



COMMISSION OF INQUIRY
RESPECTING THE MUSKRAT FALLS PROJECT

Transcript | Phase 1

Volume 16

Commissioner: Honourable Justice Richard LeBlanc

Friday

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CLERK (Mulrooney): All rise.

This Commission of Inquiry is now open. The Honourable Justice Richard LeBlanc presiding as Commissioner.

Please be seated.

THE COMMISSIONER: Good morning.

You remain affirmed at this time, Mr. Raphals, and we'll continue on now.

MS. O'BRIEN: Good morning.

I have only one further question for Mr. Raphals. And I understand this is leading from an objection that was raised by Mr. Fitzgerald yesterday with regard to Mr. Raphals' testimony. Mr. Fitzgerald is not here today. He did advise us of that. But I understand that Mr. Raphals now has permission to share the name of the expert who gave him the pricing for the wind asset.

So, Mr. Raphals, I'll let you answer that.

MR. RAPHALS: Yes, I spoke last night to my colleague, and he said now that, at seven years' remove, he has no problem in being identified.

His name is Nicholas Muzsynski, M-U-Z-S-Y-N-S-K-I. And he was, at the time, the lead wind project developer for the Maritime region for Renewable Energy Systems Canada, usually referred to as RES, RES Canada.

MS. O'BRIEN: Thank you very much, Mr. Raphals.

Those are my questions. I expect that some of the other counsel will have questions for you on cross-examination.

THE COMMISSIONER: And, Ms. O'Brien, I assume you'll make sure Mr. Fitzgerald knows that that was entered this morning.

MS. O'BRIEN: I will indeed.

THE COMMISSIONER: Okay. Good.

All right. Government of Newfoundland and Labrador.

MR. RALPH: No questions.

THE COMMISSIONER: Nalcor Energy.

MR. SIMMONS: Thank you, Commissioner, and good morning, Mr. Raphals.

MR. RAPHALS: Good morning.

MR. SIMMONS: I think I introduced myself before. It's Dan Simmons, I'm here for Nalcor Energy.

MR. RAPHALS: Good morning, Mr. Simmons.

MR. SIMMONS: So I do have a few questions for you this morning.

MR. RAPHALS: Mm-hmm.

MR. SIMMONS: I hope we won't take too long.

MR. RAPHALS: Okay.

MR. SIMMONS: And I want to start where Commission counsel started and that is with a few questions on your background –

MR. RAPHALS: Sure.

MR. SIMMONS: – and qualifications. And maybe what we can do is go to Mr. Raphals' CV, which I think is Exhibit P-00353, and in particular page 8.

THE COMMISSIONER: Tab 1.

MR. SIMMONS: So, Mr. Raphals, this is the page which identifies your formal education. And it identifies a Bachelor of Arts in 1974 in philosophy with a minor in biological sciences, and a masters in music performance in 1976. So that's an accurate summary of your formal education, is it?

MR. RAPHALS: That's correct.

MR. SIMMONS: Yeah. Have you done anything since 1976 by way of any kind of formal educational programs, in particular, related to the area that you work in now, which is energy?

MR. RAPHALS: Not in formal education institutions, no.

MR. SIMMONS: Okay.

And your educational background, then, doesn't actually include any formal training in energy policy?

MR. RAPHALS: That is correct.

MR. SIMMONS: Or in items like business or finance or accounting?

MR. RAPHALS: Indeed.

MR. SIMMONS: No engineering?

MR. RAPHALS: Not in formal education.

MR. SIMMONS: Nope.

Nothing in public policy administration, or anything of that area?

MR. RAPHALS: Not in formal education.

MR. SIMMONS: And no law.

MR. RAPHALS: Not in formal education.

MR. SIMMONS: Okay.

Now, 1976 is a long time ago –

MR. RAPHALS: Indeed.

MR. SIMMONS: – I'm – I can remember it, so that's a bad thing. That's 42 years ago.

Why – I mean, I know you had a change in career midway through here. Sometimes when people do that, they do go back and they do improve their formal credentials; they do some education. They do that. Why have you not done that over the years?

MR. RAPHALS: I suppose the answer is by the time that it occurred to me that that would be useful, in other words, by the time that I was already working in the energy field –

MR. SIMMONS: Mmm.

MR. RAPHALS: – and I said to myself, jeez, if I had a master's degree or a doctorate, I wouldn't have to face these kinds of questions in cross-examination.

MR. SIMMONS: Yes, well, I'm sure you get them all the time.

MR. RAPHALS: I do actually.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: I didn't have time. I've been exceedingly busy. I have one interesting project after another –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – and it never seemed to me to be a really – something that was worth investing the time in.

MR. SIMMONS: Right.

So, aside from, you know, formal education, university degrees, those sorts of things, some areas have other credentialing that's available. Accountants can get a CPA, for example.

MR. RAPHALS: Yeah.

MR. SIMMONS: Many specialized areas have things like that.

Have you sought any kind of credentialing with any sort of agencies or bodies that you could affiliate with in the energy area?

MR. RAPHALS: No, I'm not really aware of any body that credentials in the field in which I actually work and, again, I'm always too busy working on what I'm working on –

MR. SIMMONS: Interesting things.

MR. RAPHALS: Interesting things.

MR. SIMMONS: Yeah.

MR. RAPHALS: And each one of which, by the way, is an educational experience in itself.

MR. SIMMONS: Yes. Okay.

You – in your testimony yesterday, at one point you did refer to your colleagues from UBC.

MR. RAPHALS: Yeah.

MR. SIMMONS: So I presume that's people you've worked with from UBC, and you weren't suggesting you have any kind of formal affiliation with UBC.

MR. RAPHALS: That's correct. I was part of a team that was organized by the program on water governance –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – of UBC.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: So it – all of those interventions were formally interventions of UBC.

MR. SIMMONS: Right. Okay.

Yeah, and – but you weren't on faculty –

MR. RAPHALS: No.

MR. SIMMONS: – or –

MR. RAPHALS: No.

MR. SIMMONS: – had any kind of position –

MR. RAPHALS: No.

MR. SIMMONS: – with UBC –

MR. RAPHALS: No. No.

MR. SIMMONS: – or anything like that? All right.

So your work experience then, aside from your career being completely devoted to a musician for the first 15 years, I guess, after graduation?

MR. RAPHALS: Let me think. No, actually – well, approximately.

MR. SIMMONS: Yeah.

MR. RAPHALS: Approximately 15 years.

MR. SIMMONS: Okay.

And then you worked for a while as a freelance journalist?

MR. RAPHALS: That's right.

MR. SIMMONS: Science writing. And then you got a job with the – in connection with the Great Whale Project.

MR. RAPHALS: Exactly.

MR. SIMMONS: Right. So just tell me a little bit about what that was, because that seems to be your introduction into this area.

MR. RAPHALS: Well –

MR. SIMMONS: Was it? How – what were you doing; who were you working for?

MR. RAPHALS: Actually, the introduction, if we're – as long as we're talking about this, on the very last page of my CV.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: Page 20, the very last publication that I've listed –

MR. SIMMONS: Yes.

MR. RAPHALS: – is an article for the *New Scientist*, which is a British science magazine.

MR. SIMMONS: Okay.

MR. RAPHALS: The title is “The Hidden Cost of Canada's Cheap Power” –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – which was an article precisely about the energy policy debates in Quebec –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – about the Great Whale Project in particular.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: And in the process of working on that, I spent a lot of time with, on both sides, the technicians and the scientists, and got to know the leadership, the people involved in the question from the Grand Council of the Crees to a certain extent.

MR. SIMMONS: Mm-hmm

MR. RAPHALS: Simultaneous to all this, and actually something I wasn't really aware of at the time, but there were court proceedings going on about project splitting. The Crees had taken Hydro-Québec and the Government of Quebec to court for splitting the Great Whale Project into two separate projects in order to seek a faster approval. And there was an out-of-court settlement from that proceeding, which led to a unified environmental assessment of the project, and that was important because – look, don't want to go too far into the details of this, but –

MR. SIMMONS: No, no, 'cause – that's not really my question.

MR. RAPHALS: It – yeah. But under the James Bay Northern Quebec Agreement, there are four standing committees, each of which had jurisdiction to review the project, and there was also a federal body, the predecessor of CEAA, that had jurisdiction (inaudible) the project.

So the agreement was that all together these bodies would create sort of a single portal to the world so it would appear to be one single environmental assessment, even though it was in reality five different ones. And it was agreed that each of the Aboriginal parties could name one member to the staff of this – essentially the secretariat of the environmental assessment – of this joint environmental assessment process.

MR. SIMMONS: I see.

MR. RAPHALS: And so I was – the Crees asked me if I would be willing to accept a position.

MR. SIMMONS: I see. So you were nominated to work on this Great Whale Project by the Cree group?

MR. RAPHALS: That is correct.

MR. SIMMONS: I see. And your initial interest in this had stemmed from the article you wrote as a freelance journalist where you looked at what – your title was The Hidden Cost of, I think, hydroelectric power in Canada?

MR. RAPHALS: Canada's Cheap Power.

MR. SIMMONS: Of Canada's Cheap Power, okay. So you kind of embarked on this career with a, I'm going to suggest, with a particular perspective on what policy was around power generation in Canada. Would that be fair to say? In that you were a critic of the way this policy was being applied in the country. Is that fair?

MR. RAPHALS: Well, I mean, I was really very focused on this particular project.

MR. SIMMONS: Yes.

MR. RAPHALS: And I was critical of the project.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: For reasons which I think – still believe are valid.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: You know, one of the benefits of training in philosophy is you do sort of learn to look at things from a lot of different sides.

MR. SIMMONS: Yes, yes.

MR. RAPHALS: So I don't think that I've ever approached these questions from a single-sided –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – environmentalist perspective. But yes, I do take the environmental concerns seriously.

MR. SIMMONS: Okay, good.

So after that involvement at the Great Whale Project – and I hadn't understood how you came to be involved in that; thank you for that. You

then worked, according to your CV, as an independent energy analyst for a short time and then you were a founder of the – is it Helios?

MR. RAPHALS: Helios Centre.

MR. SIMMONS: (Inaudible) say Helios Centre. Okay. You describe that as a non-profit?

MR. RAPHALS: Correct.

MR. SIMMONS: So how large is that organization? Like, do you have a staff, are there employees or offices? How does that work?

MR. RAPHALS: It's a small organization.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: It started small. It got a little bit bigger.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: Got a little bit smaller.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: It's now getting a little bit bigger. We have a board of directors. I'm the only permanent person.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: Depending on projects – there are two, at this particular point in time, two analysts who are formally associated.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: This – one is an engineer, and one is an economist.

MR. SIMMONS: Yeah.

They have other jobs though as well, do they?

MR. RAPHALS: Yes.

MR. SIMMONS: Yes. Okay.

MR. RAPHALS: And then depending on projects, we build teams too to respond to projects.

MR. SIMMONS: Right.

MR. RAPHALS: Many of the – much of the work I've done, I've done alone.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: But other projects have involved groups of five, six, seven people.

MR. SIMMONS: Right. So it's – the Helios Centre itself is non-profit, but it's – from your personal perspective, you're an employee of the Helios Centre?

MR. RAPHALS: I'm actually not an employee.

MR. SIMMONS: No?

MR. RAPHALS: I was for a number of years.

MR. SIMMONS: Yes.

MR. RAPHALS: We ran into some financial difficulties and then –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – ceased to have employees. And now, essentially, pay for services.

MR. SIMMONS: Okay.

So for the resources that you can draw on, for the work that Helios Centre is called upon to do, you're available; you have a couple of collaborators that can make themselves available, and you say you find what resources you can when you need them, I guess?

MR. RAPHALS: Well, usually people come to us. Either –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – with funding –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – or often we've worked in regulatory environments where there are cost awards.

MR. SIMMONS: Ah, yes, yes.

MR. RAPHALS: And so are paid at the end.

MR. SIMMONS: So (inaudible) –

MR. RAPHALS: Or long after at the end.

MR. SIMMONS: So if you're assisting a participant in a regulatory matter where the participant's costs are going to be paid at –

MR. RAPHALS: Exactly.

MR. SIMMONS: – the end of it, that's what makes it possible for you to do the work that you do?

MR. RAPHALS: Exactly.

MR. SIMMONS: Okay, good. All right.

Now, here at this Inquiry, you haven't been brought in here as an expert witness, so you haven't been retained by the Inquiry with any mandate to –

MR. RAPHALS: That's correct.

MR. SIMMONS: – answer any particular questions, right? I –

MR. RAPHALS: Well, I was subpoenaed to come and speak to certain questions.

MR. SIMMONS: Yes.

And if I understand from the import of your evidence yesterday, that would be primarily to explain your involvement in the environmental assessments, which would include the Joint Review Panel assessment of the Muskrat Falls part of the project. And the – I forget the name of it – the different type of assessment of the transmission project.

MR. RAPHALS: Comprehensive study.

MR. SIMMONS: Comprehensive study. As well as you made some submissions to the Public Utilities Board when there was a question referred to it in 2011. And that was over 2011 and 2012, concerning the project as well. So that –

MR. RAPHALS: Yeah, and as I understood – the framework was –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – everything that I had done in relation to the project up until the time of sanction.

MR. SIMMONS: Okay, good. Yeah.

So you've essentially come here as what I'll call a fact witness, and in the course of explaining that, you've had to explain to us what kind of views you presented in these various proceedings without being called upon to actually present any new opinion or new expert evidence here?

MR. RAPHALS: That is how I understand the framework –

MR. SIMMONS: Yeah.

MR. RAPHALS: – yes.

MR. SIMMONS: And I think this is – I mean, we know the answer to this, but just to confirm it. So in the Joint Review Panel proceedings for the environmental assessment of the Muskrat Falls Project, you weren't retained by the panel in some independent capacity to provide expert opinion. You were there because you were asked to participate on behalf of Grand Riverkeeper?

MR. RAPHALS: In that case, I was retained by Grand Riverkeeper.

MR. SIMMONS: Okay.

And the same for the comprehensive review of the transmission project?

MR. RAPHALS: Comprehensive study.

MR. SIMMONS: The comprehensive study.

MR. RAPHALS: Yeah, the same there as well.

MR. SIMMONS: Yeah. And for the Public Utilities Board reference?

MR. RAPHALS: As well.

MR. SIMMONS: As well, okay.

MR. RAPHALS: I might point out, as long as we have my CV here, that I was retained by the Federal Review Commission of the Eastmain-Rupert project at one point – that’s on page 4.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: Just as a – in passing.

MR. SIMMONS: So you’ve participated in a number, I guess, of environmental reviews of energy projects – hydro projects, over the years.

MR. RAPHALS: Actually only a few.

MR. SIMMONS: Okay.

Which ones?

MR. RAPHALS: The Eastmain-Rupert project –

MR. SIMMONS: Yes.

MR. RAPHALS: – in Quebec.

MR. SIMMONS: That’s in Quebec was it? Yes.

MR. RAPHALS: First on behalf – in an early phase on behalf of the commission –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – itself, and in the later phase on behalf of the chiefs of the affected communities.

MR. SIMMONS: Okay.

MR. RAPHALS: I participated in the environmental assessment – the joint federal-provincial environmental assessment of the Site C Project –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – and I’ve mentioned that before.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: In British Columbia –

MR. SIMMONS: On behalf of –

MR. RAPHALS: On behalf of the Treaty 8 Tribal Association.

MR. SIMMONS: Yes.

MR. RAPHALS: I was at – when I was on the Great Whale environmental assessment team, I went to but didn’t participate in the environmental assessment of the Sainte-Marguerite 3 project, and I was also at the environmental assessment of the La Romaine Project in Quebec but I don’t recall exactly in what context. I’d have to think about that some more.

MR. SIMMONS: Okay,

MR. RAPHALS: But, generally – unfortunately, because environmental assessments I think are very important, but – I haven’t really had occasion to be directly involved in them very often.

MR. SIMMONS: Okay.

MR. RAPHALS: The vast majority of my work is really before energy regulators.

MR. SIMMONS: Right.

And, as – in those types of proceedings, am I correct that it’s – in most cases there’s not a formal process of qualification of people as experts to give opinion evidence, the way there would be in a court, because (inaudible) could be familiar with the way it would work in a court, are you?

MR. RAPHALS: In the – before the energy regulators there is –

MR. SIMMONS: Yes, yeah.

MR. RAPHALS: – such proceeding, but before the environmental assessments, that I’m aware of, there is not.

MR. SIMMONS: Okay.

Now you did refer yesterday, while we’re talking about the proceedings you’ve been involved in, to a federal court application that

had been brought by a number of parties including Grand Riverkeeper, following the release of the Joint Review Panel assessment of the Muskrat Falls Project. Do you recall that?

MR. RAPHALS: Yes.

MR. SIMMONS: And one of the exhibits that's put in evidence, I think, is an affidavit –

MR. RAPHALS: Yup.

MR. SIMMONS: – filed in that proceeding.

What did you understand that legal proceeding was about? What was being sought in that?

MR. RAPHALS: Well, I know that I understood it much better than what I remember now.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: My general understanding, my general recollection, is that it was primarily saying that the panel didn't go far enough and that having identified, for instance, that the economic justification was inadequate –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – that the panel had an obligation to dig further and extract more information and actually come to a conclusion rather than pitching a ball down the court and then suggesting that someone else should do this later.

MR. SIMMONS: Right. And that was a position put forward in your affidavit, I believe.

MR. RAPHALS: Yes.

MR. SIMMONS: Support for that.

I think in your affidavit you also raised the issue of whether the transmission project should have been separately assessed, compared to the main project?

MR. RAPHALS: I don't particularly recall that, but we can look at it if you want to, or I'll take your word for it if you like.

MR. SIMMONS: Sure.

Well, if you want to let's take a quick look at P-00359, page 2.

MR. RAPHALS: Which tab is that?

MR. SIMMONS: I don't have the tab cross-references, I'm sorry.

THE COMMISSIONER: Okay, just one second (inaudible).

MR. RAPHALS: It's tab 8. Page?

MR. SIMMONS: Yeah, if you go to the second page.

MR. RAPHALS: Yeah.

MR. SIMMONS: There's a summary there and if you scroll down a little bit, please – paragraph 7 there –

MR. RAPHALS: Mm-hmm.

MR. SIMMONS: – because you've listed three things that you're going to address in the affidavit.

MR. RAPHALS: Mm-hmm.

MR. SIMMONS: You say, "Finally, I provide evidence about **transmission projects that are closely-related** to the Lower Churchill Generation Project, and indeed that form part of the larger "Lower Churchill Project," but which were not assessed by the Panel as part of any cumulative effects assessment."

So, it was an issue that you were addressing and raising.

MR. RAPHALS: Well, I think that is an introduction to the summary of my testimony to the comprehensive study.

MR. SIMMONS: Yes.

MR. RAPHALS: But I do not recall, and I'm not sure, but I suspect that it was not an issue that was actually raised in the JR, probably because of timing.

MR. SIMMONS: Okay.

But this was a submission that you made to the federal court in your affidavit.

MR. RAPHALS: My submission –

MR. SIMMONS: Mm-hmm.

It's not a big point.

MR. RAPHALS: Sorry, I just have to find the section that's referring to – “Finally I provide evidence ...” refers to page 19, paragraph – starting at paragraph 71 – I haven't read this since the day, so I –

MR. SIMMONS: No, and I don't need you to explain it. I just wanted to identify that this was a topic that was raised in the appeal.

MR. RAPHALS: Well, again, I'm not sure it was raised in the appeal.

MR. SIMMONS: Mmm.

MR. RAPHALS: What was raised in my affidavit is that the transmission project was not part of the environmental assessment, that's a fact; and that the panel did not assess cumulative impacts between generation and transmission. That's paragraph 72.

Paragraph 73, that Nalcor Energy is also the proponent of closely-related projects.

Paragraph 75, that the generation and transmission projects are closely related; and then there's some more facts that I don't think I have to mention.

Paragraph 79 on page 22, the province acknowledges that the Muskrat Falls dam and the Labrador-Island Link projects are related. And paragraph 80, I guess this is the conclusion, the – “In addition to the need to assess the proposed Labrador-Island Transmission Link and other related transmission projects in a cumulative environment environmental affects assessment, the alleged economic benefits of and need for the proposed Lower Churchill generation project cannot, in my view, be meaningfully or fairly assessed without

including the economic cost of power transmission.”

“By excluding the proposed transmission project from the assessment of the generation project, the economic costs of the generation project can appear to be much less than what they are reasonably anticipated to be. This concern has been echoed by the media” and I mention an article.

MR. SIMMONS: So this was a concern that you articulated in your affidavit, it went to the federal court. Do you know what the outcome of that court proceeding was?

MR. RAPHALS: I believe the application was rejected but I don't recall much of the details.

MR. SIMMONS: Okay.

So you don't know what the outcome – well, we can look that up.

MR. RAPHALS: Yeah.

MR. SIMMONS: If I were to suggest to you that the application was indeed rejected – the application was dismissed – does that match your general recollection –

MR. RAPHALS: I believe so –

MR. SIMMONS: – of what happened?

MR. RAPHALS: – yeah.

MR. SIMMONS: Yeah, okay.

All right. So, I've got some more specific questions now, on some of the things that you discussed yesterday. And you made some comments regarding the Power Purchase Agreement, and in particular the method that was adopted for determining what the power rates would be over time to recover the cost of the Muskrat Falls Project?

You recall –?

MR. RAPHALS: Mm-hmm.

MR. SIMMONS: You recall that?

And you had referred us – we don't need to go to it right now – to a submission that you had made in, I think, June of 2012, where you pointed us to some discussion regarding that.

Now, at the point where you were involved in either the JRP process or the transmission line assessment or the PUB process, had there been a final power purchase agreement developed? Was there a power purchase agreement that you actually reviewed, or did that come after?

MR. RAPHALS: I don't actually know at what date it was developed –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – but I'm pretty sure at that point I had not seen it.

MR. SIMMONS: Right.

'Cause I think that the agreement itself is dated in November of 2013, so that would have been subsequent to any of your actual involvement in these matters, right?

MR. RAPHALS: Right.

MR. SIMMONS: Yeah.

One of the exhibits you've – that's been entered through you is a schedule from that Power Purchase Agreement – not the whole agreement, but a schedule from it.

MR. RAPHALS: Yeah.

MR. SIMMONS: So that's not something that you would have had available when you were involved in this matter – not something you would have analyzed or made any comment on at the time –

MR. RAPHALS: No –

MR. SIMMONS: – correct?

MR. RAPHALS: – at the time, as I think I said yesterday –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – allusions had been made to the structure –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – and to what it would eventually look like, and I suggested that would be a useful exhibit simply because it makes it concrete. But it is indeed –

MR. SIMMONS: Right.

MR. RAPHALS: – posterior –

MR. SIMMONS: Right.

MR. RAPHALS: – to the period we're talking about.

MR. SIMMONS: So that's something you had to go back and look at and identify after the fact and, I guess, in preparation for coming here, is it?

MR. RAPHALS: Well, I have looked at it many times in different contexts –

MR. SIMMONS: Mmm.

MR. RAPHALS: – as you know, I've been involved in other proceedings here, so –

MR. SIMMONS: Mm-hmm. Yeah.

MR. RAPHALS: – I'm familiar with it.

MR. SIMMONS: Okay. Good.

So if I understand your evidence about that, you've pointed out that for power projects, often the utility regulation regime uses a cost-of-service model in order to determine how much ratepayers – consumers of electricity – are going to pay for new projects – for capital development, right?

MR. RAPHALS: Yes –

MR. SIMMONS: And –

MR. RAPHALS: – among other things.

MR. SIMMONS: – in – I may be oversimplifying this, but the cost-of-service

model involves saying: what's the cost of that project this year? How much – how, you know, how much do ratepayers have to pay this year, to pay for the cost incurred this year. And year, by year, by year, by year.

MR. RAPHALS: Yes, and I –

MR. SIMMONS: In simplified terms.

MR. RAPHALS: That's correct.

MR. SIMMONS: Yeah.

MR. RAPHALS: And indeed that is the way that the electric rates are set.

MR. SIMMONS: Yes.

MR. RAPHALS: And even under the PPA that is still the way –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – Hydro's and NP's rates are set –

MR. SIMMONS: Mmm.

MR. RAPHALS: – but that the amount is not the amount of the capital cost of the project, but the amount of the contract under (inaudible).

MR. SIMMONS: Yes, right.

MR. RAPHALS: Yeah.

MR. SIMMONS: So for – if it's a cost-of-service model –

MR. RAPHALS: Uh-huh.

MR. SIMMONS: – in the – if we have a project that's built that has a 30-year life – like a combined-cycle combustion turbine, I'm told, has about a 30-year life – it has to be – it's like a buying a car or buying a house, you pay the cost up front and then you pay it off over time. And the cost-of-service model –

MR. RAPHALS: But for the capital cost, because –

MR. SIMMONS: Yes.

MR. RAPHALS: – because, of course, for a combined-cycle turbine most of the costs are fuel costs (inaudible).

MR. SIMMONS: Yes. Okay, for a generation project, say it's a small hydro project or something like that –

MR. RAPHALS: Mm-hmm.

MR. SIMMONS: – the cost-of-service model, I understood you to say, means that in the early years of the life of the project, ratepayers pay more because they're paying off the higher cost of the project. And as time goes by, the ratepayers pay less and less and less and less, so that at the end of it they're getting the power from that project fairly cheaply.

MR. RAPHALS: Yeah, largely due to depreciation.

MR. SIMMONS: Largely due to depreciation, right.

And the Power Purchase Agreement model treats it a little differently and kind of 'levelizes' the amount that ratepayers are going to pay. So they'll pay less in the early years than they would have on cost of service, but more in the later years than they would have under cost of service.

MR. RAPHALS: Well, it 'levelizes' it in real dollars.

MR. SIMMONS: Yes.

MR. RAPHALS: You could also have a Power Purchase Agreement that's 'levelized' in nominal dollars –

MR. SIMMONS: Yes.

MR. RAPHALS: – and where the amount would actually stay fixed over time.

MR. SIMMONS: Uh-huh.

MR. RAPHALS: But when it's based on real dollars, then the amount in – I mean, they're funny terms, you know, because, I mean, the dollar in your pocket is not a real dollar, it's a nominal dollar.

MR. SIMMONS: Okay, so –

MR. RAPHALS: So but – so in dollars that we actually live with, the amount goes up every year.

MR. SIMMONS: So at the time you looked at this, say, when the Joint Review Panel proceedings were underway –

MR. RAPHALS: Yeah.

MR. SIMMONS: – your assessment of it, based on what you knew then, was that a Power Purchase Agreement model was to be used for recovering the cost of the Muskrat Falls Project from the ratepayers. And am I correct that your assessment was that that would mean that the ratepayers would pay less in the early years after the project was built than if it was cost-of-service model that was being applied? Yes?

MR. RAPHALS: Yes.

MR. SIMMONS: Yes.

MR. RAPHALS: But I would like to say that –

MR. SIMMONS: Yes.

MR. RAPHALS: – in the environmental assessment hearings it was really not entirely clear.

MR. SIMMONS: Okay.

MR. RAPHALS: But, gradually, the concept took shape that this was where you were going –

MR. SIMMONS: Right.

MR. RAPHALS: – where Nalcor was going, to a PPA where effectively, indeed the cost would be lower at the beginning and higher later.

MR. SIMMONS: Right. So we're comparing the PPA method of allocating, of having ratepayers pay for the project to the cost-of-service method. And I'll just repeat it again to make sure we got this right.

MR. RAPHALS: Uh-huh.

MR. SIMMONS: Based on your involvement and your assessment at the time, from what you saw as it developed to the process –

MR. RAPHALS: Yeah.

MR. SIMMONS: – the Power Purchase Agreement method was going to keep rates lower in the early years compared to what a cost-of-service model would have been, and they would be higher in the later years compared to what a cost-of-service model would have been.

MR. RAPHALS: That's correct.

MR. SIMMONS: Right. But under the Power Purchase Agreement model, even using an escalated rate designed to keep the value of what they're paying the same and account for inflation –

MR. RAPHALS: Mm-hmm.

MR. SIMMONS: – from the beginning to the end of the time period covered by the Power Purchase Agreement, the real cost of power to ratepayers was going to stay the same. It was the model.

MR. RAPHALS: Yes, that's right.

MR. SIMMONS: That's the model.

MR. RAPHALS: (Inaudible) dollars, yeah.

MR. SIMMONS: Now we can say, well, maybe 2 per cent escalation didn't – wasn't going to actually match inflation but, conceptually, would you agree that the model was to keep the cost to the ratepayer the same through that period.

MR. RAPHALS: Yes.

MR. SIMMONS: Yeah, okay.

So you've identified those differences between the Power Purchase model and the cost-of-service model. So is one better than the other for any particular reason?

MR. RAPHALS: Well, first of all, as I say, that that understanding developed rather slowly during the hearings and so far as I know it's never been used before for a large hydro project.

There may be exceptions that you're aware of and I'm not.

MR. SIMMONS: Uh-huh.

MR. RAPHALS: But I don't know of any other large hydro project that has been – whose costs have been passed on to consumers –

MR. SIMMONS: Right.

MR. RAPHALS: – in this way. And –

MR. SIMMONS: So does that tell us anything about whether it's better or worse to use one or the other model?

MR. RAPHALS: No, but I think there are other concerns that – other reasons that there are; one is one that came up yesterday, you know, the difference between a 20-year planning period and a 50-year planning period. We know a lot more – we have – there's still very great uncertainty for even a 5-year forecast or a 10-year forecast or a 20-year forecast, but far less uncertainty than for a 50-year forecast.

And under cost-of-service financing, a large part of the costs are paid during the period for which you can actually have a reasonable idea of what the future might look like. And so if your project, based on a cost-of-service model, is affordable and makes economic sense for the next 20 years, you can really be pretty sure that after that it'll fine, because it's going to be a lot cheaper. Whereas when you use the PPA model, especially over such a long period, it may – you can – you might have confidence that it's going to be affordable for the first 10 years or 20 years, but I don't see how you can have any real understanding of what the impact of that purchase is going to be in the unknown period that starts – you know, when your picture of the future starts to get so fuzzy that you really don't know anything about it at all –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – starting maybe 20 years out.

MR. SIMMONS: Right.

MR. RAPHALS: And so in that sense I think this approach has a risk for a long-term, you can

call it intergenerational if you want, risk for consumers which the cost-of-service model does not have.

MR. SIMMONS: So – but would there not still be some risks when you're looking out over that time period of the cost-of-service model, as well, of –

MR. RAPHALS: Well –

MR. SIMMONS: – not being able to predict what the effect on rates would be of applying the cost-of-service model to that (inaudible) future.

MR. RAPHALS: I said that you know that after 20 years the real dollar cost is going to be a fraction of what it is at the beginning.

MR. SIMMONS: Yes, when that –

MR. RAPHALS: And so for the same reason that today's existing hydro projects –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – that the Churchill Falls seems to be so cheap. Why is it so cheap?

MR. SIMMONS: Uh-huh.

MR. RAPHALS: Because we're how many years out from commissioning, but even at 20 or 30 years out, it became very cheap power.

MR. SIMMONS: Right.

MR. RAPHALS: And the same is true of James Bay and the same is true of the BC Hydro dams. So that's the point I was trying to make, that after those first two decades, when the bulk of the capital costs had been paid off, there's really not much worry that this is going to be a burdensome project.

MR. SIMMONS: So I'll suggest then, just for your comment, that if that's an advantage in later years, that that comes at a cost. And the cost is the burden on the ratepayers in the early years of paying higher power rates in order to achieve that benefit that they might get in the future or they might not get in the future.

MR. RAPHALS: That's true. It's sort of like building a house, you know.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: It costs a lot of money and you have to tighten your belt and borrow money.

MR. SIMMONS: Yeah.

MR. RAPHALS: But you can be pretty sure that your kids are going to be happy when you leave it to them.

MR. SIMMONS: Right.

And when you buy a house and your mortgage is amortized over 30 years, it's a level payment that's determined in order to amortize it.

MR. RAPHALS: Well –

MR. SIMMONS: It's not the declining balance payment, right?

MR. RAPHALS: But as I pointed out yesterday, it's not an inclining payment either.

MR. SIMMONS: Uh-huh.

MR. RAPHALS: Mortgages are not – I've never heard of a mortgage where the payments increase 2 per cent every year.

MR. SIMMONS: Right, but the – okay, we don't need to stretch the analogy too far, but the mortgage doesn't work the way a cost-of-service –

MR. RAPHALS: No. No, it doesn't.

MR. SIMMONS: – payment would work. If you apply the cost-of-service model to your mortgage payment, you'd have a huge mortgage payment after you buy your house and it would gradually decline as time went on.

MR. RAPHALS: Right, but if you didn't have – well, again, we may be stretching –

MR. SIMMONS: Yes.

MR. RAPHALS: – it a little too far, but if you actually just built a house and didn't have a

mortgage, then you would indeed have high costs at the beginning –

MR. SIMMONS: Right.

MR. RAPHALS: – and it –

MR. SIMMONS: So it's an interesting debate, but would you agree with me then, that there's kind of policy considerations that exist here around evaluating whether the better route forward is going to be to apply cost-of-service model versus the Power Purchase Agreement model?

MR. RAPHALS: I would agree that it's a reasonable question to ask.

MR. SIMMONS: Yes.

MR. RAPHALS: In my view it's the kind of question that is worthy of public debate.

MR. SIMMONS: Yes.

MR. RAPHALS: And, you know, if that had been a question that was put clearly on the table in –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – well, of course, there wasn't a real forum to publicly debate whether or not this project should go forward or not, but if there were I would think that would be a very reasonable question to –

MR. SIMMONS: Right, right.

MR. RAPHALS: – to be addressed.

MR. SIMMONS: And one other small point. I think you also said that while you haven't seen a Power Purchase Agreement provision like this in the hydroelectric projects you've been exposed to, which you described earlier, you have seen them for other types of power purchases from other sources such as wind generation.

MR. RAPHALS: Yes, they're very common for wind generation. But, again, there's a difference with scale, both temporal and –

MR. SIMMONS: Sure –

MR. RAPHALS: – amount.

MR. SIMMONS: – which is a factor to take into account.

MR. RAPHALS: Power purchase – wind power purchases are usually a very small percentage of cost of service.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: And we're talking about usually 20 years and not 50.

MR. SIMMONS: You made some comment on potential export sales of power for Muskrat Falls, power that would be sold outside the Province of Newfoundland and Labrador and, presumably, would generate some revenue. And I don't want to work through the details of your calculations around that, so my first question is: At the point where you were involved in the JRP hearings and the PUB hearings, what was your understanding of what the role was that export power sales might play? And, in particular, was that revenue – potential revenue being factored in to the evaluations that were being done at the time?

MR. RAPHALS: Well, it certainly wasn't clear from the information presented in the EIS –

MR. SIMMONS: Yes.

MR. RAPHALS: – at the JRP. My initial assumption –

MR. SIMMONS: Mmm.

MR. RAPHALS: – was that the export revenues would contribute to meeting the capital costs and, therefore, reduce the burden on ratepayers.

MR. SIMMONS: Right. So that's why you engaged in trying to analyze what those revenues might be, was it?

MR. RAPHALS: Well, first of all, simply, it was an element that was put forward in the –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – EIS as a part of the justification of the project.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: So, you know, my instinct is to dig around and see, you know, is there anything missing here?

MR. SIMMONS: By the time you became involved in the PUB reference, was it – was that a factor then that was on the table in the PUB reference, the value of export sales?

MR. RAPHALS: Well, as I think I said yesterday, it's my understanding, but this is – it's sort of a vague understanding. I don't think I've –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – seen official documents that say this, that the initial conception was that exports sales would not in fact – I think I said this yesterday, that export revenues would not be deducted from the capital cost that's passed on to ratepayers, but would instead be just an additional revenue stream to the owner.

MR. SIMMONS: Uh-huh.

Which is the province.

MR. RAPHALS: Which is – well, which is Nalcor Energy and, therefore, the province. I think, and I'm not certain of this, but I think that in more recent discussions there's been – there's some question raised about that, and that it may be modified as part of a possible rate mitigation strategy. I don't really know any –

MR. SIMMONS: Right.

MR. RAPHALS: – details about that.

MR. SIMMONS: So at the time you were involved in the PUB matter –

MR. RAPHALS: Yeah.

MR. SIMMONS: – which was the reference question that government had referred to the PUB –

MR. RAPHALS: Yes.

MR. SIMMONS: – which was, I paraphrase: essentially to look at whether the Muskrat Falls option was the least-cost proposal compared to the Isolated Island alternative. And at that point, do you recall that export sales were excluded from that analysis? They were not being factored in to determine which of the options was going to be least-cost.

MR. RAPHALS: I don't believe that I –

MR. SIMMONS: Does that sound right to you?

MR. RAPHALS: I don't believe that I addressed export sales at all in my comments to the PUB.

MR. SIMMONS: Oh.

MR. RAPHALS: I don't really recall, in particular, anything about that.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: The things that we talked about yesterday were from the JRP when the –

MR. SIMMONS: Okay.

MR. RAPHALS: – export projections were definitely part of the EIS.

MR. SIMMONS: Okay.

So if you were to assume for a moment that the project – the alternatives are being evaluated on the basis that export sales are not being taken into account, so there's a comparison. And we'll talk a little bit about the way the CPW comparison works in Strategist and all stuff because I think you're familiar with that.

MR. RAPHALS: Mm-hmm.

MR. SIMMONS: And it came down to, for the economic comparison of the projects, developing sort of a current assessment of what the future costs would be for each of two scenarios – one, Muskrat Falls; one, Isolated Island – and any potential revenue from export sales was excluded from the Muskrat Falls option.

MR. RAPHALS: We're talking now about the PUB reference?

MR. SIMMONS: Yeah. By the time you get to the PUB.

MR. RAPHALS: Okay.

MR. SIMMONS: Does that sound right? Or if you don't –

MR. RAPHALS: Yes –

MR. SIMMONS: – remember, that's fine.

MR. RAPHALS: – I think that is right. And as I recall –

MR. SIMMONS: Yeah.

MR. RAPHALS: – the Maritime Link was not included either, right?

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: The cost – nothing about the supply from Maritime Link was included. But, I guess, because you're talking about –

MR. SIMMONS: So my question is –

MR. RAPHALS: Okay.

MR. SIMMONS: Let me ask the question.

MR. RAPHALS: Yeah.

MR. SIMMONS: So my question then is: If in fact there is any revenue from export sales, would that – what would the benefit then of that revenue be? Would it – and I'm going to suggest either it – depending on where it goes, it's either going to accrue to the benefit of the ratepayers, by being money that can offset rates and lower rates as you say, or accrue to the shareholder, which is the Government of Newfoundland and Labrador, which becomes revenue that it has available to use for other purposes that wouldn't have had otherwise.

MR. RAPHALS: Yes, but I have to say that of those two options, I find the second one surprising in that – insofar as you have an asset

that is producing revenue from two sources, but –

MR. SIMMONS: Yes.

MR. RAPHALS: – then you make all the people from one pay the full cost. It seems to me a little bit odd, but –

MR. SIMMONS: So your view would be that it would be better to use the revenue to reduce then, and that's a debate that's ongoing now.

MR. RAPHALS: Right.

MR. SIMMONS: So that's something government will have to deal with. Okay.

I have a bit of a more technical question for you and I don't know if you can answer this or not. You referred yesterday when – I think it was in connection with the potential for export sales to the idea that you regarded the Muskrat Falls plant as being a winter-peaking plant, and that it would have most of its power available in the wintertime when there is a higher flow on the river from power – from water that's being released at the –

MR. RAPHALS: Do you recall which –

MR. SIMMONS: – Upper Churchill?

MR. RAPHALS: – exhibit that was?

MR. SIMMONS: I don't to be honest. There's an exhibit which refers to temporal distribution of power production, if that rings a bell.

MR. RAPHALS: Yes, I think that was in the original GRP paper.

MR. SIMMONS: Mm-hmm.

That sounds right.

MR. RAPHALS: I'd like to have a look at it.

MR. SIMMONS: I've got a fairly simple – just one simple question for you in relation to that. But having – do I have the idea right that you are saying that the times when peak production at Muskrat Falls would occur, in your view, weren't matching the times when there was the

highest demand in the – you know, in the markets –

MR. RAPHALS: Yeah. It's just that –

MR. SIMMONS: – in the export markets.

MR. RAPHALS: – it's a question I've thought about a lot since then, and so I'd like to be sure. Since we're only talking about that period –

MR. SIMMONS: Yeah.

MR. RAPHALS: – I want to –

MR. SIMMONS: Sure, put yourself back in that period.

MR. RAPHALS: I want to be referring to what I said then and what I knew then and not what I know now.

MR. SIMMONS: Well, I'll tell you what my question is first –

MR. RAPHALS: Okay, yeah.

MR. SIMMONS: – before you do that.

MR. RAPHALS: Uh-huh.

MR. SIMMONS: Okay?

And my question really is that: Were you just considering the power from Muskrat Falls as being a direct transmissions market? Or were you taking into account the idea that the Muskrat Falls power would feed into the Island grid and that the export power would be able to draw on the whole Island grid? And the idea being that the Island includes a reservoir at Bay d'Espoir, which creates some capacity for storage of power, short term, maybe longer term depending on how much is there.

And did you consider whether that configuration would help offset the concern you had about not matching when the peak power was produced at Muskrat Falls to when there was the highest demand in the market?

MR. RAPHALS: Well, okay, what we're talking about P-00354, page 14 –

MR. SIMMONS: Yeah.

MR. RAPHALS: – which is tab 3. It’s a brief section.

And what I wrote was – I may as well just read the paragraph. So it’s at the bottom –

MS. O’BRIEN: That’s tab 3.

MR. RAPHALS: Tab 3, Exhibit P-00354, page 14 at the bottom: “... important to keep in mind that the Muskrat Falls Project, like the Lower Churchill Project generally, has little if any reservoir storage, and thus is obliged to turbine and sell power based on generation levels at the Churchill Falls plant upstream.”

I think at that point I did not take into account the inflows from the tributaries between Muskrat Falls.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: “As Churchill Falls is operated to meet the needs of Hydro-Quebec, which has a winter-peaking system, it seems clear that the timing of releases will not be optimized to maximize sales ... in the US market, where peak prices occur in the summer.”

So, first of all, I do think that that’s correct. And I think I then also pointed out that the freshet comes in the summer, but too early to really –

MR. SIMMONS: Right.

MR. RAPHALS: – meet those peak prices.

MR. SIMMONS: So my question –

MR. RAPHALS: But –

MR. SIMMONS: – is simply: Did you consider the entire system, the entire power –

MR. RAPHALS: No, at that time I didn’t —

MR. SIMMONS: – system?

MR. RAPHALS: – I was not thinking about the full Newfoundland power system.

MR. SIMMONS: Okay.

And, I mean, we’ve taken a look at your – you know, your formal training and background. And I mean, just to state the obvious, you don’t have any kind of formal background in the engineering, the hydrological analysis and the operation of power systems that would be involved in actually digging into this question and determining to what extent the power can be banked somewhere in the system in order to be sold at a more optimal time.

MR. RAPHALS: Well, I do have a considerable familiarity with those questions.

MR. SIMMONS: Yes.

MR. RAPHALS: And I am able to address them, though I obviously didn’t at this stage in 2006 or 2011.

MR. SIMMONS: Well, there’s a difference between addressing something and having the kind of technical background that’s required in order to do a fulsome, reliable analysis, I’ll put that to you.

MR. RAPHALS: I certainly could not do a hydrological study.

MR. SIMMONS: No?

MR. RAPHALS: I could read a hydrological study and I could probably tell you its significance in relation to the kind of question you are asking, but this is entirely hypothetical because that is certainly not what happened in 2011.

MR. SIMMONS: So you do – you would feel confident taking an engineering study and reading it and explaining the significance and critiquing it?

MR. RAPHALS: Well, it depends. There’s all kinds of engineering studies.

MR. SIMMONS: Yes.

MR. RAPHALS: There are many for which I would and many for which I would not.

MR. SIMMONS: Right, okay. And so – right, okay.

As part of your evidence yesterday was about – well, we call it CDM, I guess –

MR. RAPHALS: Mm-hmm.

MR. SIMMONS: – conservation demand management. I think DSM, is that –?

MR. RAPHALS: Yes, that is the more common term, yeah.

MR. SIMMONS: Yeah, okay.

And I get your point that you're saying that CDM measures should have been taken more explicitly into account as if they were a generation alternative in the planning for the power supply of the province.

MR. RAPHALS: Well, actually, that was –

MR. SIMMONS: And I think that's –

MR. RAPHALS: That was – those were MHI's words which I quoted.

MR. SIMMONS: Yes, okay.

MR. RAPHALS: It's not really right to think of them as generation alternative –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – because they have very different characteristics.

MR. SIMMONS: Yeah.

MR. RAPHALS: But they have their own characteristics, they have their own profiles, their own period of years it takes to ramp. You know, it's a different animal –

MR. SIMMONS: Yup.

MR. RAPHALS: – but it's an animal that collectively reduces the need for new generation.

MR. SIMMONS: Okay, so –

MR. RAPHALS: And so –

MR. SIMMONS: Yeah.

MR. RAPHALS: – yes, my point is that it should've been taken into account when looking forward, to figure out how much we were going to need.

MR. SIMMONS: Right, so what the potential was to reduce demand by using those sorts of measures. Okay.

MR. RAPHALS: Yeah.

MR. SIMMONS: And from your assessment – your assessment was that hadn't been done enough in the work that you were looking at, at the time of the JRP forecast.

MR. RAPHALS: That is correct.

MR. SIMMONS: Okay.

So I'm going to suggest, and to get your comment, on whether there are in fact some limits on how much could be achieved by those sorts of demand management measures.

MR. RAPHALS: I will grant you right away that there are limits.

MR. SIMMONS: Yes.

MR. RAPHALS: Yes.

MR. SIMMONS: Okay, well, tell me what sort of limits there are. What factors limit how far you can go with that?

MR. RAPHALS: Well, as I described yesterday, first of all I described them as potentials.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: But beyond the potential, of course, is the limit; at the end of the potential is the limit.

MR. SIMMONS: Yeah.

MR. RAPHALS: So the technical potential, if everyone did the most efficient thing – if everyone tomorrow threw out their refrigerators and bought the most efficient kind no matter what they cost –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – that becomes the – that’s the limit of what can be done in terms of refrigeration.

MR. SIMMONS: That’s like a technological limit. The best –

MR. RAPHALS: Pretty much.

MR. SIMMONS: – technology available.

MR. RAPHALS: Yeah, exactly, best available regardless of cost. But then there’s a cost-effectiveness limit.

MR. SIMMONS: Yes.

MR. RAPHALS: That – now, maybe the more efficient refrigerator only costs 5 per cent more than the regular one and that the power you’re going to save over a year is going to save 10 per cent of the price.

MR. SIMMONS: Yeah.

MR. RAPHALS: So obviously it’s cost efficient to buy the more effective one.

MR. SIMMONS: Yeah.

MR. RAPHALS: But people don’t necessarily do that. They go to the store, they look at the price, they say this one costs more, I’ll take this one.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: So, then, if you give them a little incentive and you institute a program that gives them a rebate of \$25, or who knows what, to help them to make the choice – which is really the better choice.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: So the cost-effective potential, which is also a limit, is the world of all of those measures which, in reality, are cost effective –

MR. SIMMONS: Right, so –

MR. RAPHALS: – in relation to the avoided cost of power.

MR. SIMMONS: Yeah.

So the cost effectiveness then means you have to assess both the cost of making a change, which will reduce power consumption, and the value of the, you know, the power that’s being saved as a result of that. And it’s only if it’s worth – it’s only if you’re going to save enough power will it be worth making the expenditure to change your technology or apply more insulation or whatever.

MR. RAPHALS: Yeah, that’s right.

MR. SIMMONS: So it’s a cost-benefit analysis, as simple as that.

MR. RAPHALS: It is where the benefit side is the utility’s avoided cost.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: And when the utility’s avoided cost is Holyrood operations –

MR. SIMMONS: Yeah.

MR. RAPHALS: – then the – and when the price of oil is a hundred dollars a barrel, then the avoided cost is greater than when – what’s on the margin is hydro – is paid off hydro –

MR. SIMMONS: Yeah.

MR. RAPHALS: – or the cost of oil is shipping elsewhere.

MR. SIMMONS: So the limit is going to be when the points reach where it’s not worthwhile spending any more money on it, where you’re not getting any return for the money you spend on extra level of insulation or something like that.

MR. RAPHALS: Yeah, but now we’re still talking about – again, there are different potentials, different limits. Are you talking about the utilities? Which limit are you talking about exactly?

MR. SIMMONS: Well, it generally, for the value of doing this, either on an individual basis –

MR. RAPHALS: Yeah.

MR. SIMMONS: – as an individual householder or system wide. I'm simply saying that there will come a point where it's not worthwhile to spend more money –

MR. RAPHALS: Absolutely.

MR. SIMMONS: – because you're not going to achieve any result. So it's a –

MR. RAPHALS: That is correct.

MR. SIMMONS: – limit that exists there. So there's limits on what technology can achieve and there's limits on when it becomes cost effectiveness. And I think the other one you've kind of alluded to is it's kind of a, I think, but it's a behavioural limit. You can't rely on people to always behave economically rationally, and to a certain point they'll just make choices which will limit the amount you can achieve by CDM.

MR. RAPHALS: Well –

MR. SIMMONS: You can try to influence that –

MR. RAPHALS: It's a little more complicated than that.

MR. SIMMONS: – but you identified it yesterday.

MR. RAPHALS: It's a little more complicated than that, because the – because rates in most places are constant. So rates are based on utility average costs and the – so to determine rates, the high cost of operating Holyrood gets mixed in with the low cost of Bay d'Espoir and of the remaining parts of the hydro system.

So the average price that people pay is usually, not always, but in particular in Newfoundland, significantly less than the avoided cost for the utility at peak, and your marginal cost, because at the margin you have to run a facility that costs you –

MR. SIMMONS: Yeah. No, I'd simply ask you about people's behaviour and – because you had identified yesterday –

MR. RAPHALS: But, well –

MR. SIMMONS: – that you can't count on people to offset –

MR. RAPHALS: I'm sorry, maybe I'm being too – I'm not being clear enough, but people's behaviour, even as a rational actor, if my rate is nine cents and the – you know, if I did all the calculations that the benefit of buying a refrigerator is going to cost me 10 cents, I'd say well, I shouldn't buy it, right?

But from NLH's perspective, and from society's perspective, it's better that you do buy it because the energy you're saving is really worth 15 cents. And so that difference between the rates that are based on average costs and the logic of DSM potentials is based on marginal costs, can mean that people can behave perfectly rationally and still not capture the potential. And that's why – that's precisely why, active DSM –

MR. SIMMONS: Right.

MR. RAPHALS: – or CDM programs are important.

MR. SIMMONS: Right. Okay.

So even with the active DSM-type program –

MR. RAPHALS: Mm-hmm.

MR. SIMMONS: – that you are promoting, there's – you know, there's your – and I think your position that there could be – you're arguing that there could be reductions in demand, but you do accept that there is – as I say, there's a limit to how much you can achieve –

MR. RAPHALS: Absolutely.

MR. SIMMONS: – with that.

Now, a couple other questions related to that. As to whether or not the effects of demand management efforts are – were taken into account here, you did mention that you were

aware that there was a technological change variable incorporated into the load forecast.

MR. RAPHALS: Yes.

MR. SIMMONS: Now, I do understand your argument that that's not – that you say that wasn't enough.

MR. RAPHALS: Mm-hmm.

MR. SIMMONS: But do you accept that that variable does take into account the effects of those CDM measures which had been in place in the years prior to that load forecast being performed?

MR. RAPHALS: I couldn't really speak to that because, first of all, I don't –

MR. SIMMONS: Okay.

MR. RAPHALS: I mean, I don't think – I think that's –

MR. SIMMONS: Isn't load forecasting your area?

MR. RAPHALS: Well, hang on.

MR. SIMMONS: Is load forecasting –

MR. RAPHALS: I think –

MR. SIMMONS: – something you would –

MR. RAPHALS: – that's misstating –

MR. SIMMONS: – have expertise in?

MR. RAPHALS: – the notion of the technological variable because you're talking about the past. The forecast is about the future. And what that technological variable – I think they called it –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – is saying is it's really the trend, the efficiency trend that will happen without intervention. And I agree that that's an important element, and it's – as far as I know – incorporated in load forecasts everywhere, and it should be there.

MR. SIMMONS: Mm-hmm. Yeah.

MR. RAPHALS: I think it's perfectly fine if it is there. But it doesn't replace –

MR. SIMMONS: Oh, I'm not saying it does. No, I'm not saying it does. I'm just –

MR. RAPHALS: Okay.

MR. SIMMONS: – and I – from what you said yesterday, I think – would you acknowledge that that technological change variable does, in part, account for a projection of future conservation demand management effects based on what the effects have been over the –

MR. RAPHALS: Well, I –

MR. SIMMONS: – prior years.

MR. RAPHALS: – don't think so. I don't think it's based on – it's an estimate of future conservation and demand management. Management is an active term. It's based on an estimate of future trend –

MR. SIMMONS: Yes.

MR. RAPHALS: – of increased efficiency due to the technological evolutions that will happen without conservation and demand management.

MR. SIMMONS: All right.

Can we go to P-00014, please? You were referred yesterday to the Grant Thornton analysis – and go to page 54, in particular. This was the sensitivity table that you were referred to yesterday.

MR. RAPHALS: Oh, that Commission counsel referred to?

MR. SIMMONS: Yes, yeah, that's right.

MR. RAPHALS: Mm-hmm.

MR. SIMMONS: Page – it should be page 54, I think.

MR. RAPHALS: Okay.

MR. SIMMONS: Okay, if you can just scroll down a little and show the full table – okay, that’s good. Thank you.

So our understanding of this is that this was a table that was prepared by the Grant Thornton auditors for their report with information extracted from the Nalcor submission to the PUB in the reference case, and also extracted from the report done by Manitoba Hydro International in connection with that.

So this is not something you would have seen back at the time –

MR. RAPHALS: Right.

MR. SIMMONS: – that you were involved in the JRP reference, but you would’ve seen it, I think, when you were involved in the PUB –

MR. RAPHALS: Yes, I think so.

MR. SIMMONS: – matter, right? So does it look familiar to you?

MR. RAPHALS: Yes. Broadly speaking, yeah.

MR. SIMMONS: Yeah, okay.

So I do want to draw your attention to a sensitivity that was done here – it’s several down – there’s two of them. It says: Moderate Conservation and Aggressive Conservation. So I’m – my understanding of what the purpose of this is, is to say that this is a projection of how much the analysis of the difference between Isolated Island case and Interconnected Island case would be affected if there were moderate conservation measures applied and if there were aggressive conservation measures applied.

Was that what you understood that to be at the time?

MR. RAPHALS: I mean, it’s clearly – what the intention is, I don’t – offhand I can’t give you an opinion. I know that’s not what you’re asking for. But I don’t have a sense, offhand, of the scale of 375 and 750 in relation to –

MR. SIMMONS: Okay, well, that’s not what I was asking for.

MR. RAPHALS: Okay.

MR. SIMMONS: That’s not what I was asking.

MR. RAPHALS: Yeah.

MR. SIMMONS: So this is – I’m gonna suggest that using sensitivities like this is one method of taking into account what the effect would be of the kind of conservation demand management that you’ve been promoting in your evidence to see how much effect it would have had on the comparison between the two options. Does that sound fair?

MR. RAPHALS: Well, yes and no. I’m not aware exactly how these sensitivities were calculated. I know that MHI interpreted the definitions of the two scenarios by filling them out with resources at different dates. We’ve seen that –

MR. SIMMONS: So do you know whether actual modelling was run or not in order –

MR. RAPHALS: Well, I don’t really know –

MR. SIMMONS: – to obtain the numbers in these sensitivities?

MR. RAPHALS: – I don’t know how that aggressive – what’s supposed to be the aggressive conservation case, I don’t know how that was worked through in the plan.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: And again, given the lack of flexibility to modify the Isolated Island Option, for instance, one could, purely hypothetically, one could conclude that – again, if one had the freedom to look at what –

MR. SIMMONS: (Inaudible) –

MR. RAPHALS: Please, can I finish?

If what –

MR. SIMMONS: Okay, you do that and then I’ll repeat my question because you’re not answering.

MR. RAPHALS: Please do, yeah.

But I think this is important to say. If one had the freedom to design the optimal system to meet whatever context –

MR. SIMMONS: Hmm.

MR. RAPHALS: – one was looking at, it's possible that with aggressive conservation that resources which had not been cost effective in the base case suddenly become cost effective, or feasible in some way.

And so, in fact, the entire resource plan might look very different in an aggressive conservation model. And in the BC Hydro – by the way, in the BC Hydro IRP we see that over and over again: when you change one variable the whole mix of resources changes. So if one had done that and really optimized the resource selection, based on each one of these sensitivities, then I think the result would be interesting.

MR. SIMMONS: Right. Interesting.

MR. RAPHALS: It would be valuable and interesting.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: I'm not convinced that that was done here; although, I can't really say.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: I suspect that it wasn't given the constraints to the resource planning. So –

MR. SIMMONS: So you don't know?

MR. RAPHALS: So now could you please repeat the question?

MR. SIMMONS: Okay. Let's see if I can remember – if I can remember it.

Is there value in approaching the question as a sensitivity analysis here? I hear you saying that you see there being more value in doing a complete modelling, which includes the CDM, and you don't know whether that's – what underlay how this sensitivity was prepared here or not. But even if there wasn't, is there value in approaching this and trying to work it out –?

MR. RAPHALS: Well, it depends where the numbers came from.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: If all they did was take the base case and subtract a certain amount of power sales based on the reduced demand, then I would say: No, there's not much value because it's not a realistic appreciation of what that scenario would look like. If you had, in fact, rerun your whole planning process based on a different load forecast, modified by this net of CDM –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – then, yes, it would be an important component.

MR. SIMMONS: Okay.

MR. RAPHALS: And I should add the other thing – I don't think I said this yesterday. The other difficulty of working the sensitivities is that – again, we're looking at very long-term futures where a lot of things can change. And so each of – these are looking at each one on its own. And it's very possible that you could have a change in your conservation, and a change in your fuel costs, and a change in your capital costs and all –

MR. SIMMONS: Sure.

MR. RAPHALS: – these things together and the uncertainty of how to mix and match these sensitivities becomes – they lose a lot of (inaudible) –

MR. SIMMONS: So how do you deal with that problem?

MR. RAPHALS: Well, the best way is not through strictly sensitivity approach –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – but through a resource planning approach where you work through each one of these cases.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: And then you – what you’re looking for is robustness. You’re looking for choices you can make today that you’re not going to regret, even given the uncertainty that 10, or 20 or 30 years from now that even if all – you want to make choices today such that, in the largest proportion of possible futures that you can envisage, you will not regret them later on.

MR. SIMMONS: Okay. Let me ask you a sort of related question to that, and it kind of relates to something you said yesterday, too, about – if I understood correctly – an objective in order to – or a means of reducing demand would be to move people off electric heat in this province and move them to other sources of home heating and –

MR. RAPHALS: Or at least to slow down the move towards electric heating.

MR. SIMMONS: Right. Which means that people would still have to use some other form. They would either continue to use another form, or new homes would use electric heat or existing homes would have to be converted from electric heat. And the primary alternative source that’s foreseeable, I’d suggest, as Commission counsel suggested, is fossil-based fuels. That would be either home heating oil – I mean, you suggested wood but there’s some limits to that.

So if that is the alternative and – how do you see that in the long run as fitting in with the direction that the world is going in burning fossil fuels? Because it’s – my kids would tell me there’s no future for fossil fuels. They’ll say forget it, we shouldn’t be producing any oil out of the ground; we shouldn’t be putting any more greenhouse gases into the air. That’s the future that they’re seeing –

MR. RAPHALS: Yeah.

MR. SIMMONS: – and that they’re telling me about.

MR. RAPHALS: Yeah. Well –

MR. SIMMONS: So how do you see that fitting in with this long-range planning process? And how should that be taken into account here?

MR. RAPHALS: It’s a good question. First of all, I think the comment that I had made was retrospective. I don’t recall exactly but –

MR. SIMMONS: Okay, what does that mean?

MR. RAPHALS: Well, it means they were talking about something written in 2011, talking about what could’ve been done in the past. Because the shift to electric heating, I think, was –

MR. SIMMONS: Okay.

MR. RAPHALS: – I don’t know the penetration today.

MR. SIMMONS: Well, we can’t go back and change the past –

MR. RAPHALS: Well –

MR. SIMMONS: – so we have to look forward from 2011 and see what we can do in the future.

MR. RAPHALS: Well, that’s true, but at the same time in 2011, I think, we were interested, to a certain extent, in looking back and saying if, for instance – well, no, let’s not go there.

MR. SIMMONS: No, my question’s more of a general one.

MR. RAPHALS: Yeah. No, I understand.

MR. SIMMONS: I’m (inaudible) –

MR. RAPHALS: I’m trying to come back to your question.

MR. SIMMONS: – about looking ahead.

MR. RAPHALS: Yeah, well, okay, first of all, my understanding is that Newfoundland, more than many other places – wood heating has traditionally been a very common source of heat and that many homes still have facilities for wood heat.

MR. SIMMONS: Yes.

MR. RAPHALS: Wood under – as seen by the IPCC, International – the UN body, the climate change body, wood is generally viewed as a

renewable resource that does not have greenhouse gas emissions.

MR. SIMMONS: Yeah, it recycles carbon instead of taking it out of the ground.

MR. RAPHALS: Exactly, exactly, so burning wood is not at all a greenhouse gas.

MR. SIMMONS: So is that the answer for Newfoundland?

MR. RAPHALS: Well, I think that encouraging people to use the wood resources that they have –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: Now, it's very hard to take a new home that was built with baseboards and heat it with wood.

MR. SIMMONS: Yes.

MR. RAPHALS: But to take an old home that had not converted to electric heating or to take an old home that still has a central heating system and can burn wood is – in a world where fossil fuel – where the power system is still powered by fossil fuels, is a very desirable thing to do.

MR. SIMMONS: Okay, so do you envisage CDM for this province then, as having been – promote the conversion of electric household heating to wood-burning heating. Was that – is that the CDM alternative you see that would be the longer run objective?

MR. RAPHALS: Well, no, and I – just give me a second; let me make sure I'm not –

MR. SIMMONS: Because the only –

MR. RAPHALS: – remembering –

MR. SIMMONS: – alternative seems to me to be to embark on a course, which is going to involve continued and maybe even increased reliance on fossil fuels.

MR. RAPHALS: Do you recall where the reference to wood was in the –

MR. SIMMONS: No, I don't.

MR. RAPHALS: – documents?

MR. SIMMONS: No, I don't.

MR. RAPHALS: I'd like to just go there. Yeah, it's in P-00358 on page 6 and 7 and –

MS. O'BRIEN: Tab 7.

MR. RAPHALS: Which is tab 7, page 6 and 7. As I thought I remembered, I had not included that as an example of CDM. I don't consider – that's more of a policy question than a CDM program.

MR. SIMMONS: Okay. Okay.

Well, I'll get back to my – we'll leave CDM out of it then. And my question was, from a general policy sense, taking a long view and looking ahead and deciding what direction that the power supply should go in –

MR. RAPHALS: Yeah.

MR. SIMMONS: – in the future. I mean what alternative –

MR. RAPHALS: Well –

MR. SIMMONS: From your example of controlling – wanting to control demand, to keep –

MR. RAPHALS: Yeah.

MR. SIMMONS: – demand down, the primary example I think you've cited is – would be the need to move off electric heat.

MR. RAPHALS: Well –

MR. SIMMONS: And that would seem to me to be committing ourselves to –

MR. RAPHALS: No, I'm sorry –

MR. SIMMONS: – a fossil fuel future.

MR. RAPHALS: – I don't think that's what I said. As I said –

MR. SIMMONS: Okay.

MR. RAPHALS: – CDM and electric heat question, in my mind, are two different issues. In the Isolated Island Option, in the world where Newfoundland is going to continue to produce electricity with fossil fuel –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – I think the two – it is far superior, from a greenhouse gas perspective, to burn those fuels in a home for heat than to burn them in a power plant and use electricity.

MR. SIMMONS: That's a comparative, yeah.

MR. RAPHALS: Well, but that is essentially my point, that insofar as you're looking at a fossil fuel power system –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – that electric heat is a real problem. And that –

MR. SIMMONS: Okay.

MR. RAPHALS: – way back before the – this is unfortunately something that wasn't thought about way back before the Muskrat Falls Project, when the Newfoundland power system was a largely thermal system as it still is today – not wholly obviously. And the – so the increasing penetration of electric heat was and is a problem.

MR. SIMMONS: Okay, thank you.

A couple of questions about your evidence on integrated resource planning. So I heard you describe how integrated resource planning works in your evidence yesterday. And the process you described sounded – have you watched some of the previous proceedings here at the Inquiry?

MR. RAPHALS: Only sporadically. I haven't had –

MR. SIMMONS: Only sporadically, okay.

So did you hear the description from the panel that was on when we were in Goose Bay talking

about how the CPW process was used and what the planning –

MR. RAPHALS: No, I didn't.

MR. SIMMONS: – process is and load forecasting and all that?

MR. RAPHALS: Sorry, I didn't, no.

MR. SIMMONS: No, you didn't. Okay.

Well, let me just try and summarize what my understanding is of the way the system planning works.

MR. RAPHALS: Mm-hmm.

MR. SIMMONS: And this is a process that wasn't unique to this decision-making about Muskrat Falls; this is an ongoing annual process that the utility has. That's pretty typical I think, is it, to do system planning, load forecasts, looking ahead at generation planning on an annual or regular basis for you to use –

MR. RAPHALS: On a regular basis. I wouldn't say that –

MR. SIMMONS: Yeah.

MR. RAPHALS: – annual necessarily but ...

MR. SIMMONS: Okay.

And so what was described to us was that it would – the process would start with a load forecast.

MR. RAPHALS: Mm-hmm.

MR. SIMMONS: And because the demand is influenced by how much the power costs, it starts with a seed power rate just to get the process going, goes into – you're nodding your head, this sounds familiar ?

MR. RAPHALS: Okay. No, I'm just listening.

MR. SIMMONS: Okay.

And then once the load forecast is prepared, then the load forecast is one of the inputs that goes into the Strategist program that System Planning

uses. And you're familiar with this Strategist program, I think?

MR. RAPHALS: Yes.

MR. SIMMONS: Yeah. You've run across that in other work that you've done.

MR. RAPHALS: Yes.

MR. SIMMONS: Is it something you worked with hands on or had any training or focus?

MR. RAPHALS: No, I haven't. Unfortunately, the licences are extremely expensive and I –

MR. SIMMONS: Mmm.

MR. RAPHALS: – haven't had the luxury of –

MR. SIMMONS: Okay.

MR. RAPHALS: – working with it.

MR. SIMMONS: But you've heard about it?

MR. RAPHALS: Well, I was in the Nova Scotia hearing where it was the heart of most of the discussions –

MR. SIMMONS: Okay.

MR. RAPHALS: – and where the panels – sorry, the board's expert, Synapse Energy Economics, did their own alternative Strategist run.

MR. SIMMONS: Yeah.

MR. RAPHALS: So worked quite a while with the outputs.

MR. SIMMONS: Okay.

So the load forecast is one of the things that feeds into the Strategist program.

MR. RAPHALS: Mm-hmm.

MR. SIMMONS: That sounds right to you?

MR. RAPHALS: Yes.

MR. SIMMONS: And I'm going to suggest that other things that feed into it would be all sorts of different generation alternatives that have been identified as being available.

MR. RAPHALS: Mm-hmm.

MR. SIMMONS: Right? Such hydro alternatives, wind alternatives, fossil fuel alternatives – you're nodding. That sounds correct, does it? That's the way this program works?

MR. RAPHALS: Well, you're informing me about how –

MR. SIMMONS: Yes.

MR. RAPHALS: – Nalcor uses Strategist, but –

MR. SIMMONS: Yes.

MR. RAPHALS: – certainly, that is one – something one can do, yes.

MR. SIMMONS: Okay so – and for a generation source, it would include how much it cost to build it, how much power you can get out, how much it cost to operate it: all those factors –

MR. RAPHALS: Mm-hmm.

MR. SIMMONS: – go into it.

And then the outputs that come out of the program, as I understand it from the evidence, would include sort of, multiple scenarios for the ways that those generation alternatives can be applied, you know, over a future period in order to meet the projected demand over that period of time.

MR. RAPHALS: Mm-hmm.

MR. SIMMONS: Does that sound right from your understanding of the way the program can output information?

MR. RAPHALS: It can do that, yes.

MR. SIMMONS: Yeah. Okay.

And one of – and it also allows you to calculate what the present value is of different generation scenarios, so you can compare the cost effectiveness of different ways of doing it.

MR. RAPHALS: Yes.

MR. SIMMONS: Okay?

And the evidence we've heard is that once that process is run and there's an option selected – option or options selected out of those variations that are output, then it goes to people in Investment Evaluation and they recalculate how much the power rate would have to be to pay for that scenario. Then that power rate goes back to the load forecaster, who reworks the load forecast to see if it changes. And they – this goes in a cycle until it achieves stability and they get a point where they have a stable power price and a stable forecast and a stable generation plan.

Does that sound like the way you've heard this done elsewhere, like in Nova Scotia?

MR. RAPHALS: Well, in many ways. From your description – I mean, I don't think I'm allowed to ask you questions.

MR. SIMMONS: You can try.

MR. RAPHALS: I can try. You haven't mentioned any reduction of future load demand based on CDM, so I understand that they're not taken into –

MR. SIMMONS: Right.

MR. RAPHALS: – account any future CDM –

MR. SIMMONS: And –

MR. RAPHALS: – is that correct?

MR. SIMMONS: – I understand that that is your main criticism of the –

MR. RAPHALS: Well, I just wanna be clear –

MR. SIMMONS: – process that –

MR. RAPHALS: – about what –

MR. SIMMONS: Yes.

MR. RAPHALS: – they said, 'cause I didn't hear the –

MR. SIMMONS: Yeah.

MR. RAPHALS: – that testimony.

MR. SIMMONS: Yeah.

And that – your main criticisms, from what you understood the process to be – that was used here – to be that there should have been CDM factored in explicitly.

MR. RAPHALS: Well, I just wanna know –

MR. SIMMONS: Mmm.

MR. RAPHALS: – today, as they go forward, they are still not –

MR. SIMMONS: Well, I can't speak to today.

MR. RAPHALS: Well, no – I mean, just what – just from the testimony they gave last month.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: My understanding, from what – from your description, is that there is no deduction for future CDM.

MR. SIMMONS: Okay.

MR. RAPHALS: You also didn't mention anything about exploring various load forecast scenarios. You – there's no – you haven't mentioned a high forecast and a low forecast.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: Is that not part of their planning process?

MR. SIMMONS: Yeah, I can't say.

MR. RAPHALS: Okay. Based on their testimony.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: Anyway, we haven't heard about it.

MR. SIMMONS: So –

MR. RAPHALS: That’s something –

MR. SIMMONS: – so I –

MR. RAPHALS: That’s something that –

MR. SIMMONS: – gather then –

MR. RAPHALS: Please, can I finish?

MR. SIMMONS: Yeah –

MR. RAPHALS: That –

MR. SIMMONS: – sorry, go ahead.

MR. RAPHALS: That’s something that would normally be part of a use of Strategist as I’ve seen it applied elsewhere.

MR. SIMMONS: Yeah.

So I gather, then, that this isn’t something that you’ve explored or evaluated in the JRP hearing or at the PUB hearing, ’cause you seem unfamiliar with the way that Newfoundland and Labrador Hydro – Nalcor – actually applied this process.

MR. RAPHALS: Well, no – I just wanted to be clear about –

MR. SIMMONS: Mmm.

MR. RAPHALS: – the things that weren’t there –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – and to be clear that, in my mind, that’s not a fulsome application of what you can do with Strategist, because it’s leaving out some key pieces.

But no, that is essentially what I understood that they do.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: The interesting piece that I don’t think had been mentioned at the time is the use of elasticities – sort of the feedback loop

based on elasticities – but you know, in normal circumstances, the rate increases that flow from most resource additions are relatively small, because they get diluted in with everything else.

And of course, power acquisition is only a small part – not a small part, but it’s only a part of rates, which also have to pay the transmission system and the distribution system.

MR. SIMMONS: Sure.

MR. RAPHALS: And so, usually, the elasticity component is not particularly significant. So I’m glad to hear that –

MR. SIMMONS: Yeah.

MR. RAPHALS: – they do –

MR. SIMMONS: Yeah, and –

MR. RAPHALS: – they do do this –

MR. SIMMONS: – there are more (inaudible) –

MR. RAPHALS: Just can I please –

MR. SIMMONS: – explore –

MR. RAPHALS: – finish?

I’m glad to hear that they do do this feedback step. I think that that’s a good thing to do, but as I said I think there are important pieces missing.

MR. SIMMONS: Okay.

So if, in – if the – to – so part of that sounds like what you described as being an integrated-resource-planning approach, taking into account the different alternatives that existed for generation and some of these other factors and so on.

MR. RAPHALS: Well, no.

MR. SIMMONS: When I heard you describe it yesterday –

MR. RAPHALS: Yeah, no.

MR. SIMMONS: – it sounded –

MR. RAPHALS: No.

MR. SIMMONS: – somewhat similar to that.

MR. RAPHALS: I mean, there are – I think that is part of an integrated-resource- –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – planning approach.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: But the really important part that's missing – that's because essentially what you're describing –

MR. SIMMONS: (Inaudible.)

MR. RAPHALS: – is using Strategist to pick resources based on one scenario, and that is precisely what integrated resource planning –

MR. SIMMONS: So when you say one scenario, what do you mean? One load forecast scenario?

MR. RAPHALS: Load forecast scenario, price scenarios. You haven't mentioned using alternate fuel prices because we don't know what the cost of fuel is gonna be in the future. You haven't mentioned taking into account improvements or changes in other resource costs – like, we know that cost of wind and solar and storage are falling, have been falling for years and continue to fall fairly dramatically, and of course, you know, the big missing piece, like we said before, the CDM.

And the other really important thing about an integrated-resource-planning process is that it's – there's a collaborative aspect; that it's not just done alone by the utility that then produces a report that gives the outcome, but that it's done in a way that involves stakeholders and – but you know, integrated resource planning I think is the best way to go, but it's not the only way to go, and –

MR. SIMMONS: Sure.

MR. RAPHALS: – many utilities don't do that.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: But these other elements I've mentioned, I think those other utilities do do, and I think – so you know, obviously it's not for us here to – you know, integrated resource planning, as I've said, as I've been saying for a number of years, you know, is sort of the gold standard.

MR. SIMMONS: Right.

MR. RAPHALS: But you know, the silver standard would be good, too.

MR. SIMMONS: Where there's potential to generate revenue from export sales, is that something that would be an appropriate factor to consider in an integrated resource plan, the opportunity to get other revenue that could potentially subsidize rates or offset –

MR. RAPHALS: Well –

MR. SIMMONS: – costs?

MR. RAPHALS: – that depends very much on the institutional structure.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: So I'd like to – two very different institutional structures are in Quebec and in British Columbia.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: In British Columbia, the hydro system is part of the regulated utility, and so its export revenues are directly applied to costs –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – and therefore directly come out of rates.

MR. SIMMONS: Right, so that's –

MR. RAPHALS: And so –

MR. SIMMONS: – one model.

MR. RAPHALS: And so in the BC Hydro integrated-resource-planning process, export

revenues are clearly identified and are an important factor.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: In – Hydro-Québec has a different institutional structure where Hydro-Québec production is not regulated, and where its costs and revenues do not affect rates. Export revenues are completely irrelevant to the rate-making process and to HQ distributions planning process and so are not at all mentioned in that.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: So it really depends on the structure.

MR. SIMMONS: Mm-hmm. Okay.

What about things like potential costs arising from regulation around greenhouse gas emissions? Is that something that you would see as being appropriate to take into account in an integrated-resource-planning approach?

MR. RAPHALS: Yes, indeed.

And of course, there's –

MR. SIMMONS: How would you do that?

MR. RAPHALS: – considerable uncertainty –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – about future carbon costs.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: And for instance, the BC Hydro IRP uses a number of different scenarios based on possible futures of what carbon costs may be in the future.

MR. SIMMONS: Right.

So that's a challenging thing to predict at the moment, but there is a real likelihood, I think you'd agree, that there are going to be costs for carbon in the future.

MR. RAPHALS: A likelihood is a political speculation that I won't –

MR. SIMMONS: Yes.

MR. RAPHALS: – indulge in.

MR. SIMMONS: Okay.

MR. RAPHALS: I think it would be a good thing if there were, but I'm not sure that's the case.

MR. SIMMONS: But would you advocate excluding the potential for there to be future costs related to greenhouse gases from an integrated-resource-planning approach?

MR. RAPHALS: No, no. I would not exclude that, but I would not try to carry it out with simply one forecast of what those costs will be.

MR. SIMMONS: Okay.

Is there enough certainty around what future greenhouse gas costs may be to factor it in as an input in something like a Strategist analysis or would you think it would be as useful to deal with it as a sensitivity analysis?

MR. RAPHALS: No, I think it should be included. But again, an integrated-resource-planning process and also a slightly less sophisticated process would still involve multiple Strategist runs –

MR. SIMMONS: Yes.

MR. RAPHALS: – which would be based on – which I hope would include various scenarios of future carbon costs. But insofar as one expects them –

MR. SIMMONS: Yeah.

MR. RAPHALS: – they should be part of that cost.

MR. SIMMONS: So as long as there are – there are multiple Strategist runs to assess the impact of factors like greenhouse gases. That would meet the concern that you're expressing.

MR. RAPHALS: I think that's an important component.

MR. SIMMONS: Yeah.

Okay.

All right. Well, let's take a look at the sensitivity table again just for a moment, please. P-00014. If we go back to P-00014, we should be on that page. Good. Thank you.

Now, I think you've probably answered this already, so I gather that you don't know from your own involvement in the JRP matter, or the PUB matter, what the actual processes were that were used to prepare these sensitivities, whether they were Strategist runs or not?

MR. RAPHALS: First, I don't know, and second, even if there were Strategist runs, the question is with what margins – you know, what instructions were given to Strategist.

MR. SIMMONS: Sure. Okay. All right.

So I'm going to suggest that some of these address uncertainties in forecasting. There are some that relate to fuel costs; for example, we see PIRA high, low and various other ones in there, there's capital cost sensitivities in here. These are things that I think would relate to uncertainties about trying to forecast future values that you plug into a Strategist-type analysis. Do you agree with that?

MR. RAPHALS: Can you scroll down a bit into the bottom of the page?

Yeah, one certainly could approach any one of these through Strategist.

MR. SIMMONS: Yeah, okay. Okay.

And you mentioned yesterday that there are factors I think you referred to as externalities.

MR. RAPHALS: Yes.

MR. SIMMONS: Now, what did you – what sort of things were you referring to as externalities in this analysis?

MR. RAPHALS: Well, externalities, I mean the – I believe the economist definition of externalities are costs that are incurred by third parties.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: Costs, whether they're incurred by – so when one party produces and sells something to a second party, normally it's the second party that pays the cost to the first party, but – so the buyer of electricity pays the cost to the utility, but if utility's actions also create cost to third parties through – most often, it's most often used in respect to environmental externalities.

So whether it's through the people that live next to the nuclear waste deposit or the people that work and, you know, are exposed to radiation, or whether it's the citizens of the world that have to live with the greenhouse gases, or whether it's the peoples whose lands were expropriated for a hydro – all those things are – can be held as externalities.

MR. SIMMONS: Mm-hmm.

Okay.

MR. RAPHALS: So it essentially means they're external to the economic analysis, unless a specific effort is made to cost and to find a way to integrate them.

MR. SIMMONS: Okay, all right.

So I just wanted to look up what some of the sensitivities were that were done here. In the middle there – or, sorry, if we could scroll up a little bit, please, we've already talked about the conservation. There are a number of sensitivities there for the fuel cost forecast, PIRA high, PIRA low and PIRA reference case.

MR. RAPHALS: Mm-hmm.

MR. SIMMONS: And then there are calculations there of what the cumulative present worth is for each of the Isolated and Interconnected case for each of those.

MR. RAPHALS: Just a second, I'm not really sure I understand the fifth one, fuel costs: PIRA May 2011 update for reference case.

MR. SIMMONS: Well, I'm not – I can't explain it to you, but at this point I'll just point out that there are a series of different sensitivities done for a range of oil forecasts into the future.

MR. RAPHALS: Okay.

MR. SIMMONS: And is – in your view, is using a sensitivity for that type of comparison a useful way to try and measure or take into account the uncertainty around the oil price forecasts?

MR. RAPHALS: Well, again, I'm starting to repeat myself, but the usefulness of this whole process –

MR. SIMMONS: Yes.

MR. RAPHALS: – depends on to what extent the whole resource plan is redesigned in each one of these –

MR. SIMMONS: Right.

MR. RAPHALS: – which I don't know.

MR. SIMMONS: Right. So if there's modelling done behind this, then it's useful.

MR. RAPHALS: Again, if there's modelling – but then the question is what constraints are posed on the modelling.

MR. SIMMONS: Yeah.

MR. RAPHALS: If the constraint is thermal only, which I suspect that it is because that's what the – we saw the, in the – excuse me, the Isolated Island scenario as defined in the terms of reference to the PUB which showed from 2000– I think we should look at that just to be sure. It's in P-00052.

MR. SIMMONS: Okay, if – so I gather your answer is that it would be useful, but it depends on the modelling that was done and whether appropriate constraints were used in the modelling. So someone else would have to tell

us what kind of constraints were used in that modelling.

MR. RAPHALS: Well, everything I've seen suggests that the constraint was that this is a thermal-only option. And I would like to –

MR. SIMMONS: Okay. Well, let's go – in that case, we'll move on to P-00161, please.

THE COMMISSIONER: Did you want to go to something else first?

MR. RAPHALS: Yes. Thank you.

THE COMMISSIONER: In fairness to the witness, let him go to where he wants to go –

MR. SIMMONS: Oh, sure.

THE COMMISSIONER: – and then we can go to that one.

MR. SIMMONS: Okay, yeah.

MR. RAPHALS: Thank you.

Yes, if we could just look quickly at P-00052, page 113.

THE COMMISSIONER: That's tab ...?

MR. RAPHALS: It's not in the binder. P-00052 is the –

THE COMMISSIONER: Okay.

MR. RAPHALS: It's the PUB report, I believe. Yeah.

So this is from the terms of reference given to the PUB by the government, I believe, in an order-in-council.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: And what it shows on the right for the period 2030 to 2067, it says: Holyrood replacement, additional thermal. And from my recollection – and from simply looking at the document – my understanding is that the constraint that was placed on all of the Isolated Island Options were that they were additional thermal, so that any of the sensitivities that

might have affected the cost effectiveness of non-thermal options remaining Isolated were simply not addressed. And, to me, that's a very fundamental constraint that limits the usefulness of the sensitivities that we're looking at.

MR. SIMMONS: Well, maybe it would be appropriate now for us to go to P-00161, please?

MR. RAPHALS: Do I have P-00161?

MR. SIMMONS: You probably don't.

MR. RAPHALS: Well, what is it?

MR. SIMMONS: It'll – the clerk will bring it up on your –

MR. RAPHALS: Okay.

MR. SIMMONS: – on your screen now.

MR. RAPHALS: Yeah.

MR. SIMMONS: Okay.

So we understand this was taken from a report done by Manitoba Hydro International, MHI, and I believe it was in October 2012. So this probably wasn't available to you when you did your work for the JRP or the – on the PUB reference. And is – this is an Isolated Island Option showing the expansion plan out to 2065. Is that something that you've had a chance to review before?

MR. RAPHALS: Well, I'm a little perplexed because –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – it's similar to but different from the one which was in P-00052, the –

MR. SIMMONS: Yes.

MR. RAPHALS: Which report is this from?

MR. SIMMONS: This is from MHI's report of October 2012.

MR. RAPHALS: That's the report done for the government after the PUB process?

MR. SIMMONS: Yes.

And our understanding is this represents the Isolated Island Option. That was the one that was used for the comparison when the final sanction decision was made in December 2012.

MR. RAPHALS: Okay, but it's not the one that was used in the PUB reference.

MR. SIMMONS: It's not the one that you – well, this is the – I can't answer that definitively, so –

MR. RAPHALS: Well, if we could go back –

MR. SIMMONS: So I'll just – so my question to you is have you – is this something you've seen before? Or did you have occasion to review this and be aware –

MR. RAPHALS: I am – certainly no.

MR. SIMMONS: – that this was the expansion plan that was the one that was on the table at the time of sanction?

MR. RAPHALS: Okay, I'm – I have in front of me a printout of P-00052, page 27, which is similar but different.

MR. SIMMONS: Yes.

MR. RAPHALS: P-00027 which – P-00052 which is, I believe – could you please confirm the PUB report?

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: Is that right?

MR. SIMMONS: Yeah.

MR. RAPHALS: Page 27. So this is the version – I believe this is the version that MHI produced in the PUB reference.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: Which is –

MR. SIMMONS: Right.

MR. RAPHALS: I guess we can't see them both on the screen at the same time, but –

MR. SIMMONS: Right. So your evaluation on the evidence you're giving was based on the expansion plan as you saw it in the JRP process and in the PUB reference?

MR. RAPHALS: Well, I thought we were talking about the PUB reference. And the sensitivities you were showing me –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – were also from the PUB process.

MR. SIMMONS: Yes, that's right.

MR. RAPHALS: So in that process –

MR. SIMMONS: Yeah.

MR. RAPHALS: – I believe that this is the expansion plan.

MR. SIMMONS: So I just want to bring you to the expansion plan –

MR. RAPHALS: Okay, fine.

MR. SIMMONS: – the –

MR. RAPHALS: And I'm happy to look at them (inaudible) I just want to be clear about it.

MR. SIMMONS: –right, to just point out a couple of things.

MR. RAPHALS: Because we're changing, moving forward a year perhaps, or six months?

MR. SIMMONS: No, we're moving ahead to – the one I'm showing you at 00161 –

MR. RAPHALS: Yeah.

MR. SIMMONS: – is from a report in October of 2012, okay? So –

MR. RAPHALS: Was that made public at the time?

MR. SIMMONS: Let me ask you some questions about it, okay?

MR. RAPHALS: Yeah, (inaudible). Yeah.

MR. SIMMONS: I'll just point it out to you. I know you haven't looked at it before –

MR. RAPHALS: Yeah.

MR. SIMMONS: – but there's a couple of things just to point out there. So I understand that this – correct me – but that this is not something that you've considered prior to giving your evidence here today.

MR. RAPHALS: No, no.

MR. SIMMONS: Okay.

Now, my first question is: If you look at this, are there a variety of generation sources in this plan?

MR. RAPHALS: Well, I see CCCTs, which are thermal fossil, the fuel isn't mentioned, I see Holyrood refurbishment, I see CTs, combustion turbines, which are also presumably fossil fueled.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: I see a number of wind replacements, which is essentially – I understand that that's replacing the turbines and existing wind farms. And I also see new wind, 25 megawatts in 2015, 50 megawatts in 2020, 50 megawatts in 2025, 50 megawatts in 2030 and I believe there's no more after that.

MR. SIMMONS: Okay, and there's some hydro projects there too.

MR. RAPHALS: Yeah, before 2030.

MR. SIMMONS: Right.

MR. RAPHALS: Yeah, they were there on the original one as well, for Portland Creek, Island Pond and Round Pond.

MR. SIMMONS: Right.

So do you know how many scenarios had to be run through the planning process in order to come up with this as being the optimal Isolated Island Option?

MR. RAPHALS: Do I know how many were run?

MR. SIMMONS: Yeah.

MR. RAPHALS: No, certainly don't.

MR. SIMMONS: Okay.

I'll ask you about the wind. In your submissions in June, I think, of that year, 2012, you'd done a submission to the environmental review process for the Labrador-Island Link. It's at 00363; we don't need to go to it necessarily.

But am I correct there that your analysis, then, of whether more account should've been taken for wind as a power source was based on the information you had that the assessment was that 80 megawatts of wind was the maximum amount that could be applied to the system (inaudible) –?

MR. RAPHALS: I believe that's what was stated in the EIS.

MR. SIMMONS: Yeah, yeah. So that was the basis of the analysis that you had there then, yeah.

MR. RAPHALS: Just a second, let me just verify that. I referred to a 2004 NLH study – qualified as a preliminary investigation. Yeah, that was all that I had seen at that time.

MR. SIMMONS: Right. So when you look at P-00161, which I gave you here – the plan – you've already identified that there's considerably more wind being applied to this expansion plan now.

MR. RAPHALS: I think I identified a 175 megawatts, perhaps –

MR. SIMMONS: Right, yeah.

MR. RAPHALS: – of new wind after 20 – oops – yeah – no, starting in 2015.

MR. SIMMONS: Right. And of course – and there's – I'm going to suggest, there was already 54 megawatts of wind in this system even before this. So we're getting up in the range of 230 megawatts of wind –

MR. RAPHALS: Right.

MR. SIMMONS: – in this planning here, considerably more than the 80 that you were looking at in your work.

And if I can bring you to P-00057, please. This is probably not in your binder. This is a report done by Hatch. I think you did refer to it in your evidence yesterday –

MR. RAPHALS: Yes, I have a copy of it.

MR. SIMMONS: – as something you had read.

MR. RAPHALS: Yeah.

MR. SIMMONS: Now, if we can just scroll down to where we can see the Executive Summary, please. I'm not sure which page. Okay, that page there.

So this is one that you said you had read. Did you – is this something you read as part of your work as either – well, it wouldn't have been the JRP process because the JRP process, I think, was complete. Is this something you read as part of your involvement in the PUB – or reference or subsequently?

MR. RAPHALS: Definitely subsequently.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: And I think that I had – actually I don't think that I had read it before yesterday or the day before.

MR. SIMMONS: Okay. So yesterday would've been the first time that you had seen –?

MR. RAPHALS: Yeah, I think I may have seen it or heard of it, but I don't recall seeing it before.

MR. SIMMONS: Right. Because I recall you yesterday giving some evidence that it was really only economic factors that were limits on

the amount of wind that could be applied to the Isolated Island system.

MR. RAPHALS: I believe that that is – that the – I didn't say there are only economic factors.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: But that in this study the factors are primarily economic.

MR. SIMMONS: Okay. Well, maybe we can just look at the Executive Summary there.

MR. RAPHALS: Mm-hmm.

MR. SIMMONS: And if I can bring you down – one, two, three – the fifth paragraph down, it begins: “The review of system stability”

MR. RAPHALS: Mm-hmm.

MR. SIMMONS: “The review of system stability and voltage regulation issues recommended a maximum of 300 MW during the extreme light load conditions for 2035 to prevent violation of stability criteria.”

MR. RAPHALS: Mm-hmm.

MR. SIMMONS: So part of what Hatch seems to have done here was evaluated how much wind could be added in order to comply with the requirements to maintain the stability of the electrical system, control the voltage and not violate, as they say, their stability criteria.

MR. RAPHALS: Right.

MR. SIMMONS: Is that something that you are – have any expertise in assessing whether they were right, wrong, did a good job, bad job –

MR. RAPHALS: I would –

MR. SIMMONS: – with that assessment?

MR. RAPHALS: I would not presume to assess their analysis of stability.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: I would point out, though, that they're talking about under a particular case

of low load conditions, and they seem not to have taken to account the issue of curtailment – the possibility of curtailment.

MR. SIMMONS: So on what basis –

MR. RAPHALS: (Inaudible.)

MR. SIMMONS: – do you do that analysis? What kind of expertise do you bring to bear to critique that? 'Cause you only read this yesterday.

MR. RAPHALS: Yes.

I believe somewhere they talk about – maybe – I don't remember if it was in this document, but that – it may have been elsewhere – that, traditionally, wind contracts are on a take-or-pay basis, and that there's assumed delivery.

MR. SIMMONS: So what does –

MR. RAPHALS: But –

MR. SIMMONS: – that have to do with voltage control on the electrical –

MR. RAPHALS: (Inaudible.)

MR. SIMMONS: – power system?

MR. RAPHALS: It has a lot to do with it, because if the contract with the wind owner –

MR. SIMMONS: Mmm.

MR. RAPHALS: – says that when system conditions require, you may be required to shut down and not inject power into the grid – and this is, in fact, a very common feature of wind contracts –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – then simply, under light load conditions, you tell your wind generators: I'm sorry, we can't take your power today.

MR. SIMMONS: Mmm.

MR. RAPHALS: And that constraint – and that's essentially an economic issue. Now, the question of who – of whether you have to pay

for it anyway, or whether that's part of the deal, is a question that is resolved in negotiations with the wind developer.

MR. SIMMONS: So you can negotiate away the concern about system stability and –

MR. RAPHALS: No.

MR. SIMMONS: – voltage regulation?

MR. RAPHALS: No, no. The – Hatch is very clear. That concern exists – again, to read the paragraph you just read – one, two, three, four. “The review of system stability and voltage regulation issues recommended a maximum of 300 MW during ... extreme light load conditions for 2035 to prevent violation of stability criteria.”

If the contractual arrangement with the wind farm owner says that when required – for instance, under light load conditions or perhaps under other conditions – our system cannot safely and stably accept your power, you will be required to stop generating power. That is not – it's not something wind developers like, but it's something that is a feature of most modern wind contracts. And then the question becomes, during negotiating that contract, under those conditions, do you have to pay first anyway for the power that you couldn't –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – accept, or do we just have to eat it? And that's simply one of the things that gets negotiated.

MR. SIMMONS: (Inaudible.)

MR. RAPHALS: So that's what I mean to say that this – it is a technical constraint, but it's one that can be solved by economic means.

MR. SIMMONS: Okay.

But by taking measures that add costs, either by paying the wind operator a higher price than you would have to pay if the power were coming from, say, another source? And would it also mean that you would have to have sufficient alternative generation sources in the system in

order to make up the power that you have to cancel from the wind –

MR. RAPHALS: Well, no –

MR. SIMMONS: – source?

MR. RAPHALS: – because you're talking precisely about extreme low load conditions.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: Obviously, under extreme –

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: – low load conditions your power system – the whole point is you don't need this additional power. And that accepting it would mean – would create problems for your other generators.

MR. SIMMONS: Okay.

So this is your critique of Hatch's conclusion (inaudible) –

MR. RAPHALS: No, it's not a critique. Their conclusion is perfectly correct.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: It's the question of what their conclusion means. The conclusion doesn't mean you can't have more than 300 megawatts of wind. It just means that if you do, you have to have curtailment provisions.

MR. SIMMONS: Okay, which – and you'll have to pay for that?

MR. RAPHALS: Well, maybe or maybe not. That depends on the negotiations.

MR. SIMMONS: Okay.

So the only other question I had for you then, related to the evidence you gave yesterday about the proposal for an 800-megawatt wind farm on the Island. I just wanted to clarify.

MR. RAPHALS: Mm-hmm.

MR. SIMMONS: You've given us the name of the gentlemen who contributed some information to you for that. When did you develop that proposal? How much work and time went into putting that forward as an option when you put it forward in the environmental assessment?

MR. RAPHALS: I don't recall precisely. It was quite short.

MR. SIMMONS: Mm-hmm.

MR. RAPHALS: Certainly less than a week.

MR. SIMMONS: Okay.

And the contributors to that were you and I don't remember the name of the other gentlemen.

MR. RAPHALS: It was – I mean, the details of it come from Mr. Muzsynski.

MR. SIMMONS: Yes.

MR. RAPHALS: It is not my expertise to cost –

MR. SIMMONS: Yeah.

MR. RAPHALS: – wind projects.

MR. SIMMONS: Yeah, yeah. Did you get, you know, formal – did you retain him and –

MR. RAPHALS: No.

MR. SIMMONS: – get a –

MR. RAPHALS: No.

MR. SIMMONS: – report or analysis?

MR. RAPHALS: It was very informal, and it was, I think I said yesterday, back of the envelope. It is definitely not – certainly, if his company were presenting a formal proposal, more work would go into it.

MR. SIMMONS: Was anything more done after that to develop that proposal and to put it forward as something that was a feasible, viable alternative?

MR. RAPHALS: No one asked us to, and so we didn't.

MR. SIMMONS: Okay. All right.

Okay, thanks very much. That's all the questions I have.

MR. RAPHALS: Thank you.

THE COMMISSIONER: Okay. This might be a good time to take our break then this morning, and then we'll come back and see if there's questions from others. So we'll just adjourn for 10 minutes.

CLERK: All rise.

Recess

UNIDENTIFIED FEMALE SPEAKER: Oh, sorry.

THE COMMISSIONER: Concerned Citizens Coalition?

MR. BUDDEN: Good day, Mr. Raphals.

As you know from our earlier conversation, my name is Geoff Budden. I represent the Concerned Citizens Coalition.

MR. RAPHALS: Good morning.

MR. BUDDEN: Only have a handful of questions for you, but I'd like to start with growing out of some comments that Mr. Simmons made a few moments ago in talking about the conversion or the use, I guess, of baseboard heating and the possible alternatives to that.

As I understand it in Newfoundland at the moment, the Island of Newfoundland – and which was the case, obviously, in the pre-sanction era – if it's a cold night in February and you turn the heat on to make your suburban St. John's house comfortable, even if you have electric baseboard heating, you're essentially heating your house with oil. I'm correct on that I assume.

MR. RAPHALS: Yes, I believe that's right.

MR. BUDDEN: Okay, oil from the Holyrood Generating Station.

MR. RAPHALS: That's right.

MR. BUDDEN: Okay.

MR. RAPHALS: But you're only getting a third of the heating value of that oil because the rest went out the chimney.

MR. BUDDEN: That's my next point. So if you take out your baseboard heating and convert to an oil furnace, are you in fact raising your carbon footprint or lowering it?

MR. RAPHALS: Based on my unfortunately incomplete understanding of the details of Holyrood – but assuming that Holyrood is in operation during the heating season, insofar – let's put it this way, insofar as Holyrood is in operation during the heating system, you are in fact decreasing your carbon footprint.

MR. BUDDEN: By installing ...

MR. RAPHALS: By switching from baseboard heating to an oil furnace.

MR. BUDDEN: And why, again, is that?

MR. RAPHALS: It's because the oil burned in your house gets converted to heat at – from efficiency level, let's say between 70 and 80 per cent, maybe, or 90 per cent, depending on how efficient your furnace is. And the oil burned in Holyrood gets converted to electricity with an efficiency of maybe 35 per cent, possibly 40, but I don't think so, which then there are transmission losses to get it to your house, and then ...

But your baseboard heater is extremely efficient, so you're getting roughly double the efficiency by burning oil in your home instead of in a power plant.

MR. BUDDEN: Wow.

So, however counterintuitive it may be, if the oil truck is pulling up in front of your house and your neighbour on the other hand is total electric heat, you in fact have the lower carbon footprint.

MR. RAPHALS: I believe that is today true in Newfoundland, yes.

MR. BUDDEN: In Newfoundland.

MR. RAPHALS: Yes.

MR. BUDDEN: Okay.

That leads somewhat into my next question. From your CV I noted that you are involved with an organization called the Low Impact Hydropower Institute, Renewable Markets Advisory Panel. What is that organization?

MR. RAPHALS: The Low Impact Hydropower Institute is a non-profit organization in the United States that was created – it was founded in about the year 2000. It was actually – grew out of a collaboration between two organizations that had been fighting each other for years.

MR. BUDDEN: Okay.

MR. RAPHALS: One was the hydropower industry and the other was a group called American Rivers that protects American interests of conservation of rivers.

And it's essentially an organization whose sole mission is to identify and certify existing hydro projects as being of low impact. And to do this it's developed a very exhaustive and detailed series of criteria that – much of which have to do with flow management, but with upstream and downstream impacts, recreational impacts; essentially, all the impacts of a hydro power installation that are within – one way or another are within the control of the operator.

And then it – so owners of projects apply and consultants are hired to review the applications. Decisions are ultimately made or endorsed by the board with public comments. And I don't remember the number now, but they've certified, I would say, several hundred, I think, US hydro facilities as being of low impact.

MR. BUDDEN: To your knowledge, has the Muskrat Falls hydroelectric project gone through such a certification process?

MR. RAPHALS: Unfortunately, the LIHI system is not at this time applicable to Canadian projects.

MR. BUDDEN: Okay.

MR. RAPHALS: There's been – so I guess I should mention I have been an advisor to the boards almost since the founding in 2000. And there have been many discussions, and it's still sort of a – it's a future project which – it's a current project that keeps getting, unfortunately, pushed forward into the future to expand to be able to look at Canadian projects.

The reason is that – the fundamental reason is that in the US, hydro projects are all – well, most hydro projects are regulated by FERC, the Federal Energy Regulatory Commission. And in that regulatory process and approval process a great deal of detailed information is generated and available –

MR. BUDDEN: Okay.

MR. RAPHALS: – and which has, in many ways, been integrated into their processes. Steps have been made to separate that out and, actually, there's a new set of criteria just as of, I think two or three years ago, that doesn't explicitly rely on that, partly in view to be able to look at non-US projects. But – so at the time – at this time there are – there's no such certification.

MR. BUDDEN: Okay.

So my final question on that particular topic, I take it that not all hydro projects are – hydroelectric projects are the same in terms of their environmental impact, their carbon footprint?

MR. RAPHALS: No. Well, before we talk about carbon footprint, hydro projects are probably unique, or at least at the extreme end in the generating world of the – to the extent to which each project is really different from another. If you think about a gas plant – both technologically and in terms of impact, it's pretty much the same wherever it is. Each hydro project is different. Knowing one doesn't mean you know another. They all have their own particularities, they're extremely local.

So – I'm sorry, I lost track. What was the question?

MR. BUDDEN: My question: Not all hydro project – hydroelectric projects are created equal in terms of their environmental impact.

MR. RAPHALS: No, okay, yeah. No, they're all very different, but in terms of the kinds of impacts that LIHI uses, the most important factor is flow management, and the more that you manipulate flows, the greater the impacts on ecosystems.

MR. BUDDEN: Okay.

MR. RAPHALS: Yup.

MR. BUDDEN: The – do you have anything more you wish to say about that or should I move on to my next topic, 'cause you seemed to hesitate there.

MR. RAPHALS: I did. I did have another – no, it seems to have slipped away so

MR. BUDDEN: Okay. Well, if it –

MR. RAPHALS: Sorry about that.

MR. BUDDEN: – comes back to you, I'll give you another chance.

MR. RAPHALS: Thanks.

MR. BUDDEN: Perhaps we could put up Exhibit P-00358, and I'm particularly interested in page 10, and I'm sorry, I don't know what tab that is.

MR. RAPHALS: It's tab 7.

MR. BUDDEN: Okay.

And I'll get to that, but I have a bit of a preamble. You were here, of course, on a Wednesday, I believe.

MR. RAPHALS: Could I interrupt before you go there?

MR. BUDDEN: Sure.

MR. RAPHALS: Just to add something to the previous discussion about electric heating –

MR. BUDDEN: Yes.

MR. RAPHALS: – that I think I – just to complete my responses to you and also to Mr. Simmons.

I had said that conversion – issues around conversion to electric heat or not, which is essentially in the world of fuel switching, is traditionally not thought of as a part of a CDM, but other measures to improve the efficiency of electric heating very much are.

And so things like providing subsidies for heat pumps, which are electric but can provide the same amount of heat with less than half of the electricity, is very much common terrain and important terrain for CDM programs, as are things like insulation, windows, all the building envelope issues that very much determine how much energy it takes to keep your home warm.

MR. BUDDEN: Mm-hmm.

MR. RAPHALS: Thank you.

MR. BUDDEN: Thank you.

I'll get – I have a question, too, about this particular chart, but I guess by way of preamble, I believe you were here on Wednesday afternoon when my colleague Mr. Williams, Tommy Williams, was examining Mr. Vardy on the topic of CDM –

MR. RAPHALS: I'm afraid I wasn't, I was working in the back –

MR. BUDDEN: Oh, fair enough.

MR. RAPHALS: – in the afternoon so I didn't get to hear it.

MR. BUDDEN: Okay, well, Mr. Williams put to Mr. Vardy evidence that the Government of Newfoundland and Labrador has, in fact, spent significant sums of money with regard to CDM programs. He mentioned a figure of \$10 million in one particular program; I believe, 5 million in another.

And I guess my point, these obviously are large and impressive numbers; however, in the broader picture, how does Newfoundland compare to other provinces with regard to its commitment to CDM?

MR. RAPHALS: Well, based on this chart, which was of course from what year – 2000 –

MR. BUDDEN: Nine, I believe. It's a –

MR. RAPHALS: It's from a 2010 report of the CEE, which is the Consortium on Energy Efficiency. I mean, I haven't reviewed this in detail, or if I did at the time I certainly don't remember. So I can only speak to what the chart says.

MR. BUDDEN: Sure.

MR. RAPHALS: But the chart certainly shows that Newfoundland and Labrador's per capita budgets for efficiency and load management are very much lower than those of most other provinces.

MR. BUDDEN: By a factor of several multiples.

MR. RAPHALS: I think the numbers are here. It shows just below the chart – if you could scroll down just a bit. That according to CEE, Newfoundland and Labrador utilities spend \$2.22 on CDM per capita, per year, I believe that is, compared to \$29 in Quebec and \$40 in BC. So, yeah.

MR. BUDDEN: So BC, at this time, which is really at the heart of this pre-sanction period, was spending almost 20 times as much per capita as CDM as Newfoundland and Labrador.

MR. RAPHALS: According to the CEE, that's right.

MR. BUDDEN: So, even though there may be significant sums of money spent here in the broader picture of CDM measures, it's a relative pittance.

MR. RAPHALS: It certainly appears to be that way.

MR. BUDDEN: Okay. Thank you.

While again on the topic of load forecasting or, I guess, the related topic of load forecasting, we are aware from the earlier evidence in this Inquiry that Nalcor did load forecasting and there's been some suggestion that Newfoundland light and power also did its load forecasting in this pre-sanction period and perhaps before and after.

Are you personally aware of any of the load forecasts that Newfoundland and Labrador – Newfoundland Power has done and to what degree they are – they differ or are similar to those of Nalcor?

MR. RAPHALS: No, I'm afraid I've never really looked at Newfoundland Power documentation.

MR. BUDDEN: Okay.

I believe this is my final question from you, and I think this is from an earlier look at your CV, though I went back a few minutes ago, I couldn't find it, and also from some comments you made to – in cross-examination with Mr. Simmons, but you did author, I understand, a paper on water management. Am I correct on that?

MR. RAPHALS: Yes.

MR. BUDDEN: Okay. Can you tell me a little bit about your thesis, your conclusions in that paper? What you were looking at and what you concluded?

MR. RAPHALS: This paper was –

THE COMMISSIONER: Excuse me just for a second.

So this is an area, I think, we've had some discussions about internally, so I'll let Ms. O'Brien speak to this.

MS. O'BRIEN: Yes. Thank you.

I am aware that Mr. Raphals has done some work in the area of water management. We are not going to be addressing that with Mr. Raphals because when we deal with water management, we're going to deal with it comprehensively. It's a complicated area.

We have set aside a day in our schedule that we will be looking at that. We are still working on the details of the process and how it will be handled, but we do have work that was done by Mr. Raphals that will certainly be considered at that time.

MR. BUDDEN: Okay. I guess the only issue is, of course, we have Mr. Raphals here now, in the flesh, and we won't have him then. So –

THE COMMISSIONER: One of the things that we have thought about, having been part of these discussions, is the possibility that if we need him we can always Skype him, and that was the thought that we would have.

Based upon the plan, right at the moment, and I don't want to get too much into it here, we likely won't need him because we'll have his material available.

The only reason I'm treading very carefully here, as you know, is that I'm very concerned about doing anything that might negatively impact what's going on in the courts right at the moment. So, you will certainly be involved just as well as other counsel with regard to how we're going to figure this out the best way we can, but we will be dealing with water management and we will have Mr. Raphals' paper there.

If there's a need to call him, we will make that – we will do that at that time.

MR. BUDDEN: Okay, that's fair enough. I may make further representations when the time comes but –

THE COMMISSIONER: Right, okay.

MR. BUDDEN: – I obviously won't continue with that question right now.

THE COMMISSIONER: I'd appreciate that –

MR. BUDDEN: Sure.

THE COMMISSIONER: – if you would.

And I'm assuming what I just said is absolutely your understanding as well, Ms. O'Brien. I just

want to make sure I don't – haven't misled anybody here.

MS. O'BRIEN: Yes, we are actively working at it and as soon as – we will be getting input from all counsel and as soon as we settle on a plan everyone will be advised of it.

THE COMMISSIONER: Okay.

MR. BUDDEN: Those are all my questions, Mr. Raphals.

Thank you very much.

MR. RAPHALS: I do recall what I wanted to say about low impact hydro power (inaudible), if I may.

MR. BUDDEN: Okay.

MR. RAPHALS: You may be familiar with a structure that's called renewable portfolio standards. These are administrative mechanisms in place in many US states, which essentially require a utility to meet a certain percentage of its energy supply from sources that are deemed to be eligible for this program and the eligibility criteria vary a lot from one state to another.

You know, it's generally thought of as: it's a notion of greenness, it's whatever the state has decided are resources that are societally valuable enough that they deserve essentially a credit. Because by creating this requirement to have a certain amount of eligible resources, it creates a market. I don't want to get into the details of how it works, but it essentially creates an additional payment that goes to those resources which comes out of rates.

So, essentially, it's saying that for societal reasons, we've decided that a certain amount of our power should come from green sources and we're willing to make consumers pay an additional price for that.

MR. BUDDEN: Sure.

MR. RAPHALS: So a question that's been raised a lot is, you know: Is hydro power green? And in most of those state renewable-portfolio scenarios, hydro power is not included. There are exceptions; Vermont recognizes hydro

power as eligible, although it's, in a sense, not a true RPS because there's not a cost associated with it. But in many states, I'd say in the majority of states, large hydro power is not included. In some states small hydro power is included with a cut-off of five or 10 or 50 or 30 megawatts.

Régie's perspective on this is that size-based criteria are not really appropriate because some very small projects have very large impacts and some very large projects, if very well managed, don't have such large impacts. I think that the largest project that Régie has certified is over 600 megawatts in the US in the West, in Oregon.

MR. BUDDEN: Okay.

MR. RAPHALS: The point I wanted to make is that several states now, four states in particular – and Massachusetts is one of them, which is in the export zone – have changed their RPS definitions such that hydro power is eligible insofar as it is certified by Régie. And it's a very unusual thing for a state, in its regulations, to use an external third party certification as a criterion, but that is the case in, most importantly, Massachusetts, which gives Régie certification sort of a role bigger than simply a stamp of approval.

MR. BUDDEN: Sure. So this concept of low-impact hydro power is a concept which has – is now being recognized by governing authorities such as the State of Massachusetts.

MR. RAPHALS: That's right.

MR. BUDDEN: Okay.

So if I may sort of, I guess, pull that together, a hydroelectric power may be green, particularly in the smaller projects, but certainly isn't necessarily green.

MR. RAPHALS: It certainly – in my view and in Régie's it is not necessarily green. And whether or not it is, depends on an enormous number of very particular factors that vary from project to project.

MR. BUDDEN: Okay. Thank you.

And, I guess, my final comment, what you just spoke of, these incentive programs, the CDM programs that other jurisdictions have, would it be fair to say that even in this pre-sanction era there's a whole world of innovation and CDM innovative programs out there way beyond anything that was happening in Newfoundland at the time?

MR. RAPHALS: Certainly in scope. I can't say that I've reviewed one by one the programs that were in place, so I don't really want to comment on them, but in terms of the level of effort, it certainly has been much greater elsewhere.

MR. BUDDEN: Thank you.

THE COMMISSIONER: Edmund Martin.

MR. SMITH: No questions.

THE COMMISSIONER: Kathy Dunderdale's not here.

Former Provincial Government Officials '03 to '15. Not here.

Julia Mullaley, Charles Bown? Not here?

MR. COFFEY: He's not here, Commissioner, but he indicated he would have no questions.

THE COMMISSIONER: Okay. Robert Thompson?

MR. COFFEY: No questions.

THE COMMISSIONER: Consumer Advocate?

MR. HOGAN: Good morning.

MR. RAPHALS: Good morning.

MR. HOGAN: My name is John Hogan; I'm counsel for the Consumer Advocate. I just have a few questions for you.

You spoke in some detail this morning to Mr. Simmons, and to Ms. O'Brien yesterday, about the cost of service versus power purchase and the effects of rates, up, down, cost now, cost later, et cetera, et cetera. I'm not sure if you answered this or not, if you spoke about this. I

think you said that that's an unusual scenario, what we have here, the Power Purchase Agreement for this sort of project.

MR. RAPHALS: For this sort of project, yes.

MR. HOGAN: Yes.

Can you tell me why Nalcor made that decision in this case? Do you know or no?

MR. RAPHALS: Obviously, it would be Nalcor that'd have to say why they did, but my impression of –

MR. HOGAN: Sure.

MR. RAPHALS: – why they did is that it was to diminish the early – the rate impacts during the early years.

MR. HOGAN: Which is what Mr. Simmons, I think, was getting at.

MR. RAPHALS: I think so.

MR. HOGAN: Okay.

And so why is it unusual to do that? If – he seemed to indicate, you know, there's two options. At the end of the day the cost is going to be the same throughout. So your evidence is that it's unusual to do it this way. Well, why is it unusual to do it is this way?

MR. RAPHALS: First of all, you know, most large hydro projects were developed in the past and not so many in the last few years. In the last few years, the main ones that I'm aware of anyway are in Quebec, Manitoba and BC.

In both Manitoba and BC the hydro system is part of the regulated utility and so there's no question of a power purchase agreement because the – sorry, it would be as if the Muskrat Falls Project were owned and operated by Newfoundland and Labrador Hydro, and therefore its costs would enter into NLH's annual cost-of-service review and enter rates automatically on that basis.

In Quebec, as I think I mentioned, the projects are developed by HQ Production, which is a non-regulated division with complicated

contractual relationships with HQ Distribution, but where the – its own costs and revenues are completely separated from rates. So neither in one case, nor in the other could you see this kind of arrangement.

And, as I said, in the past, so if we – over the longer period of what is normal is that utilities build hydro when they find it to be necessary to and that the costs become part of rates through the same cost-of-service mechanism as all other rates are determined.

MR. HOGAN: Okay. Thank you.

So we did hear some evidence that this is called a multi-generational project, which I take to mean we need to look at the benefits and the costs down the road, which I took to mean the cost is going to be cheaper, but that's not true. That –

MR. RAPHALS: Or it would be true – that would be true if it were handled through a cost-of-service arrangement but –

MR. HOGAN: It's not.

MR. RAPHALS: – it's not true.

MR. HOGAN: Okay.

We also heard evidence that we, Newfoundlanders and Labradorians, are going to have some of the lowest rates in North America. Do you have a comment on that?

MR. RAPHALS: If you're talking about Labrador, the answer is probably true, but for Newfoundland (inaudible).

MR. HOGAN: And, fair enough, I should have just said Newfoundlanders. Yeah.

MR. RAPHALS: No, I don't think that's the case.

MR. HOGAN: Okay.

MR. RAPHALS: And can I mention there's one thing – I mentioned it in one of the papers; I don't remember which one. As I understand it, the Power Purchase Agreement is for 50 years and it states the revenue and, therefore,

implicitly the cents per kilowatt hour cost for every year through 2067 and, I think, maybe it was in the PUB reference.

I ask the question: What happens in 2068? How much is Muskrat Falls power going to cost to Island consumers in 2068? Of course, we don't know, it's 50 years from now. But, technically, one could say that at that point, the project is paid off and that the – so the operating costs, it will be worth a half a cent a kilowatt hour, and maybe starting in 2068 Island consumers will have access to this incredibly cheap power.

MR. HOGAN: And multi-generational could be accurate, but we're talking lots of generations.

MR. RAPHALS: You have to skip a couple of generations to get –

MR. HOGAN: Yeah, okay, fair enough.

When Ms. O'Brien was taking you through your evidence yesterday she brought you to a document, I can't remember where it is, but we hadn't heard this word before and I saw it in your evidence, the word "pancaking."

MR. RAPHALS: Yeah.

MR. HOGAN: Can you just explain to the Commission what that is?

MR. RAPHALS: Yes, it's a common term in transmission tariff discussions. Most transmission tariffs are postage stamp, which means that the amount you pay isn't based on how far you're transmitting power, but the same way that when you put a stamp on a letter you can send it across town or to Vancouver, it's the same price. Most transmission tariffs are structured that way as well.

But when you go through several jurisdictions, each one is going to charge its postage stamp. So in order to sell power from Newfoundland to Massachusetts, well really, I assume New England is all one zone, but you're going to have to pay a transmission tariff in Nova Scotia and in New Brunswick and in New England.

MR. HOGAN: Okay.

MR. RAPHALS: And so pancaking means the adding up of those multiple transmission tariffs.

MR. HOGAN: So the Maritime Link, that's how the pancaking is going to work?

MR. RAPHALS: Well, to export –

MR. HOGAN: Yeah.

MR. RAPHALS: To Export to New England via the Maritime Link –

MR. HOGAN: Exactly.

MR. RAPHALS: – would involve pancaked transmission tariffs. And that was sort of the point that Nova Scotia was making in the UARB hearings that it's much more intelligent, much more cost effective for Nalcor to sell to us to avoid those pancaked charges.

MR. HOGAN: And what if we had gone Gull Island through the Quebec route, what would the pancaking (inaudible) –?

MR. RAPHALS: Well, then you wouldn't really be pancaking. You would pay your own transmission costs. You'd pay the Quebec transmission tariff, and then you'd be in New England. So –

MR. HOGAN: So we did hear evidence – I don't know if you were listening or not – about trying to get around Quebec and this was a way to get around Quebec. In terms of transmission costs, is the Maritime route, because of the pancaking, a more expensive way to do this, and we actually haven't got around Quebec, but rather, we've built in extra jurisdictions that we have to pay for transmission now?

MR. RAPHALS: You'd have to do the exercise of adding up transmission. Quebec transmission is relatively expensive, so you'd have to actually add up –

MR. HOGAN: Okay.

MR. RAPHALS: – the cost. I don't know which is greater.

MR. HOGAN: Theoretically, it could go one way or the other then, I guess?

MR. RAPHALS: Yeah.

MR. HOGAN: Okay.

MR. RAPHALS: But it's also more complicated to go through multiple jurisdictions, because in each one, you have to reserve power. You have to say I want to transmit, you know, 100 megawatts from one end of Nova Scotia into New Brunswick, and you have to schedule that with the Nova Scotia regulator, and then you have to do the same thing with the New Brunswick regulator.

MR. HOGAN: Well, cost aside. Logistically, we've gotten around one jurisdiction, but we now have to deal with two, right? Okay.

Just a quick question on the PUB. You have experience obviously with other utility regulators throughout the country. And we heard evidence from Mr. Vardy that, you know, the PUB was given option A or B, that it wasn't really a fair question – which is the least cost option A or B as opposed to, you know, here's all the evidence you tell us what the least cost option is.

Is that unusual in your experience at regulatory utilities? To just be given the option A or B?

MR. RAPHALS: I've never seen it anywhere else.

MR. HOGAN: Never seen it anywhere else.

MR. RAPHALS: Yeah.

MR. HOGAN: What's the typical question posed?

MR. RAPHALS: Well, you know, it's not a typical kind of thing to come up, but if we're talking about references, I can only think of two.

One was in Quebec in 2004, after – relatively recently after the deregulation of HQP – HQ Production – making it separate, and they had a project to build a gas plant, a combined cycle gas plant called the Suroît plant that gave rise to a lot of public opposition.

And so, sort of ironically, after having taken generation out of the regulator, they saw the way

to deal with this hot potato was to put a reference to the regulator, and so they asked the Quebec energy board, the Régie de l'Énergie, to give them an advisory opinion on whether or not to proceed with the Suroît. There were absolutely no conditions posed as to what other options could be considered.

The second is, I mentioned earlier, the Site C Inquiry that took place just last year in British Columbia where the NDP government asked the BC Utilities Commission to evaluate essentially whether or not it was desirable to proceed with building Site C, which was already under construction.

And again, there were definitely no constraints, and the BC Utilities Commission, through those intervenors, such as my group, but also its own staff, worked very hard to explore possible portfolios. And indeed, in the very last step, the BC Utilities Commission put forward, on a spreadsheet basis, its own portfolio, what it considered at that time to be the best alternative portfolio, for comment and for discussion and for parties to suggest improvements to it, so that was very much a part of the process.

MR. HOGAN: How –

MR. RAPHALS: Maybe – could I also, just on that point, mention that if we go way back to the JRP report – the recommendations that we saw at the very beginning – I don't have the page reference in the report. If we could bring it up –

MS. O'BRIEN: I believe that will be P-00041, and the page numbers I have are – for recommendation 4.1 is page 59.

MR. RAPHALS: It's 4.2, actually.

MS. O'BRIEN: 4.2 is on page 68.

MR. RAPHALS: Yeah, could we see that?

MS. O'BRIEN: Page 68.

MR. RAPHALS: Yeah, so the first paragraph: "The Panel recommends that, before governments make their decision on the Project, the Government of Newfoundland and Labrador and Nalcor commission an independent analysis to address the question 'What would be the best

way to meet domestic demand under the 'No Project' option ..."

That's the heart of the question.

MR. HOGAN: Right.

MR. RAPHALS: If you don't build the project, what is the best other option? And by asking it in a binary way, which is better: A or B –

MR. HOGAN: You may not get the answer.

MR. RAPHALS: Well –

MR. HOGAN: You might –

MR. RAPHALS: – you can't get the answer –

MR. HOGAN: Can't get the answer.

MR. RAPHALS: – because you didn't ask the question.

MR. HOGAN: You didn't ask the question. Okay, thank you.

Mr. Simmons was asking you this morning – or you guys were talking about burning fossil fuels and his kids – not talking about your kids – you know, and probably a lot of the younger generation is of the view that we shouldn't be doing this anymore, so –

MR. RAPHALS: Yeah.

MR. HOGAN: – that's the trend, I think, probably of maybe away from fossil fuels, but there's gotta be – there's always developments, things change in the energy world, things change all the time in technology. You mentioned, when you were doing your interview prior to this, talking about things like Tesla battery and things like that.

So technology changes. How do we account for that in terms of capacity and building it into forecasts 40 or 50 years out, or do we consider it, or do we wait until it actually happens?

MR. RAPHALS: Well first of all, I really think that forecasts 40 and 50 years out are not worth the paper they're written on. It's simply an unknown world out there.

But I mentioned – was it yesterday or today – the notion of optionality. That keeping your options opened to respond to the future as it unfolds is a very substantial benefit; one which, generally, utility planning hasn't been very good at capturing. I think I mentioned the Northwest Power Planning Council, of what I'm familiar with, has been the most sophisticated in their dealing with this.

So the biggest constraint – so first of all, I totally agree that getting off of fossil fuels is an extremely important objective. The obvious resource available to the Island is wind, because you have – you're one of the windiest places on earth. Now, the constraints of integrating wind into power systems are very well known, and there are limits. I think – I suspect that the limits are higher than those that we've seen in these documents, but there really are limits.

However, storage is what you need to solve those limits, and the price – the cost of utility-scale energy storage – well, back in 2011, utility-scale energy storage didn't exist. It was on the horizon. Someone knew that maybe someday, you know? Today, it does exist, and its cost are falling dramatically. It was a very important factor in the Site C analysis. That was 2017.

And going forwards, I mean, there are major advances being made – just a week or two ago, *New York Times* published an article about new zinc-air batteries. So the – unlike the Tesla batteries, which are made from lithium, which is rare and limited, zinc is everywhere. And the expectation is that zinc-oxide batteries, where, basically, you use electricity to separate the oxygen – zinc-oxide back to zinc – and then you produce energy by oxidizing it, seem to be the most likely technology in the future and at costs that are going to become probably very economic within a decade.

So if you're asking on a longer scale, you know, what would be the solutions if you kept your options opened, there's a really good chance that you could integrate a great deal of wind power taking advantage of the innovations and storage that are on the way.

MR. HOGAN: The easiest answer would be don't predict 50 years out, because things are gonna change?

MR. RAPHALS: Well, that's for sure.

MR. HOGAN: That's for sure.

MR. RAPHALS: And that doesn't mean that, you know, under certain circumstances building a hydro project, and a large hydro project –

MR. HOGAN: I understand.

MR. RAPHALS: – isn't a good solution.

MR. HOGAN: Yeah.

MR. RAPHALS: But to assume that nothing will change, and to assume that there won't be better choices in the future, I think is not a safe bet.

MR. HOGAN: The last question I have is on the Joint Review Panel and the process. Throughout your submissions – your documents – you said the project changed, the project changed. It was Lower Churchill, and then it went to Muskrat Falls.

MR. RAPHALS: Right.

MR. HOGAN: So can you just explain that in a little bit more detail, maybe elaborate on that?

MR. RAPHALS: I think you probably all know that history better than I do.

MR. HOGAN: Well, let's ask this: In terms of how it was handled by the Joint Review Panel, was –

MR. RAPHALS: Okay, yes.

MR. HOGAN: – it handled okay or should something different have been done?

MR. RAPHALS: Well, it gradually became clear – well, first of all, it was already clear before the hearing started that – I mean, there have been a lot of – the term sheet had been announced and everyone sort of knew that what was on the table was primarily Muskrat Falls.

MR. HOGAN: It was only Muskrat Falls.

MR. RAPHALS: It was only Muskrat Falls.

MR. HOGAN: Yeah.

MR. RAPHALS: I wasn't here but if you say so.

I was very surprised that the panel at that point didn't say: Wait a second, you know, you need to provide us additional information because you're – the project has changed and we're not ready to go to hearings because we don't know enough. You know, all the background work that had been done was really on a different project, which was essentially, primarily, Gull Island for export. And I think that was a mistake that the panel made, to not ring the bell and say –

MR. HOGAN: Start from scratch.

MR. RAPHALS: Well, not necessarily from scratch. But at least update your documentation to take into account what we're reading in the newspapers.

And not having done that, then the challenge became to extract relative information during an extremely constrained hearing process. Where – it's in the terms of reference that's in the appendix to the report – I think it's 75 days – I don't remember exactly. But there was no margin of error, like there's no – sorry, not margin of error – there's no margin of flexibility. The panel had to terminate hearings X number of days after they started and they did – I mean, I think, they did the best they could within those constraints.

MR. HOGAN: Yeah, and I didn't mean to suggest that it was their fault or anything.

MR. RAPHALS: Well, they – and these are issues, I think, that probably came up in the Federal Court proceeding as well. They did request additional information and they were very open to, in particular, my suggestions about what they needed to know, but the information came so late in the process. Really it came, like, the last day of hearings and there wasn't the capacity on any level to fully integrate that into the report.

MR. HOGAN: Those are my questions.

Thank you.

MR. RAPHALS: Thank you.

THE COMMISSIONER: Former Nalcor Board Members.

MR. GRIFFIN: No questions, Commissioner.

THE COMMISSIONER: Okay, so I believe that's it.

Redirect.

MS. O'BRIEN: Just one question on redirect, Commissioner.

I just wanted to confirm, Mr. Raphals, that we – the Commission here – although we subpoenaed you, called you as a witness, we have not paid you for your testimony. Is that not right?

MR. RAPHALS: That is correct.

MS. O'BRIEN: Thank you.

THE COMMISSIONER: Okay.

Thank you, Sir, you can step down.

So I think that's it for this week and so next week I think we start on Monday with some Nalcor board members, if my recollection is correct.

So have a good weekend everyone and we'll come back at 9:30 on Monday morning.

CLERK: All rise.

This Commission of Inquiry is concluded for the day.