25 there's no doubt that there are critical

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1 and a gentleman in Carbonear, Mr. Graham
 2 Moores, said that I could use his name, so
 3 I'll use it, and he wished to know if there
 4 were to be a cable failure for the Strait of
 5 Belle Isle, what would be the plan and how
 6 long would it be to fix it?
 7 MR. HUMPHRIES:
 8 A. Well, if there were -- to begin with, there
 9 will be spare cable on the link so that if we
 10 have a single cable loss, it's business as
 11 usual. From the perspective of the repair of
 12 a damaged cable, that could take up to six
 13 months to repair a damaged cable.
 14 MR. JOHNSON:
 15 Q. Coming back then to the transmission line, say
 16 what's the part of our geography in
 17 Newfoundland where this line is going to run
 18 through that has the Nalcor, the Hydro people
 19 the most concerned?
 20 MR. HUMPHRIES:
 21 A. Well obviously the main area of concern is the
 22 crossing of the Long Range Mountains. You
 23 know, that's new terrain. We've done a lot of
 24 study on it, but we have no transmission in
 25 that area at this time. And again, the Avalon

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1 Peninsula, we've had a history of icing events
 2 on the Avalon Peninsula and we've beefed up
 3 our line designs considerably in recent
 4 history to mitigate those outages.
 5 MR. JOHNSON:
 6 Q. Did you -- but you didn't beef them up beyond
 7 a one in 50, I take it?
 8 MR. HUMPHRIES:
 9 A. No, in fact they're only at one in 25.
 10 MR. JOHNSON:
 11 Q. Okay. And how did you beef them up?
 12 MR. HUMPHRIES:
 13 A. We actually -- we changed out conductors, put
 14 in midspan structures to strengthen the line.
 15 We put in anti-cascading structures so that if
 16 we have a failure to limit the amount of
 17 damage, that we would lose fewer spans and
 18 those types of things.
 19 MR. JOHNSON:
 20 Q. Yeah, that's -- I guess I should have probably
 21 asked that question. What does it mean --
 22 let's say, let's take the Avalon situation and
 23 we know what a one and 50 year storm is and we
 24 know what sort of configuration you have for
 25 that and then we'll say, okay, now we're going

1 to have a design for a one in 150 year event
 2 for that section of the Avalon. Sort of
 3 explain to me how it might look differently in
 4 terms of the beefing up. More towers? More
 5 steel?
 6 MR. HUMPHRIES:
 7 A. The spans could be shorter. The towers would
 8 be heavier, heavier steel. The conductors
 9 would be stronger. You know, it would have a
 10 general overall different appearance.
 11 MR. JOHNSON:
 12 Q. The same gentleman also wanted me to ask you a
 13 question and he asked if the transmission line
 14 goes down, and I take it he's referring to the
 15 HVDC, goes down and we can't access power from
 16 Muskrat Falls, is Nalcor planning to have
 17 backup generation on the island on account of
 18 the fact that the plan is to retire Holyrood
 19 as a generating facility? I think the record
 20 would indicate in Exhibit 106 that there's no
 21 plan for backup, but I'd like for you to
 22 discuss that.
 23 MR. HUMPHRIES:
 24 A. Yeah, well, again, I think we need to go back
 25 and consider the overall scheme that we're

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1 looking at. We are confident and hopeful --
 2 or it's hopeful that the Maritime link will
 3 progress after Muskrat Falls and we will have
 4 a second connection to the North American grid
 5 via Nova Scotia. That will be a bi-
 6 directional connection meaning that power can
 7 flow in either direction. So, that will be a
 8 great benefit to mitigate the risk of the loss
 9 of the Labrador link and it would cover off --
 10 give us the ability to cover off the loss. So
 11 in effect, that would be a backup source of
 12 generation.
 13 MR. JOHNSON:
 14 Q. And I guess that leads me to a question I
 15 think I got over the weekend from a gentleman
 16 and I think I filed it this morning or asked
 17 my office to file it, and that is whether or
 18 not this proposal, Muskrat Labrador link,
 19 depends upon successful conclusion of the
 20 Maritime link and that was, I think, the
 21 gentleman's question.
 22 MR. HUMPHRIES:
 23 A. And my answer is no, it doesn't.
 24 MR. JOHNSON:
 25 Q. While I have these questions, there was some -

1 - I'll put them now. They don't particularly
 2 tie into what I've been -- we've been
 3 discussing thus far, but I have a question
 4 that arises out of -- from a gentleman that
 5 arises out of the presentation this morning
 6 that said that by going with the Muskrat Falls
 7 option, we are going to be, in relatively
 8 short order, largely clean energy as opposed
 9 to 35 percent thermal now, roundabout, but the
 10 individual pointed out, well at 2067, we're
 11 all 35 percent thermal at that stage, so you
 12 know, what are -- I guess the implication is,
 13 you know, you're planning to bring us back to
 14 35 percent thermal by 2067. What's the answer
 15 to that concern?
 16 MR. BENNETT:
 17 A. It's Gilbert Bennett. Our answer is a
 18 distinction between capacity and energy on the
 19 system and there will be thermal capacity on
 20 the system, but it's only used when the system
 21 is under peak loading. So, the amount of
 22 energy produced by that thermal generation is
 23 very small. There are two places we can look
 24 at that. The pie chart that I had this
 25 morning in the presentation with the CPW

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1 breakdown, if you pull that one up, if
 2 everybody can bear with me for a moment,
 3 please. So on page 33, the fuel bill post
 4 2017 is a very small sliver that's extended
 5 out of the pie and it's .4 percent of our CPW.
 6 MR. JOHNSON:
 7 Q. Okay.
 8 MR. BENNETT:
 9 A. Very small amount of fuel that's burned from
 10 that thermal generation.
 11 MR. JOHNSON:
 12 Q. So the thermal we have at that point is for
 13 peaking purposes?
 14 MR. BENNETT:
 15 A. That's right.
 16 MR. JOHNSON:
 17 Q. Not to be used very much?
 18 MR. BENNETT:
 19 A. That's right, and I think if we refer to
 20 Exhibit 99, we can see the fuel expenditures
 21 in there and there's a stark difference
 22 between the two, the two plans in the latter
 23 years.
 24 MR. JOHNSON:
 25 Q. Exhibit 99.

1 MR. BENNETT:
 2 A. So if we go right to the last page of this
 3 spreadsheet, the fuel expense in the
 4 Interconnected scenario is actually right here
 5 on -- you can see under the heading, the red
 6 heading, total fuel expense, there were four
 7 rows underneath there and if you go over to
 8 2067 on the bottom row, that's the total
 9 amount of fuel burned or forecasted to be
 10 burned in the Interconnected scenario. That's
 11 176,000 barrels.
 12 MR. JOHNSON:
 13 Q. Okay.
 14 MR. BENNETT:
 15 A. So, very small amount.
 16 MR. JOHNSON:
 17 Q. Okay. Yeah, okay.
 18 MR. BENNETT:
 19 A. I think just for reference, the equivalent
 20 number in the Isolated scenario is about 6.1
 21 million barrels.
 22 MR. JOHNSON:
 23 Q. Yes, okay. Question sort of having to do with
 24 the addition of Portland Creek. I think
 25 Portland Creek would be an addition that would

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1 be contemplated under the Muskrat Falls
 2 Labrador-Island link scenario and the question
 3 was what would be the purpose of building the
 4 Portland Creek hydro facility? Is it for
 5 peaking use or is it for energy?
 6 MR. BENNETT:
 7 A. The predominant driver is for peaking
 8 capacity, but when we look at Portland Creek,
 9 Portland Creek is a very attractive hydro
 10 site. It has a competitive price, so when the
 11 strategists program was looking at the
 12 resources available, we had a capacity
 13 deficit, but because the energy price was also
 14 attractive, it was chosen to fill a double
 15 bill.
 16 MR. JOHNSON:
 17 Q. So, did the attractiveness of the energy have
 18 anything to do with water flows during the
 19 critical heating period with Portland Creek?
 20 You know, some -- as I understand it, some
 21 small hydro, they don't have water when you
 22 need it and they got water when you don't need
 23 it, you know, May-June type of idea. How does
 24 Portland Creek profile?
 25 MR. BENNETT:

1 A. We would have the ability to be able to access
 2 peak capacity at Portland Creek.
 3 MR. JOHNSON:
 4 Q. Okay, yeah, and also, this individual
 5 indicated to me that isn't this also a major
 6 salmon river, Portland Creek? I guess it's
 7 one of the few that I haven't fished, I
 8 suppose.
 9 MR. BENNETT:
 10 A. We have done the environmental screening on
 11 Portland Creek. We've had feasibility studies
 12 completed and we don't anticipate it being a
 13 significant environmental issue.
 14 MR. JOHNSON:
 15 Q. On the topic of Portland Creek, because while
 16 the Portland Creek shows up in the Muskrat
 17 Falls Labrador-Island link scenario, it also
 18 obviously figures prominently in the Isolated
 19 scenario and that along with Island Pond and
 20 thermal and et cetera, and in terms of -- as
 21 your presentation indicated this morning that
 22 the bulk of the bucks being spent in the
 23 island Isolated scenario is oil, but there's
 24 obviously capital costs associated with not
 25 only remediation at Holyrood, but building

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1 these hydro electric facilities as well. In
 2 terms of the numbers on the hydroelectric
 3 capital additions, how old are these numbers?
 4 How solid are these numbers? Are they
 5 conservative?
 6 MR. BENNETT:
 7 A. The Island Pond and Portland Creek are based
 8 on studies that were completed in the early to
 9 mid 2000 time frame and have been updated
 10 regularly to reflect current trends in the
 11 industry. The actual Round Pond estimate is
 12 more dated, but it has been updated, but on a
 13 -- based on current escalation indices, but it
 14 hasn't been reviewed in detail since -- in a
 15 number of years.
 16 MR. JOHNSON:
 17 Q. A question also put to me was what is the
 18 current status of decision making regarding
 19 the Federal loan guarantee for the project?
 20 Is that a question that anybody can answer on
 21 this panel?
 22 MR. HUMPHRIES:
 23 A. I think all I can say is that discussions with
 24 the Government of Canada are ongoing.
 25 MR. JOHNSON:

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1 and so on, but the nature and extent of
 2 negotiations between the Government of Canada
 3 and say the Province or whatever, I don't know
 4 how that is really helpful to inform this
 5 process. I'm having some difficulty in that.
 6 CHAIRMAN:
 7 Q. What have you got to say for yourself?
 8 O'REILLY, Q.C.:
 9 Q. Put his credit card on the table.
 10 MR. JOHNSON:
 11 Q. I asked the person's question and I realize
 12 issues between government to government
 13 negotiations are not something that Nalcor can
 14 be expected to speak too much in detail about,
 15 I would think, but in fairness to the
 16 gentleman, I put the question there.
 17 CHAIRMAN:
 18 Q. Put the question in the record.
 19 MR. JOHNSON:
 20 Q. Yeah, I put the question on the record.
 21 CHAIRMAN:
 22 Q. What do you think, Madame?
 23 GREENE, Q.C.:
 24 Q. I guess one of the challenges for all of us is
 25 interpreting the Terms of Reference and the

1 Q. A question also was the Government of Canada
 2 commitment at at least one point had been put
 3 in terms of a Federal loan guarantee or the
 4 financial equivalent and the questioner was
 5 interested in knowing whether the financial
 6 equivalent would be to have the Federal
 7 government, in essence, be in the exact same
 8 position as they would be had they provided a
 9 guarantee and there was a default. In other
 10 words, I think the implication of the question
 11 was, to this person's thinking, that if the
 12 Federal government guarantee is worth 600
 13 million dollars in 2010 dollars, according to
 14 your sensitivity test, getting a cheque from
 15 the Federal Government for 600 million is not
 16 the same as having them give a guarantee and
 17 he was interested in knowing if there was any
 18 thoughts on that concern.
 19 O'REILLY, Q.C.:
 20 Q. Mr. Chairman, I don't know how this is helping
 21 us. I mean, I can understand that this is a
 22 part of the equation and it's been out there
 23 that there has been, you know, negotiation as
 24 a part of it, it might affect the status of
 25 negotiations on the progress of the project

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1 mandate question. There have been instances,
 2 for example, the Maritime link has been
 3 excluded from review, but yet there have been
 4 references to it with respect to reliability.
 5 So I guess it would be a challenge for all of
 6 us as we move forward to stay within the
 7 mandate. The issue of the loan guarantee was
 8 not included and was excluded from the
 9 reference before the Board.
 10 MR. JOHNSON:
 11 Q. Turning then to the -
 12 CHAIRMAN:
 13 Q. I mean, would it have any effect on the final
 14 cost, I guess is the question. Would it
 15 affect this two billion dollar difference?
 16 MR. JOHNSON:
 17 Q. It certainly will affect the 2.2 billion as
 18 pointed out in the sensitivity and I think
 19 from what I understand unless something is
 20 more certain -- if something is less than
 21 certain, it's used as a sensitivity. I think
 22 that's the approach that's been taken in the
 23 materials. But certainly for the purpose of
 24 the sensitivity, there's a dollar figure on
 25 it.

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<p>1 The issue of the integration studies, the</p> <p>2 AC integration studies, I'd like to try to</p> <p>3 address that. As I understand it -- well, why</p> <p>4 don't we just start bottom up. The</p> <p>5 integration study is aimed at finding out</p> <p>6 what?</p> <p>7 MR. HUMPHRIES:</p> <p>8 A. It's aimed at looking at and identifying</p> <p>9 issues with the integration of the Muskrat</p> <p>10 Falls and Labrador-Island link with the Island</p> <p>11 system, operational type issues.</p> <p>12 MR. JOHNSON:</p> <p>13 Q. And what are the operational type issues?</p> <p>14 MR. HUMPHRIES:</p> <p>15 A. Well, there may be equipment, for argument</p> <p>16 sake, that would need upgrading because of the</p> <p>17 integration of the project. There may -- how</p> <p>18 the system is going to react to contingencies,</p> <p>19 being outages, be they trips of transmission</p> <p>20 lines on the island or loss of link, those</p> <p>21 types of things and ensure that the system</p> <p>22 operates in an orderly fashion.</p> <p>23 MR. JOHNSON:</p> <p>24 Q. And just could you give us some examples of,</p> <p>25 you know, problems that may have to be</p>	<p>1 overcome and how you would overcome them</p> <p>2 through the suggestions in an integration</p> <p>3 study?</p> <p>4 MR. HUMPHRIES:</p> <p>5 A. Well, one obvious thing that's come out from</p> <p>6 previous studies that as we integrate the link</p> <p>7 and we add all this additional synchronous</p> <p>8 condenser capability at Soldier's Pond, that</p> <p>9 basically increases the strength or the fault</p> <p>10 level of the system and there's a number of</p> <p>11 circuit breakers in the system that are --</p> <p>12 existing circuit breakers that are no longer</p> <p>13 adequate and they have to be changed out</p> <p>14 because of this increased fault level.</p> <p>15 MR. JOHNSON:</p> <p>16 Q. And is that something that's been costed in</p> <p>17 DG2?</p> <p>18 MR. HUMPHRIES:</p> <p>19 A. Yes, it is.</p> <p>20 MR. JOHNSON:</p> <p>21 Q. And who is completing the integration studies?</p> <p>22 Are they being completed in house?</p> <p>23 MR. HUMPHRIES:</p> <p>24 A. No, they're being completed by SNC.</p> <p>25 MR. JOHNSON:</p>
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<p>1 Q. Okay. And they have -- Manitoba Hydro</p> <p>2 International, of course, has identified the</p> <p>3 integration study issue as a gap that they</p> <p>4 indicate they would have expected to be</p> <p>5 completed as part of the project screening</p> <p>6 process at DG2 and I'd like your assessment as</p> <p>7 to whether is this a gap or not a gap or</p> <p>8 what's Nalcor's position on it?</p> <p>9 MR. HUMPHRIES:</p> <p>10 A. Well, I'll first fill you in and tell you what</p> <p>11 we've done and what we've assumed. If you</p> <p>12 look back over the history of the integration</p> <p>13 of a DC link into the island of Newfoundland,</p> <p>14 we've been looking at it for a number of years</p> <p>15 and there have been a number of varying</p> <p>16 integration studies on different schemes, as</p> <p>17 was indicated in the MHI report. The most</p> <p>18 recent of those would have been in 1998 when</p> <p>19 we looked at the integration of a bi-pole</p> <p>20 point-to-point HVDC link from Gull Island to</p> <p>21 Soldier's Pond. There was an extensive</p> <p>22 integration study done on that configuration.</p> <p>23 And in the 2007 time frame, we also completed</p> <p>24 an integration study based on another</p> <p>25 arrangement which was a 1600 megawatt larger</p>	<p>1 arrangement. It was what you call a multi-</p> <p>2 terminal and which there was a link to New</p> <p>3 Brunswick. We have the results of those</p> <p>4 studies. We are of the opinion that the 1998</p> <p>5 scheme is very similar to what we are looking</p> <p>6 at today and further, we compared the results</p> <p>7 of the integration study from '98 with the</p> <p>8 2007 and from the perspective of the</p> <p>9 integration impacts into the island system,</p> <p>10 they're practically identical. There were --</p> <p>11 the differences were insignificant.</p> <p>12 MR. JOHNSON:</p> <p>13 Q. Could I stop you there for a second, Mr.</p> <p>14 Humphries, and what were the things that you</p> <p>15 were finding practically identical?</p> <p>16 MR. HUMPHRIES:</p> <p>17 A. Well, the circuit breakers that I spoke of</p> <p>18 earlier that needed to be upgraded, they were</p> <p>19 the same. The overload conditions we may have</p> <p>20 had on transmission lines were the same. The</p> <p>21 system performance for various contingencies,</p> <p>22 that be line trips or generator trips, were</p> <p>23 practically the same. Actually, more than</p> <p>24 practically, they were the same.</p> <p>25 MR. JOHNSON:</p>

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<p>1 Q. And so that was the knowledge that was used by</p> <p>2 Nalcor in terms of coming up with the features</p> <p>3 -</p> <p>4 MR. HUMPHRIES:</p> <p>5 A. For DG2.</p> <p>6 MR. JOHNSON:</p> <p>7 Q. - for project definition for the system to</p> <p>8 successfully integrate the power coming down</p> <p>9 from Muskrat?</p> <p>10 MR. HUMPHRIES:</p> <p>11 A. Yes.</p> <p>12 MR. JOHNSON:</p> <p>13 Q. And you're telling me that got costed in?</p> <p>14 MR. HUMPHRIES:</p> <p>15 A. All those items are costed in, yes, to the DG2</p> <p>16 basis of design.</p> <p>17 MR. JOHNSON:</p> <p>18 Q. Okay. And when you say all those items got</p> <p>19 costed in, would that have contemplated</p> <p>20 costing in any backup generation or beefed up</p> <p>21 lines?</p> <p>22 MR. HUMPHRIES:</p> <p>23 A. No, the system integration does not address</p> <p>24 system reliability issues.</p> <p>25 MR. JOHNSON:</p>	<p>1 Q. Okay. So the items then, can you be specific</p> <p>2 about what got costed in at DG2 as a result of</p> <p>3 where your analysis had led you to on the</p> <p>4 integration needs?</p> <p>5 MR. HUMPHRIES:</p> <p>6 A. We costed in three additional synchronous</p> <p>7 condensers at the Soldier's Pond converter</p> <p>8 station. There were a number of circuit</p> <p>9 breaker upgrades that were identified. And</p> <p>10 those are the bulk of the items that are in</p> <p>11 the plan right now.</p> <p>12 MR. JOHNSON:</p> <p>13 Q. And I take it your presentation indicates that</p> <p>14 as a result Nalcor had sufficient input data</p> <p>15 to move through DG2 with the intention of</p> <p>16 completing the full integration studies for</p> <p>17 DG3?</p> <p>18 MR. HUMPHRIES:</p> <p>19 A. That's correct.</p> <p>20 MR. JOHNSON:</p> <p>21 Q. So that's the one that are still ongoing. I</p> <p>22 do have to ask you a question though. The</p> <p>23 bullet point before that said "analysis</p> <p>24 determined point-to-point link will have</p> <p>25 similar characteristics regardless of change</p>
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<p>1 in generation source provided there is a line</p> <p>2 to Churchill Falls," and how did the AC line</p> <p>3 to Churchill Falls figure into that?</p> <p>4 MR. HUMPHRIES:</p> <p>5 A. Well, basically, with a strong connection back</p> <p>6 to Churchill Falls, Churchill Falls is the</p> <p>7 dominating force in Labrador from the</p> <p>8 perspective and whether the generation source</p> <p>9 at the converter location, whether it be</p> <p>10 Muskrat Falls or Gull Island, is not</p> <p>11 significant in the overall performance.</p> <p>12 MR. JOHNSON:</p> <p>13 Q. Okay.</p> <p>14 CHAIRMAN:</p> <p>15 Q. Does anybody feel inclined to a break? I'll</p> <p>16 speak for myself, I don't, but -</p> <p>17 MR. JOHNSON:</p> <p>18 Q. No.</p> <p>19 CHAIRMAN:</p> <p>20 Q. - somebody asked me whether -- but I mean,</p> <p>21 I'll defer to the - I don't -</p> <p>22 MR. JOHNSON:</p> <p>23 Q. I don't require one.</p> <p>24 COMMISSIONER:</p> <p>25 Q. What about the panel?</p>	<p>1 CHAIRMAN:</p> <p>2 Q. How are you guys?</p> <p>3 MR. BENNETT:</p> <p>4 A. I think we're okay.</p> <p>5 MR. HUMPHRIES:</p> <p>6 A. We're okay.</p> <p>7 CHAIRMAN:</p> <p>8 Q. Well, let's keep her going.</p> <p>9 MR. JOHNSON:</p> <p>10 Q. I'm now in trouble. Someone wanted one,</p> <p>11 didn't they?</p> <p>12 CHAIRMAN:</p> <p>13 Q. Does anybody want a break?</p> <p>14 VICE-CHAIR WHALEN:</p> <p>15 Q. Hearing none.</p> <p>16 CHAIRMAN:</p> <p>17 Q. Carry on.</p> <p>18 MR. JOHNSON:</p> <p>19 Q. Okay. Bringing it -- you know, all these</p> <p>20 things obviously are important from my point</p> <p>21 of view in terms of looking at the costs,</p> <p>22 right, and I'd just like to get your comment</p> <p>23 on MHI says that there may be additional risk</p> <p>24 factors that may impact cumulative present</p> <p>25 worth of the in-feed option. That was their</p>

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1 conclusion based -- you know, you're all
2 familiar with the AC integration comments, and
3 so, you know, I would be worried if there was
4 something there that we don't know about as of
5 DG2 and I'd like you to address that. You
6 know, is there a known unknown or an unknown
7 unknown?

8 MR. HUMPHRIES:

9 A. Based on -- it's our view, based on our
10 understanding of our system and the previous
11 studies, that the items identified in these
12 studies were representative of what we would
13 be faced with with the integration of the
14 Muskrat Falls scenario and further to that,
15 the studies, the current studies are ongoing
16 and while they're not complete yet, we have
17 seen some preliminary results or indication --
18 I haven't seen them, but I've talked to --
19 some of my staff are participating and we have
20 not identified it and don't expect to.

21 MR. JOHNSON:

22 Q. MHI refers specifically, and I'm not taking
23 away from your answer, but they refer
24 specifically to possibilities such as
25 installation of backup supplies to cover

1 operational limitations in the Labrador-Island
2 link system maybe required and additional
3 transmission lines may be needed or spare
4 equipment, and I guess I'd be interested in
5 knowing are those the type of things that you
6 could get into at the stage that -- at DG3?

7 MR. HUMPHRIES:

8 A. We don't think so, no. We don't think we
9 would get into those.

10 MR. JOHNSON:

11 Q. The other issue regarding system reliability
12 had to do with probabilistic modelling and
13 everything. Now I understand that in your
14 presentation this morning, you've indicated
15 that Nalcor is implementing a more advanced
16 and comprehensive reliability model that
17 incorporates all components of the Labrador-
18 Island link HVDC system for DG3. However, I'm
19 interested in knowing, as at DG2, the numbers
20 we have, are there any cost implications that
21 we are not aware of or not on the record that
22 may be -- that may grow out of DG3 efforts as
23 relation -- in relation to the system
24 reliability piece?

25 MR. HUMPHRIES:

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1 A. No, I do not think so. The probabilistic
2 model that we're speaking of that we're
3 developing is a refinement of -- well, the
4 result and a refinement of the forced outage
5 rate for the Labrador-Island link which
6 Manitoba Hydro has already commented the
7 number we're using appears to be in an
8 acceptable range. So I don't expect any
9 issue.

10 MR. JOHNSON:

11 Q. I've got two questions. The number that
12 you're using is .89 percent.

13 MR. HUMPHRIES:

14 A. Yes.

15 MR. JOHNSON:

16 Q. On a per pole basis, and I understand the
17 presentation this morning indicated that was
18 an assumed figure?

19 MR. HUMPHRIES:

20 A. It was based on a previous probabilistic
21 assessment of a similar arrangement, yes.

22 MR. JOHNSON:

23 Q. And MHI, and I just want to see where the
24 points, if any, of disagreement are. MHI, I
25 believe, going on memory, said that they

1 accepted .89 percent as being, you know, a
2 decent value, didn't quibble with that, but
3 found that in the information that they had
4 seen, they couldn't determine that number on
5 their own. They couldn't, I guess, validate
6 the number. Is that a fair comment from MHI?

7 MR. HUMPHRIES:

8 A. Yeah. We've accepted that and the work that
9 we're currently carrying out will address and
10 the model will be specific to the scheme we're
11 looking at today.

12 MR. JOHNSON:

13 Q. I'd like to turn to system upgrades pertaining
14 to the Muskrat Falls Labrador-Island link
15 scenario and I believe that's a 194 million
16 dollar component to the scenario and first of
17 all, what are we talking about in terms of
18 system upgrades? What falls under that?

19 MR. HUMPHRIES:

20 A. These are the items that we identified
21 previously. I spoke of the synchronous
22 condensers, the circuit breaker upgrades.

23 MR. JOHNSON:

24 Q. Okay. Now MHI indicated that they found that
25 Nalcor's DG2 estimates for the converter

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<p>1 stations and electrodes were found to be</p> <p>2 reasonable for DG2 purposes which they compare</p> <p>3 to industry benchmarks. However, at page 60,</p> <p>4 I think it's of Volume 1, they state that</p> <p>5 "Nalcor's estimates for system upgrades,</p> <p>6 including the three 300 MVA synchronous</p> <p>7 condensers, plus the conversion of the two</p> <p>8 generating units at Holyrood, as well as the</p> <p>9 addition of several high voltage breakers were</p> <p>10 low" and they said they're low but are within</p> <p>11 the bounds of cost estimate variability, and</p> <p>12 they found them to be reasonable inputs to the</p> <p>13 DG2 screening process and the CPW analysis.</p> <p>14 So I guess, first of all, how did you guys at</p> <p>15 -- or I shouldn't say you guys -- how did</p> <p>16 Nalcor, at DG2, come to put your estimate in</p> <p>17 place for these components?</p> <p>18 MR. HUMPHRIES:</p> <p>19 A. I'll get Mr. Kean to address that.</p> <p>20 MR. KEAN:</p> <p>21 A. Thank you. Yes, we appreciate Manitoba</p> <p>22 Hydro's insight in this regard. I recall</p> <p>23 having some discussion with them during the</p> <p>24 interview phase. At Decision Gate 2, for the</p> <p>25 synchronous condenser component, we looked at</p>	<p>1 two aspects. The largest cost aspect of that</p> <p>2 is the machine itself and we went and</p> <p>3 requested budgetary quotes. The quote that we</p> <p>4 selected to use in the estimate is from</p> <p>5 Toshiba, Toshiba out of Japan. Further, we</p> <p>6 looked at the civil and site works associated</p> <p>7 with that structure. So we looked at the size</p> <p>8 of the yard, the concrete, and got some basic</p> <p>9 structural dimensions and did a review of what</p> <p>10 the cost of the civil works would be. So</p> <p>11 that's the primary basis of the DG2 estimate.</p> <p>12 Since that time, we were doing, you know,</p> <p>13 fairly detailed layouts of that site at</p> <p>14 Soldier's Pond and verifying the machine</p> <p>15 characteristics and we're in the process --</p> <p>16 we've actually gone out and are requesting new</p> <p>17 up-to-date budgetary quotes that we will be</p> <p>18 able to incorporate in the Decision Gate 3</p> <p>19 estimate.</p> <p>20 MR. JOHNSON:</p> <p>21 Q. So as at Decision Gate 2, what was left to be</p> <p>22 done or what had to be done to get to DG 3</p> <p>23 level? I guess what I'm getting at, in terms</p> <p>24 of putting a cost estimate in place for these</p> <p>25 system upgrades.</p>
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<p>1 MR. KEAN:</p> <p>2 A. The DG2 estimate would have been fairly</p> <p>3 preliminary in many aspects, in particular on</p> <p>4 the civil works, as well as the associated</p> <p>5 electromechanical works for the facility. The</p> <p>6 synchronous condensers are housed in a large</p> <p>7 structure, so we would have not had, let's</p> <p>8 say, detailed drawings to support a quantity</p> <p>9 take off of concrete, nor would we have</p> <p>10 details on overhead cranes or electrical</p> <p>11 mechanical outfitting that would be required</p> <p>12 for that facility. So between -- over the</p> <p>13 last year with SNC's engagement, we've worked</p> <p>14 on defining that much further and of course,</p> <p>15 having greater clarity on the characteristics</p> <p>16 of the machine so we can go out and get</p> <p>17 further and more advanced budgetary quotes.</p> <p>18 MR. JOHNSON:</p> <p>19 Q. And are we expecting an increase in the cost</p> <p>20 between DG2 and DG3 or can you state?</p> <p>21 MR. KEAN:</p> <p>22 A. A little bit difficult to comment on the</p> <p>23 machine aspect. The DG2 was done in a Q1-2010</p> <p>24 economic environment. We're gone out today to</p> <p>25 get new budgetary prices. That is the largest</p>	<p>1 cost element of that, of the synchronous</p> <p>2 condensers, the machine itself. I really</p> <p>3 can't speculate until we go through the</p> <p>4 process and look at in the entire picture of</p> <p>5 the DG3 estimate.</p> <p>6 MR. JOHNSON:</p> <p>7 Q. MHI indicates that they -- this is, for the</p> <p>8 record, page 112 of Volume 2. They say that</p> <p>9 for the purpose of developing a cost estimate</p> <p>10 comparison, MHI used data from similar prior</p> <p>11 projects. Are you familiar with what prior</p> <p>12 projects they were referring to or have you --</p> <p>13 did you look at other projects yourselves in</p> <p>14 terms of coming up with DG2 numbers?</p> <p>15 MR. KEAN:</p> <p>16 A. Yes, we did. With actual engagement of</p> <p>17 Manitoba Hydro a couple of years back and some</p> <p>18 visits that we had to Dorsey and so on.</p> <p>19 MR. JOHNSON:</p> <p>20 Q. Okay.</p> <p>21 MR. KEAN:</p> <p>22 A. So we did look at some of that, as well as</p> <p>23 engagement with Toshiba.</p> <p>24 MR. JOHNSON:</p> <p>25 Q. Okay. I'm going to put to you some concerns</p>

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1 that have been raised from commentators that
 2 I've been following, monitoring commentary
 3 from citizens about Muskrat Falls and I know
 4 there's been a considerable amount of back and
 5 forth over the issues and I want to take this
 6 opportunity to put to you some concerns that
 7 have been expressed for your response in this
 8 forum as certainly some of these concerns
 9 would seem to go to the matters raised in the
 10 reference.

11 One concern I saw expressed in an October
 12 8th commentary from 2011 in The Telegram was
 13 that projects like Muskrat Falls are known for
 14 cost overruns. One commentary, the commentary
 15 cited a World Commission on Dams report which
 16 according to the commentary concluded that
 17 building dams had overruns on average of 56
 18 percent. There was also reference in the
 19 commentary to a proposed site sea dam in
 20 British Columbia which started at a three
 21 billion dollar cost estimate and on May 2011,
 22 the new price was almost eight billion
 23 dollars. And this is a concern that goes to
 24 the cost estimation and the prospect for
 25 overruns and I'd like for you to speak to that

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1 to do. We have a team that's been together
 2 that is -- and we further have engaged a world
 3 class EPCM consultant to work with us. The
 4 plans and targets are realistic. They're
 5 based on well founded engineering and work
 6 that we've undertaken extensively over the
 7 past few years and they're achievable.

8 MR. JOHNSON:

9 Q. A question I'd have coming out of that concern
 10 would be the -- has Nalcor looked at where
 11 these other projects seemingly -- and I'm not
 12 familiar with some of them, but the horror
 13 stories are out there, but has Nalcor looked
 14 at what went on in those projects to figure
 15 out where these drivers happened?

16 MR. HARRINGTON:

17 A. Nalcor is part of the Canadian Electrical
 18 Utilities Project Management Network. That's
 19 quite a mouthful for me to say, but anyway, so
 20 we meet twice a year to go through lessons
 21 learned from different projects and, you know,
 22 we take all of those lessons learned under
 23 good advisement. We listen to what the other
 24 challenges are on different projects and you
 25 made a reference to site sea and the evolution

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1 concern.

2 MR. KEAN:

3 A. Yes, we are aware of this phenomena. It's
 4 actually an area that I've published a couple
 5 papers on myself. Mega projects are
 6 challenging, but as we indicated in our
 7 presentation, there are some key things that
 8 one can do in planning a project of this size
 9 and magnitude that can get things going well.
 10 A key aspect of that is front end loading.
 11 Front end loading is the number one predictor
 12 of success of a mega project. So many of the
 13 things that we've been focused on throughout
 14 the last four years, four plus years, is to
 15 ensure we're well established in that regard.
 16 We've engaged independent project analysts out
 17 of Virginia to come in and assess, using their
 18 proprietary technology and proprietary
 19 methods, how well defined our project is and
 20 are we on track in terms of being for front
 21 end loading. They said we were -- at DG2, we
 22 were best in class at that point and we were
 23 on track to being in very good shape for DG3.
 24 Further, I guess the project has very
 25 well defined objectives. We know what we need

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1 of that project. Well, that project has
 2 changed significantly from that which was
 3 originally contemplated. So, those things
 4 have to be taken into account when you review
 5 how a cost estimate changes over time. In
 6 addition, I mean, if you look at site sea and
 7 compare it to the Muskrat Falls Project, just
 8 from a -- just one metric, for example, how
 9 much material you have to move. In site sea,
 10 it's over 48 million metres cubed of material
 11 and of that, over 20 million metres cubed of
 12 material has to be moved off site. Whereas
 13 Muskrat Falls is in the two, two and a half
 14 million metres cubed of material. So from a
 15 scale perspective, we're dealing with -- we're
 16 one of the best sites in North America that's
 17 never been developed before, from a
 18 hydroelectric perspective, and that was an NEB
 19 report. I can't remember exactly the year,
 20 but you know, it's still a great project. So
 21 you know, we have certain physical conditions
 22 that Mr. Bennett pointed out in one of his
 23 slides, which escapes me, but I'm sure
 24 somebody will help me out but going to it.

25 MR. BENNETT:

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<p>1 A. 48.</p> <p>2 MR. HARRINGTON:</p> <p>3 A. 48. These are the things that give me</p> <p>4 comfort, right, and should give us all comfort</p> <p>5 from the fact that we're dealing with a site</p> <p>6 that has competent bedrock. It doesn't have</p> <p>7 this massive amount of overburden or clay</p> <p>8 seams that we have to remove. We have this</p> <p>9 minimal overburden to remove and dispose of.</p> <p>10 We have conditions that have been validated by</p> <p>11 site investigations going over 20 years. We</p> <p>12 have constructability aspects which are</p> <p>13 beneficial. All of the materials that we've</p> <p>14 got are sourced from site excavation. So</p> <p>15 we're not dealing with massive amounts of</p> <p>16 trucks moving backwards and forwards to get</p> <p>17 the right type of material. We have this very</p> <p>18 good material balance, so we don't have to</p> <p>19 remove 20 odd million metres cubed of material</p> <p>20 off site, and we're dealing with basically</p> <p>21 conventional concrete methods.</p> <p>22 We go to the next slide, please. Thank</p> <p>23 you. We don't require a massive amount of</p> <p>24 additional dams and dikes. It's all in one</p> <p>25 place. If you look at Romaine or East Main</p>	<p>1 projects, they required additional dams and</p> <p>2 dikes to be able to form the reservoir.</p> <p>3 Muskrat Falls does not require that. We also</p> <p>4 have the reliable hydrology aspect. So you</p> <p>5 know, that's another fantastic benefit for the</p> <p>6 project. We've got robust, conventional</p> <p>7 designs for all the structures. We're using</p> <p>8 conventional methods. We don't require</p> <p>9 underground. We don't require temporary</p> <p>10 diversion tunnels which also add costs. Some</p> <p>11 projects are dealing with one and a half</p> <p>12 kilometres of diversion tunnels. We've got</p> <p>13 conventional equipment. We're using the TG</p> <p>14 sets, the gates and the cranes that's been</p> <p>15 tried and tested and we're close to Happy</p> <p>16 Valley Goose Bay. We're, you know, within 20</p> <p>17 minutes of a major facility with a airport and</p> <p>18 port.</p> <p>19 So all of these things give us a great</p> <p>20 comfort that we believe that we understand the</p> <p>21 risks of our project. We are not complacent</p> <p>22 with regards to other projects and other mega</p> <p>23 projects that have gone off the rails. We</p> <p>24 listen to what those other mega projects had</p> <p>25 to say and we've incorporated that in our</p>
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<p>1 project execution by embracing the concept of</p> <p>2 front end loading.</p> <p>3 MR. JOHNSON:</p> <p>4 Q. Another concern expressed in the commentary --</p> <p>5 and it's a bit of a different concern. I</p> <p>6 don't know who will field this one -- was that</p> <p>7 in this province, since 2006, over 85 percent</p> <p>8 of our electricity had been produced by Hydro</p> <p>9 and less than 13 percent by the Holyrood</p> <p>10 generating station with presently two percent</p> <p>11 being wind generated. The commentary further</p> <p>12 stated that Holyrood's oil consumption was</p> <p>13 3,678,183 barrels in 2002 and in 2010, this</p> <p>14 had decreased to 1,362,373 barrels of oil; in</p> <p>15 other words, the implication I think from the</p> <p>16 concern is that we are not using Holyrood like</p> <p>17 we once were, so I think that's what the</p> <p>18 implication was. Could someone address that</p> <p>19 concern?</p> <p>20 MR. HUMPHRIES:</p> <p>21 A. That is true, we are not using it like we once</p> <p>22 were, but based on our forecast on a go-</p> <p>23 forward basis, we are predicting that we will</p> <p>24 be using it and using it more than we probably</p> <p>25 we ever have.</p>	<p>1 MR. JOHNSON:</p> <p>2 Q. I guess it gets at a bigger issue in terms of</p> <p>3 what, you know, we can talk about when we get</p> <p>4 specific into the load forecast with the drop</p> <p>5 off of the industrial load that we saw,</p> <p>6 starting with Abitibi Stephenville in 2005 and</p> <p>7 continuing on. But, so we can come back on</p> <p>8 that, the other concern raised in the</p> <p>9 commentary had to do with, was that the</p> <p>10 Holyrood generating station will be needed,</p> <p>11 even with Muskrat Falls because it is our only</p> <p>12 backup generating facility, that goes to</p> <p>13 another concern expressed earlier. The</p> <p>14 commentary went on to say that as Nalcor has</p> <p>15 stated in a recent capital plan, this is now a</p> <p>16 quote of Nalcor in its capital plan, "It is</p> <p>17 important to consider that whichever expansion</p> <p>18 plan occurs, an isolated island electrical</p> <p>19 system or interconnected to the Lower</p> <p>20 Churchill via HVDC link, Holyrood will be an</p> <p>21 integral and vital component of the electrical</p> <p>22 system for decades to come." And apparently</p> <p>23 taken from one of Nalcor's documents. What's</p> <p>24 the reply from Nalcor to that concern?</p> <p>25 MR. HUMPHRIES:</p>

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<p>1 A. Well I think to begin to answer that question, 2 let's go back to a point where we were earlier 3 on this whole issue of level of backup and the 4 critical nature of the line and the supply 5 from Muskrat Falls. If we look at our load 6 profile on the system and how much we really 7 depend on that line to contribute to the 8 overall reliability, if we look at starting in 9 2017, all but approximately 600 hours of the 10 year we would be able to supply all of the 11 requirements on the island without the link. 12 It's not the most economic way of doing it, 13 there's enough capacity on the island to 14 supply the needs. So as load grows, the line 15 becomes more significant, that peaks at just 16 under 3,000 hours in 2036 where we would have 17 an exposure. The other remaining 6,000 hours, 18 if the line came out, we would still be able 19 to supply all the requirements on the island 20 with the existing generation that's in place. 21 Post 2036, it tends to moderate because we do 22 start adding capacity to the island to 23 maintain our reliability, generation 24 reliability level, the LOLH and that sort of 25 moderates 2,000 hours, there's a 2,000 hour</p>	<p>1 exposure that we would be at risk of not being 2 able to serve all our load if we lost the 3 lake. 4 MR. JOHNSON: 5 Q. And when would those 2,000 hours occur? 6 MR. HUMPHRIES: 7 A. Well, they're going to occur in the winter 8 periods. 9 MR. JOHNSON: 10 Q. Yes. 11 MR. HUMPHRIES: 12 A. There's no argument about that and from the 13 perspective then when we look at and we--as we 14 stated earlier, to provide a level of 15 reliability whether that be through the line 16 or through generation to the customer, if we 17 looked at--let's just take the 150 million 18 dollars for argument's sake that we're going 19 to invest in the design upright from 1 to 50, 20 to 1 to 150, in round dollars, that could add 21 in the range of 125 to 150 megawatts of 22 combustion turbine generation on the island. 23 Because that extra 150 megawatts is there, the 24 hours of exposure that we've had, have now 25 decreased from 2,000 down to 1,000, there's</p>
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<p>1 less risk of not being able to serve the load. 2 And in the event that the line does fail, 3 we're in a much better situation with the 4 generation than we were with the line design, 5 so from the perspective of the level of 6 backup, we are covering off load probability 7 events. We have to have a failure at the 8 worse possible time to have these exposures, 9 right. 10 MR. JOHNSON: 11 Q. The commentary also went on to state that 12 since 2004, electricity demand is down 15 13 percent on the island and there has been 14 negative electricity growth of minus two 15 percent over the last six years, again I guess 16 a demand observation, and I guess the 17 implication being, well why would we do 18 Muskrat if that's what's happening with the 19 recent demand? 20 MR. BENNETT: 21 A. Maybe I can take that one, it's Gilbert 22 Bennett. If we can turn to page 8 of the 23 presentation this morning, hopefully I can put 24 this in perspective. So on this slide here, 25 there are two points that are noteworthy. The</p>	<p>1 first one is that our utility load, both 2 historically and through our forecasting 3 period is expected to increase on a continual 4 basis. As I pointed out this morning, 5 notwithstanding a population decline that 6 happened during the 1990's, this trend of 7 increasing utility usage has continued through 8 that period. The second noteworthy point is 9 that during this period two pulp and paper 10 mills in Stephenville and Grand Falls-Windsor, 11 respectfully, shut down and we could see those 12 drops in demand on the industrial side. In 13 the 2014 timeframe, we can see the increase 14 that's expected from the Vale facility in Long 15 Harbour, so most of this fluctuation in 16 electricity consumption has been from the 17 industrial sector. Over this period we see 18 continuous and expected continual increase in 19 utility requirements over the forecast period. 20 MR. JOHNSON: 21 Q. A concern was also expressed in a commentary 22 in the Telegram on December 17th, 2011, a 23 concern about PIRA's oil price forecast and 24 the commentator noted that PIRA only provided 25 a forecast to 2025 and that for the year 2025</p>

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<p>1 onward, Nalcor's forecast is "little more than 2 an extrapolation of PIRA's last 2020 to 2025 3 forecast period, combined with an estimated 4 inflation factor." So a concern about relying 5 on the PIRA forecast and the extrapolation, 6 what's the reply to Nalcor about that?</p> <p>7 MR. GOUDIE:</p> <p>8 A. Steve Goudie. PIRA does forecast out to 2025, 9 that's certainly true for its crude oil and 10 its oil product slates (phonetic). Beyond 11 2025, what we do for our long-term 12 calculations is to hold that price real in 13 constant dollars, hold it constant in real 14 dollars, I should say, sorry, so all we're 15 adding after 2025 is a nominal inflation rate 16 every year. We're not assuming that that 17 price increases in real terms.</p> <p>18 MR. JOHNSON:</p> <p>19 Q. And would Nalcor--in Nalcor's judgment by 20 holding it constant, except for CPI, I guess.</p> <p>21 MR. GOUDIE:</p> <p>22 A. Right.</p> <p>23 MR. JOHNSON:</p> <p>24 Q. In Nalcor's judgment is that conservative or 25 is it--is that conservative or -</p>	<p>1 MR. GOUDIE:</p> <p>2 A. Yes, that's conservative. If you look at the 3 average annual compound growth rate of the 4 nominal prices during their forecast period, 5 that would range between three and a half and 6 four and a half percent. I believe that was 7 in Gilbert's presentation this morning.</p> <p>8 MR. JOHNSON:</p> <p>9 Q. I think there was reference as well to MHI did 10 a little, sort of test, if you will, around 11 one percent either way on the inflation.</p> <p>12 MR. GOUDIE:</p> <p>13 A. They did and their results indicated that 14 there wasn't a material difference in the 15 preference for the Interconnected Island case 16 as a result of that assumption.</p> <p>17 MR. JOHNSON:</p> <p>18 Q. How long has Nalcor been using PIRA?</p> <p>19 MR. GOUDIE:</p> <p>20 A. We have been using PIRA since 1998 actually.</p> <p>21 MR. JOHNSON:</p> <p>22 Q. And they only forecast out for a certain 23 period of time, that's as much as they'll 24 forecast out, I think.</p> <p>25 MR. GOUDIE:</p>
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<p>1 A. That's correct.</p> <p>2 MR. JOHNSON:</p> <p>3 Q. In the same commentary the writer expresses a 4 concern as follows: "Furthermore, Canada's 5 own national energy board in its Canada's 6 energy future, energy supply and demand 7 projections to 2035, November 2011"--that's 8 how it's described, this is the report, I 9 guess they issued on November, 2011, they say 10 that "The NEB also forecast oil prices, but 11 only out to the year 2035. For the year 2035, 12 the NEB forecasts that oil prices will only be 13 about one half of Nalcor's most recent year, 14 2035 forecasts." And I want to put that 15 concern to you to address.</p> <p>16 MR. GOUDIE:</p> <p>17 A. I haven't seen the NEB numbers exactly and I'm 18 not sure specifically what your reference is, 19 but what it sounds like to me is that the NEB 20 has a constant dollar forecast that they're 21 presenting in their reports, and what you 22 would see in our exhibits would be nominal 23 dollar forecasts, inclusive of inflation; 24 whereas the NEB may be reporting their long- 25 run crude price, excluding inflation.</p>	<p>1 MR. JOHNSON:</p> <p>2 Q. Okay, and maybe if you could confirm that, I 3 think the NEB material is in one of your 4 exhibits that were filed recently, so it might 5 be useful to have some definitiveness on that 6 issue.</p> <p>7 O'REILLY, Q.C.:</p> <p>8 Q. So the question is, is there a different 9 formula for reporting in on the NEB forecast 10 prices for oil, as opposed to what Nalcor 11 uses?</p> <p>12 MR. GOUDIE:</p> <p>13 A. Well essentially the question is whether NEB 14 who is using inflation adjusted prices.</p> <p>15 O'REILLY, Q.C.:</p> <p>16 Q. The same as Nalcor's, okay.</p> <p>17 MR. GOUDIE:</p> <p>18 A. Yes.</p> <p>19 MR. JOHNSON:</p> <p>20 Q. Just going in to load forecast, just on the 21 domestic side, MHI has indicated that you are 22 using a methodology which is acceptable, but 23 which consistently underpredicts future energy 24 needs at a rate of one percent per future 25 year, and I just want to get your comment on</p>

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<p>1 that finding by MHI.</p> <p>2 MR. HUMPHRIES:</p> <p>3 A. Do you want me to comment on it?</p> <p>4 MR. GOUDIE:</p> <p>5 A. Yeah, we should switch out, I suppose, because</p> <p>6 load forecasting would be Paul's.</p> <p>7 MR. HUMPHRIES:</p> <p>8 A. On the construction issue, Mr. Chair, would it</p> <p>9 be okay to switch back?</p> <p>10 MR. CHAIRMAN:</p> <p>11 Q. Oh absolutely.</p> <p>12 O'REILLY, Q.C.:</p> <p>13 Q. Paul Stratton, you have his bio there.</p> <p>14 MR. STRATTON:</p> <p>15 A. It's Paul Stratton, could you just refresh the</p> <p>16 question for me.</p> <p>17 MR. JOHNSON:</p> <p>18 Q. Yes, Mr. Stratton, I wonder if you could</p> <p>19 comment upon MHI's finding that your domestic</p> <p>20 forecast methodology is acceptable, but</p> <p>21 consistently underpredicts future energy needs</p> <p>22 at a rate of one percent per future year. Any</p> <p>23 comment on that observation?</p> <p>24 MR. STRATTON:</p> <p>25 A. Well the one percent error that they've seen</p>	<p>1 over that historical period would reflect both</p> <p>2 the--any modelling error, that would be in the</p> <p>3 model, as well as any assumptions that go in</p> <p>4 to feed that model. I mean, it's also an</p> <p>5 indication of bias and as a load forecaster, I</p> <p>6 am very concerned that there would be any bias</p> <p>7 in the model, but at the same time, I'm less</p> <p>8 concerned because over that period it's</p> <p>9 underforecasting and over that time period our</p> <p>10 models would be continually updated to adjust</p> <p>11 and to correct for any errors that would occur</p> <p>12 over that time.</p> <p>13 MR. JOHNSON:</p> <p>14 Q. So does the--I understand the load forecast is</p> <p>15 going to be updated for DG3 in any event.</p> <p>16 MR. STRATTON:</p> <p>17 A. That is correct.</p> <p>18 MR. JOHNSON:</p> <p>19 Q. But in terms of the DG2 forecast, does that</p> <p>20 embed an over estimation or an under</p> <p>21 estimation of future load for the domestic</p> <p>22 class?</p> <p>23 MR. STRATTON:</p> <p>24 A. No, it does not necessarily mean that that</p> <p>25 forecast would under forecast load or in--</p>
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<p>1 towards the future, no.</p> <p>2 MR. JOHNSON:</p> <p>3 Q. Okay, all right, they were just talking--okay,</p> <p>4 I understand. In terms of the industrial</p> <p>5 forecast, you know, we have a small number of</p> <p>6 industrial customers. Tell us how you get a</p> <p>7 handle on industrial energy demand forecasting</p> <p>8 at Nalcor?</p> <p>9 MR. STRATTON:</p> <p>10 A. We request from our industrial customers,</p> <p>11 typically twice a year, what their</p> <p>12 requirements would be. We assess those</p> <p>13 requirements against any recent load that they</p> <p>14 have. If there are variations that we see,</p> <p>15 significant variations in the history verses</p> <p>16 where they expect to be, we would communicate</p> <p>17 that with them, and have probably, you know,</p> <p>18 discussions with them probably over the phone.</p> <p>19 And based on those assumptions, we may make</p> <p>20 minor adjustments to their projections, but</p> <p>21 otherwise we--they are the keepers of their</p> <p>22 load, they understand their load, so we</p> <p>23 typically take, primarily take their loads.</p> <p>24 MR. JOHNSON:</p> <p>25 Q. So they have a sense of what they're going to</p>	<p>1 be doing in terms of production, shutdowns,</p> <p>2 maintenance, all that type of -</p> <p>3 MR. STRATTON:</p> <p>4 A. That is right because we're not inside looking</p> <p>5 at those operations and they understand how</p> <p>6 they're--how the changes in their operations</p> <p>7 would affect their loads and we wouldn't be in</p> <p>8 tune to that, so -</p> <p>9 MR. JOHNSON:</p> <p>10 Q. So just to get a sense then, as between DG2</p> <p>11 and where we sit, when was the last time you</p> <p>12 had a chat with each of the industrial</p> <p>13 customers about what their load requirements</p> <p>14 were going to be?</p> <p>15 MR. STRATTON:</p> <p>16 A. Well, as part of our, Hydro's operating</p> <p>17 review, we've just recently completed an</p> <p>18 assessment of the industrial forecast, so we</p> <p>19 just heard back from them within the last</p> <p>20 month.</p> <p>21 MR. JOHNSON:</p> <p>22 Q. And this is a normal twice a year thing?</p> <p>23 MR. STRATTON:</p> <p>24 A. That would be part of a twice a year</p> <p>25 forecasting process that we undertake.</p>

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<p>1 MR. JOHNSON:</p> <p>2 Q. Okay, and I guess relative to where they</p> <p>3 thought they were going to be at DG2, is there</p> <p>4 any material changes?</p> <p>5 MR. STRATTON:</p> <p>6 A. There are no material changes in the</p> <p>7 industrial outlook for many of those customers</p> <p>8 that has been provided to us.</p> <p>9 MR. JOHNSON:</p> <p>10 Q. And how far are they--when you go to them, say</p> <p>11 recently or they come to you, how far out are</p> <p>12 they looking?</p> <p>13 MR. STRATTON:</p> <p>14 A. We typically request a detailed monthly</p> <p>15 forecast for a two to three year period and</p> <p>16 then just, their annual requirements up to</p> <p>17 five or six years after.</p> <p>18 MR. JOHNSON:</p> <p>19 Q. So that's information that they provide twice</p> <p>20 a year and each time it looks out four or five</p> <p>21 years.</p> <p>22 MR. STRATTON:</p> <p>23 Q. That is a request that goes out to the</p> <p>24 industrial customers twice a year, yes.</p> <p>25 MR. JOHNSON:</p>	<p>1 Q. The industrial forecast has been wrong over</p> <p>2 the past number of years. I presume it's been</p> <p>3 wrong. I think it's been wrong because of</p> <p>4 the, sort of, unprecedented happenings in the</p> <p>5 pulp and paper industry, at least in this</p> <p>6 province with Stephenville and Abitibi in</p> <p>7 Grand Falls, et cetera. So, there is some</p> <p>8 interest in the forecast assumption for,</p> <p>9 particularly Corner Brook Pulp and Paper</p> <p>10 because the DG2 forecast would, sort of, embed</p> <p>11 an assumption that Corner Brook more or less</p> <p>12 continues rate out for the duration of the</p> <p>13 sunny period. And just give your comment on</p> <p>14 that in terms of whether that's unduly</p> <p>15 optimistic or reasonable or what's the</p> <p>16 thinking on that?</p> <p>17 MR. BENNETT:</p> <p>18 Q. This is Gilbert Bennett. I think that the</p> <p>19 facility is in operation, existing facility,</p> <p>20 they're continuing to run their business, so</p> <p>21 that's one aspect, that's one aspect of the</p> <p>22 industrial forecast. The other forecast of</p> <p>23 the industrial forecast is we did not forecast</p> <p>24 any additions to industrial demand in the form</p> <p>25 of new customers, so with the information</p>
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<p>1 that's available to us, we have a customer who</p> <p>2 is signalled to us that they're continuing to</p> <p>3 operate their business, so I have difficulty</p> <p>4 forecasting that that mill is going to</p> <p>5 disappear, I mean, that action of itself has</p> <p>6 significant consequences and that's something</p> <p>7 that we have no basis to do. We have the</p> <p>8 customer there, they're in operations and I</p> <p>9 think the best way to address, you know, those</p> <p>10 kinds of potential changes in demands is using</p> <p>11 the method that we did, through a sensitivity</p> <p>12 analysis to test what would happen if in the</p> <p>13 long term any of the forecasts were to vary,</p> <p>14 so as we can come at it that way from a</p> <p>15 probabilistic perspective and just see what</p> <p>16 the impacts are, as opposed to identifying,</p> <p>17 you know, the future of a particular</p> <p>18 individual customer in our forecast.</p> <p>19 MR. JOHNSON:</p> <p>20 Q. You mention "probabilistic", is it</p> <p>21 probabilistic is the sensitivity test?</p> <p>22 MR. BENNETT:</p> <p>23 A. Well I guess it is in the sense of we've</p> <p>24 looked at a couple of scenarios where, for</p> <p>25 example, 374 gigawatt hours per year of demand</p>	<p>1 disappeared, another one at 750, so we look at</p> <p>2 that in the same was as CDM. We also did</p> <p>3 another sensitivity analysis where we said</p> <p>4 let's see how much demand would have to</p> <p>5 disappear in order for the CPWs to be the</p> <p>6 same, so there's a combination of approaches</p> <p>7 there.</p> <p>8 MR. JOHNSON:</p> <p>9 Q. Just back up for a second, just so we can</p> <p>10 understand because you referred to the loss of</p> <p>11 375 gigawatt hours or, I think in sensitivity</p> <p>12 tests you term that conservation, CDM et</p> <p>13 cetera, and now you just linked that to the</p> <p>14 Corner Brook situation in a sense, what were</p> <p>15 you getting at, how are they thematically</p> <p>16 linked?</p> <p>17 MR. BENNETT:</p> <p>18 A. I think the question was what's happening with</p> <p>19 the load forecast.</p> <p>20 MR. JOHNSON:</p> <p>21 Q. Yes, that's what I meant, I don't mean that</p> <p>22 means Corner Brook, I'm just -</p> <p>23 MR. BENNETT:</p> <p>24 A. Right, so there were three sensitivities on</p> <p>25 the load forecast, one was how much load would</p>

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<p>1 have to disappear immediately in order for the</p> <p>2 CPWs to be the same, and then the other test</p> <p>3 that we did on the load forecast was a more</p> <p>4 gradual reduction in demand over a longer</p> <p>5 period of time and that's the 375 and 750</p> <p>6 gigawatt hour per year loss in, I guess,</p> <p>7 forecasted demand out to 2031.</p> <p>8 MR. JOHNSON:</p> <p>9 Q. So in terms of, just to flip around the other</p> <p>10 side for a moment, the pessimistic view of not</p> <p>11 having any more industrial load than what</p> <p>12 we've had now going out to 2067, is that--is</p> <p>13 that what you're supposed to do to say</p> <p>14 basically, look, there's no one here in the</p> <p>15 immediate offing (phonetic), we've got no firm</p> <p>16 commitment to take power energy from us, so</p> <p>17 let's just assume that it doesn't exist for</p> <p>18 the planning period, you know, why did you</p> <p>19 pitch on that assumption?</p> <p>20 MR. BENNETT:</p> <p>21 A. Well I think we have had--I mean to be candid,</p> <p>22 we have had comments raised in our public</p> <p>23 consultation that we're overstating our</p> <p>24 forecast, so coming at this from the</p> <p>25 perspective of saying, you know, we think this</p>	<p>1 is a reasonable utility forecast, we're not</p> <p>2 going to make any significant variations in</p> <p>3 our industrial forecast and we've looked to</p> <p>4 sensitivities and see what happens when demand</p> <p>5 decreases off our forecasted amounts.</p> <p>6 MR. JOHNSON:</p> <p>7 Q. I'm looking for the--the sensitivity on the</p> <p>8 880 gigawatt hour load would be in -</p> <p>9 GREENE, Q.C.:</p> <p>10 Q. Nalcor's submission, page 126 and 158 has the</p> <p>11 loss of 880 gigawatt hours.</p> <p>12 MR. JOHNSON:</p> <p>13 Q. Yes, thank you, Ms. Greene. If we could pull</p> <p>14 that up, Mike?</p> <p>15 GREENE, Q.C.:</p> <p>16 Q. Page 126 of 158.</p> <p>17 MR. JOHNSON:</p> <p>18 Q. It's table 29.</p> <p>19 GREENE, Q.C.:</p> <p>20 Q. Volume 1 of their submission.</p> <p>21 MR. JOHNSON:</p> <p>22 Q. Okay, so you indicated, Mr. Bennett, that you</p> <p>23 tested basically how much load would have to</p> <p>24 come off the system for the two CPWs to draw</p> <p>25 even and that comes out to zero, lost of 880</p>
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<p>1 gigawatt hours assumed starting 2013.</p> <p>2 MR. BENNETT:</p> <p>3 A. Now that sensitivity was updated, so this</p> <p>4 analysis was updated in response to the RFI.</p> <p>5 MR. JOHNSON:</p> <p>6 Q. Oh, I'm sorry, yes, I'm sorry, it's on the</p> <p>7 flip and I have it there, I'm sorry, because</p> <p>8 that was a bit surprising, actually. So,</p> <p>9 yeah, if we lose 880 gigawatt hours at 2013,</p> <p>10 there is a preference, a much reduced</p> <p>11 preference for the Muskrat Falls option, down</p> <p>12 to 400 million dollars and basically give us</p> <p>13 an overview on the math of what's happening to</p> <p>14 shrink the preference and we know there is oil</p> <p>15 implications, just walk us through that.</p> <p>16 MR. GOUDIE:</p> <p>17 A. I can speak to that, it's predominantly oil,</p> <p>18 that's how much leverage oil has in that case</p> <p>19 because it's 880 gigawatt hours of our</p> <p>20 marginal production coming out of the</p> <p>21 production costing, so it is oil -</p> <p>22 MR. JOHNSON:</p> <p>23 Q. So you would be able to meet the island load</p> <p>24 with your Hydro electric resources, which is</p> <p>25 cheaper than oil and that's the big difference</p>	<p>1 in the seeping up -</p> <p>2 MR. GOUDIE:</p> <p>3 A. You're going to draw up your most expensive</p> <p>4 generation source and that's going to be oil</p> <p>5 and in the Interconnected case, because that</p> <p>6 sensitivity starts in 2013 and we're still</p> <p>7 burning oil right through to 2017 when we</p> <p>8 commission the in feed, so that's why there's</p> <p>9 a reduction in the interconnected CPW from</p> <p>10 6652 down to 6217.</p> <p>11 MR. JOHNSON:</p> <p>12 Q. Right, okay. And is there any assumptions</p> <p>13 being made about what the cost of the</p> <p>14 replacement hydro electric energy is?</p> <p>15 MR. GOUDIE:</p> <p>16 A. Not in that load sensitivity, and in fact,</p> <p>17 just to follow up a little bit, there was a</p> <p>18 PUB RFI that requested that we run this</p> <p>19 particular sensitivity through the strategist</p> <p>20 program so that we could take account of the</p> <p>21 capacity impacts on the system, and that was</p> <p>22 subsequently done for PUB 51, I believe, or</p> <p>23 52, and the preference for the Interconnected</p> <p>24 Island option would have increased from 408 to</p> <p>25 around 550, I believe.</p>

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<p>1 MR. JOHNSON:</p> <p>2 Q. Do you want to bring that one up?</p> <p>3 MR. MCNIVEN:</p> <p>4 Q. I wasn't sure which one -</p> <p>5 MR. JOHNSON:</p> <p>6 Q. PUB 51, I believe.</p> <p>7 MR. MCNIVEN:</p> <p>8 Q. Sorry about that.</p> <p>9 MR. GOUDIE:</p> <p>10 A. So you can see in this RFI that if you take</p> <p>11 into account the capacity impacts on the CPW</p> <p>12 analysis, in addition to just the fuel</p> <p>13 savings, that the preference for</p> <p>14 Interconnected Island actually increases to</p> <p>15 545 million dollars.</p> <p>16 MR. JOHNSON:</p> <p>17 Q. So just translate for us the capacity impacts,</p> <p>18 why would the preference increase by a hundred</p> <p>19 and some odd million?</p> <p>20 MR. GOUDIE:</p> <p>21 A. Well you would expected it maybe to go the</p> <p>22 other way, that on the isolated island case we</p> <p>23 dropped 880 megawatts or 880 gigawatt hours of</p> <p>24 energy and you would expect that that would</p> <p>25 have pushed out the timing of our energy</p>	<p>1 requirements, so that any capacity additions</p> <p>2 that we would have coming down the pipe, they</p> <p>3 would get pushed further in time and that</p> <p>4 would decrease their cost from an economic</p> <p>5 point of view. But what happens here is that</p> <p>6 because those hydro plants, essentially are</p> <p>7 pushed out in time that we would have built</p> <p>8 sooner under the Isolated Island case, there's</p> <p>9 now going to be additional oil burnt on the</p> <p>10 Isolated case than otherwise would have been</p> <p>11 the case. And that actually increases the</p> <p>12 preference for Interconnected Island</p> <p>13 marginally.</p> <p>14 MR. JOHNSON:</p> <p>15 Q. So the strategists, your strategists can tell</p> <p>16 you what's the optimal roll out?</p> <p>17 MR. GOUDIE:</p> <p>18 A. Yes.</p> <p>19 MR. JOHNSON:</p> <p>20 Q. Okay.</p> <p>21 MR. GOUDIE:</p> <p>22 A. And again, this was not a case that was</p> <p>23 specific to Corner Brook Pulp and Paper.</p> <p>24 MR. JOHNSON:</p> <p>25 Q. If it were made specific to the case of Corner</p>
Page 235	Page 236
<p>1 Brook Pulp and Paper, what would be the</p> <p>2 difference?</p> <p>3 MR. GOUDIE:</p> <p>4 A. Under the Isolated Island case, there would</p> <p>5 be--well, there's a lot of different kind of</p> <p>6 outcomes here now, right. Assuming that the</p> <p>7 Deer Lake Power Plant continued to be</p> <p>8 operating and I don't think it really matters</p> <p>9 whether the owner of that resource today or</p> <p>10 whether we own the resource, but there would</p> <p>11 be some kind of transaction cost that has to</p> <p>12 be accounted for under the Isolated Island</p> <p>13 case, because if that power is going to come</p> <p>14 into the grid, then it has to be acquired and</p> <p>15 paid for. It's not going to come into the</p> <p>16 grid free, so that's an important</p> <p>17 consideration. So what that will do,</p> <p>18 obviously, will again increase the preference</p> <p>19 for the Interconnected Island case.</p> <p>20 MR. JOHNSON:</p> <p>21 Q. In terms of the sensitivity test, again going</p> <p>22 back to your sensitivity test on page 126 of</p> <p>23 158, volume 1, Mike.</p> <p>24 MR. MCNIVEN:</p> <p>25 Q. I'm sorry, the reference again?</p>	<p>1 MR. JOHNSON:</p> <p>2 Q. It's page 126 of volume 1.</p> <p>3 MR. MCNIVEN:</p> <p>4 Q. Of the submission?</p> <p>5 MR. JOHNSON:</p> <p>6 Q. Yes. The testing, I'm just interested in the</p> <p>7 sensitivity testing on moderate conservation</p> <p>8 and aggressive conservation, how did you</p> <p>9 decide what was moderate and what was</p> <p>10 aggressive for purposes of your sensitivity?</p> <p>11 MR. GOUDIE:</p> <p>12 A. Those targets would have been identified in a</p> <p>13 study that Hydro and Newfoundland Power</p> <p>14 commissioned, I believe in 2007 or 8 regarding</p> <p>15 conservation potential.</p> <p>16 MR. JOHNSON:</p> <p>17 Q. Could you put the aggressive conservation of,</p> <p>18 by 2031 having taking 750 gigawatt hours off</p> <p>19 the system, can you put that into some sort of</p> <p>20 context of what that would mean? Can you</p> <p>21 translate that for us, in terms, you know, put</p> <p>22 it in maybe less load per year going forward</p> <p>23 or, you know, how significant is it?</p> <p>24 MR. GOUDIE:</p> <p>25 A. Well cumulatively it's very significant,</p>

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1 obviously. I don't have a calculator and I
 2 shouldn't be making calculations up here, so -
 3 MR. JOHNSON:
 4 Q. Okay, no.
 5 MR. GOUDIE:
 6 A. But you could relate that to the number of
 7 barrels of oil at Holyrood quite readily.
 8 MR. JOHNSON:
 9 Q. Yes, the heat rate and calculate it up. And
 10 so what do we see, just walk us through the
 11 numbers, if you will. I see that through the
 12 rest of conservation, is this just pure oil
 13 savings again?
 14 MR. GOUDIE:
 15 A. In the moderate conservation case, it's pretty
 16 well fuel savings only.
 17 MR. JOHNSON:
 18 Q. Yes.
 19 MR. GOUDIE:
 20 A. But we would allow for some program costs on
 21 the cost side, so we got a benefit side that's
 22 fuel, we got a cost side that will be program.
 23 In the aggressive conservation, sensitivity,
 24 there was an additional credit provided that
 25 reflected basically deferring a gas a turbine.

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1 what I'm talking about?
 2 MR. BENNETT:
 3 A. Yes, I know where you're going. Maybe if it's
 4 helpful, I can come back tomorrow morning with
 5 a sheet.
 6 CHAIRMAN:
 7 Q. There's no hurry, I mean, whenever you're--I
 8 just -
 9 MR. O'REILLY:
 10 Q. I think that's your question too, isn't it.
 11 CHAIRMAN:
 12 Q. I think it would help, like, I believe in
 13 trying to keep things simple, but I don't
 14 think I'm a simpleton, but I like to try and
 15 understand it in terms of numbers and when I
 16 think about carbon and consumers think about
 17 how much is going to cost me. And you got to
 18 think of how much per tonne, I assume, and
 19 then you, you know, that's on a yearly basis.
 20 Do you know what I'm talking about?
 21 MR. BENNETT:
 22 Q. I understand where you're coming from. S, we
 23 can report back.
 24 CHAIRMAN:
 25 Q. And on the 1 in 150, 1 in 50, 1 in 150 and 1

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1 MR. JOHNSON:
 2 Q. Okay.
 3 MR. GOUDIE:
 4 A. So there was some capacity credit given to the
 5 aggressive conservation.
 6 MR. JOHNSON:
 7 Q. So embedded in the numbers which lead to the
 8 preference number, there are assumptions and
 9 inputs as it relates to the costs of actually
 10 achieving the energy reduction?
 11 MR. GOUDIE:
 12 A. Yes, that's correct.
 13 MR. JOHNSON:
 14 Q. Okay. Mr. Chairman, I'm thinking at this
 15 point I probably would like to take a break
 16 and have a look at it and start again fresh in
 17 the morning.
 18 CHAIRMAN:
 19 Q. Okay, we will start at 9:30? But before--can
 20 I piggyback on one of your questions to Mr.
 21 Bennett on this carbon business. You used a
 22 number with respect to 100,000 tonnes and you
 23 used a number with respect to dollars. So,
 24 can you convert that into a, I guess it would
 25 be a carbon charge per tonne? Do you know

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1 in 500, I mean, what you guys are saying there
 2 is that from the point of view of marginal
 3 efficiency or marginal cost, it's better to be
 4 spending your last dollar on backup gas
 5 generation on the Island, rather than going,
 6 saying, from 1 in 50 to 1 in 150, is that your
 7 basic argument?
 8 MR. BENNETT:
 9 A. That's the basic point. We prefer to invest
 10 in additional generation locally, so that we
 11 reduce the impact of line failure.
 12 CHAIRMAN:
 13 Q. Cause you still got to have your backup
 14 generation, even if it's 1 in 500? You still
 15 got to have some -
 16 MR. BENNETT:
 17 A. That's right, because it still would be a
 18 consumer effect if we did lose the line in
 19 that very unlikely event.
 20 CHAIRMAN:
 21 Q. And on the point with the federal loan
 22 guarantee, I mean, there's no downside risks.
 23 We can take it off the table because there's
 24 no downside risk to the federal--if it comes
 25 in, if we get a federal loan guarantee, it can

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1 only enhance the viability of Muskrat Falls,
2 is that what you're saying, it won't make any
3 different to the Isolated Island?
4 MR. GOUDIE:
5 A. That's correct.
6 CHAIRMAN:
7 Q. So 9:30 tomorrow morning? We'll adjourn until
8 then.
9 Upon conclusion at 4:45 p.m.

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1 CERTIFICATE
2 I, Judy Moss, hereby certify that the foregoing is
3 a true and correct transcript of a hearing of the
4 Muskrat Falls Review, heard before the Board of
5 Commissioners of Public Utilities on the 13th day of
6 February, A.D., 2012, St. John's, Newfoundland and
7 Labrador and was transcribed by me to the best of
8 my ability by means of a sound apparatus.
9 Dated at St. John's, Newfoundland and Labrador
10 this 13th day of February, A.D., 2012
11 Judy Moss

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