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1 October 28, 2003 2 (9:05 a.m.) 3 CHAIRMAN: 4 Q. Good morning, Ms. Newman. Any preliminary 5 matters before we begin? 6 MS. NEWMAN: 7 Q. Good morning. No, there are not. 8 CHAIRMAN: 9 Q. Thank you. Good morning, Ms. Richter, how are 10 you this morning. 11 MR. SUSAN RICHTER (SWORN) 12 CHAIRMAN: 13 Q. I'd like to welcome you, and Ms. Greene, if 14 you could begin your examination-in-chief, 15 please. 16 GREENE, Q.C.: 17 Q. Good morning. For the record, Ms. Richter, 18 could you please state your full name. 19 A. Susan H. Richter. 20 Q. And why have you been asked by Hydro to appear 21 before the Board at this hearing? 22 A. I've been asked to appear before the Board by 23 Newfoundland and Labrador Hydro to respond to 24 questions on a report entitled, "Island 25 Hydrology Review", prepared by SGE Acres under	1 my direction. The report was submitted as 2 part of Hydro's Rate Application as Appendix 3 JRH 2. It was prepared in 2002 at the request 4 of Hydro in response to Public Utility Order 5 No. 7, 2002, 2003. 6 Q. For the transcriber, I wonder if you could sit 7 a bit closer to the microphone. Could you 8 please state your experience and 9 qualifications for completing hydrology 10 studies in determining the average energy 11 production capability of Hydro electric 12 development. 13 A. I've been employed by Acres International 14 since 1980 to perform various hydro technical 15 studies for clients. In the province of 16 Newfoundland and Labrador I've carried out 17 hydrology studies for the purposes of 18 determining the energy production capability 19 of hydro electric developments for several 20 clients, including the following: 21 Newfoundland Power, Newfoundland and Labrador 22 Hydro, Fortis, Abitibi Consolidated, Star Lake 23 Hydro and Deer Lake Power. These are further 24 described in my attached CV and supplementary 25 experience list.
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1 Q. Have the results of any of your studies been 2 presented to the Board? 3 A. Yes. In 2000, Acres completed a study of the 4 average energy capability of the hydro 5 electric facilities of Newfoundland Power. 6 Newfoundland Power presented the results of 7 that study to the Board in December 2000. 8 Q. Were the results of that work adopted by the 9 Board? 10 A. I understand it is used in Newfoundland 11 Power's weather normalization reserve. 12 Q. What work was SGE Acres asked to do for Hydro 13 in the island hydrology review? 14 A. The main work activities consisted of a review 15 of Hydro's data and methodology for estimating 16 annual hydro electric capability for 17 production, forecasting and rate setting 18 purposes, the determination and recommendation 19 of the most appropriate length of record and 20 methodology to develop the estimate and 21 additional activities including addressing the 22 possibility of trends in climate change and 23 providing an overview of practices in other 24 jurisdictions. 25 Q. Could you please summarize the study's	1 findings with respect to the appropriate 2 length of record. 3 A. With respect to the length of hydrological 4 record, the longest reliable record is 5 preferable. Hydro is fortunate to have 6 records from 1950 onwards at each of the 7 stations key to its purposes, providing a 8 respectable record length of 52 years 9 increasing with time. The sources on which 10 the stream flow sequences are based are sound, 11 with the exception of the early part of the 12 Cat Arm sequence. The technological 13 improvements in data collection from 1950 to 14 the present have not affected accuracy and 15 should not affect the selection of the length 16 of record in this period. SGE Acres 17 recommends the use of the full historic 18 records for all purposes, including the 19 estimate of hydraulic production for rate 20 setting purposes. The only reason to curtail 21 a record is for computer modelling purposes 22 where a consistent length of record is 23 necessary for all the facilities to be used in 24 an integrated system model. 25 Q. In the study you completed a survey of the

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1 GREENE, Q.C.: 2 practices in other jurisdictions and of other 3 utilities in determining the estimated energy 4 productions in their hydro electric 5 facilities. Could you please summarize your 6 finding with respect to the length of the 7 hydrological record used by utilities in 8 developing the estimate? 9 A. We contacted 25 utilities with 10 responding; 10 and 6 regulators, with three responding. The 11 length of record used varied from about 25 to 12 over 70 years. All utilities indicated in 13 their response that they used the longest 14 possible record. Only one of the responding 15 regulators indicated that they set how the 16 estimate is to be performed. In that 17 jurisdiction, about eight years ago the 18 regulator required the utility to use a 20- 19 year record. However, following appeal it 20 reversed its decision and the full 21 hydrological record is now used. The survey 22 found that no utility curtailed the record for 23 reasons other than to have a common period for 24 a model or to assess and adjust recent periods 25 for changes in water use.	1 Q. What were the findings of your study with 2 respect of the characteristics of Hydro's 3 historic inflow sequences? 4 A. The Hydro records have some problems in regard 5 to internal consistency arising principally 6 from changes in methods of flow derivation and 7 internal water balance accounting. These 8 deficiencies can and should be corrected. 9 Aside from these minor internal 10 inconsistencies, the sequences appear to be 11 free of systematic and random errors. 12 Q. Did the study determine whether there were any 13 trends due to climate change? 14 A. Examination of the stream flow records and 15 Hydro inflow series on the island does not 16 reveal any definitive recent trends or changes 17 attributable to climate change. Nor is it 18 possible at this point to predict the effects 19 of climate change on future inflows. In any 20 case, such changes are likely to occur slowly 21 over a long period of time relative to the 22 normal planning and rate setting horizons for 23 Hydro power systems. 24 Q. Do the internal inconsistency problems make 25 the older data unsuitable for use in
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1 determining the project energy capability? 2 A. No, the problems are minor and can be 3 corrected using standard methodologies. It 4 was recommended that these inconsistencies be 5 corrected. Hydro has accepted this 6 recommendation and recently hired SGE Acres to 7 carry out the corrections. This work is 8 targeted for completion by the end of this 9 year. However, in the interim, because of the 10 minor nature of the inconsistencies, we 11 recommend all data continue to be used. 12 Q. What were the findings with respect to the 13 methodology used by Hydro to determine the 14 expected average energy capability of its 15 hydro electric facilities? 16 A. Computer simulation of reservoir operation and 17 power production from the Hydro electric 18 system would be a more appropriate methodology 19 than the one presently used by Hydro to 20 calculate the expected average annual energy 21 from hydraulic resources. In particular, 22 since spills are an important cause of lost 23 energy, they should be considered in the 24 estimate. 25 Q. Doesn't Hydro currently adjust its estimate	1 for spills? 2 A. Yes, but it's only reflective of the more 3 recent sequences. A simulation will provide a 4 better estimate because it will determine the 5 amount of skill that would occur for all 6 historic sequences. 7 Q. Does Hydro have simulation models that can be 8 used for estimating the average energy 9 capability? 10 A. Hydro does have a number of models. However, 11 they need to be assessed to determine whether 12 they're suitable for providing the estimated 13 annual energy capability. The model must be 14 able to integrate all the plants including the 15 Holyrood thermal plant to meet a common system 16 load. A model that does not do this would not 17 produce realistic results, therefore, the 18 model must be properly set up for Hydro's 19 circumstances. 20 Q. Were there other conclusions and 21 recommendations from the study? 22 A. Yes, there were a number of recommendations 23 outlined in the report on page 93. These 24 relate to the energy production estimates for 25 the small Hydro electric plants and Paradise

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1 MS. RICHTER: 2 River, continued monitoring of climate change 3 research and the interim use of the existing 4 records. 5 Q. Are you familiar with Hydro's inflow 6 experience since the last General Rate 7 Application in 2001? 8 A. Yes. 9 Q. What has been the actual experience with 10 respect to the 30-year average ending in 2000 11 and the full historic record ending in 2000? 12 A. Well 2001 and 2002 were below the 30-year 13 average and the full historic record average. 14 They were closely to the full historic record 15 because it was not so influenced by the wet 16 period of the 1990s. 17 Q. Thank you very much, Ms. Richter, that 18 concludes the direct examination. 19 CHAIRMAN: 20 Q. Thank you, Ms. Greene. Good morning, Mr. 21 Browne. 22 BROWNE, Q.C.: 23 Q. Good morning, Mr. Chair and Ms. Richter. You 24 indicated in your evidence on page 8, line 4 25 that there is wide agreement that climate	1 change is occurring although the effect on 2 precipitation and stream flow is uncertain. 3 Given the fact that the climate is changing, 4 wouldn't it be most appropriate to use only 5 the most recent years of stream flow data? 6 (9:15 a.m.) 7 A. There is no indication of what the effect of 8 climate change is, if any, from stream flow. 9 Everybody agrees that, or almost everybody 10 agrees, that temperatures, global temperatures 11 are increasing. But besides that, there's not 12 a whole lot of agreement on what the effects 13 of climate change are. When you go from 14 climate change to precipitation, if you look 15 at some of the websites you'll see a cyclical 16 trend. You'll see that it will show weather 17 in certain, maybe the 2020s and then drier and 18 wetter and drier, like that. And then in 19 turn, you don't know what the effect of the 20 precipitation is going to be on the stream 21 flow because what can happen is you can have 22 more rain, but if it's a little bit warmer, 23 then you might have more evaporation or more 24 take up by trees and you might have less 25 stream flow. So there's really no agreement
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1 whatsoever, and there's no evidence of trends 2 either--or very little evidence of trends in 3 Newfoundland or across Canada in what's 4 actually happening with stream flow. 5 Q. Within your experience and within your 6 knowledge, how long does it typically take for 7 changes to occur owing to what we call sort of 8 climate change? 9 A. I don't think there's any--I wouldn't be able 10 to answer that. 11 Q. There's no data. 12 A. No. 13 Q. On page 92 of your report you indicate that 14 the same inflow reference, page 9, at line 2, 15 I should say. So you might just want to go to 16 that for a moment. You indicate that the same 17 inflow reference sequence should be used for 18 all purposes including planning, risk 19 management, operations and rate setting. Can 20 you think of any possible circumstance for 21 using a different inflow reference sequence 22 for an application? 23 A. I mean I think you should use the best 24 estimate that you have for whatever purpose, 25 you know.	1 Q. So, whatever available information you have, 2 that's what you should be using for 3 everything. 4 A. Yes, I mean if you were analysing dry 5 sequences, then you would only use a dry 6 sequence. You know, I mean they're sort of 7 specific, very specific questions like that 8 but you take the best information that you 9 have for the application of concern and you 10 use that best estimate. 11 Q. And at page 9, line 3 you recommend that Hydro 12 continue to assess the possibility of trends 13 in its stream flow series and that if evidence 14 of trends is found to make appropriate 15 adjustments. In your estimation and what time 16 frame might this happen, how speculative do 17 you wish to become here? 18 A. Well they're talking about--the best estimate 19 of temperature change is half a degree over 20 100 years. So I don't know how long it would 21 take for that to have an effect in stream 22 flow, if any. I can't speculate. I would 23 suggest a review, you know, before 100 years, 24 but - 25 Q. In reference to that we filed with the Board a

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1 BROWNE, Q.C.:
 2 mediator's report called Consent 1. And in R
 3 of Consent 1--just to go that for a moment,
 4 please, Mr. O'Reilly. It's page 3, R. In
 5 here, the parties have put a consent document
 6 before the Board saying the appropriate
 7 hydraulic data stream for both hydraulic
 8 production projections and RSP calculations is
 9 long-term. The parties agree that Hydro has
 10 properly filed its case using the 30-year
 11 record at this time. The Board may consider
 12 using the full historic hydraulic data flow
 13 record at Hydro's next General Rate
 14 Application after Hydro addresses
 15 discrepancies identified in the Acres island
 16 study and parties have had an opportunity to
 17 comment on them. What's your opinion on that
 18 in that Hydro has properly filed its case
 19 using the 30- year record at this time, do you
 20 agree with that?
 21 A. I don't really know about that because that
 22 was part of your agreement. I assume that
 23 that was the recommendation of the Board and I
 24 think Hydro would be more properly--would be
 25 the appropriate ones to decide why that was

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1 are more likely to be right if you use the--
 2 the longer the average you use, the more
 3 likely you are to be right. So you're taking
 4 more of a risk at being wrong. The other
 5 thing is you have more volatility. You know,
 6 a 30-year mean will float more than the long-
 7 term mean. So you risk volatility but more--
 8 the essential point is that you're more likely
 9 to be right if you use the long term.
 10 Q. Just moving away from that. On page 92 of
 11 your report you recommend that Hydro used
 12 computer simulation of hydraulic operation to
 13 estimate energy production and spill from
 14 Hydro's hydraulic resources. Do all utilities
 15 with a large hydraulic resource component use
 16 such models?
 17 A. All the ones we surveyed and all the ones we
 18 know of, yes.
 19 Q. Does Hydro currently have such a model in
 20 house?
 21 A. They have a couple of models that they could
 22 consider. I don't think there's anything that
 23 they could immediately, like tomorrow do it,
 24 but they certainly have some that within a
 25 reasonable time frame I'm sure they could, or

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1 done. I think it was recommended by the Board
 2 until the results of the study were out. One
 3 thing I might mention is that when we're
 4 talking about the small discrepancies we're
 5 not talking about discrepancies necessarily
 6 simply between, you know, the 50 year and the
 7 30 year. There are discrepancies, you know,
 8 throughout the period. And whether you use 30
 9 years or whether you use 50 years, the
 10 discrepancies in the more recent period would
 11 also need to be resolved. So that's not an
 12 issue between the 30 and the 50.
 13 Q. So, eventually you believe whatever
 14 information is available should be used, not
 15 just a 30 year -
 16 A. Yes.
 17 Q. You have no doubt about that.
 18 A. I have no doubt about that.
 19 Q. What are we losing out in the meantime by
 20 using just the 30-year record and waiting
 21 until Hydro's next General Rate Application,
 22 what are we losing here?
 23 A. Well you're not making the best estimate for
 24 the next few years. The best estimate for the
 25 next few years is the long-term means. You

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1 they could get one from elsewhere, they could
 2 purchase one from someone else.
 3 Q. And how is it--how difficult is it to develop
 4 such a model?
 5 A. Well there's two things. There's actual
 6 development of say a generic model which
 7 might--then a utility would buy and they'd
 8 have to spend a fair bit of work to make sure
 9 that it was tailored for their system and
 10 would represent their system correctly. So
 11 there's two aspects, there's the original
 12 model development which we would assume Hydro
 13 would choose one that's already been
 14 developed. And then there's the work of
 15 making sure that it adequately represents
 16 their system.
 17 Q. So you can purchase the model, can you lease
 18 such am model, software, I guess it would be?
 19 A. Well you can--I mean most people who sell
 20 models are prepared to come to various kinds
 21 of agreement. I would imagine you could make
 22 a lease arrangement, I couldn't really speak
 23 to that.
 24 Q. So would it make more sense for Hydro to spend
 25 time developing a model or purchasing one off

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1 BROWNE, Q.C.:

2 the shelf? Do you have an opinion on that?

3 A. There's no--off the shelf is really--it's not
4 like you're buying Word Perfect or Word or
5 Excel. I mean, you know, they really have to
6 be tailored to a specific utility system and
7 all the people we surveyed have done that.
8 Wherever they got the model, Acres--we sell
9 models but we spend a lot of time then making
10 sure that the generic model works for the
11 individual system, because every system has it
12 quirks and you really need to draw on the
13 experience of the utility to make sure that
14 the model represents their system properly.

15 Q. Now I notice in your resume that you've done
16 work for other utilities, including
17 Newfoundland Power? Did they have such a
18 model available in reference to their
19 hydrology?

20 A. Yes, their system is a lot simpler because
21 they just have to model the water resources
22 part of it whereas Newfoundland and Labrador
23 Hydro have to incorporate the load forecast
24 and the thermal production and a lot of other
25 things. Where we worked for Newfoundland

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1 water basin accounting. You could do it
2 yourself by hand, it would just take you a
3 long time.

4 Q. Now I guess all these companies have to deal
5 with spillage, don't they?

6 A. Yes.

7 Q. That's part of the nature of the beast is it?

8 A. And that's one of the main things that a water
9 basin accounting model can help you with.

10 Q. I think Newfoundland Power estimates its
11 spillage represents less than one percent of
12 its normalized energy requirements. Is that a
13 high amount or -

14 A. Well that's a relatively low amount and I
15 think in the case of Newfoundland Power, it's
16 attributable to the fact that many of their
17 developments were sized to provide reliable
18 electricity and therefore, they have
19 relatively large amounts of storage. That's
20 not true, for example, with their more recent
21 development, Rose Blanche, because that was
22 simply developed to optimize hydro electric
23 generation, so there's a lot more spill there.
24 But the other ones--where you've got a big
25 reservoir, Hydro has the same thing and we're

1 Power what we did was we modeled the energy
2 production from their hydraulic resources
3 without worrying about thermal or other
4 aspects.

5 Q. So they have something there that's useable by
6 them.

7 A. Yes.

8 Q. What is the purpose of these models, what is
9 the objective of them?

10 A. The objective of the model--let's take the
11 case of--well the objective of the model is to
12 estimate the energy production that you get
13 from your resources and if it's simply a water
14 resource model as we're using for example with
15 Newfoundland Power, then you model the
16 operation of the reservoirs and you model the
17 inflows and you see how much you model the
18 actual unit, how efficient they are and so on,
19 the turbines and the generators. And then you
20 see how much energy you can get from that and
21 if you have some spill or fisheries release or
22 in the case of Newfoundland Power there's a
23 few of their systems which supply water to the
24 communities, you would have to subtract that.
25 So they do an accounting, a sophisticated

1 very fortunate in Newfoundland that we do have
2 a lot of storage capacity in our reservoirs.

3 Q. So Newfoundland Power has a lot more spillage
4 at Rose Blanche?

5 A. Than in their other stations.

6 Q. That's because of the fish habitat or -

7 A. No, it's because they've only got a small pond
8 to store the water. You can imagine on the
9 south coast you get--they might be dry for
10 weeks and then all of a sudden you get heavy
11 rain like they had a couple of weeks ago and
12 all they've got is a very small pond and it
13 fills up quickly and they spill. Whereas in
14 their other--like if you take any of their
15 developments they have going down along the
16 southern shore, what you'll find is all those
17 big ponds up country, Frank's Pond and Rocky
18 Pond and all those, Mobil Big Pond, they all
19 store water. So when it rains, they can keep
20 the water, they don't spill it. And Hydro has
21 the same, also a large amount of storage. So
22 we don't waste as much water in that sense.
23 The fish is a relatively small component I
24 think. But somebody from Newfoundland Power
25 would have to speak to that specifically.

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1 BROWNE, Q.C.: 2 Q. Less than one percent of its normalized energy 3 requirements to deal with spillage, that isn't 4 a great amount. How does that compare with 5 Hydro, for instance? 6 A. I would say it must be about the same. I'm 7 guessing now. I would say one or two percent 8 on the average from Hydro. And I haven't 9 checked that number from Newfoundland Power so 10 I'm - 11 Q. Because Newfoundland Power is claiming that 12 we're trying to advocate a proposed demand 13 energy rate which is not your area, but 14 they're stating as an excuse there is a danger 15 that its Hydro generating facilities will be 16 operated at less than optimum with the 17 possibility of spillage, do you have any 18 comment on that? They already have spillage 19 don't they? 20 A. I'm sorry I don't quite follow your question 21 here. 22 Q. Okay. Newfoundland Power were trying to 23 advocate a demand energy rate for consumers in 24 the province and Newfoundland Power is 25 claiming that they can't move to that because	1 there's a danger that its hydro generating 2 facilities would be operated at less than 3 optimum with the possibility of spillage. 4 A. Newfoundland Power says that they can't do it 5 or Newfoundland and Labrador Hydro says they 6 can't do it? 7 Q. No, Newfoundland Power, Newfoundland Power is 8 advocating it. 9 A. And Newfoundland Power says they can't do it 10 because of - 11 Q. Because of its Hydro generating facilities 12 will be operated at less than optimum with the 13 possibility of spillage. I think they're 14 using spillage - 15 A. I'd have to look at that in some more detail, 16 I can't comment on that right now. 17 Q. But there is optimization software there to 18 reduce any expected spillage in any case or to 19 monitor. 20 A. That's right. And I have to say I simplified 21 the case a little bit when I talked about 22 water basin accounting for the models because 23 the better models actually do an optimization 24 as well. 25 Q. And the spillage they have now is well within
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1 normal bounds of other utilities. 2 A. I would have said so, yes. 3 Q. Okay, these are our questions, thank you very 4 much. 5 (9:30 a.m.) 6 CHAIRMAN: 7 Q. Thank you, Mr. Browne. Good morning, Mr. 8 Kelly. 9 KELLY, Q.C.: 10 Q. Good morning, Chair. 11 CHAIRMAN: 12 Q. When you're ready, please. 13 KELLY, Q.C.: 14 Q. Good morning, Ms. Richter. My name is Ian 15 Kelly for Newfoundland Power. 16 A. Good morning. 17 Q. I just have a few questions. Mr. Browne took 18 you to the provision of the mediation 19 agreement in which the parties have agreed 20 that this matter will be dealt with on the 30- 21 year data. So I guess the main points that I 22 want to explore with you is where you are now 23 in the process and what Hydro has asked you to 24 do. So can I start at this by taking you to 25 your report, first of all, to Section 8. I	1 want to take you down to 8.1.2, just get you 2 to explain a little bit here about what we 3 have. In the first sentence there it talks 4 about "For several reservoirs the Hydro inflow 5 sequences are internally inconsistent. The 6 breakpoint tends to occur around the time when 7 the project came online. This is not 8 unexpected since the methodology for 9 developing the inflow has changed." Can you 10 just explain that to us briefly? 11 A. Okay. I think it's explained in the report 12 but just to expand on that a little bit. What 13 happened when the projects were first 14 designed, which would have been in the early 15 60s, the companies that were developing the 16 estimates of the energy for Hydro developed 17 flow sequences based on the gauges nearby, or 18 whatever gauges they could find. Then after 19 the projects came online, Hydro started to do 20 their own accounting, water basin accounting. 21 At that time and there was no particular 22 reason for it, they didn't go back and revise 23 the ones that were done before, and in fact 24 you can't do it until you have a certain 25 amount of data on which to base your

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1 MS. RICHTER: 2 revisions. So in a couple of the reservoirs, 3 I'm thinking specifically of Victoria and Grey 4 Reservoir, there was a--when we plotted the 5 curves, as I'm sure you saw in the report, you 6 could see a break there. In the case of some 7 of the others, as mentioned, there's also some 8 minor inconsistencies that have occurred since 9 the project, since the projects came online as 10 well. 11 Q. So the place where the inconsistencies show up 12 is at the point at which the plants are 13 constructed and come into operation for the 14 previous data, is that essentially correct? 15 A. For the case of Grey and Victoria. For the 16 case of Upper and Lower Salmon, there are 17 other inconsistencies in the last 30 years as 18 well. 19 Q. Can we just go to the top of - 20 A. And the same with Paradise River, the 21 inconsistencies are within the last 30 - 22 Q. So these inconsistencies are in a number of 23 the data streams. 24 A. That's right. But they particularly show up 25 in--we mention that in particular because it	1 showed up in the step trend test. 2 Q. And in the top of page 8.2 you explain there 3 that "More recent data suggested the 4 transposition of data from gauge basins to the 5 Hydro basins may be incorrect." Is that 6 essentially what you've just said or is there 7 anything - 8 A. Yes. For example, they might have said well, 9 when we transpose this data we think it might 10 be that we expect the Victoria is 90 percent 11 less than this other station. It's a very 12 common thing to do. And maybe the more recent 13 data would show that it should have been 91 14 percent instead of 90 percent, that's what I'm 15 saying. 16 Q. Now you've been retained now by Hydro to 17 correct this sequence. 18 A. Yes. 19 Q. When will that part of the project be 20 completed? 21 A. We're targeting the end of this year. 22 Q. Just go down into the next paragraph in 8. 2 23 and if you pick it up about four lines from 24 the bottom, "The analysis would include 25 checking to make sure the pre and post project
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1 series have similar distributions and show no 2 breaks in the mass curves. For the post 3 project series, the information used for 4 backgrounding would be checked if there are 5 anomalies." So is that one of the processes 6 that you're going to go through? 7 A. That's right. We're doing that right now. 8 Q. So when you get this analysis done, will you 9 be preparing a written report for Hydro on 10 that analysis? 11 A. Yes. 12 Q. And be providing it to Hydro to provide to the 13 Board and the parties, presumably? 14 A. I assume. 15 Q. Let me just take you down a little bit further 16 and I'll take you--if you go down to Section 9 17 of the report and we come over to the 18 "Recommendations" section. I think we have a 19 draft on the screen there, Mr. O'Reilly, do 20 you have the final version? The paper one is 21 different than this. No? 22 MR. O'REILLY: 23 Q. This is the only version. 24 KELLY, Q.C.: 25 Q. That's the only version you have. Well	1 perhaps we'll go to the paper version if you 2 have that Mr. Richter, because it's a bit 3 different from what we got on the screen 4 there. 5 MR. SEVIOUR: 6 Q. You might want to go back a page. 7 KELLY, Q.C.: 8 Q. Sorry? 9 MR. SEVIOUR: 10 Q. You might want to go back a page, I think 11 she's ahead of you. 12 KELLY, Q.C.: 13 Q. No, I need Section 9.2, but what we have here 14 is a little bit different. The first bullet 15 talks about the longest reliable reference 16 inflow sequence should be used for all of 17 Hydro's operation planning and rate setting 18 purposes. Are you aware that Hydro, for some 19 of its planning purposes, in particular, its 20 firm energy commitment, uses a shorter period, 21 uses this dry sequence from 1958 to '61? 22 A. That's right. It takes the sequence it needs 23 for any particular purpose from the longest 24 sequence. 25 Q. Right.

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1 MS. RICHTER: 2 A. For example it wouldn't take--just look at the 3 30 years and take the dry sequence in the 30 4 years because it wouldn't get it. So it looks 5 at the longest sequence and whatever its needs 6 are, it chooses them from the longest 7 sequence. But that would be a pretty specific 8 application. It's really using the longest 9 sequence, it just used it wasting a lot of 10 time by running the whole sequence when it 11 knows right away where the driest is. 12 Q. So if we just pull up Mr. Haynes' Schedule 2 13 on the screen for a moment so we see this. In 14 his firm energy calculation--if you just go 15 down a little bit, there you go. To get his 16 firm energy he uses a different piece of the 17 segment or uses a piece of the segment as 18 opposed to the whole of the segment, correct? 19 A. Yes, that's correct. 20 Q. And you have no problem with that. 21 A. No. 22 Q. So one can select pieces of this segment for 23 different purposes, agreed? 24 A. Yes. 25 Q. If I take you back to the next bullet is the	1 one we talked about, "the inflow sequences 2 presently used by Hydro should be corrected to 3 ensure internal consistency," that's in your 4 Recommendation, 9.2. And then I'll skip 5 through the next one because we've touched on 6 that. "Computer simulation of the operation 7 of the Hydro electric system using reference 8 inflow sequences should be used to estimate 9 energy production and spill from Hydro's 10 hydraulic resources." And then you go on to 11 talk about Hydro having to review its models. 12 And in your evidence at page 5 you say, "This 13 would be a more appropriate methodology." I 14 have a number of questions. First of all, has 15 Hydro now retained you to look at the 16 selection of an appropriate computer model for 17 Hydro? 18 A. No, they have not. I believe they're doing 19 that in house. That's something they can do 20 in house. 21 Q. So that's not part of your mandate. 22 A. No. 23 Q. Have you had discussions with Hydro though 24 that they are in the process of doing that or 25 they will be doing it?
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1 A. You'd get your information better from them 2 but I believe they are, yes. 3 Q. Do you have any sense of the time period in 4 which that is going to be completed? 5 A. I think you better get that information from 6 Hydro. 7 Q. Are you advising them as to the selection of 8 the model at all or the analysis to make the 9 model appropriate for their purposes? 10 A. Not at the moment, no. 11 Q. If I take you over to page 6 of your testimony 12 and you come down to line 16. You talk about 13 the assessment of the model and then you talk 14 about integrating the Holyrood thermal plant 15 and "the model that does not do this would not 16 produce realistic results, therefore the model 17 must be properly set up for Hydro's 18 circumstances." Could you just explain what's 19 required in terms of assessing and setting up 20 this model? What sort of process is that and 21 how long does it take? 22 A. Well you have to make sure that--I mean, the 23 purpose of this is to come up with the best 24 average energy estimate. 25 Q. Yes, I understand that.	1 A. So the couple of models that Hydro has, one of 2 them they use it for, kind of to set their 3 target levels for the next week and looking at 4 for sort of medium term and so on. And the 5 other one that they have that I'm aware of is 6 one that they've specifically used for 7 planning. Now both of those, to my knowledge 8 already incorporate the Holyrood thermal 9 plant, they incorporate the load forecast, 10 they incorporate a lot of the things we're 11 talking about. So what they need to do and I 12 presume this is what they're doing, is to look 13 at those and perhaps look at others from 14 outside, that they might purchase and choose 15 the one of those that meets the requirement of 16 this, which is to come up with the best 17 estimate of the average energy over the next 18 few years or - 19 Q. You say that this computer modelling process 20 is, to use your language, I think a more 21 appropriate methodology than the one presently 22 used by Hydro. Why is that the case? 23 A. The main reason that we said that is because 24 it allows a better calculation of the--I won't 25 say better because the way they're doing it

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1 MS. RICHTER: 2 now is pretty good, but a more objective, you 3 might say, accounting for things--other water 4 uses like fish, fish flows and spill and so 5 on. And those are relatively small 6 proportions of the total Hydro generation. 7 But at the same time whatever energy they lose 8 is in those aspects and it may just be a small 9 amount. But a small amount can actually be 10 quite a few dollars. And the other thing is 11 the present method of what they're doing, the 12 way Hydro does it now, relies on the expertise 13 of the people that they have. And, you know, 14 they--as I say, they do a good job with it, 15 but as time goes on, you know, they may be 16 doing other things. There may be people 17 coming in who don't have their knowledge and 18 their best of experience and it could be--that 19 information, their knowledge, can be 20 incorporated into the model for other people 21 to use. 22 Q. And do you know whether--go at it this way. 23 First of all I understand, would I understand 24 it correctly that this modelling, if the right 25 model is selected and it's properly set up,	1 would give a more accurate picture, more 2 accurate sense of the average energy 3 production? 4 A. It's hard to say. One assumes, yes. 5 Q. But hard to say until you know the model and 6 how it's set up and the data stream that comes 7 out of it? 8 A. No, the reason I say that is because as I say, 9 they're doing a very good job with it right 10 now, and, you know, a fancier tool is not 11 always a better tool. But in this case, I 12 think for the reasons that I mentioned 13 earlier, I think it's more appropriate. 14 Q. Do you know if there are--are you familiar 15 with Hydro's models and do you know whether in 16 your view there are better models now 17 available on the market or can you help us 18 with that at all? 19 A. I know there are other models available. I 20 don't know if there's better. 21 Q. Can I just take you back to Section 9.2 again. 22 The last part of that bullet says, "Since 23 system simulation models usually require a 24 common start date for all inflow sequences, 25 data from early years of some inflow sequences
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1 will have to be cut off." So I take it there 2 is--when you get this model set up there is 3 some curtailment of some of the early data to 4 get a common period? 5 A. That usually happens, yes. It doesn't always 6 but it usually it occurs. 7 Q. Do you have a sense yet of how much of a 8 curtailment of the data stream that that will 9 mean in Hydro's model? 10 A. I think we said it in the report. I think a 11 start date in the early '50s is consistent 12 with what good data there are available. 13 Q. Yes. I understand that in terms of the 14 reliability of the data, but in terms of what-- 15 getting a common start date for a model, will 16 that take us to what sort of period in the 17 data stream or - 18 A. That would take us from the early '50s to the 19 present. So the records that would be 20 curtailed would be the early part of the Cat 21 Arm record and the early part of the Hind's 22 Lake record. 23 Q. And you're not able to assist us with how long 24 Hydro then would be with this computer 25 modelling process?	1 A. No. I don't think it's--I mean it's not--it's 2 a fair bit of work but it's not, you know, 3 five years. 4 Q. So your mandate right now then is to do the 5 inconsistency corrections, provide a report to 6 Hydro on that consistency correction, and 7 Hydro I take it would need that before then 8 moving forward with the modelling? 9 A. No, I believe that they are--my understanding 10 is that they're already looking at the model 11 selection, the model development. That 12 doesn't require--when you finally put it 13 altogether, yes, they can't do the final - 14 Q. That's what I meant, I didn't phrase that very 15 well. 16 A. But I mean most of the work of it is selecting 17 a model and making sure that it represents 18 their system correctly. 19 (9:46 a.m.) 20 Q. One last question I just wanted to explore a 21 little bit. You talked about your survey of 22 jurisdictions and I take it only one of the 23 regulators prescribed the--of the ones that 24 reported, I take it there were only three that 25 reported, but only one prescribed the

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1 KELLY, Q.C.: 2 hydraulic data stream in some fashion. Which 3 one was that, which jurisdiction? 4 A. That was a very interesting case. That was 5 the Idaho Board of Commissioners. I think 6 they might be called--I can't remember the 7 exact name but it's equivalent to the Board of 8 Commissioners of Public Utilities. They 9 regulate all the utilities, except for the 10 ones like the municipalities which might be 11 small. And they had huge hearings. I think 12 the first one was about 16 or 17 years ago and 13 then they had another one eight or nine years 14 ago, and if you think that the efforts that 15 were made here a few years ago, a couple of 16 years ago on the subject of hydrology were 17 monumental, you wouldn't have believed the 18 number of witnesses and so on that came in. 19 Some people were recommending five years, some 20 35 years. The utility wanted to use a full 21 record and I mean, it just had arguments this 22 way and that. It was--most of them are 23 available on the website and I've gone through 24 a few of them. And - 25 Q. I take it this is an area with different	1 views. 2 A. Anyway, so in the end, I'm not sure exactly 3 why, I think the Board, perhaps because it was 4 time to close the issue, they said we'll go 5 with 20 years. Well, of course, no sooner had 6 they done that but they had the big drought in 7 the western--this was in Idaho, so they had 8 the big drought. Of course the consumers then 9 were--the rates were inappropriate for the 10 conditions. It turned out because of those 11 few dry years that the 20 year was very close 12 to the 70 year, which is what the utility 13 wanted anyway. There was an appeal, and in 14 the end, the Board overturned their original 15 decision and they decided to go with the full 16 record, and in the meanwhile, they had to-- 17 they have something like the Rate 18 Stabilization Plan and they had to have a 19 special rate for two or three years, which was 20 20 or 30 percent higher than what had 21 occurred, because of those dry years, because 22 their rate stabilization plan or whatever they 23 called it, I guess, didn't--hadn't kept up 24 with it. 25 So anyway, they are now using the--they
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1 overturned that 20-year decision after 2 goodness knows how many days and hours and 3 years of hearings, it was overturned and 4 they're now using the full record. 5 Q. And my question was, just want everyone to 6 understand - 7 A. Sure. 8 Q. - it was the Board who revisited that decision 9 based upon new information and changes in 10 circumstances. In other words - 11 A. Well, I'm not sure exactly - 12 Q. - it wasn't overturned by the - 13 A. - I'm not sure of the exact timing of that 14 because somebody appealed it, and I don't know 15 if they appealed it immediately after the 16 decision was made, and then it just so 17 happened that there was a drought or - 18 Q. That's what I was trying to understand. Did 19 the Board reverse its decision or did the 20 Court reverse the Board's decision, or do you 21 know? 22 A. No, the Board reversed it. The Board reversed 23 its decision, to my understanding of it. 24 Q. That's what I thought. 25 A. Yes, the Board reversed its decision. And I	1 think they had kind of lost interest in it. 2 The 20-year and the 70-year were by then about 3 the same, so they just reversed their decision 4 and went back to the full record. 5 Q. Thank you, Ms. Richter, those are my 6 questions. Thank you very much. 7 CHAIRMAN: 8 Q. Thank you, Mr. Kelly. Good morning, Mr. 9 Hutchings. 10 HUTCHINGS Q.C.: 11 Q. Good morning, Mr. Chair, Commissioners. Good 12 morning, Ms. Richter. 13 A. Good morning. 14 Q. My name is Joe Hutchings. Mr. Seviour and I 15 represent the Industrial Customers of Hydro. 16 I just have a few questions for you. In 17 speaking with Mr. Kelly just now, I thought 18 you used the phrase at one stage when dealing 19 with the issue of the accounting for spills of 20 the phrase that I thought I heard you say was 21 something to the effect that energy could be 22 lost if the spills were not properly accounted 23 for. I think what you were discussing at the 24 time was the value of the computer models in 25 dealing with the issue of spills. But just so

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1 HUTCHINGS, Q.C.: 2 that I'm clear, what the model is going to 3 produce is a forecast? Is that correct? 4 A. No, not exactly. The model would produce an 5 estimate of the average annual energy, and the 6 best estimate of the average annual energy, 7 the most likely value that you will have for 8 the next year or the next year or the next 9 year would be the average for that record that 10 you had simulated. 11 Q. Okay. 12 A. So it doesn't actually forecast--it doesn't 13 take into account, for example, the fact that 14 Environment Canada says it's going to rain in 15 the next two days or it's going to be dry for 16 the next month. It's not a forecast in that 17 sense. 18 Q. Okay. 19 A. You're making a prediction based on your full 20 historic record. You don't know what it's 21 going to be for the next year or the next two 22 years or the next five years, so you look at 23 your record and you say what is going to give 24 me the best estimate of what I will get next 25 year or the year after or the year after, and	1 your best estimate will be by simulating your 2 full record. 3 Q. So the accuracy of what the model produces is 4 only going to affect your plans essentially? 5 It's not going to affect how much energy you 6 actually produce or don't produce? 7 A. No. Sorry, if I gave you that impression, no, 8 it won't. It wouldn't do that, no. 9 Q. No, I wasn't clear. 10 A. It will do a calculation of the energy lost 11 from spills. 12 Q. The only way that actual energy and value is 13 going to be lost is if there are spills that 14 could be avoided? 15 A. Yes. 16 Q. Yes, okay. I'd just like to follow up along 17 the same lines with the discussion you had 18 with Mr. Kelly about your recommendation for 19 the computer modelling system. Do I correctly 20 take your point that while this system is, in 21 your view, more appropriate, it won't 22 necessarily produce better results? 23 A. I think it will give you a better idea of what 24 is likely to happen, but the reason I put the 25 caveats on it is because I think that Hydro's
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1 present methodology is quite good, but it just 2 has some limitations in the sense that it's 3 only using the historic spills and so on. I 4 guess I'm probably splitting hairs here. I 5 think the answer is yes, we wouldn't have 6 recommended if we didn't think it would give 7 better estimates. 8 Q. Okay. And your phrase was that it would 9 provide us with a more objective accounting 10 for spills. Can you explain to me how a 11 computer modelling system will do that? 12 A. That's a little bit what I was just referring 13 to, in the sense that the estimates that are 14 now produced by Hydro rely on the expertise of 15 an experience and history with Newfoundland 16 and Labrador Hydro. If you have a model, if 17 those people are busy or taken on to do 18 something else, if you have a model, you can 19 incorporate that experience and that expertise 20 and then the model will do regardless of--I 21 won't say quite regardless of who runs it, but 22 it's separate from the expertise of the 23 individuals, except from the sense of getting 24 it set up, make sure it's running correctly. 25 Q. As I understood your report, the way Hydro is	1 doing this now is based upon an average 2 historic record of spills and how will the 3 computer model be different? 4 A. Well, their historic record of spills, of 5 course, only goes back as long as they've had 6 the projects and even before that, they didn't 7 always have the load to use all the water. So 8 they had to spill some just because they 9 didn't have the load. So if you can--if you 10 want to look at what spill might have happened 11 before that, you would need a model to 12 simulate it. 13 Q. I mean, what we're trying to get to is the 14 best predictor of spills which are inherent in 15 the current system, if you will. 16 A. That's right. 17 Q. Which is a managed system, correct? 18 A. That's right, and so in your model, you would 19 take your flows from before there were the 20 project and you would operate the system in a 21 computer simulation as if the system were 22 there as it exists today, and that's why the 23 model is useful, for that period before you 24 actually had any historic spills. And the 25 other thing is obviously the operation may

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1 MS. RICHTER: 2 have changed since the project came online, so 3 you've got historic spill and now you've got 4 some changes. They've made runner 5 improvements and so on. You can incorporate 6 all those changes into your model, put in the 7 same flows and then say "now, what will 8 happen?" and the computer allows you to do 9 that. It allows you to take advantage of 10 changes like changes in efficiency or 11 introduction of new--of, you know, like 12 Granite Canal, for example, coming on and 13 actually make a good estimate of how much 14 spill you would expect from those projects as 15 well as from your existing projects. So it 16 gives you a lot more flexibility. As the 17 system grows, as it becomes more complex, you 18 can look at what would have happened and 19 you've got a good variety of flows right from 20 the early 50s up to now and you say no matter 21 what kind of flows I get with the system that 22 I have today, let's simulate all those years 23 and see what happens. How much spill will I 24 get? How much will be used for fisheries and 25 how much will be used for energy production?	1 Q. I mean, it just strikes me that the amount of 2 spillage is subject to human intervention, if 3 you will. You know, just for instance, as you 4 note in your Appendix J, Hydro made a 5 deliberate decision to store some water for 6 one of its customers and I mean, that is 7 obviously an external force in the system, if 8 you will, that I don't see how a computer 9 simulation could take into account unless it 10 was specifically told to do so. 11 A. Well, that's right. That's what you would do. 12 If you had some what ifs like that and you 13 wanted to know, well--especially in Hydro's 14 system where they have a lot of storage, 15 sometimes a decision you make now might only 16 affect spill two or three years down the road, 17 and if you have a computer model, you can say 18 "well, now what if I do this, what might 19 happen two or three years down the road? 20 What's my range of probabilities as to what 21 will happen?" and then they can make a 22 decision whether that is something appropriate 23 to do or whether no, they shouldn't store it 24 for their customers because it may result in 25 spill. And right now, they do those
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1 calculations manually, but if they have the 2 simulation model, they would be able to test 3 more of these what ifs. 4 Q. I guess what I'm trying to get to is the value 5 of the ability to test those what ifs, given 6 that the only actual loss to the system will 7 occur if there is an unplanned spill. I mean, 8 how much value are we getting out of - 9 A. It'll still be a loss to the system. I mean, 10 what you want to do is to estimate how much 11 spill--what's your likelihood of losing that. 12 I mean, you don't know what the flows are 13 going to be next year or the year after, the 14 year after. So in doing your--if you can do 15 your simulation model, then you're in a better 16 position to make a decision as to what you 17 should do right now. Plus, you're in a better 18 decision simply to say "if I don't do that, 19 what is my energy going to be?" Then, "if I 20 do do it, what is my energy going to be?" You 21 have to do it anyway, because you want to know 22 what your energy is going to be for the 23 purposes of the Board and the rates, so then 24 you also have the capability of doing some 25 other what ifs.	1 Q. Obviously there is a cost to changing the 2 system and putting in the computer modelling 3 methodology that you're recommending? 4 A. Yes. 5 Q. Do you know how much that cost is? 6 A. I don't, but all you need is to make the wrong 7 decision once and spill some water from one of 8 the major reservoirs and you've paid for an 9 awful lot of models. 10 Q. No, I understand that, but I mean, you have 11 already told us that the methodology that 12 Hydro's using now is pretty good? 13 A. Yes. Yes, for the--but, as their system grows 14 and as it's become more complex, it's more 15 difficult to make those kind of adjustments. 16 And getting back to one of the main issues 17 before this Board is you want to be pretty 18 sure that the estimate you're getting of your 19 average energy is the best estimate you can 20 have, and this will give you, getting back to 21 your question, this will give you a better, at 22 least more objective, estimate of that energy. 23 Q. Okay. Let's leave that there. One of the 24 items attached to a response, NP-68, was a 25 series of information sheets, I guess, on

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1 HUTCHINGS, Q.C.: 2 Acres' experience in various fields, and one 3 of them dealt with what's called the Acres 4 Reservoir Simulation Program Modelling. I 5 take it that's some sort of package basically 6 that Acres sells. Is that correct? 7 A. That's correct. We first developed it 8 actually in 1977 in response to the needs of 9 our clients who wanted to be able to do this, 10 you know, figure out how they should be 11 operating their water resources, and it 12 started in Ontario where they had to actually- 13 they had a lot of competing usage. You have 14 people with cottages and they wanted to have 15 the water levels high in the winter, but not 16 in the summer and then they have locks for 17 navigation and then they have a hydro 18 generation and so on. How do you deal with 19 all those competing water uses? So we 20 developed it for a client there and it just 21 became so useful. It's continued to be 22 developed and, in fact, the most recent 23 version is out now for XT because it's such a 24 powerful and useful program and that's the one 25 that Newfoundland Power uses or we used for	1 Newfoundland Power, and that's certainly one 2 that we have used in Newfoundland and Labrador 3 Hydro, some of Newfoundland and Labrador 4 Hydro's applications as well, on Lower 5 Churchill. We use it for many, many purposes 6 because it's served clients so well and allows 7 people to see the effects of their decisions. 8 (10:00 a.m.) 9 Q. So the computer modelling that you're 10 recommending that Hydro do now, is that 11 anything really more than some sort of add-on 12 to this program that you've already provided 13 to them? 14 A. No, it would probably be the other way around, 15 because in the case of that--for Newfoundland 16 Power, that's all they need. But in the case 17 of Newfoundland and Labrador Hydro, they need 18 a model, first of all, it's going to be driven 19 by loads as well. It's going to be loads and 20 then they've got to--fuel prices are going to 21 come into it and there's a lot of other 22 factors, and as well as their hydraulic 23 production. So it's got to be tied in. It 24 wouldn't be an add-on to that. It would be 25 incorporated--it would have to be tied in to
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1 it. 2 Q. But what I'm just trying to get to is whether 3 or not the basic program that you've provided 4 already to Newfoundland Hydro will be utilized 5 in this modelling, but there will be 6 additional factors as well? Is that the idea? 7 A. It could be. It could be. It could be, but 8 it's--you know, that's one of their choices. 9 Q. As I understand your answers to Mr. Kelly, 10 you're not consulting with Hydro on their 11 decisions on this modelling issue now, are 12 you? 13 A. No. 14 Q. No, okay. In the work that you have done with 15 Hydro in the past and this ARSP, as you call 16 it, notes that you've been working with Hydro 17 since at least 1979 in that regard, have you 18 previously done work on the issue of 19 estimating the average energy capability of 20 the hydrological resources? 21 A. With the--yes, those particular applications 22 have been for to look at the energy 23 contribution of new projects, has been one of 24 the primary uses, and also, we've used it for 25 floods.	1 Q. Yes. 2 A. For flood studies for them. 3 Q. Okay. So prior to preparing the report that's 4 before the Board now, had you provided advice 5 to Hydro on what was the appropriate historic 6 record to use for this purpose? 7 A. We didn't provide advice because it's 8 generally accepted that in the absence of 9 trend, the best record you can use is the 10 longest one. The advantage of this report is 11 that it demonstrates that there is the absence 12 of trend, that there are no definitive trends, 13 and in fact, even if you have small trends, 14 your longest record would be better. So it 15 was just never an issue. Nobody would ever, 16 as you could see from the survey, nobody ever 17 dropped data, if they find it--if they can use 18 it. You know, unless there's real problems 19 with it, they don't drop it. 20 Q. Yes, except in Idaho. 21 A. So it was never questioned. We always use the 22 longest record. 23 Q. Except in Idaho apparently, where they fight 24 about it. 25 A. Well, the utility wanted to use it and if the

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1 MS. RICHTER: 2 utility had been the client, we would have 3 used the longest record. It was just the 4 Board, I think, who were sick and tired of the 5 18 years of hearings or whatever it was. 6 Q. So throughout the 20 odd years of cooperation 7 between Acres and Hydro, Hydro always wanted 8 to use the longest record and Acres never made 9 an issue out of that? 10 A. I don't know if you'd even say that. I mean, 11 it was always agreed by both parties. 12 Q. Okay. 13 A. It was never an issue. 14 Q. Okay. All right. Just a question of 15 curiosity more than anything else, also in 16 another of the sheets attached to or included 17 in the disk which was attached to NP-68, there 18 was a list of hydroelectric experience in 19 Canada and you noted, from 1992 to current, 20 Little Harbour River hydro development, St. 21 Mary's Bay for Hydro Corporation Newfoundland. 22 Is that a current project? 23 A. No. 24 Q. No, okay. 25 A. No, it's wishful thinking on somebody's part,	1 I think. 2 Q. Okay. No, it just surprised me because - 3 A. You have a summer house down there, do you? 4 Q. No. I thought that I would have heard about 5 it if there was something current going on in 6 that regard. 7 A. There's a lot of people who have ideas about 8 hydro projects and they come to people like us 9 and see whether they can make any money at 10 them and if they can't, they drop them. 11 Q. Okay. So that was nothing to do with 12 Newfoundland and Labrador Hydro as such? 13 A. No. 14 Q. No, okay. All right. At page 4-7 of your 15 report, and I think you referred to this 16 previously, maybe we can bring that up, Mr. 17 O'Reilly? 18 MR. O'REILLY: 19 Q. I've been told I have a draft version. 20 HUTCHINGS Q.C.: 21 Q. Yes. Actually, that was an issue I wanted to 22 address, Mr. Chair, because there seemed to be 23 some additional information coming up on the 24 one that Mr. O'Reilly had that wasn't included 25 here. So I think we probably need to get
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1 clarified what's the right one. 2 GREENE, Q.C.: 3 Q. The right one is the one that is filed with 4 JRH-2 with the paper copy. The only thing 5 that I can think of is that Mr. O'Reilly may, 6 in getting the electronic version ready, 7 didn't use the final JRH-2. But the paper copy 8 is - 9 A. But actually try 4-7 anyway, because I would 10 be surprised--that was a section that was 11 written, you know, fairly early on in the 12 project and there may be no changes in that 13 part. 14 CHAIRMAN: 15 Q. I guess the paper copy is the correct version, 16 and the official version, and I believe it's 17 what Mr. Kelly was referring to in his cross- 18 examination, and I think we will stick with 19 that, Mr. Hutchings, I guess. 20 HUTCHINGS Q.C.: 21 Q. Okay. Sorry, Mr. Chair. 22 A. This looks the same as my paper copy. 23 Q. At page 4-7, it's in the second last paragraph 24 of the version that I have where you talk 25 about some internal consistencies and I think	1 this is what you were referring to earlier in 2 your evidence. The last sentence there it 3 says, "it appears that the Grey and Victoria 4 inflows are underestimated prior to 1971." 5 A. Um-hm. 6 Q. So is that one of the inconsistencies that 7 needs to be resolved in the work that's 8 presently ongoing? 9 A. That's right, because it may be an 10 underestimation or it may be a problem in how 11 they're allocated between the basins or 12 something like that. You know, we might be 13 talking, you know, for example coming out of 14 the end of the Grey Reservoir, you might have 15 150 cubic metres per second. We might be 16 talking about one or two cubic metres per 17 second. We're not talking, you know, ten 18 percent. We're talking - 19 Q. Coming over onto the top of the next page 20 then, well, starting at the bottom of the 21 page, "this result suggests that it is the 22 distribution of the flows among the four major 23 basins that require rectification and that the 24 underestimate of the Grey and Victoria flows 25 prior to 1971 is at least partly compensated

Page 57 1 HUTCHINGS, Q.C.: 2 for by Upper and Lower Salmon overestimates 3 for that period." I take it, to this point, 4 neither the underestimate nor the overestimate 5 has been quantified? Is that correct? 6 A. That's right. 7 Q. Are you going to be able to do that? 8 A. That's the whole point of what we're doing 9 right now. You know, while this is all 10 underway, it only makes sense, even if it's 11 only a couple of cubic metres per second, this 12 is a good time to get it sorted out. You 13 know, the issue has been raised. Let's sort 14 it out and get everything and just carry on. 15 Get the principles, you know, decide how we're 16 going to do it, get the principles agreed now, 17 I think, in these hearings and then Hydro can 18 just proceed and you won't have to hear all 19 this over again in a few years. You know, 20 because once you're on this road, it's not a-- 21 there's nothing--you know, it might go up a 22 little bit, might go down a bit, but the idea 23 is still the same. Same with the computer 24 simulation, might go up a little, might go 25 down a little, but once you figure out how	Page 58 1 you're doing it, it should be relatively 2 small, and even then, what are you going to 3 do. 4 Q. Okay. Thank you, Ms. Richter. Those are my 5 questions, Mr. Chair. 6 CHAIRMAN: 7 Q. Thank you, Mr. Hutchings. Mr. Kennedy, good 8 morning. 9 MR. KENNEDY: 10 Q. Thank you, Chair. Ms. Richter, Mark Kennedy, 11 I'm Board counsel. Just wanted to cover one 12 area with you involving the treatment by Hydro 13 of its data to establish minimum energy 14 storage targets. 15 A. Um-hm. 16 Q. First I just wanted to touch on some sections 17 in your report, just to lead into that, and I 18 guess as good a place as any, go to Section 19 7.3, Mr. O'Reilly. 20 GREENE, Q.C.: 21 Q. The concern that I have, and I don't know what 22 has happened, but it's not the final in the - 23 MR. KENNEDY: 24 Q. Oh yes, beg your pardon. 25 GREENE, Q.C.:
Page 59 1 Q. - it's not the final in the electronic record, 2 so I think we should use the hard copy. 3 MR. KENNEDY: 4 Q. Okay. Section 7.3, Ms. Richter, of your 5 report is a section where you provide a 6 summary of the responses received from various 7 utilities that were canvassed by SGE and 8 asking them specific questions relating to how 9 they use their hydrological data, correct? 10 A. Um-hm. 11 Q. Okay. And one of the questions was actually 12 question nine, which was the questions why or 13 why not, so you have to go back to the 14 previous one, and it involved the--this all 15 involved the length of the record being 16 employed by the company. Question eight was 17 "do you drop any data or curtail it to a 18 common period?" and it was indicated in the 19 reply that one indicated that water years are 20 commonly curtailed for operational planning 21 purposes and another curtailed data to provide 22 a common data set, and so then 7.4, I guess, 23 is elaboration of that why or why not, and you 24 said the only reason given for curtailing data 25 in the early part of the record is to have a	Page 60 1 common period of record for computer modelling 2 assistance. I think you've referenced that 3 previously that you want to start off all the 4 plants with the same start date, I guess, for 5 your computer modelling. Correct? 6 A. Yes. 7 Q. Then your last sentence there, "another 8 utility indicated water years having low 9 probability of occurrence are often omitted in 10 near term operational studies." Okay. So I 11 just wanted to put that out there first. Your 12 recommendations include, in 8.1.4, "use 13 sustained estimates for all purposes. Hydro 14 requires as sound a base as possible for its 15 varied uses of the inflow sequences for rate 16 setting, maintaining reliable system, 17 financial planning, forecasting fuel purchase 18 requirements, dispatching units, long-term 19 planning on so on, and all these uses require 20 the best possible estimate of hydrology. 21 There is no reason to use a different 22 reference sequence for one purpose rather than 23 another." Now one last thing that I wanted to 24 get you to comment on before we get to the 25 ultimate question was in your report in

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1 MR. KENNEDY: 2 Section 4.8 or sorry, page 4-8, so it's under 3 Section 4.2.5 Mass Curve Analysis, so the 4 second page under that heading. You have a 5 discussion there in the first full paragraph 6 that starts with Figure 4.12 and you refer to 7 "there's a period from 1957 to the early 1960s 8 when changes occurred in the natural flow 9 series from which the Hydro record was 10 developed. In 1957," and this all applies to 11 Hind's Lake, "in 1957, EC" that would be 12 Environment Canada? 13 (10:15 a.m.) 14 A. Um-hm. 15 Q. "Established a flow measuring station on 16 Hind's Brook so the method of deriving the 17 inflows changed. Also flows in the early 18 1960s were unusually low, which would affect 19 the interpretation of the point of the change 20 in slope of the mass curve." And then the 21 next paragraph, you talk about Cat Arm, and 22 you indicate there's some inconsistency in the 23 first part of the record. "After 1959, data 24 were available from the Torrent River 25 hydrometric station for estimating flows, so	1 the additional information from this river 2 appears to have improved the estimated of Cat 3 Arm." And I just thought, if we could, just 4 flick to Chart 4.12, Figure 4.12--I'm sorry. 5 That's like the power goes out, you keep 6 hitting the light switch. The figure 4.12, 7 there was a chart there, the second one, your 8 single mass curve for Cat Arm, and as well, 9 your double mass curve for Hind's Lake. So 10 they're the two that I think the reference 11 that we just spoke about in those paragraphs, 12 and there seems to be, in both cases, an 13 inflection point in your graph starting around 14 1950, and I'm just wondering if you could just 15 explain what's going on there. What does 16 that, from your perspective, from your 17 analysis in this double mass and single mass 18 analysis, indicate when you see that 19 inflection point? 20 A. Well, in the case of the Cat Arm inflows, 21 that's the point at which they changed the 22 stations that they were using for to make the 23 assessment of Cat Arm. In the case of Hind's 24 Lake - 25 Q. There's a box there in the Hind's Lake graph
Page 63	Page 64
1 which says 1964, so is that the actual 2 inflection point then, 1964? 3 A. That was our--yes, that's kind of an 4 interpretation of the inflection point 5 occurred somewhere around that period. 6 Q. Okay. So if I'm gathering correctly though 7 that at least in some of your data analysis of 8 the stream flow information that you were 9 using that at least in the case of Hind's Lake 10 and Cat Arm, there is some sort of, can I, is 11 it fair to say anomaly or change in data in 12 around that period of the 50s, during the 50s? 13 A. Yes. Certainly in the early, and in fact, you 14 know, when you look at the Hind's Lake one, I 15 mean, you could as easily have drawn your 16 break in slope to another period there. 17 Q. Yes. 18 A. The Environment Canada flow measuring system 19 only really came into use in Newfoundland 20 after Confederation, so whatever happened 21 before 1950 there's less knowledge about how 22 it was done. It may have been done perfectly 23 right, but there's certainly less knowledge, 24 and there were more gauges established, and 25 that's what happened with Cat Arm, is before	1 1950, they only had Upper Humber and then 2 there's a water survey of Canada station on 3 the Upper Humber at Reidville, and that's the 4 only one they had and they had to make a guess 5 as to how those related. Then as they got 6 more information, for example, from Torrent 7 River, which is on the other side of Cat Arm, 8 that allowed them to make better estimates, 9 and so it's that kind of situation that makes 10 a break in slope. It's another reason that 11 we're suggesting--I mean, we could have said 12 well, what Hydro should do is try to 13 reconstruct records for all the basins back to 14 1920, but looking at the available data, you 15 know, there's a point at which it's not worth 16 doing, because you're not--there's just not 17 enough data to make that worthwhile. So by 18 starting in the 1950s, we eliminate any of 19 these possible problems with Hind's Lake and 20 Cat Arm and we're pretty confident that we can 21 develop good records for all the stations from 22 that point on. So this shows, you know, the 23 whole series for those two and if it were 24 really important, then you would go in and try 25 to see what you could do with these. But I

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1 MS. RICHTER: 2 think that would be a waste of money. 3 Q. And I think, in response to a question by 4 counsel for the Industrial Customers, you 5 confirmed that the whole purpose of this 6 analysis is to calculate an average annual as 7 opposed to trying to develop a forecast, 8 correct? 9 A. That's right. You will use that average 10 annual for your forecast. 11 Q. For its predictive qualities? 12 A. For predictive qualities, because that's all 13 you have. 14 Q. Right. 15 A. And the other purpose is of developing a 16 sequence. I mean, you develop your sequence 17 and if you want the average energy, and the 18 average energy is what you need for rates, for 19 operations or whatever, then you use the 20 average energy from the longest sequence you 21 have. If you have another purpose, for 22 example, the dry sequence has come up, you use 23 the same sequence but you're not trying to get 24 the average annual, you're trying to get the 25 firm. So you use the same sequence, but you	1 look for the firm. 2 Q. Okay. 3 A. So if you need the firm for rate setting, you 4 would use the same, all from the same 5 sequence. So - 6 Q. Okay. Can I just stop you there? 7 A. Sure, sorry. 8 Q. And I just want to bring up a chart for us, 9 which is Schedule 4 of Mr. Haynes' prefiled. 10 Ms. Richter, this is, as I understand it, a 11 chart with the infamous magenta line and it's 12 really, as I understand it, an operational 13 based chart showing, for 2002 and then through 14 to April for 2003, Hydro's use of its 15 hydrological reserves as buffered between the 16 green line representing the minimum energy 17 storage target, and the red line, orange line, 18 representing the maximum operating level. Are 19 you familiar with this kind of chart? 20 A. Yes. 21 Q. Okay. And I believe it's been put forward 22 testimony by Mr. Haynes in particular that the 23 green line is based on a model that Hydro uses 24 that takes into account a number of factors, 25 including the nature of the water reserves or
Page 67	Page 68
1 its ability to hold capacity at different 2 times of the year, predicted or forecasted 3 rainfall seasonally and so on, but that 4 ultimately it represents the minimum energy 5 storage target as based upon a sequence of dry 6 years. Correct? 7 A. That's what I understand too, yes. 8 Q. And I understand that the sequence of dry 9 years used by Hydro is in the late 50s? 10 A. Um-hm. 11 Q. A period something - 12 A. Late 50s to the early 60s, yes. 13 Q. Yes, and I think it was something like a two 14 or three year dry sequence period? 15 A. Yes, I think it's at least that long, yes. 16 Q. Okay. So I'm just wondering first, as you 17 indicated, Environment Canada didn't step into 18 the picture and start acquiring information 19 for us until Confederation, so after 1949 20 obviously, and it was that point where you 21 could start normalizing your data or at least 22 having something to compare it to for your 23 mass curve analysis, correct? 24 A. Um-hm. 25 Q. So have you had any involvement or has SGE had	1 any involvement in assisting Hydro in the 2 determination of the minimum energy storage 3 target that's used operationally during a 4 year? 5 A. No, only in the sense of providing them with 6 the model that they're using for it. 7 Q. Okay. Do you know if the methodology employed 8 by Hydro in using the lowest water sequence 9 that it can find through its period of record, 10 as I understand it is the basis, is an 11 acceptable methodology, one used by other 12 utilities? 13 A. Yes. 14 Q. And the reference that I put you to earlier 15 about the other utility omitting certain low 16 probability of occurrence data from its near 17 term operational studies, would that be a case 18 where you would, similar to a situation here, 19 where you might ignore these low water years? 20 Is that what that's referencing? 21 A. It could be. The other thing that makes 22 Newfoundland and Labrador Hydro especially 23 careful about this minimum energy is because 24 they have no backstop. You know, Newfoundland 25 and Labrador Hydro is it. If they run out of

1 MS. RICHTER:

2 water, you know, we're all in the dark.
3 Whereas I don't recollect exactly what utility
4 that was, but chances are they may have other
5 resources. They may be able to buy
6 transmission from someone else. They might
7 have different reasons or, as you say, there
8 might even be the particular circumstances at
9 the time. They might have some idea of--when
10 they say near term, they might be talking next
11 week.

12 Q. Right. So we don't know, in that particular
13 case, that utility may have some greater
14 flexibility in its operations on a day by day
15 or week by week basis that they may not be as
16 sensitive to running out of water, as you put
17 it?

18 A. That's right.

19 Q. But so -

20 A. Just as Newfoundland Power isn't.

21 Q. Sure. So from your perspective, an expert in
22 the field, is using--is going back through
23 your data for as long as your data goes back
24 and finding a two or three year driest
25 possible sequence through that whole period of

1 and say "if we're all right in the sequence,
2 we're all right." Now you can put
3 probabilities on, you know, is this is a one
4 in fifty drought or one in hundred or
5 whatever, but it is a question of what is the
6 acceptable risk, and a particularly acceptable
7 risk to the public in the case of Newfoundland
8 and Labrador Hydro.

9 Q. Case of running out of water?

10 A. Of running out of water because we've run out
11 of water and we then start to get into brown
12 outs and ultimately, you know, and of course,
13 the politicians will be concerned about
14 economics because people won't want to build
15 their facilities here if they can't have
16 electricity, et cetera, et cetera.

17 Q. So just based on that, would you agree with
18 the statement that the further you get away
19 from when that dry sequence occurred that it
20 becomes more reasonable to apply some
21 probabilities to the likelihood of it
22 occurring again when you go to actually use
23 that dry sequence in an operational sense?

24 A. You're more able to apply probabilities to it,
25 yes.

1 time and using or setting your operational,
2 day-to-day operational requirements for your
3 minimum energy storage targets an acceptable
4 practice to you?

5 A. Yes.

6 Q. And how long would you maintain that for? In
7 other words, we're back to 50 years ago now in
8 selecting a period of time to base our
9 operations on in 2004. Do you continue that
10 on ad infinitum or -

11 A. This is a question of, I think, risk. You
12 know, what risk the Board, the public,
13 Newfoundland and Labrador Hydro is prepared to
14 accept. I have--this is a dry sequence that
15 occurred in different ways across Newfoundland
16 in many, many areas. There was a huge forest
17 fire, for example, not too far from Come by
18 Chance in the Piper's Hole basin in 1961. It
19 was a very, very, very dry summer, that was,
20 and this is kind of at the end of Hydro's dry
21 sequence, and it has, in Newfoundland, become
22 an accepted dry sequence, for example, for the
23 purposes of water supply planning for
24 municipalities, for fishery flows and so on.
25 People will look to this particular sequence

1 Q. And would you, for operational purposes, you
2 know, week by week, month by month,
3 operational purposes consider that to be an
4 acceptable practice?

5 A. Yes. I think Newfoundland and Labrador Hydro
6 always has to be aware of what their risk is
7 day to day. Their storage, as you just said
8 yourself, this might go over several years,
9 three years, so they have to be concerned
10 today as to where they might be three years
11 from now, and I think that that's the way they
12 derive these curves. And certainly, as a
13 resident of the province, I'm happy that they
14 do this.

15 Q. Okay. Ms. Richter, the other question is, as
16 indicated, you provided also your expert
17 services, SGE did, to Newfoundland Power and
18 it was SGE, I believe, whose evidence in
19 Newfoundland Power's most recent general rate
20 application, in the winter of this year,
21 recommended an adjustment in the annual
22 hydraulic production expected from
23 Newfoundland Power's plants. Does that -

24 A. Yes.

25 Q. Okay.

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1 MS. RICHTER: 2 A. I don't know much about what happened to the 3 report after it left us, you know, as to where 4 it went with the Board. 5 (10:30 a.m.) 6 Q. Okay. Well, it got filed. 7 A. Yes. 8 Q. It was incorporated by Newfoundland Power in 9 its application. 10 A. Yes. 11 Q. And the recommendation ultimately, I believe, 12 was accepted by the Board. 13 A. Yes. 14 Q. To make that--it was a very small adjustment 15 in the recommended annual production. Do both 16 utilities, Newfoundland Power and Hydro, 17 currently use the same methodologies for 18 determining annual hydraulic production? 19 A. Well, in the sense that if you are saying that 20 Newfoundland Power is now using our--if they 21 use our report, that was done actually by 22 computer simulation. 23 Q. And the method used by SGE Acres in arriving 24 at its recommendation of what the annual 25 hydraulic production should be for rate	1 setting purposes and the like, in the case of 2 Newfoundland Power, is it the same as what was 3 used, same methodologies used by SGE in making 4 recommendations to Hydro concerning estimated 5 annual energy production, do you know? 6 A. In a broad sense, yes. 7 Q. From your perspective, would it be important 8 to have both utilities singing from the same 9 hymn book here or does it make a difference? 10 A. Well, I think in a sense, we are recommending 11 that both, that Newfoundland and Labrador 12 Hydro also use a simulation modelling. 13 There's differences. For example, 14 Newfoundland Power has nowhere near the 15 quality of data that Newfoundland and Labrador 16 Hydro has. We had to do a lot of work to come 17 up with suitable data sets for them to use and 18 so on, in their records. But by and large, 19 it's the same as other utilities are doing. 20 It's the longest record that we could get for 21 them, and we're recommending the same kinds of 22 simulation models. I think we used daily 23 simulation in theirs because some of their 24 systems don't have a lot of storage, whereas I 25 think monthly simulation is probably adequate
Page 75	Page 76
1 for Newfoundland and Labrador Hydro because 2 they have so much storage, and so little 3 spill. 4 Q. Okay. 5 A. So you know, there's differences like that. 6 Q. Sure. 7 A. But broadly speaking, I think both are similar 8 approaches. 9 Q. Okay. And so from your perspective, let me 10 sort of phrase the converse, there are no 11 logical inconsistencies or incompatibilities, 12 if you will, that are created as a result of 13 some differences being employed by the 14 utilities when they go to estimate their 15 average annual hydraulic production? 16 A. That's correct. 17 Q. Okay. That's all the questions I have, Chair. 18 Thank you, Ms. Richter. 19 CHAIRMAN: 20 Q. Thank you, Mr. Kennedy. Have any redirect, 21 Ms. Greene? 22 GREENE, Q.C.: 23 Q. No, thank you, Mr. Chair. 24 CHAIRMAN: 25 Q. Thank you. We'll move now to Board questions.	1 Commissioner Saunders, do you have any? 2 COMMISSIONER SAUNDERS: 3 Q. No questions, Mr. Chair. 4 CHAIRMAN: 5 Q. Commissioner Whalen? 6 COMMISSIONER WHALEN: 7 Q. No, I have no questions. Thank you, Ms. 8 Richter. 9 CHAIRMAN: 10 Q. I have no questions either. Thank you very 11 much, Ms. Richter, for your testimony in this 12 fairly technical area, and appreciate your 13 caution. We won't be going to repeating Idaho 14 any time soon, I don't think. Thank you very 15 much. 16 A. Chairman Noseworthy, I was hoping I would be 17 able to quote something that you said in the 18 last hearings, which is that doubt is not 19 pleasant, I think you said, but certainty is 20 absurd. 21 Q. Yes, that's right. 22 A. And I think in the word of hydrology - 23 Q. Sounds like an apt quotation. Thank you very 24 much. I guess that concludes. We have no 25 more activity or witnesses scheduled for the

Page 77 1 CHAIRMAN: 2 remainder of the week? That's correct? 3 GREENE, Q.C.: 4 Q. No, Mr. Chair. It has been agreed that the 5 next area is the cost of service back here in 6 St. John's on, I believe it's the 13th of 7 November. Prior to that, we have one day, 8 November 12th, where I believe we will be in a 9 position to review the revised revenue 10 requirement that we hope to file possibly by 11 Friday of this week, or if not, very early 12 next week. So we believe that for the 12th of 13 November, which is the first day on the 14 schedule for back here in St. John's after 15 Labrador, we will be dealing with the revised 16 2004 revenue requirement, and followed then on 17 the 13th with the commencement of the cost of 18 service experts. 19 CHAIRMAN: 20 Q. Okay. Thank you, and I guess next week we're 21 scheduled to travel to Labrador. I understand 22 we're leaving by charter at 9:30 on Monday 23 night and--Sunday night, I'm sorry, and I 24 trust that everybody is aware of schedule and 25 itinerary and start times and their	Page 78 1 obligations with respect to arranging hotel 2 accommodation and travel and those types of 3 things, where necessary. 4 GREENE, Q.C.: 5 Q. Mr. Chair, I should point out that the revised 6 revenue requirement that will be filed of 7 course also affects the Labrador 8 Interconnected system rates. So we will have 9 revised evidence available for the Labrador 10 hearing and we will be providing it to the 11 parties certainly by Friday. 12 CHAIRMAN: 13 Q. Thank you. So we have two days of evidentiary 14 hearings set for Labrador City. We have a 15 public participation day set, and we have a 16 public participation day set for Goose Bay as 17 well, returning on Friday. Okay. 18 MS. NEWMAN: 19 Q. Returning Thursday - 20 CHAIRMAN: 21 Q. Pardon? 22 MS. NEWMAN: 23 Q. We return on Thursday evening. 24 CHAIRMAN: 25 Q. Thursday evening, yes.
Page 79 1 MS. NEWMAN: 2 Q. And Friday will be a day off. 3 CHAIRMAN: 4 Q. That's fine. Thank you very much. Look 5 forward to seeing you on Sunday night. You 6 may not be looking forward to seeing each 7 other, but anyway, I think it's probably 8 convenient that we're travelling by charter in 9 any event to Labrador and we'll be reconvening 10 what time on Monday morning? 11 MS. NEWMAN: 12 Q. 9:30. 13 CHAIRMAN: 14 Q. 9:30. Thank you very much. Thank you, Ms. 15 Richter.	Page 80 1 CERTIFICATE 2 I, Judy Moss Lauzon, hereby certify that the foregoing is 3 a true and correct transcript in the matter of 4 Newfoundland and Labrador Hydro's 2003 General Rate 5 Application for approval of, among other things, its 6 rates commencing January, 2004, heard on the 28th day of 7 October, A.D., 2003 before the Board of Commissioners of 8 Public Utilities, Prince Charles Building, St. John's, 9 Newfoundland and Labrador and was transcribed by me to 10 the best of my ability by means of a sound apparatus. 11 Dated at St. John's, Newfoundland and Labrador 12 this 28th day of October, A.D., 2003 13 Judy Moss Lauzon