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ONTARIO ENERGY BOARD

FILE NO.:	**EB-2016-0152**	**Ontario Power Generation Inc.**
VOLUME:	**3**	**UNREDACTED - CONFIDENTIAL**
DATE:	**March 2, 2017**	
BEFORE:	**Christine Long**	**Presiding Member and Vice-Chair**
	Ellen Fry	**Member**
	Cathy Spoel	**Member**

EB-2016-0152

THE ONTARIO ENERGY BOARD

Ontario Power Generation Inc.

Application for payment amounts for the period from January 1, 2017 to December 31, 2021

Hearing held at 2300 Yonge Street,
25th Floor, Toronto, Ontario,
on Thursday, March 2, 2017,
commencing at 9:32 a.m.

VOLUME 3

BEFORE:

CHRISTINE LONG	Presiding Member and Vice Chair
ELLEN FRY	Member
CATHY SPOEL	Member

A P P E A R A N C E S

MICHAEL MILLAR IAN RICHLER	Board Counsel
VIOLET BINETTE LAWRIE GLUCK JANE SCOTT RUDRA MUKHERJI	Board Staff
CHARLES KEIZER CRAWFORD SMITH BARBARA REUBER JOHN BEAUCHAMP CHRIS FRALICK	Ontario Power Generation Inc. (OPG)
IAN MONDROW SHELLY GRICE	Association of Major Power Consumers of Ontario (AMPCO)
MICHAEL BUONAGURO JULIE GIRVAN	Consumers Council of Canada (CCC)
BRADY YAUCH LARRY SCHWARTZ	Energy Probe Research Foundation
KENT ELSON	Environmental Defence (ED)
DAVID POCH	Green Energy Coalition (GEC)
SCOTT WALKER	Ontario Association of Physical Plant Administration (OAPPA)
RICHARD STEPHENSON	Power Workers' Union (PWU)
MIKE McLEOD	Quinte Manufacturers' Association
MARK RUBENSTEIN JAY SHEPHERD	School Energy Coalition (SEC)
BOHDAN DUMKA	Society of Energy Professionals (SEP)
MICHAEL JANIGAN	Vulnerable Energy Consumers Coalition

I N D E X O F P R O C E E D I N G S

E X H I B I T S

U N D E R T A K I N G S

Thursday, March 2, 2017

--- On commencing at 9:32 a.m.

MS. LONG: Good morning. Please be seated.

Good morning, everyone. Before we begin, I have a preliminary matter. The court reporting service has said that they had some difficulty on our last day with people talking over each other, and it's very important for the integrity of the transcript that we only have one person talking at a time, so I would remind everybody if they can just pause, let the other person finish, and then speak.

Mr. Keizer, do you have any preliminary matters this morning?

PRELIMINARY MATTERS:

MR. KEIZER: Just two minor matters, Madam Chair. One is that -- just an update on the undertakings. We have filed both the redacted and unredacted versions of Undertakings 1.1, 1.2, and 1.3, which arose from the first day, and we've filed Undertakings 2.5 and 2.7. We gave a verbal answer to 2.3 yesterday on the record. So we're continuing to work away on the undertakings and doing the best we can to try to answer as promptly as we can.

And the only other preliminary matter was that Mr. Reiner has advised me that there is a correction he would like to make with respect to the transcript from yesterday -- from Tuesday, and if he could be permitted to do that before Mr. Rubenstein begins.

MS. LONG: Mr. Reiner?

MR. REINER: This was specifically -- this was in the

in camera session, but this is not a confidential item here that I'm going to speak to. And it was in regards to questions Mr. DeRose was asking about the Refurbishment Construction Review Board's finding related to task completion rates --

MS. LONG: Mr. Reiner, do you have a page reference for me?

MR. REINER: It's page 201 on the transcript, and it appears on -- starting at line number 8 on page 201.

MS. LONG: I have that.

MR. REINER: So in the -- and the question was about the target that we are aiming for in task completion rates.

The 90 percent target that I referenced relates to operations and maintenance related work that we are executing during the refurbishment for project work. The target that we are aiming for is between 70 and 80 percent, which is deemed to be a reasonable target for project work.

MS. LONG: Okay. Thank you.

MR. REINER: Thank you.

MS. LONG: Anything else, Mr. Keizer?

MR. KEIZER: No, Madam Chair, that's the only matters we have.

MS. LONG: Mr. Rubenstein, I believe you are starting this morning.

ONTARIO POWER GENERATION - PANEL 1B, RESUMED

Mr. D. Reiner,

Mr. G. Rose,

Mr. L. Saagi; Previously Affirmed.

CROSS-EXAMINATION BY MR. RUBENSTEIN:

MR. RUBENSTEIN: Yes, I am. Good morning, panels.

I have a compendium of documents for this panel. I'm not sure if the Board Panel has it.

MS. LONG: We have it.

MR. RICHLER: Exhibit K3.1.

EXHIBIT NO. K3.1: COMPENDIUM SUBMITTED BY MR. RUBENSTEIN

MR. RUBENSTEIN: I want to start off with a quick follow-up to the examination-in-chief from Tuesday late in the day. And in your examination-in-chief, Mr. Keizer was asking you about a document that's on page 2 of my compendium. And as I understood the exchange and your responses, what you were doing was following up on questions about panel 1A about the incentives. There was discussion that those incentives are in the compensation scheme, and the balance scorecard is part of that compensation scheme, and you were showing us that there are various refurbishment-specific incentives in the plan.

Did I understand sort of the point of that discussion that you were having?

MR. REINER: Yes, that's correct.

MR. RUBENSTEIN: All right. So, first off, this is the 2016 scorecard?

MR. REINER: Yes.

MR. RUBENSTEIN: Is there a 2017 version of this now?

MR. REINER: There will be a 2017 version. It goes through an internal approvals process. It has not yet been

approved, and I believe that that's a matter for discussion at the upcoming board -- the upcoming OPG board meeting.

MR. RUBENSTEIN: When is that?

MR. REINER: That is -- the board meeting is on March the 10th.

MR. RUBENSTEIN: All right. Well, can I ask you to -- obviously we'll wait for the board meeting when it's approved, but can I ask you to undertake to provide the 2017 one upon -- I guess around the 10th for the remainder of the hearing?

MR. KEIZER: Can I just have a moment, Madam Chair, just to clarify timing?

MS. LONG: Yes.

MR. KEIZER: Thank you, Madam Chair. I think that's fine. We just -- I was concerned about timing, because once it's approved, there may still be communications to employees within the organization and how that relates relative to filing it here on the public record, so we'll just have to make that assessment at the time we're ready to file.

MS. LONG: Okay. I think we have quite a few days after that --

MR. KEIZER: I think we do have quite a few days after that.

MS. LONG: -- on the schedule.

MR. RICHLER: That is Undertaking J3.1.

UNDERTAKING NO. J3.1: TO PROVIDE THE 2017 SCORECARD

MR. RUBENSTEIN: So you may not be able to answer this

question, then. You don't know what the 2017 Darlington-specific metrics would be? Maybe not -- I'm not asking about the numbers, but are they going to be the same sort of 2017 actual expenditures as a percentage of approved 2017 budget? Is that going to be on there again, or...

MR. REINER: In my role, I provide input into what those measures should be for the refurbishment project. It is not yet approved, that scorecard, but I can tell you safety performance will be on our scorecard again, and there is a refurbishment contribution in safety. There will be a financial indicator just to see how cost is doing on the refurbishment project and then some specific milestone-type metrics again that relate to what we expect to execute and achieve in 2017.

MR. RUBENSTEIN: All right. When we're looking at the 2016, and I'm looking at the refurbishment project costs, when it says "2016 actual expenditures as a percentage of approved 2016 budget," what is the 2016 budget that we're talking about for this? Where does that come from?

MR. ROSE: The budget starts from what was approved in our business plan, so for this year, but there are some adjustments made to that budget, and this is why it's reflecting 100 percent for work that, for example, did not get completed in the year, so it gets removed from the base, so we don't get any credit for that, and/or any work that was moved up from a future year, moved up into the year, it would adjust the base.

So what we're doing, similar to earned value

management, which is something we'll likely talk about later this morning, in essence, applies an earned value methodology. So you only get credit for the work that you got done or assessing whether or not for the work that we got done whether the costs were above or below budget in accordance with these percentages.

MR. RUBENSTEIN: I understand that. I'm just trying to -- actually just trying to link it to all the other budgets and approvals that we've been talking about in this hearing. Is this -- who is approving that amount? And I'm just trying to link it to something else that we --

MR. ROSE: I'll ask Mr. Saagi to speak to the budgets, because what we do -- this comes from our business plan -- we feed into it -- the finance or controller actually does the reconciliation and validation and submits the final numbers, so he will have all the details.

MR. SAAGI: So the 2016 approved business plan is predicated on the RQE estimate, so the 2016 budget would be based on year 1 of the cash flows that were presented in the RQE.

MR. RUBENSTEIN: So if we're talking about -- if the same concept was going to exist in the 2017 balance scorecard, what would you be drawing the 2017 budget from?

MR. SAAGI: So what we would do is we would -- the unit 2 check estimate, unit 2 EE, I believe it's called, feeds into the business-planning process, so year 1 would be the unit 2 check estimate cash flow for 2017.

MR. RUBENSTEIN: So it's from the business plan,

the --

MR. SAAGI: Yes. The actual project feeds into the business plan, and the business plan will -- updates the flows. So year 1 would be in line with unit 2 EE.

MR. RUBENSTEIN: Thank you very much.

I want to follow up with respect to a question Mr. Elson from Environmental Defence was asking panel 1A about reporting. And, as I understood, he was asking you: Would you report on a quarterly basis your actual cumulative capital expenditures that you had forecast and provided in JT1.17?

Mr. Reiner, do you recall the discussion that panel 1A was having with respect to that?

MR. REINER: Yes.

MR. RUBENSTEIN: I understood OPG's position that, well, wasn't a good idea because it doesn't give you the idea of progress, because while you may be under budget, you may be also be behind schedule. So it may look good, but if you're behind schedule, it's not providing an accurate picture.

Did I understand that really was the gist of why you didn't think his metric was a good idea as a reporting tool?

MR. REINER: I think the metrics -- the metrics that he identified align with what we proposed to provide to the OEB on an annual basis, and his questioning was really about would we provide that same level of information that we're proposing to provide on an annual basis on a

quarterly basis, and that isn't what we had proposed. What we had proposed is to provide a quarterly report, similar to the August report that was provided in evidence, which provides a roll-up of those metrics into that graded bar that you see on that August report, which really factors in, in terms of cost, how we're doing currently on cost plus takes a look at -- it also adjusts a grading based on what we see the estimate to complete as being and provides a green, being ahead of plan, to white, being on plan, to yellow and red, being behind plan. And so we were not -- we were not proposing to provide the level of detail that he was requesting on a quarterly basis.

MR. RUBENSTEIN: On the annual number that you're going to provide the Board, is it what you're proposing today to spend in 2017, 2018, 2019, and 2020, or 2021? Or is it going to be more similar to the forecast annual expenditures in the balanced scorecard where they may change if, in 2017, you're behind in spending and you need to do it in 2018, that 2018 is increased? Which number will you be reporting to the Board as the denominator, essentially?

MR. ROSE: I think the decision on the details specifically about what the Board -- what we will report to the Board and what the Board requires us to report is probably still not determined. But notwithstanding that comment, I'll give you -- I'll respond to you about what I think how we would manage product.

From a product management perspective, we start off

with a baseline budget. So U2EE as an example, we have a baseline for the budget flow over the life of the project. That's our starting point; we call that the baseline budget. We will measure performance on a routine basis against that baseline budget, and after three months, we could be above or below that budget.

The question is: Is that a good or a bad thing? Well, it depends. It depends whether I advanced work, right, and I did more, or I could be overspent because I did the amount that I had planned, but it cost me more. So this is where earned value metrics, cost performance index, et cetera, comes in play.

MR. RUBENSTEIN: I want to stop you, because you said we don't -- essentially, we haven't decided. But, ultimately, we need to provide argument to the Board to say do we like your idea or do we not like your idea. So I'm trying to understand what you're actually proposing when you say you're going to report on an annual basis against the cost which is what -- is the forecast able to change every year like your balanced scorecard, or would it be what your proposal is today that you expect to spend in each of those years?

MR. ROSE: Our proposal is to provide the original baseline and the cost performance index, which shows you how we're doing against the flows.

MR. RUBENSTEIN: Okay. Thank you very much.

And that gets me to my next question, which is the CPI/SPI metrics; this is the earned value metrics.

As I understood the conversation you were having in the context of Mr. Elson's panel 1A cross is the denominator cost may change over time, and I wanted to understand -- well, first, am I correct about that? The nominator cost may change as things happen over time?

MR. ROSE: You're referring to the cost performance index specifically?

MR. RUBENSTEIN: Yes.

MR. ROSE: Cost performance index is we measure -- we call it earned value, the amount of work that got done, over the actual cost incurred, so earned over actual.

MR. KEIZER: I don't want there to be confusion on the record. Mr. Rubenstein, I think, asked a question about the denominator in relation to Mr. Elson's question, which I think was related to JT1.17 or something like that. I just want to make sure we're talking about the same denominator. That's my concern.

MR. RUBENSTEIN: I had understood the conversation as the panel was talking about the benefits of the earned value metrics over this, so I want to talk about the earned value metrics now, putting aside --

MR. KEIZER: Sorry, Mr. Rubenstein.

MR. RUBENSTEIN: No, that's fine.

MR. ROSE: CPI is earned over actuals. That, on its own, isn't a comparison to the original plan that I just spoke of. If I spent $100 and for that $100 I earned $100 off my plan, I have a CPI of 1.2. I'm more efficient budget-wise. I spent less money to earn more.

MR. RUBENSTEIN: That's what I thought it meant. I was confused in the last panel.

I want to start to discuss the facilities infrastructure and safety improvement projects. If we can turn to page 6 of the compendium, you were asked at AMPCO 30 to provide a chart of safety opportunity projects and facility infrastructure project costs, the original budget and the revised budget, and if they've been reclassified. And if we flip over to page 8 of the compendium, in chart 2, we have the facilities and infrastructure and, in chart 3, we have the SIO projects. Do you see that?

MR. REINER: Yes.

MR. RUBENSTEIN: Just to make sure I understand this, when you were asked to provide the budgeted amount, you provided the original full release. Do I understand that doesn't actually mean the original budgeted amount; it may mean something else? Your definition of full release is a slightly different -- it has a slightly different meaning?

MR. ROSE: Full release, so when a project gets planned, a project starts off at initiation phase, goes through definition phase, and when it gets to execution phase, we refer to that as its full release. It has done enough planning to be able to put a -- put forward a reasonable budget that we can measure performance to, not any different than our RQE budget, being our budget we're going to measure performance to.

MR. RUBENSTEIN: All right. If we go looking along the projects on chart 2, so this would be for the

facilities and infrastructure projects as originally provided in the original full release, we see the Darlington OSB refurbishment, the Darlington auxiliary heating system, the D2O storage facility water facility, the water and sewage project, the electrical power distribution system and the vehicle screening facilities. Their forecasts in this budget are now higher than the original full release? Do I understand that correctly?

MR. ROSE: That is correct. As per this IR, that's correct.

MR. RUBENSTEIN: The OSB -- the first two projects, the Darlington OSB refurbishment and the auxiliary system, have been reclassified to the nuclear portfolio? I think we had discussion about that in panel 1A; correct?

MR. SAAGI: That's correct.

MR. RUBENSTEIN: So the water and sewage -- we've talked about the D2O project in some depth. If I go to the water and sewage project, I see it being 42 percent over budget. Am I correct?

MR. SAAGI: Subject to checking the math, that's correct. It's gone up.

MR. RUBENSTEIN: Can you explain why the water and sewage project is significantly over budget?

MR. SAAGI: The water and sewage project ended up with superseding PCS to address a significant contractor claim that came about during the work. Mr. Rose or Mr. Reiner will have to explain the technical side of that, but from a financial perspective, a superseding PCS was approved for

the higher amount.

MR. RUBENSTEIN: I'm still not sure why the -- I understand there's obviously a cost overrun, and you got approval. That's what I understand the superseding, but help me understand why.

MR. REINER: So I'll just go back a little bit on this. So that project, along with many of the campus plan projects, as we have previously said and said in the last hearing, estimates were put forth before all of the engineering was completed to understand the full -- the full costs associated with executing that work. So the budgets that were established at the time were established without a recognition to the class of estimate and without an allowance for risks associated with that class of estimate. So the costs for execution were higher.

There was -- that water and sewer line is required to cross underneath a railway track that crosses the Darlington property. And there were some technical complexities with doing the excavation work underneath that railway crossing, and there was also -- at the time of execution, there was also a collapse of some of the excavation in the vicinity of that railway crossing, and that is what led to a claim in this particular project.

MR. RUBENSTEIN: I thought I understood Mr. Rose saying what a full release meant was that it's similar to what -- your RQE estimate.

MR. ROSE: So a full release means that you've done sufficient planning to baseline the project, which is what

this is here. That's the traditional definition of what that means. It doesn't mean there aren't risks that are going to occur beyond, and, as we did for RQE, we assess what those risks are and we carried those in our baseline budget.

For these projects, in some cases, the full understanding of the risks weren't included in the base of that project, and we, in fact, carried contingency at the program level to deal with variations in costs of many of these projects.

MR. RUBENSTEIN: So when I go down to the electrical power distribution system, I have that being 23 percent over budget. I've got the vehicle screening facility costing more than double. Is that the same issue?

MR. ROSE: The issue being, sorry?

MR. RUBENSTEIN: All your -- you didn't include all the risks; you didn't do all the engineering at the full release stage, and there were problems, similar to, as I understand, the water and sewage project?

MR. REINER: That's precisely right. So these projects were all -- execution of these projects began before this methodology for project management that we've incorporated into the Darlington refurbishment was implemented. Now, each of these do, however, though, undergo internally an approvals process. There is a superseding business case that goes along with those that reflects that risk and then allocation of contingency to mitigate that risk, and I believe the superseding business

cases have been provided in evidence.

MS. LONG: So I'm sorry. I just want to clarify here, Mr. Reiner. So your evidence is that, for these projects, the full release amount was determined prior to engineering being completed?

MR. REINER: Yes, yes. They were -- the estimates were characterized as full release, and there was not contingency released to go with the class of estimate. The process that we undertook previously in the corporation is, as these risks materialized and costs were incurred, a superseding business case would get produced, which will get routed internally for approvals. And the purpose behind the superseding base case is to address: Are there options to mitigate the risks? If not, what is the expected cost going to be?

MR. RUBENSTEIN: Sorry, as I understand from reading a lot of these full releases and that -- there's contingency built in. In fact, I have binders full of confidential numbers for those contingencies in my office. So I -- there is contingency built into the original full release; correct?

MR. REINER: There are contingencies built in, but if you look at those contingencies and you were just to take it up a level to class of estimate and what best practice and project management would suggest the range of uncertainty around that estimate is, there were not sufficient contingencies built in to address that. The contingencies built in tended to be relative to specific

things that might have been anticipated in the execution of the work.

Now, I will say all of these costs, with the exception of the reclassified, are included in the 12.8 billion, and we do not expect any of these to result in a cost push in the overall Darlington refurbishment.

MR. RUBENSTEIN: As I understand, when you're talking about in the class, the estimate, the AACE class estimate process, you know, the higher the number, the earlier you are in planning, the higher the potential error ranges, plus or minus; correct?

MR. ROSE: That is correct.

MR. RUBENSTEIN: As you go down, you're getting smaller; you're getting more.

MR. ROSE: As you go from a Class 5, which is, in essence, feasibility, to a Class 3, which is usually aligned with completion of sufficient engineering to be able to get to a release quality estimate, what we've referred to earlier as a full release, there is sufficient engineering done to get confidence within a certain range.

MR. RUBENSTEIN: And as I understand, what you're saying is these are at a higher class estimate than at least the core refurbishment projects, RQE releases; correct?

MR. ROSE: Sorry, can you repeat that question?

MR. RUBENSTEIN: Sorry. And as I understand what you're saying about these is the full release was at a higher class estimate than maybe you liked and is at a

higher level than the -- at a higher class estimate than the -- what I'm going to call the core refurbishment work?

MR. ROSE: So, at the last hearing, we had quite a lengthy discussion about the fact that, one, these projects were being executed by our products and modifications organization and, two, under the procedures that they had in place at that point in time.

The full understanding of the estimate classification process and the attribution of contingency based on whether it was Class 5 or Class 3 is a lesson learned that we've spoken to many times. So these projects would have all started under that same area, same type of -- in the same time frame. We now apply, and through all the projects in the nuclear portfolio as well as those in refurb, the estimate classification process a little more rigorously than we did when some of these business cases were sanctioned and released.

MR. RUBENSTEIN: So is that a yes to my question?

MR. ROSE: So the question -- sorry, ask your question again, sorry.

MR. RUBENSTEIN: That's fine. Is this -- these projects ready when you, at this time, at least, the original full release was at a higher class estimate than you would maybe do now?

MR. ROSE: At the time of release, some of these projects had articulated that they were at a class estimate that, in hindsight, based on our knowledge now, we don't believe they are. For example, we've talked about the D2O.

At the 110 million, that business case said it was at a Class 2. However, if you read the details of the business case, the engineering was not complete, so how it got to Class 2 without completing engineering is difficult to understand. That is the lesson learned that we've applied to all projects going forward.

MR. RUBENSTEIN: All right. So you may have thought it was at a Class -- you know, with hindsight and more rigour, they really should have been at a higher class estimate than they were?

MR. ROSE: So -- yes.

MR. RUBENSTEIN: So when I look through all of the -- on chart 2 and 3, if that's essentially the case for these projects, I don't see any where they came in under budget from that. And my understanding of the class estimates is it's plus or minus. As you get down, that range lowers, but it can go in either direction. And every one -- there's none that are coming in under budget. They're all coming in over budget or on budget. Help explain that.

MR. REINER: So if I could, at the -- so at the time of the release quality estimate, we incorporated a revised set of cost estimates based on what we knew at that point in time in regards to progression of engineering, what the status of the project was at, and those estimates are embedded in the RQE.

Now, the information provided here that was asked for in this particular interrogatory didn't request what was in RQE, but if I compare to what we said at the time of

release quality estimate to where these projects actually landed, the vehicle screening facility, it came in about $100,000 under estimate. The electrical power distribution came in at about a half a million under estimate. The water and sewer project came in at about 3.6 million under estimate. And the Darlington energy complex, it came in at about 22 million under estimate, and there was an emergency -- I'm trying to see if it's listed here. The emergency service water, buried services, that came in at about $700,000 under estimate.

MR. RUBENSTEIN: Would I be correct that, at the time of the RQE estimate, you were in construction of most of these projects? This is not before you had done anything. Many of these projects were really far along at that time?

MR. REINER: At the time of the RQE estimate, the estimates for these projects were based on an end of 2014 estimate. At the end of 2014, some of these were still in engineering phase, and some were in construction. And that's the point in time where we had made the decision to incorporate these projects into the methodology that we are using for project planning in the refurbishment project.

MR. RUBENSTEIN: All right. I want to take you to page 9 of the compendium. This was a chart we looked at and that was talked about in the last panel, and it's the build-up to the definition -- the end of the definition phase. Do I understand that correctly?

MR. SAAGI: That's correct.

MR. RUBENSTEIN: I understood from Mr. Reiner, your

discussion with Mr. Mondrow on panel 1, that putting aside the interest bar, you can generally categorize the costs into two categories. One is planning to do execution phase work, so building the budgets, negotiating the contracts, doing the engineering the planning. And the other was undertaking physical work you needed to do as a prerequisite to the execution work or for safety reasons, and those would be safety improvement projects and the facilities infrastructure project.

Is that a fair way to characterize sort of the two groups of costs?

MR. REINER: You could create those two groups of costs, yes.

MR. RUBENSTEIN: Would that be a fair way to categorize?

MR. REINER: It isn't the way we would -- the way we would characterize it is the way we broke it down here in this chart. And if you were looking at specifically -- and we didn't break it down that way because if you look at the facilities and infrastructure category here, some of that work would be in execution, field construction. There would still be an element of planning taking place on those projects that would also be in that category. So we didn't break it down into that kind of a division.

MR. RUBENSTEIN: If I wanted to -- and I'm not talking about specific numbers here, but conceptually, as I understood the discussion when Mr. Mondrow was walking through a bunch of these things. So, for example, the RFR

mock-up, something is being built, but there's also a planning element. The turbine generator parts are -- you're buying the parts; there is a physical thing there.

The EPC definition-phase planning is planning costs. There's more in the planning category because you're planning with the contractor to do the work.

Facilities infrastructure and safety improvements, I think you just discussed.

Then there's OPG's definition planning and support services, more in the planning category.

Is that -- if we were sort of conceptually breaking those down, is that sort of fair? I recognize it's not a hundred percent pure in any of these categories, but is this sort of a high-level sense?

MR. SAAGI: I would make one small change to what you had just said. In the turbine generator parts, in as much, it says the word "parts." It's really engineering and planning activities related to the parts, so I would characterize that as a planning activity as well.

MR. RUBENSTEIN: All right.

MR. ROSE: Mr. Rubenstein, let me also further answer the entirety of your question. I think you're correct. In the RFR mock-up, in tooling, the facilities infrastructure, and SIO categories, each of those are self-contained projects. Each of those have planning components, engineering components, and execution components.

The SIO and F&IP projects specifically are being executed by our product and modification organization, so

we charter them to execute those projects, whereas the other lines, the turbine generator parts, which is mainly engineering, and the vendor definition phase planning as well as OPG's definition phase planning is all the things related to us being able to get to release quality estimate, which included completing the environmental assessment, the integrated safety, scoping, estimating, scheduling, development cost and budget development, et cetera, and the reporting that went through that phase and the oversight of all the planning work that was being undertaken in that phase, including contract management, claims management, et cetera.

MR. RUBENSTEIN: When I add up the three categories, the turbine generator, which is planning for parts, the vendor APC planning, and OPG definition stage, it's about a billion dollars; correct?

MR. SAAGI: That's correct.

MR. RUBENSTEIN: And, as I understand it, you're planning to put to -- all those costs will go in-service with unit 2. The entire definition stage, including that $1 billion, will go in service with unit 2 or before?

MR. SAAGI: Of that $1 billion you just referenced, that is correct. Some of the F&IP and SIO would be earlier in-service amounts.

MR. RUBENSTEIN: But the planning costs would go in, all of it, in unit 2?

MR. SAAGI: That is correct.

MR. RUBENSTEIN: As I understood from discussions in

panel 1B -- sorry 1A, you looked at this as an integrated four-unit project. You set out the contracts that way, all of the planning. So if that's the case, why is it fair to put all of the planning for that that's being done in the definition phase in unit 2 and not spread it out over the four projects, the four units?

MR. ROSE: The planning being done for unit 2, this planning we're speaking to here, needs to be done in order to execute unit 2. We cannot execute unit 2 without doing the environmental assessment, integrated safety review, or the planning that was required for us to get to the release quality estimate.

The engineering that was done in this spend is engineering related to unit 2. There is engineering that will need to be done for the subsequent units specifically related to those units.

MR. RUBENSTEIN: So if you were only doing one unit, if we can imagine a scenario you were only refurbishing unit 2 and were not refurbishing all the others, would you have spent a billion dollars on planning?

MR. REINER: So this is really a hypothetical question, because we did come at this from a four-unit project perspective, and we could not have only incurred 25 -- we could not have done only a quarter of the planning for the first unit. All the planning that was done is needed for each unit.

Now, had somebody said to OPG, "We only want you to refurbish one unit, not four units; that's all the long-

term energy program requires," there might have been a different approach in planning. I would say there likely would have been a different approach taken.

But that's not what we were asked to do. We were asked to develop a plan for the refurbishment of the entire facility. And our plan and the method we went about this is, in our view, a reasonable way of executing a four-unit refurbishment at Darlington.

MR. RUBENSTEIN: I recognize it may not be 25 percent of the planning. Can you give us some sense of how much of the -- how much of that you would have ended up having to do, at least dollar-wise?

MR. ROSE: Of course, as Mr. Reiner says, it's a hypothetical situation. It's not how we planned this job. But being very close to the planning that happened in here, I don't anticipate we would do any less planning for a single unit. The planning that we did, which was about developing the scope, developing the cost estimate, performing engineering and developing a schedule, was all required to execute unit 2.

MR. RUBENSTEIN: One would assume that it would be -- say negotiating the contract. If you're negotiating one unit versus four units, it would take less time. It would be less complex; correct?

MR. REINER: Certainly a four-unit contract has elements in it that recognize that that contract gets executed over four units, but the general terms and conditions tend to be very much the same. When you get

into specifics like what amounts would we expect the contractor to put forth in liquidated damages, that would certainly be different given the size of the investment. But the actual contract itself, I think you'd find that the contract would be very, very similar.

MS. LONG: I'm sorry. I'm not clear on your evidence, Mr. Rose. So what you are saying is you've spent a billion dollars on planning. Your position is that is for the entire project. But I thought I heard you say there would be extra planning costs for the extra units past unit 2. Is that correct?

MR. ROSE: There are -- so within each of the units, there's unit-specific engineering that needs to be done, unit-specific work planning that needs to be done, unit-specific scheduling that needs to be done.

Now, our basis being unit 2 and our ability to replicate that makes those subsequent units more efficient, more -- less costly to obviously replicate, because we're going to take the schedule that we developed for unit 2. We're going to apply lessons learned from the execution of unit 2 and develop a unit 3 schedule. But all of the work that we did in planning to be able to develop the Unit 2 plan had to be done.

MS. LONG: And what's your estimate on those additional planning costs for units -- the other three units? I mean, if this Board approves a billion dollars for planning costs, thinking that it's for the -- I guess, the planning for all four units, and there are additional

planning costs, I think we would like to have some idea of what the additional planning costs are.

MR. REINER: Those -- so those additional planning costs that Mr. Rose refers to are captured in -- when you look at the release quality estimate, we provide a unit breakdown of costs. It is captured in that cost.

So the release quality estimate provided cash flows over the entire project and did an attribution to units. It would be in the unit 3. So the planning for unit 3 is in the unit 3 estimate, and we're not bringing forth that request --

MS. LONG: Well, I appreciate that you're not bringing it --

MR. REINER: -- here.

MS. LONG: -- forth, but we would like to have some idea of what quantum, what percentage it is.

MR. KEIZER: And we could do that, go back and look at the evidence, and make sure that we've either highlighted where it could be found in the evidence or clarify it with --

MS. LONG: I'd appreciate that. Thank you.

MR. REINER: Now, just, I do --

MR. RICHLER: Sorry, I suppose we should give that an undertaking number. J3.2.

UNDERTAKING NO. J3.2: TO ADVISE WHAT THE ADDITIONAL PLANNING COSTS ARE

MR. REINER: So I want to be very clear on what that undertaking is, because I do need to tell you we have not

yet started the specific planning work, with some minor exceptions, on subsequent units. That's work yet to be done, and I would not want to put numbers on, because we would find ourselves in the same place that we're finding ourselves here in discussing the estimates associated with the campus plan projects. We have only just started to look at the cost of replicating engineering for unit 3 to begin preparing for unit 3, but that planning work for unit 3 is -- it's going to start in 2017 and it's going to take us right up to breaker open.

We will have a look in evidence. If we provided some breakdown, it would be -- I would put all kinds of caveats around any sort of a number we put forth around that, and we would have to give that a lot of thought on what portions --

MS. LONG: But it's captured -- it's captured in your $12.8 billion.

MR. REINER: Yes.

MS. LONG: So you must have some sense of what the number is. I imagine, like, you can't tell me definitely, but there must be some idea of what it is.

MR. REINER: We can give you a sense, but I would not want that number to get used as a measure in future to compare what our actual planning cost is relative to that number.

MS. LONG: Well, I would like to know the number, and you can provide whatever caveats you need, and we'll take a look at those. But I would like to better understand that.

MR. KEIZER: Understood.

MS. LONG: Thank you.

MR. RUBENSTEIN: Now I'm --

MS. LONG: Mr. Rubenstein, I don't know if I've helped there or not.

MR. RUBENSTEIN: I think you have. I was going to ask for a similar undertaking. But it raises the question, in building the $12.8 billion budget, you -- what is the basis, then, of whatever built into that that we don't -- I'm unaware it's on the record to date of what the definition or the planning costs are going to be for three, four, and one.

MR. REINER: So, in the 12.8 billion, there are contingencies that relate to estimating uncertainties. And those estimating uncertainties for work that has not yet been completely estimated, like, for example, the execution of the control system on the second unit, there are contingencies associated with variations in that cost that we would expect to see as we fine-tune the details of unit 3 execution.

MR. RUBENSTEIN: So when you say "I don't know" -- or, as I understood your discussion with Chair Long, it's that, that you -- that may change because you may be pulling in some contingency amounts in the planning, but underlying that, there is a base number --

MR. REINER: Yes.

MR. RUBENSTEIN: -- no contingencies.

MR. REINER: There is a base estimate for the units

that was derived and extrapolated as part of the unit 2 execution estimate calculation.

MR. RUBENSTEIN: I'm not talking about unit 2. I'm talking about for the --

MR. REINER: Yeah.

MR. RUBENSTEIN: -- getting to the 12.8, the planning costs. There's some base number when you built up your non-contingency amounts to get to the 12.8; correct? And that's what I assume this undertaking will be showing us.

MR. ROSE: Yeah, that's correct. So the lowest level, I have a scope of work that I know what the estimate was to do the planning for unit 2, and I have a high confidence Class 3 estimate of what it's going to be to execute during unit 3. I then extrapolated that times all those work packages with reductions in the cost of engineering, because I expect the engineering to cost me less because it's replication. But there is replication for that unit that needs to be done, engineering work that needs to be done specific to that unit.

MR. RUBENSTEIN: All right. If I can ask you to turn to page 17 of the compendium. And this was a response to an AMPCO interrogatory, and you provided in Figure 1 -- essentially, this is a chart about the ramp-up of staffing that you're going to need for this project. And it shows -- it's very hard to see, because it's shrunk in the interrogatory, but there is a chart at the -- there's sort of a table at the bottom of the chart that's showing approved plan, current forecast, and actual FTEs, and the

overlap of approved and actual that we can see is at, as I read, August, and I think I'm reading 791 were approved, and 691 was the actual at that time, so you were, at least in August, short employees. Am I right? At that point, you were short? That's what this is showing?

MR. ROSE: We were short regular employees. So we call regular employees, which include staff, OPG direct staff, and what we call augment services, which are contracted employees that are filling augment services spots.

MR. RUBENSTEIN: All right. And then we have the forecast going forward against the approved plan. Where are you actually compared to the approved plan? Have we closed the gap? Do you have the amount of people you need today?

MR. ROSE: I don't have the precise numbers exactly where we are today, and I'm not certain that it's in the latest reports that we've provided in the undertakings. On day 1, there was some reporting that was provided. I can check that at the break. But we have significantly closed the gap between August and the end of the year, and we are slightly -- a little bit under where we want to be right now, and what we end up doing is we end up bringing in contractors to help facilitate that staffing gap.

But what we did is we actually -- the organization has invested or spent considerable time putting in place recruitment programs, and we, in turn, put in a, within my organization, a process to help managers with the

recruiting process. I mean, hiring somebody, going through interviews, and that takes time. We wanted our managers focused on the work, so we facilitated and helped them through the hiring, and we hired about 200 people between August and the end of the year on the project.

MR. RUBENSTEIN: All right. So if you had hired 691 at the actual in August, then you add 200, it still seems to me you are below where you would -- where you needed to be by a good amount?

MR. REINER: So below where this -- where this curve was generated, but what I will tell you is we are not below where we need to be. We have access to resources to manage the project. If we can't get them as full-time regular OPG staff, we're able to hire contractors, and we're also able to -- if we were to find ourselves in a critical need of a resource, we're also able to move people around in our nuclear fleet and assign people to the project.

Now, the staffing plan is a living plan, so this is not "Here's a forecast, and we're going to exactly match the forecast." At the time the forecast was built, there were assumptions that needed to be made about what level of effort is needed on behalf of OPG to manage the work.

As we get into execution and as that changes, we adjust the resources. And there are -- as Mr. Rose said, there are some areas where we are still currently hiring people, and we are bringing people on staff, but we're not at a place where we have a significant shortfall that introduces a complication for us in terms of managing the

project.

MR. RUBENSTEIN: Have you changed your forecast? Is there somewhere that you have now adjusted what you actually -- I would say equivalent to adjusting the approved plan, so what you need to do?

MR. REINER: We have, in our one of our program management plans -- and it is an attachment to evidence that we submitted -- a staffing management plan. That staffing management plan lays out what the strategy is for acquiring resources and then also takes a look at expected demands and supplies. It's a living document. We continually update it. We would have to go back and check if we've got something that is more current than what we submitted in evidence. If we have something that's more current, we can provide that.

MR. RUBENSTEIN: Can you do that?

MS. FRY: Mr. Rubenstein, if I can interrupt for a moment? What about training time? The people you're hiring, are they basically able to get right into the job on day 1, or is there like a month or two learning curve?

MR. REINER: There is training time that is required. When we hire professional staff, say engineers or project managers, obviously they come with qualifications and experience, which is why they're being hired. But there is specific training that they then need to do.

An easy example is you cannot access a nuclear site unless you've had some radiation protection related training. So we have to do that. And then also for all

staff that are brought on through the trade unions, there is also specific training that we have to undertake to meet. Some of it is related to meeting provincial requirements -- so fall arrest training, for example, to get to current standards. And then we also have to familiarize them with specific things related to the Darlington site. and that's done in what we call an on-boarding process. It takes several weeks to get a qualified -- sort of a qualified tradesperson trained and ready for the job site.

In terms of a professional person, it's a slightly shorter duration, and then it's ongoing. There is an ongoing thing that's built into their development program, and there is a specific training program as they execute their careers in the project.

MS. FRY: I'm not trying to tie you to a specific time frame; obviously that's a difficult thing. But are you generally talking a period of weeks per employee? Is that fair?

MR. REINER: It would be a period of weeks, yes.

MS. FRY: Thanks.

MS. LONG: Mr. Rubenstein, can you restate your undertaking?

MR. RUBENSTEIN: Mr. Reiner was offering to provide something. What I'm looking for is a more up-to-date chart like this or some set of numbers which is showing what your new plan is and where you are, essentially.

MR. KEIZER: I think Mr. Reiner indicated it was

related to the resource plan that they have and that he would look to see if there was a more up-to-date one and provide that resource.

MS. LONG: Will you mark that please, Mr. Richler?

MR. RICHLER: J3.3.

MS. LONG: Thank you.

UNDERTAKING NO. J3.3: TO PROVIDE AN UPDATED RESOURCE PLAN

MR. RUBENSTEIN: I ask because -- and Mr. Rose was eluding to it -- in the quarterly performance reports -- and you've now provided a more updated one -- this was in one -- these were in a previous version of it, but this sort of similar chart is not in the newer one, or at least the one that I believe set a reporting time at the end of September-October.

MR. REINER: That's right. We did not provide this as an update.

MR. RUBENSTEIN: Is it because it's not an issue anymore that you don't need to sort of track? Why is it not -- why was it not in that quarterly report?

MR. REINER: That quarterly report that was requested was the quarterly report that went to the Darlington refurbishment committee. And, yes, when we don't have a significant issue, we don't provide data.

MR. RUBENSTEIN: So when we're talking about staffing and looking at this chart, am I correct this is -- and I think you said this -- this is OPG employees or OPG contracted employees; correct? These are the ones you have

direct oversight over?

MR. REINER: That is correct.

MR. RUBENSTEIN: Let me ask about all the other employees. All the contractors are retaining people to do their work. Are you monitoring their ability to staff up, and can you help us understand where are they? Are they also having problems? Are they below where they need to be?

MR. REINER: Obviously the contractors also need to staff up to execute their work; that's their accountability. Part of our oversight is to satisfy ourselves that there are sufficient resources available to do the work. We do not prescribe that to them.

The way we identify an issue is based on actual performance of getting work done in the field. You would see potential schedule delays, if you're understaffed, potential productivity impacts, if you are overstaffed, and those show up in the metrics. But it is the contractor's accountability to provide resources.

There was -- I believe in the release quality estimate submission that was provided, there were resourcing histograms included that showed our assumptions that are built into the release quality estimate for all resources, including contractor hired resources.

MR. RUBENSTEIN: You actually do not have visibility -- let's just say the RFR contract with the joint venture. I assume that, internally, they have a similar chart that says, "We need to have this many people this month," and so

on. You have no visibility to that and what their actuals are compared to that?

MR. REINER: All the work done by contractors is open book. We have access to anything and everything we need to look at. We don't get prescriptive in terms of their specific areas that they have accountability for, because what can happen under the contracts is risk starts to shift back to OPG.

What we would identify, if we saw an issue that might be tied to resources, we would say to the contractor, "Are you adequately resourced to perform the work?" And we would expect them to come to us with evidence that tells us that that specific issue is not related to resourcing. If it is, we would urge them to correct it. But we don't have a requirement for the contractors to report to us their resourcing plans and how they staff. That's their accountability to manage.

MR. ROSE: Just to add on that, our product managers which are overseeing the contractors day to day and have weekly product meetings, they're looking at metrics. They're looking at what the resource needs are for the coming weeks. They're interactively having those types of conversations on a working level continuous basis to make sure the contractors have the appropriate resources to do the work in front of them. So that is -- we might not have all the rolled-up reports, but our project managers who are overseeing the contractors certainly be engaged in those types of conversations.

MR. RUBENSTEIN: So because it takes time for you -- as Member Fry was exploring with you, there is a lead-up time before they start to work. I assume it's a similar thing for the contractors; correct?

MR. ROSE: That's correct. And if I could point you to some evidence that we filed recently under undertaking J1.3, page number 2.

MR. KEIZER: I want to make sure -- I think that wasn't filed in confidence, that whatever we're referring to -- there is no confidential information on that page thankfully, so we can keep going.

MR. ROSE: Thank you for clarifying. Section B talks specifically to a couple of these questions that you've asked. So if I read:

> "Considerable progress has been made in recruiting the necessary people to support the project. Approximately 200 have been hired since staffing levels were reviewed in April by the RCRB."

So fairly comparable to my earlier comment. It then goes on to talk about on-boarding process:

> "The time to hire current security-cleared augment staff has been reduced to approximately 23 days. The overall on-boarding process is more efficient."

So we have a full on-boarding process in place that we on-board employees in time for the date they need to be in the field. We've been working at making that process as

efficient and streamlined as we possibly can, and the RCRB are recognizing some of those efforts and improvements that we've made.

MR. RUBENSTEIN: Is that your people or the contractors' people?

MR. ROSE: The on-boarding process is mainly contractors, but also our people.

MR. RUBENSTEIN: All right. I want to talk about everybody's favourite topic, contingency. A number of parties asked you during IRs to write various confidence-level scenarios, and you provided a couple in AMPCO 72 and SEC 27. That's on pages 18 and 19 of our compendium. Do you see that?

MR. ROSE: Yes.

MR. RUBENSTEIN: And then, on page 21, sort of just put them all together and charted it out. And I think, Mr. Reiner, there's discussion with panel 1B -- this is the hockey stick that Mr. Mondrow was talking to you about; correct?

MR. REINER: I think that's what he referred to it as, yes.

MR. RUBENSTEIN: That's a pretty accurate description of the shape.

And as I look at this, you are the third -- you would be the third from the right. That's where we are. That's the P90 we're talking about?

MR. ROSE: That's correct. The P90 is at the $1.7 billion mark.

MR. RUBENSTEIN: All right. So just before the real jump in contingency; correct?

MR. ROSE: That is before the -- yes. And as you get to that, you know, at that point of high confidence, the -- you know, it becomes no longer economical to carry those risks. You're assuming that everything will go wrong, which isn't a reasonable assumption, and, quite honestly, the only thing I would comment on here is that -- I know you're at 99 percent. I don't know you ever get to 100 percent probability in a case like this. It would go on infinitely. But --

MR. RUBENSTEIN: Yes. I think that's -- yes, it would be an infinite number.

And if I asked you to turn to page 26, this was essentially a similar chart I talked about on panel 1B. It's the same table, Figure 3, and this was the execution phase cost build-up, and it shows $12.8 billion, which includes contingency, and then there's the management reserve. And as I understood with my discussions on panel 1B with you, Mr. Reiner and Mr. Lyash, was -- the point of that was to essentially show the Board that there could be some -- there are these long-tail risks, and we wanted them to understand what that is. But we're not including it in the 12.8. We're not seeking approval for that; correct?

MR. REINER: Yes, that's correct.

MR. ROSE: Just to clarify, Mr. Rubenstein, this reference here is not actually the final document that formed the basis of the unit 2 estimate approval. This was

an interim document in, I believe, August of -- or earlier -- sorry? October 1st, prior to our final. So there was some reviews that were going on right up to -- so this is not the final document. This was a preliminary view of that.

MR. RUBENSTEIN: But the total program estimate is the same, 12.8.

MR. ROSE: 12.8 billion, right, and -- but if you looked at this chart in the final business case, you would see that there are changes to it, including the removal of the managed reserve -- management reserve to the right of that 12.8.

MR. RUBENSTEIN: Sure. My understanding from Mr. Lyash was not that you were including it this time. It was -- at least as I understood, his testimony was simply just to sort of explain to the Board that there may be something else that you're not including?

MR. ROSE: There are management reserve items, low-probability, high-consequence items. They're very difficult to predict and are not included in the $12.8 billion estimate.

MR. RUBENSTEIN: All right. And if we turn in AMPCO 103 and if we turn to page 28, line 5, you were asked about the management reserve, and your -- and you say at line -- and I'm starting at line 5, sorry:

> "It is difficult to assess the impact of such events. However, OPG's assessment concluded that these low-probability events, if they did occur,

may result in a project cost impact of up to $800 million."

Do you see that?

MR. ROSE: Yes, I do.

MR. RUBENSTEIN: And I take away from that what you were saying is if all -- if these things -- these low-probability events all occurred, it would cost about $800 million.

MR. REINER: No. That -- that's not what that refers to. So we ran some specific scenarios, because it's very, very hard to even speculate what the occurrence of every event might be. So we ran some scenarios that could result in an $800 million push in cost. And those scenarios, they are in evidence, and we can point you to them.

There were three specific scenarios that we ran. One of them included a -- if there were a schedule delay of 1.7 years on the project, we ran into something unforeseen on execution of the project, that could result in an $800 million cost push.

We looked at another scenario that said, if interest rates and inflation rates were a percentage point above our assumptions for the entire duration of the project, that could result in an $800 million impact, and there were three specific scenarios that we looked at to derive that $800 million number.

The third one that we looked at, we said, you know, if there were -- if there were an international nuclear event that resulted in some requirement to invest in safety-

related systems, given the investment we made to get Darlington to the current standard, which is -- which reflects past events like the Fukushima event, that could result in an $800 million investment in safety system improvements in Darlington. That's how we got to this number.

MR. RUBENSTEIN: All right. Thank you very much.

If we can turn to page 29, this is AMPCO 72. And in panel 1A, there was a lot of discussion about the contingencies, and you were similarly taken to this interrogatory, I believe, and you were asked, "Well, what type of contingencies are built into some of the contracts?" And in Part F, you respond, and as I understand it -- so for the target price contracts, for the RFR contract with the JV, the execution phase target class is 371 million, and the turbine generator EPC contract is $28.4 million; correct?

MR. ROSE: That's correct. For four units.

MR. RUBENSTEIN: And, as I understand, for the fixed-price contracts, you would have no visibility. Obviously there is some contingency that the contractor would have built into their winning bid, but you don't know what it is exactly.

MR. ROSE: That's correct.

MR. RUBENSTEIN: But it's fair to assume there's something in there for a contingency?

MR. ROSE: That would be an assumption.

MR. RUBENSTEIN: Is it a --

MR. ROSE: It's a fair assumption, I believe.

MR. RUBENSTEIN: So if we add the RFR and the turbine generator EPC contracts, target cost contingency that's built in, we get -- and we add that to the $1.7 billion in contingency that you have built into your part, am I correct then you would get $2.1 billion in contingency that we know of? Is that fair?

MR. ROSE: Based on that math, yes.

MR. RUBENSTEIN: And, as we've discussed in 1B, there's no -- you've made sure that there is no double counting.

MR. ROSE: That's correct.

MR. RUBENSTEIN: And so if we take a look at -- for example, on page 31 or 32, this was an RQE estimate. We look at the subtotal before interest in the -- sorry, the subtotal before interest and escalation. It's about $10.4 billion; correct?

MR. ROSE: That's correct.

MR. RUBENSTEIN: So if we know that there's $2.1 dollars of explicitly contingency and the cost is $10.4 billion, both before interest and escalation, that's over 20 percent of the cost that we know of is contingency; correct?

MR. ROSE: That is correct. And I think that's reasonably comparable to what the Association for the Advancement of Cost Engineering would expect for a Class 3 estimate, which has got an upper bound of 30 percent.

MR. RUBENSTEIN: Now, if we go back and we talk about,

say, the RFR contract, the $371 million contingency, am I correct that is at a P50 estimate?

MR. ROSE: That is my understanding of how the RFR was estimated. That's correct.

MR. RUBENSTEIN: And then you take the contingency that you've layered on or assigned to that. You've taken it from the P50 to the P90.

MR. ROSE: For the risk that OPG is managing and owning just separately from those risks that the joint venture is owning, we have added contingency for those risks. That is correct.

MR. RUBENSTEIN: All right. If we can go to page 33 of the compendium. This was AMPCO 44. And essentially it's asking you the P50 for the RFR contract, and in Part B, it says:

> "Please explain why the P50 analysis was selected."

And you say:

> "P50 means that, all other things being equal, there is an equal probability of the final result being better than or worse than the calculated outcome. It would not be appropriate when negotiating a contract for either party to aim for higher than P50, as that would imply that one party was attempting to achieve greater certainty at the expense of the other party taking on more risks. P50 is a standard analysis based on AECL international recommended practice number 18R97."

Do you see that?

MR. REINER: Yes.

MR. RUBENSTEIN: So between OPG and the contractor, P50 is appropriate, but between OPG and the ratepayers, P90 is appropriate? Do I understand that?

MR. ROSE: Between OPG and the contractors, P50 is correct. For us, as good project managers trying to put forward a business case that provides confidence to our board of directors and our shareholders, P90 is reasonable. And the reason for that, Mr. Rubenstein, is when we're negotiating with a vendor -- in this case, the joint venture vendor, which is setting a target price -- we were motivated to make sure the amount of funds in their target price was as low as we could get it to. So by putting it at P50, we drove that down.

In recognizing that, and for us to be confident to our board and shareholders that we're building and delivering this project, we included additional contingency to P90, which we believe is reasonable. And all the folks that have come in, the experts that have reviewed our RQE, also believed it to be reasonable.

MR. RUBENSTEIN: I want to understand this. It confuses me, and I don't understand it. Between you and the contractor, P50 is appropriate. You don't want to give anyone more -- the appropriate allocation of risk. But between OPG and ratepayers, you need to have more contingency built in. Why doesn't the exact same principle apply, and it should be P50 between the ratepayers and OPG?

MR. REINER: I wouldn't say we need more or we need less. Our proposal that we're putting forth is that we have a high degree of confidence we can execute this project within a 90 percent probability. The actual costs will be the actual costs, and the variances will then be held in the CRVA, in OPG's space.

There isn't that kind of mechanism between contractor and OPG. The contractor earns a profit margin associated with the work they do, and they put that profit margin at risk if they perform the work at a higher cost than what we landed on in that negotiation at P50, and they have the opportunity to earn more if they can bring it in at a lower cost. That's not the same construct that we have with the ratepayer. So I don't think you can put the two side by side, and if it's good with the contractor, why is it not good with the ratepayer. I think are two very different things.

MR. RUBENSTEIN: If the JV came to you and said, "Actually, we think a P90 is appropriate instead of a P50 for the project. It's a complex project, and we want certainty. We think P50 is not appropriate for work of this magnitude and this difficulty," would I be correct -- and you must have -- if you didn't agree with it, you wouldn't have accepted that?

MR. REINER: We would not, because it could create a situation for us. Ultimately, as the owner who would bear the risk, it could create a situation where there isn't sufficient attention paid to the performance of the project

and to resolution of the issues.

We spoke in panel 1A about the need in the management of this project to be able to identify issues early, rectify them early. If you manage to a P90 level inside the contractor space, we may not get that kind of visibility into those issues. So the place that we opted to land with the contracts is to create that transparency, create that tension that recognizes there is a 50 percent likelihood this could go over budget so we always have visibility and focus on the issues that are being managed.

MR. RUBENSTEIN: Why shouldn't ratepayers expect the exact same thing from OPG, that you're going to ensure that you're managing to a P50 budget?

MR. REINER: I think what ratepayers should expect from OPG is that we deliver this project at the lowest possible cost. What we put forth is we're highly confident we can do that inside the P90, but the ratepayer will only ever pay the actual cost. And everything that we have put in place here ensures that's done at the lowest possible cost without -- and we talked about this in panel 1A -- without compromising safety, without compromising the quality of the work that needs to be done, and without descoping the project, because that would create downstream risks for the operation of the plant.

MR. RUBENSTEIN: If we can flip back to page 30, this is AMPCO 72; we can use this as a guide. As I understand it, you've categorized risks into three buckets: cost uncertainty, discrete risks, and schedule uncertainty risk.

Is that correct how you've done that?

MR. ROSE: That's correct.

MR. RUBENSTEIN: What's the difference between a discrete risk and one that has schedule uncertainty or cost uncertainty? What's the distinction?

MR. ROSE: Discrete risk is, in essence, an event that has a probability of occurrence, and if that event occurs, there is a consequential cost to the project, where cost uncertainty and schedule uncertainty are ranges of uncertainty within the base estimate, whether it be cost or base estimate being schedule.

So I scheduled something to be ten days. It could be done as early as nine or as late as twelve. That's schedule uncertainty. I'm going to buy a widget at $100, but I may get lucky and the cost may be $90 or as high as $110. That's cost uncertainty.

MR. RUBENSTEIN: So you have the three types of risks when you split the contingency into project and program; correct?

MR. ROSE: That is correct.

MR. RUBENSTEIN: And all the amounts are at a P90 level; correct?

MR. ROSE: The $1.7 billion is P90. That's correct. And each of the amounts that are distributed to the projects are at their P90 amount.

MR. RUBENSTEIN: Were you always planning to do the P90?

MR. ROSE: Yes. I've been on this project since 2008.

Our feasibility estimate and our charter at the time was for us to put forward a business case that was of high confidence that we wanted to make sure that what we could do. We had high confidence in our ability to deliver it. So that has been our motivation as far as I can remember.

MR. RUBENSTEIN: Did high confidence mean P90 always?

MR. ROSE: That's how we translated high confidence to P90, and that has been -- P90 has been a formal part of our discussions with our management team, our board of directors, and others ever since that time.

MR. RUBENSTEIN: If we can turn to page 35 of the compendium, this was a presentation Mr. Ryan Smith gave on June 24, 2015, and this was filed in response interrogatory asking you:

> "What did KPMG, who reviewed your contingency program contingency or your contingency process, what did they review?"

And this was one of the documents that was attached. This is dated 2015, and if we turn over to page 36, as I'm reading this -- and you can help me here -- it breaks down various types of uncertainties on risks into the P50 to P70 and then P70 to P90 and shows where those risks would show up.

Using an example, the cost estimate uncertainty for projects up to P50, that's in the project contingency, P50 to P70. That's in the program contingency, and P70 to P90 is in a management reserve. So do you see that?

MR. ROSE: I do.

MR. RUBENSTEIN: Can you help me understand? Because I see P70 to P90 for all the categories in management reserve, and yet, as I understood it, you're not including management reserve in the budget.

MR. ROSE: That's correct. This is a language problem. The presentation was prepared. What was interpreted here is that management reserve was the amount that our management, the CEO, would have at his disposal to approve. It is obviously confusing to what management reserve is, which is unknown unknown. So contingency, known unknowns, probabilistically derived to get to P90, is contingency. It is not management reserve. Management reserve is the unknown unknowns which are above and beyond, not including this analysis.

MR. RUBENSTEIN: So it's just an issue of using different language here than you use --

MR. ROSE: It was an issue that management reserve was that amount that the CEO -- we'd have to go to the CEO for release of funding. It was early adoption of how we were going to process our change management process.

MR. RUBENSTEIN: All right. Thank you.

At the highest level, the Monte Carlo simulation, what it does is you provide a set of risks with various probability that it's going to occur, what the cost will be, and then it runs a simulation with all that information doing the project over a vast amount of iterations and sort of provides you at each iteration what the end cost would be, and then you're able to determine based on that, you

know, what the P50 confidence level, that it would be -- a cost is and what the P90, and that's how you determine the contingency? That's, at the highest level, what the Monte Carlo simulation is attempting to do?

MR. ROSE: Correct. Monte Carlo is an industry practice that's used to assess probable outcomes of anything with different probabilities of occurrences. It's used in many industries for product management. It's recognized as a best practice, but, in essence, the application is many inputs. You get a tool that runs each of those inputs thousands of times and creates a curve as to, based on running all of your inputs thousands of times, at what value would you have at different levels of confidence.

MR. RUBENSTEIN: And let me ask you about that and how this actually works. The risks that you put into the Monte Carlo simulation, are those the risks -- are those risks that were from your risk register?

MR. ROSE: Some of. About -- just under 60 percent of our risks actually have contingencies associated with them. So what we do is, you know, again, good project management practices. We want to identify all risks that could foreseeably impact the execution of a project. Some of those risks can be managed with contingencies. Some can be managed without contingency.

I just give you an example. If I have a risk of having inadequate supply chain buyers on my project, I don't need to apply contingency to that, because they've

got money to have the right level of supply chain people. It's a risk that they need to manage, but it's not one that requires contingency; right?

About 50 -- I think it's 57 percent of our risks actually have contingency on them. So of those risks with contingency, we do three-point analysis, and they go into the Monte Carlo.

MR. RUBENSTEIN: When you say three-point analysis, can you explain that?

MR. ROSE: Sure. So I have a risk that has a probability of occurrence at 50 percent, and that estimate could be $100 if it occurs. It could cost me $100 medium case, $80 best case, $130 worst case. And that analysis is done at the discrete risk level based on the people who ultimately need to own and manage that risk but oversaw -- overseen by our risk management organization and assessed through multiple challenge meetings, et cetera, to make sure that those numbers are reasonable.

MR. RUBENSTEIN: Just a question of the Board, when it wanted to take its morning break.

MS. LONG: I would like to break around eleven o'clock, but if now is a convenient time --

MR. RUBENSTEIN: Yes.

MS. LONG: -- we can do that. And I would like to take 20 minutes, so we'll be back at 11:15, please.

--- Recess taken at 10:56 a.m.

--- On resuming at 11:21 a.m.

MS. LONG: Mr. Rubenstein?

MR. RUBENSTEIN: Thank you very much. I want to follow up with something we discussed before the break with respect to contingency. We were talking about the 1.7 P90 contingency, and that's 2.1 after the escalation; correct? 2.056, I believe, is the number.

MR. ROSE: That's correct.

MR. RUBENSTEIN: And, at page 30 of my compendium, this is the response in AMPCO 72. We have the target cost contingency for the RFR and the turbine generator EPC, 371 and 28.4. Are you able to provide what those numbers would be after you include escalation and interest so we have a like-to-like number with the 2.056 billion?

MR. ROSE: I think with some level of reasonability.

MR. RUBENSTEIN: Can you provide that?

MR. RICHLER: J3.4.

UNDERTAKING NO. J3.4: TO PROVIDE WHAT THE NUMBERS ARE FOR THE TARGET COST CONTINGENCY FOR THE RFR AND THE TURBINE GENERATOR EPC INCLUDING ESCALATION AND INTEREST

MR. RUBENSTEIN: Thank you very much. I want to ask you about the risk register and how that works. As I understand it, at a high level, the point of the risk register is to log all the various project risks that exist; correct?

MR. ROSE: We actually log both risks and potential opportunities.

MR. RUBENSTEIN: Can you explain what you mean by "potential opportunities"?

MR. ROSE: If there is an opportunity to actually reduce costs of a delivery, we would log that there as well. We have some risks in our tool that have a negative amount in them for an opportunity of reducing costs.

MR. RUBENSTEIN: All right. In SEC 26, we asked for your risk register, and you provided it on page 40 – just pulled sort of a couple of excerpts; specific pages are not meaningful.

Do these documents include the opportunities or just the risks?

MR. ROSE: I believe that they would include the opportunities as well, subject to check, but I believe that they would.

MR. RUBENSTEIN: As I understand it, it's a living document. Things are added and removed and updated all the time; correct?

MR. ROSE: Risk management is a living process. So yes, we would add new risks. We would retire risks no longer -- that are no longer applicable.

MR. RUBENSTEIN: I want to walk through an example, just to understand what this is. As I see how this works, in the first three columns, you have an ID, I guess, and then you title the risk and you sort of describe the risk; correct?

MR. ROSE: Yes, correct.

MR. RUBENSTEIN: And then we go over a couple columns and someone -- there is an owner of the risk and a delegate of the risk.

MR. ROSE: That's correct. The owner could be the project manager. The delegate could be the engineer who's responsible and closest to managing that risk.

MR. RUBENSTEIN: As I see, between the risk description and the risk status, you have an urgency score; correct?

MR. ROSE: That's correct.

MR. RUBENSTEIN: And if we turn to page 44 -- I want to make sure I'm mapping this correctly -- this is what you mean by the urgency score. Depending on what the score is, it's the response time you need to deal with the specific risk; correct?

MR. ROSE: That's correct.

MR. RUBENSTEIN: All right. And if we go back to page 44 and go across, we see the delegate and then the risk, the date last reviewed, and then we have the risk response type. Do you see that?

MR. ROSE: Yes, I do.

MR. RUBENSTEIN: If we turn to page 50, is that the same thing as risk treatment? Is that the same thing as risk treatment on page 50?

MR. ROSE: Yes, it is.

MR. RUBENSTEIN: And what this is showing is you have a risk; you have the urgency of the risk; and then you categorize the risk into what you should do about it. So you can avoid the risk by doing some action. You could transfer the risk to another entity. You could mitigate the risk by taking some action, simply accept the risk, or

you can sort of monitor it.

Do I understand that's how you would categorize those?

MR. ROSE: That is how -- that is standard terminology used in the industry which we applied for this project, yes.

MR. RUBENSTEIN: Jumping back to page 40, if we go down to current, you've broken the risk down to the probability, the financial impact, the schedule impact; correct?

MR. ROSE: That's correct.

MR. RUBENSTEIN: And if we turn to page 43, this is from your nuclear refurbishment risk management and contingency development guide. This is what we're talking about. So, for financial impact and schedule impact, this is how you defined it, that residual risk would be aligned pretty much to post.

MR. ROSE: All right. I'm -- probably need to explain it to me again.

MR. RUBENSTEIN: For the purposes of the Monte Carlo simulation, I guess outside of the obvious risks that you've built in, when you have to take specific mitigation activities that you list -- I mean, there are hundreds of pages of the -- there's -- I mean, there's hundreds of -- hundreds and hundreds of risks. Are you using what the risk is at the time, or, if you undertake those specific planning activities to mitigate the risk or avoid the risk or transfer the risk, is that what gets plugged in?

MR. ROSE: Again, I know I'm not doing a great job,

and I'll try again. I think it depends a little bit. If -- the goal would be to put in your base plan the cost to mitigate that risk, and what you would carry in your contingency is the cost to mitigate that risk if the risk did occur. There are times, though, based on where you are in the project, that it may not -- it really -- you have to look at what's in the base estimate and what isn't in the base estimate to manage that risk. Generally speaking, we want the base estimate to include the cost to mitigate that risk, where the contingency is the risks associated with your inability to mitigate -- fully mitigate that risk.

MR. RUBENSTEIN: So, in the Monte Carlo simulation, you do not always build in activities to mitigate risk. You may do them later. It may be put in the risk register, but it's not built in necessarily into the Monte Carlo simulation.

MR. ROSE: I can't -- I'm thinking through different scenarios in my head, but if I have a schedule risk -- for example, let's talk about the three different types: discrete risk, schedule uncertainty, cost uncertainty.

In the case of the schedule risk, my expectation is that my base plan is how I'm going to do that job, right, you know, execute that in ten days. There could be productivity issues or other risks that could take me to 12 days. That difference between that ten, which would be my planned duration, and that 12, which is the contingency in case it happens, would be in the contingency amount.

MR. RUBENSTEIN: All right. Now, is my understanding

-- and I think we had offline discussion with OPG staff -- that the risk register that was provided in attachment 3 to SEC 26 is the latest one we have on the record?

MR. ROSE: That is my understanding.

MR. RUBENSTEIN: My understanding, so that would have been -- I believe, based on some of the dates here, that would have been from the fall when the IRs were provided; correct?

MR. ROSE: So this actually says -- are you referring to the bottom left? It was run on August 21, 2015, so I would have to check if we provided you a different run date after that. Just hold on one moment while we pull up that IR, that full IR.

MR. KEIZER: I'm just going to clarify that, Mr. Rubenstein.

MR. RUBENSTEIN: I ask only -- just to give you the background here, there is another one provided in Staff 73, attachment 7. I was just trying to -- you know, maybe I misunderstood what --

MR. KEIZER: No, no. I think the one in Staff is not the one. We just want to confirm whether attachment 4 is -- I believe to that...

MR. ROSE: So correct. I'm reading -- do you have the response to Part F? Maybe I'll wait. So Part F says -- so this is 4.3 -- I think it's your page 39 of your compendium, the top, line 1 -- risk register at the time of the Monte Carlo simulation at RQE, and the conversation are provided at attachment 3 and 4. So my assumption is that

attachment 3 is the one we run at the time of the RQE, and the current risk register is attachment 4.

MR. RUBENSTEIN: All right. Thank you very much.

And as we move through the project -- I'm not asking for an average. Just give me a -- if we sort of look at each iteration from whatever would have existed, the RQE, versus what would exist today and anytime in between, are there -- are you -- are there more things in the risk register, or is there less risks in the risk register? Like, are you removing things as you mitigate them out or transfer them?

Let me rephrase that. Are there -- would there be more red risks, the ones that are at the highest level, today than there would have been a year ago?

MR. ROSE: So I have got to say theoretically in my response, and I think that's what you're asking for. As a project goes on, two things happen: Work gets done. Certain risks either trigger; they occur; or they get retired with no occurrence. As the project goes on, there are new risks that weren't envisioned at the start of the project that may get added.

And as you get to closer to the end of the project, and one of the things that drives the red is urgency. So there may be times where you would get a risk that is red solely because of the urgency related to it, but generally speaking, as you go on and you -- the project -- there's less work to be done. Generally speaking, your risk exposure totally should be declining.

MR. RUBENSTEIN: At the time of the RQE estimate versus, say, today, would you say the project is riskier or less riskier?

MR. ROSE: At the time of the RQE project the project was riskier, and for one main reason. Our planning wasn't completed -- sorry, at the time of RQE estimate was the project riskier than it is today?

MR. RUBENSTEIN: Yes.

MR. ROSE: I think, again, I haven't -- this is a theoretical response. My response would be I believe it's less risky, because there are certain things that we've closed off since RQE. And, as an example, the unit 2 contingency went from 694 to 677 in that time frame.

MR. RUBENSTEIN: And if we talk about mitigating risk, you've taken mitigated risks -- you've mitigated risks since the RQE estimate; correct? You've lowered risks; you've done activities to lower those risks?

MR. ROSE: Since the RQE estimate, there would be risks that have been mitigated. There would be new risks that have occurred. There would be risks that triggered for amounts different than we would have had in the original contingency. It's a living process, and, every day, risks get retired. New risks may come to be.

MR. RUBENSTEIN: If we ran the Monte Carlo simulation again with the risks as they exist today, do you think the contingency would have been higher or lower based on than on where we are with the RQE estimate?

MR. ROSE: I can't answer that without -- I don't have

an easy answer to that question.

MR. RUBENSTEIN: Directionally?

MR. REINER: I would say if -- directionally, it's probably not significantly different. As Mr. Rose said, it did drop from 694 to 677, but it is too early in the project to start to trend which way it's going.

MR. RUBENSTEIN: All right.

MR. ROSE: Defuelling, as you noted -- and we noted that we do that less than the working schedule. Since that time, we've been completing all preparations, and as was discussed in panel 1A, we are -- it's taking a little bit longer than we had planned, so there's some gives and takes in the flow, which is to be expected in the -- through the process of managing a project.

MR. RUBENSTEIN: Okay. If we can turn to page 53 of the compendium, response to CCC 18, there was discussion on panel 1A, as you will recall, Mr. Reiner, about, if the Board determines we want to use a different P confidence level for the contingency amount, how would we -- what would that be for unit 2? And this, as I understand, answers that question. I think we've talked about this interrogatory before. And it provides what the P50 would be based on the original numbers for just unit 2 if it was at P50 level. Am I correct? This is Part B, beginning at line 37.

MR. ROSE: Yes, that's correct.

MR. RUBENSTEIN: Am I correct that the way that you've come to that number is essentially applying the 40 percent

factor? So that, if the Board said, "Well, maybe not P50, we want P60," it could use the same mathematical calculation, put in the numbers, and you'll get to that amount, where, instead of 1.4, you'd put in whatever the P60 number is?

MR. ROSE: I think what we've done is we've taken the P50 of the four units against the total cost and prorated against the estimate in the RQE.

MR. RUBENSTEIN: My understanding, then, would be, if the Board wants to use a number besides P90, it would simply be the same proration that the Board should apply?

MR. ROSE: What do you mean when the Board wants to use a number different than P90?

MR. RUBENSTEIN: Say the Board says, "We think P60 is the proper number. We have P60 at a four-unit level; we want to get to a two-unit level for the in-service additions in the test period"?

MR. ROSE: I think we provided -- this is -- we provided values at P50. We've also provided values at P60 at different intervals. If I was to pick one of those intervals, I would use that number from the RQE and then do the same formula. I wouldn't take P50 and weight that to P70. I would take the P70 number from the RQE and then apply that --

MR. RUBENSTEIN: I understand and I agree. I just wanted to -- what you're saying, then, is the same proportion that you used at P90 between unit 2 and the full contingency, the Board could use the exact same proportion

to determine at any other P confidence level. That's how it should do it?

MR. ROSE: I'm responding to whether that mathematical -- I'm not suggesting you should or shouldn't do it. But, yes, I would apply the same formula.

MR. RUBENSTEIN: Should it do that if the Board says, "We don't think it should be P90 it should be some number less"? How would you advise the Board to determine how it should change the actual dollars for unit 2?

MR. ROSE: I think -- notionally, I think you're right. But I would rather -- if you're asking me that question and want to know how I would apply it at P70, I wouldn't want to just give you that answer now. I would want to think about that and take an undertaking and respond to that.

MR. RUBENSTEIN: Would it be the same for P50, then? Would you like to think about the P50 answer as well?

MR. ROSE: I believe this is the P50; right?

MR. RUBENSTEIN: But it's just taking a proportion, so I understand --

MR. ROSE: It seems reasonable, Mr. Rubenstein. But without going back and looking at the numbers and doing that calculation, I wouldn't want to just say, yes, that's the way to do it.

MR. RUBENSTEIN: Can you, I guess, take an undertaking to think about how the Board should approach this question?

MS. LONG: Are you asking with respect to P50, or are you asking with respect to P60 or 70? What are you asking

there?

MR. RUBENSTEIN: I think the question would be: Is there a rule the Board should apply that it could mathematically determine, or is it -- it would have to change based on the confidence level?

MS. LONG: You're asking for the methodology to get to unit 2 at an alternate P level, let's say?

MR. RUBENSTEIN: If there is a methodology. If not, you can tell us that.

MR. RICHLER: J 3.5.

UNDERTAKING NO. J3.5: TO PROVIDE THE METHODOLOGY TO GET TO UNIT 2 AT AN ALTERNATE P LEVEL, IF THERE IS ONE. IF NOT, ADVISE THERE IS NO METHODOLOGY

MR. RUBENSTEIN: I want to move on from contingency and talk about the contracts themselves. As I understand the prime contractor model you've selected, you have multiple prime contractors doing different pieces of work at different contract structures. Do I understand that correctly?

MR. REINER: That is correct, yes.

MR. RUBENSTEIN: And, at page 58, you've broken down the categories, the large categories that you have, and what I see is 52 percent of the contract costs are in target price contracts; 32 are at the cost plus mark-up; and 16 are at the fixed price. Do I have that correct?

MR. REINER: That's correct.

MR. RUBENSTEIN: And if we go back to page 57, Figure 1 is attempting to show the trade-offs between the various

contract structures; correct?

MR. REINER: Yes. So that figure tries to illustrate the model that we utilized to determine what type of a structure to utilize for the work that looks at -- looks at risk, whether it lies with the contractor or whether it lies with the owner, and then looks at potential risk mitigation fees, and provides a bit of a guide in terms of how the contracts land based on those parameters.

MR. RUBENSTEIN: If we flip to page 56, we see the major contracts, the models, and the values of the contracts; correct?

MR. REINER: Yes, that's correct.

MR. RUBENSTEIN: The single largest by far is with the SNC-Aecon joint venture for the RFR project work bundle; correct?

MR. REINER: Correct.

MR. RUBENSTEIN: While there's a fixed price and a cost mark-up component, the majority -- a significant portion is in the target price; correct?

MR. REINER: Yes. The execution phase of that contract is done under the target price, and a portion of the definition-phase work was done under that same model.

MR. RUBENSTEIN: And as I conceptually understand how the contract work is that there is a fixed-fee amount to be paid and a target price to do the work and a target schedule to do that work. And, at the end of the day, if the contractor gets paid for what they actually do with the work, what it actually costs, and then if it's more than

the target price, then they get an incentive, and the fixed amount increases. And if it's less than the targeted cost and it's behind schedule, that fixed amount gets -- they have to pay a disincentive, and that fixed amount is less. At a high level, that is my understanding of how that contracts works.

MR. REINER: Yes, one minor correction. I think you had it backwards. So if it takes longer or the contractor's cost is higher than the target price, they earn less fee. If it's lower, they earn more. So the incentive drives the contractor to do better than the target.

MR. RUBENSTEIN: Thank you for correcting me. I would hope the contract is not structured the opposite way.

If we go to page 62, starting page 62 of the evidence, you provided simple illustrations in the prefiled evidence of, well, what happens if there is a cost overrun and a cost underrun; correct? This is what this is trying to simplistically show?

MR. SAAGI: That's correct, using simplified assumptions.

MR. RUBENSTEIN: We had asked you at SEC 15, page 66, essentially to run some further illustrations of different cost overrun amounts, and you see that up until page 69; correct?

MR. SAAGI: That's correct. Again using the simplified assumptions.

MR. RUBENSTEIN: If we turn to page 70, what I've

attempted to do is to put that all on one page so we can get an understanding what this looks like. Do you see that?

MR. SAAGI: I do.

MR. RUBENSTEIN: As I understand what this looks like, and help me here, and we can see the last two columns are the important part, the variance borne by the contractor, and ultimately the variance borne by OPG that it has to pay, and I would assume it would seek from ratepayers. Do you see that two columns?

MR. SAAGI: I do.

MR. RUBENSTEIN: And what I see is that if there's a small cost overrun, a higher percentage is borne by OPG, and it gets lower and lower. But then it sort of creeps up again as we get to significant cost overruns at 100 percent. Do you see that?

MR. SAAGI: Yes, I do.

MR. RUBENSTEIN: All right. And, on page 71, we did the exact same thing. But I only looked at the execution phase, which is broken out in the -- it's broken out in those examples, if we can turn to page 71. And what I see here is that when it comes to execution phase costs only, if there's a small cost overrun, OPG has to pay 77.27 percent. And, again, it decreases, but then as we get to large cost overruns, it increases again. That's the shape, and that's the risk allocation between OPG and the joint venture. Am I correct?

MR. SAAGI: That's how it's illustrated on here based

on the scenarios that were requested at the time of evidence and using the assumptions that were put forth in evidence with the interrogatories.

MR. RUBENSTEIN: Is this generally what would happen? Target price cost overrun of 1 percent, OPG is going to bear 77.2 percent on the execution part, and --

MR. SAAGI: So I think what we can do, if we turn to a couple of the examples -- or a couple of -- of the evidence, ED 4, I think if you can pull up ED 4 on the second page -- you can just pull that up -- we list through some simplifying assumptions, which I think is important for us to understand.

MR. RUBENSTEIN: I think part of this one is -- ED 4 is confidential, if I recall correctly.

MR. SAAGI: Okay. So I can read out the non-confidential pieces for the record. But it goes on to state that:

> "In order to respond to this undertaking, which SEC 16 is predicated on, OPG has adhered to the assumptions requested but which OPG does not view as reasonable. And, specifically, OPG was asked to assume that all contingency is spent before applying the cost overrun percentages. OPG does not believe that this is appropriate. Contingency would be used to offset the risks and cost growth in executing the DRP and should be first reduced to zero before cost overrun percentages are applied."

Secondly, it says:

> "OPG has artificially prorated all the functional costs, including project management associated with each major work bundle, by the cost overrun percentage. It does not believe that this is reasonable, as the functional cost would be unlikely to grow at the same proportion as the cost in the major work bundle and that the scenarios include all costs, including ones that are incurred to date."

And we can further go into --

MR. RUBENSTEIN: I'm going to stop you, because my understanding of this is ED was asking you your total -- all your costs, and the numbers I put in front of you were based on the same methodology used, and it was simply between OPG and the JV with respect to the contract, not any other added costs. Am I correct about that?

MR. SAAGI: Correct. And if we go to the evidence on D223, they do again highlight some of the simplifying assumptions that are there, and the one probably the most specific to this example would be the structure -- the assumption around the disincentive amounts, which we used a 20 percent factor rather than what was in the contract, which is a more creative approach, which goes from 10 percent to 50 percent. Applying those types of percentages or disincentives would cause you a different curve than those that are illustrated by your handout.

MR. RUBENSTEIN: So help me understand this. Instead

of talking about, you know, very, very specific numbers, if we just sort of talk about where on the curve we're talking about in terms of varied contract price, if there is a 100 percent cost overrun, the target price is double what you expect is OPG based on -- if we don't use the simplified assumptions, would OPG, with respect to the contract part only, not on other costs, bear more or less than the simplified assumptions you have made of 66.28 on the execution?

MR. SAAGI: So I can't do that analysis quickly in my head. That contract is, you know, quite complex and would require some calculations. I think the 100 percent scenario is -- you know, that's quite aggressive. We wouldn't, you know -- you know, these were scenarios that we were requested to provide through evidence and interrogatories, but to give you a specific answer on if the simplified assumption of 20 percent is higher or lower than what the specific contract says, I would just be guessing.

MS. LONG: Are you able to answer that question, I guess, just more generally or conceptually, as you get to the higher end of cost overruns, say 80 percent to 100 percent, that OPG is bearing greater risk than the contractor is?

MR. SAAGI: So what happens in these scenarios, why you see the curve come up, is the cost disincentive cap would have been achieved. So there is a cap in the contract that states that 48 percent of the fee is limited

for the cost disincentive, and that's why also the cost -- that line, you know, brings the OPG's percentage higher.

But what this thing -- what the modelling doesn't factor in is if the cost increases were related to any type of rework or warranty work. Those weren't modelled in the contract. So we're talking a very significant cost overrun where we're at the 100 percentage amounts, and it's very, very likely that we're into a very large schedule as well, push.

MR. REINER: Just -- maybe I can chime in here. So the modelling -- I think the curve would do that on the tail end, as Mr. Saagi suggested, because of the caps that the contractor eventually hits on the targets that were negotiated.

In reality, if we had a 100 percent cost overrun, we would have made some decisions well in advance that would have made adjustments. We would not allow just the work to progress and the contract to progress in that form. And that is why -- you know, that's also one of the reasons why we are more aggressive with the P50 contingency in the target price, so we have that visibility into the work. But if we start to see the contractor get into disincentive space, our expectation is that corrective actions get taken.

So, really, the contract is intended to work effectively in a much narrower range of cost overruns. If we got into a significant cost overrun, that is why we built in things like termination for convenience, options

to allow us to exit. We also have the ability to direct the contractor and give specific direction if we got into scenarios like that, and you would not see this sort of an event unfold. It's the outcome of the mathematical modelling, but I don't think you can draw a connection to an actual scenario here.

MR. RUBENSTEIN: No. I understand the scenarios -- you know, many things will occur when there are cost overruns, and you're going to do many actions. I'm just trying to understand how the contract itself is structured. I recognize large cost overruns, you're going to do lots of different things outside of the structure. But I'm just trying to -- the questions are just trying to understand how it's built.

So putting -- working on the simplified assumptions for a second and understanding you get larger cost overruns; you hit those caps; and you sort of can't pull anything -- you can't take anything away anymore from the contractor or less, am I correct that. on top of that and before that, before the risk and the actual contract, OPG will be spending other money if the -- to deal with issues? So if the contract goes long and they're delayed, you'll need -- more project management staff will have to work longer than you had budgeted, and if the cost -- for whatever reason there's significant issues, that will require increasing of OPG's resources, so there will be a further added cost. Is that correct?

MR. REINER: A schedule extension carries a cost,

absolutely. There is an OPG overhead cost associated with schedule. There is a project management team that needs to get paid. So, yes, there are OPG costs.

Now, up to the 90 percent confidence level, those costs are all in contingency, and when we do all of the risk modelling, including the work the contractor executes, our modelling, factoring in everything we know about the job -- all the things that could go wrong, all the historic optics that we have, and the steps we took to mitigate -- we would never get into a scenario that pushes us to the 100 percent cost overrun range or even close to that.

MR. RUBENSTEIN: So forget about 100 percent. We're talking a 10 percent cost overrun range. And would I be correct that besides the -- on top of contractor issues in the costs that you would incur that would be directly as a result of the contractual provisions, the cost consequences are much broader, as it will affect other OPG costs or outside of those contracts will also increase?

MR. REINER: Yes. If you were looking at a 10 percent overrun on this contractor and if I were just to -- so hypothetically speaking, that could take our 35-month working schedule to 37 or 38 months. There is costs associated with that, but it is included in our 90 percent confidence level. It isn't in addition to the 12.8; right? It is already included in our contingency.

MR. RUBENSTEIN: You have a number of contracts that are extended service master service agreements using that model. Am I correct?

MR. REINER: The extended service master services agreement is a slight variation of this model. It's not exactly the same in the extended service master service agreement. The contractor puts a portion of their fee, their profits and their overheads into what we call a fee pool. And then there is a scorecard that is utilized to determine how much of that fee pool is paid out, and the scorecard looks at four primary factors. It looks at safety performance. It looks at human performance, so events caused by execution of work, and then it looks at cost and schedule. So it's a little different than the RFR contract, but also has an element of profit and overhead that is at risk.

MR. RUBENSTEIN: Maybe I should be clear. Moving on to a different question about the ESMSAs, I wasn't trying to compare them to the RFR. As I understand, for the balance of plant bundles, you have a number of these agreements. Am I correct? I believe there are three contractors who have ESMSA agreements. Am I correct?

MR. REINER: Yes, there are three contractors that we have contracted under that ESMSA contract.

MR. RUBENSTEIN: You have Black McDonald, E.S. Fox, and the joint venture. Is that correct?

MR. REINER: That's correct.

MR. RUBENSTEIN: When we talked about the H20 project a while back, I believe it was under an ESMSA contract.

MR. REINER: The D2O storage project is being contracted under ESMSA contract, yes.

MR. RUBENSTEINL And when Black & McDonald was removed and the joint venture got the work -- how does it work? Do you essentially say to the two remaining contractors, under this provision, to bid for the work, or do you just select one? How does it work?

MR. REINER: So there is an option for us to do either of those. We could ask them to bid on the work, and we could make a selection based on that bidding. The bidding would, in essence -- because the ESMSA contract already defines key terms and conditions, it would be essentially a price and a schedule for completing that job, or we could also make a decision based an our own assessment of which contractor is most capable and suited to be able to execute that work and do an assignment to that contractor.

MR. RUBENSTEIN: When you first determined who was going to do the various balance of plant projects, is that what you did with the three contractors?

MR. REINER: When we initially started with the ESMSA contractors on those facility and infrastructure and safety improvement projects, we actually had two contractors under contract at the time. It was Black & MacDonald and E.S. Fox, and those projects were -- they were largely awarded through a sub -- a competitive process within that contract framework.

MR. RUBENSTEIN: All right. I want to move to another section. I want to talk about other projects, what we've learned from some of those other refurbishment projects.

At page 75, AMPCO 53 -- I think this was shown to you

on Panel 1A. This is page 76, and you provided a table of other CANDU refurbishments, as I understood it, and the planned and actual duration and the actual costs. That's what this table is demonstrating; correct?

MR. REINER: I'm sorry, Mr. Rubenstein. Can you please repeat that?

MR. RUBENSTEIN: My understanding is the table on this is -- you were asked to provide, with other various CANDU refurbishments, to fill out this chart. And it shows how many units, the planned versus actual duration, and the planned versus actual cost; correct?

MR. REINER: Yes. Based on publicly available information, that's what we did here, yes.

MR. RUBENSTEIN: And you'd agree with me -- I think this was discussed before -- they tend to be more expensive than originally forecast and tend to take longer to actually do; correct?

MR. REINER: Yes. So Wolsong, I had indicated previously, I think, was actually executed within the schedule. We don't have cost information for that, but given it got executed largely inside schedule, there probably wasn't a significant cost variance, if there was one. But the others were all outside of their initial estimates.

MR. RUBENSTEIN: So you think doing it within -- planned to do Wolsong in 22 months, but doing it within 28 months is within the bounds of being on time?

MR. REINER: I think in the case of -- you would have

to look at the details of what drove it to the 28 months, and there may have been specific scope they chose to add which drove it to that 28 months. But from our look in, the best performance we were able to find in terms of schedule was the Wolsong project.

MR. RUBENSTEIN: All right. And if we turn to page -- skip ahead a bit and turn to page 84, this is a research report that, as I understand it, KPMG did, essentially looking at other nuclear builds or refurbishments, giving a narrative about what happened, and providing lessons learned. Is that your understanding what this was supposed to be, or what you asked KPMG to do?

MR. REINER: Yes.

MR. RUBENSTEIN: I want to talk about a couple of those projects so I can understand what you're doing differently. The first is with respect to the Bruce project, and my understanding is that the original plan was, for Bruce, stations 1 and 2 were supposed to be refurbished at 2.75 billion and take five years. Am I correct?

MR. REINER: Yes, I believe that's correct.

MR. RUBENSTEIN: Ultimately, it took a lot longer and came in a lot more expensive; correct?

MR. REINER: Correct.

MR. RUBENSTEIN: As I understand it, if we turn to page 87 where KPMG talks about the lessons learned from that project, is that -- as I read it, at a high level, they're talking about there were technical challenges

associated with refurbishment projects that, I guess, they didn't take into account. Is that what I understand? It quotes from a Mr. Hawthorne, essentially saying it's far more complicated, and the work schedule was far too ambitious. At a high level, what happened -- they didn't prepare properly. They didn't plan as properly as they should have maybe?

MR. REINER: It's -- you can probably generalize that with a very significant overrun in cost and schedule. There was some shortcoming in planning, which is one of the reasons why we took the time we took to plan the work.

In the case of Bruce Power, those units were returned to service after a very lengthy lay-up period when Ontario Hydro still had operating custody of those units. They were shut down with a plan to restart and refurbish. But the initial plan at that time was to have a relatively short shutdown period and then bring the plant back.

It was a very lengthy shutdown period, and, in the case of Bruce Power, what drove that schedule extension was all of what we call balance of plant equipment that had to get -- that required maintenance work because of the length of time it was sitting idle. They had a significant number of valves and pumps and switch gear that needed to be maintained because the plant was sitting idle for such a long time. So that was the primary contributor to the schedule extension. They also had a failure on a major piece of equipment on the generator on one of the units, which was a significant contributor to schedule delay.

If you were to put Darlington beside Bruce as to what the differences are, the performance of Darlington at this stage, pre-refurbishment, is far better than what Bruce Power was before it got shut down. We're not shutting down Darlington for extended period of time. We're shutting it down. We're putting it into a lay-up state that protects equipment and allows us to bring it back relatively quickly. So that risk we see as being mitigated.

There was also a project management approach change that Bruce Power made midway through that impacted their schedule. They had actually contracted out the management of the refurbishment project to a contractor, so they didn't choose that multi-prime model that we selected. They contracted all of that out. And that failed to get the results they were looking for. Issues amongst contractors occurred. They weren't resolved. That integration that that contractor was to provide didn't occur, and that was another key lesson that we incorporated into refurbishment. And so we structured the contracts into management very differently to not get into this situation.

And the third thing I would say we've done very differently than Bruce on this is we have limited and scheduled that balance of plant-type work. We've limited the scope of that to only what needs to be done to fit within sort of those roles that characterize the refurbishment. And we've front-end loaded that into the execution schedule so that we clearly avoid it from getting

onto critical path.

MR. RUBENSTEIN: And with respect to the Genteel (sic) project -- I hope I'm pronouncing -- sorry, I apologize. I actually wanted to ask about the Point Lepreau project next. My understanding, that project was supposed to take 1.5 years and cost 1.4 billion, and it ended up taking 4.5 years and costing 2.4 billion. Is that your understanding generally, went over budget and ran long, significantly?

MR. REINER: Yes, that's correct.

MR. RUBENSTEIN: Am I understanding the big issue there was with replacing the calandria tubes? Essentially it got it wrong, and they had to remove them and then put them back in again?

MR. REINER: Yes, correct.

MR. RUBENSTEIN: And my understanding, you -- the primary way you are dealing with to ensure that doesn't happen, one of the ways, but the primary way is you have got the full mock-up. Everyone is testing this stuff out. You're testing the tooling. You're doing that? Is that the primary way you're handling that --

MR. REINER: So the mock-up is definitely a key contributor to ensuring that we don't have that type of event. The other contributor is what caused that is well understood, and there was a flaw in one of the methods that were used to prepare the reactor for the new components, and it is something that was not and would not have been built into the execution of our work at the Darlington refurbishment.

Even if that flaw had occurred -- let's say technically we went down exactly the same path -- another key difference is, in the case of Point Lepreau, they continued to execute work, knowing that the work was not meeting the quality standards and took a risk, and the contractor took this risk on behalf of the owner. The owner ultimately borrowed the risk in the schedule and cost overrun, but the contractor chose to take this risk.

It's another reason why we have got the visibility into the contracts that we have and why we've structured them the way we have. And so, in our model, we do quality checks, and we will do quality checks as the work progresses. So if a technical flaw like this were to arise, we could very quickly deal with it, rectify it, and then move on without having to go back and redo -- replace an entire reactor's worth of Calandria tubes.

MR. RUBENSTEIN: Am I correct they also had a -- they did a mock-up as well before they started that project?

MR. REINER: They did not do a mock-up. None of the refurbishments that were done -- Korea, Bruce Power, or Point Lepreau -- utilized a mock-up the way we've utilized it. And so what drove us to build this mock-up was the experience from all three of those in what they chose.

They had very simplified mock-ups. They did a lot of tool testing in labs before tools arrived at site, and when tools arrived at site, they were used on the reactor face as they arrived. So it introduced kind of a level of risk by not having a mock-up to test tooling. They did have

what we call sort of a single fuel channel arrangement type mock-up to do some testing and some training, but not to the degree that we have implemented.

MR. RUBENSTEIN: Let me finally ask you about the Votgle nuclear generating station, the work being done there. If we go to page 102, as I understand, this is an ongoing new build, and it's over budget, and it's taken a lot longer. Do I understand that correctly? That's, at a high level, what's going on?

MR. REINER: Yes, that's correct.

MR. RUBENSTEIN: This is a memo you wrote, Mr. Reiner, as I understand that, correct, to the Darlington Refurbishment Committee?

MR. REINER: Yes, that's correct.

MR. RUBENSTEIN: If we flip it over to 104 of the compendium, this is your conclusions and your analysis with respect to this document. You say:

> "Some refurbishment F&IP/SIO projects were carried out with an expedited execution strategy and experienced issues similar to the project costs and schedule drivers identified in the NIW article on Votgle."

So the problems that they're having are essentially very similar to the problems you're having with the facilities and infrastructure and the safety and improvement projects; correct?

MR. REINER: So, yes, we had recognized, because we started some of our F&IP and SIO projects outside of

refurbishment using existing processes that we had not yet refined as we did through the refurbishment, we were seeing similar risks with some of our projects.

MR. RUBENSTEIN: And now you have better processes in place for the rest of the project?

MR. REINER: That's correct.

MR. RUBENSTEIN: That's the end of my public cross-examination.

MS. LONG: Do you now want to go in camera?

MR. RUBENSTEIN: Yes, please.

MS. LONG: So we are going to go off air, and I would ask those people that have not signed the declaration and undertaking to leave the room unless you are Board staff or employee of OPG.

And then I think, Mr. Rubenstein, you'll take us to the lunch break, and then for those that have not signed, we'll reconvene after lunch, to give you an idea of timing.

--- On commencing in camera at 12:18 p.m.

MR. RUBENSTEIN: Just so the panel is -- I don't have a compendium to limit, obviously, the confidential information, although my friends have the cites --

MS. LONG: Okay.

MR. RUBENSTEIN: -- so they can put them up on the screen.

MS. LONG: Okay. You're fine with everyone in the room? Okay.

UNIDENTIFIED FEMALE SPEAKER: Well, I believe -- I should confirm that there was one that was signed yesterday

that I wasn't aware of, but I am now.

MS. LONG: All right. We are off air, so you can continue, Mr. Rubenstein.

MR. RUBENSTEIN: Thank you very much.

I just have a couple of areas I want to talk about. Some we've talked about already. I want to go back to the contracts, the RFR contracts, specifically. And, as I understand how you've structured the RFR contract with the joint venture, you have unit-by-unit productivity built into the contract. Do I understand? We can see this at tab 32 of the confidential materials.

MR. REINER: Yes. There are --

MR. RUBENSTEIN: Page 5 of this -- sorry, page 5 of this exhibit.

MR. REINER: Yes.

MR. RUBENSTEIN: [redacted] Do I understand that correctly?

MR. REINER: Yes, that's correct.

MR. RUBENSTEIN: And, as I understand it, you've amended the agreement with respect to this, and we can turn to tab 23. I think it's tab 28, or -- did I write this down wrong? SEC 22, attachment 2, tab 19 -- not this. Is it 123? Sorry, 123 not 23; I apologize.

As I understand, this is a summary to -- a letter to Mr. Lyash, a memo to Mr. Lyash, explaining certain

amendments you made for the execution phase. This is what this document is?

MR. REINER: Yes, that is correct.

MR. RUBENSTEIN: And if we go over to page 3 of that document, what you've done is you've amended that.

[redacted] Do I understand that correctly?

MR. REINER: That's correct.

MR. RUBENSTEIN: Why would it be in the best interests of ratepayers to lower the built-in productivity that you had already agreed to?

MR. REINER: So the outcome of all of this is the outcome of a negotiated process that has many puts and takes. The primary reason why we had agreed to lower these percentages is we took a significant amount of schedule duration out of the target price in our discussion, so back to the drive towards P50 and a schedule that is relatively aggressive. And the target that we used for schedule for the RFR contract was the best performance that we had seen in refurbishments, which is the Wolsong refurbishment. So we took an approach that the first unit at Darlington will do better than the last unit that was refurbished. Therefore, the opportunities to get the unit-over-unit improvements were not as significant, and that was essentially the Trade-off that was made.

MR. RUBENSTEIN: Thank you very much.

If we can go to tab 92. You don't need to necessarily

pull this up, but as I understand it, you have no experience-based adjustments to execution phase target cost. Am I correct? There is none of that built in where there is for schedule?

MR. REINER: Can you repeat?

MR. RUBENSTEIN: As I understand it, there is no experience-based adjustments of the execution phase target cost. Is that -- do I understand that? You can see if we go back -- I apologize -- to tab 32.

MR. REINER: So that -- that would be reflected in the cost, the shorter duration. And then, when you build the cost up, less time to perform the same work, less cost. So the cost goes hand in hand with the schedule.

MR. RUBENSTEIN: I think you're getting to exactly the question I was asking. The productivity deals with the schedule.

MR. REINER: Yes.

MR. RUBENSTEIN: Obviously schedule is correlated with cost.

MR. REINER: Yes.

MR. RUBENSTEIN: Is that also then adjusting -- I don't know if it would be necessarily on the same percentages, but is it adjusting -- is there essentially an adjustment to the cost for each of those units that reflect the change in schedule and the reduction in labour that would be needed?

MR. REINER: Yes. That change is factored into the target price.

MR. RUBENSTEIN: Thank you. That helps me understand that.

If we can go back to tab 132, this is the letter you provided with the execution -- sorry 123. Now I'm confusing myself. I apologize.

As I understand part -- if we go to page 3, bullet point 5, as I understand, one of the other changes you made is you changed the neutral band from $25 million to $75 million. Do I understand that correctly?

MR. REINER: Yes, that is correct.

MR. RUBENSTEIN: And I understand the trade-off -- and you talk about this in that section -- is that the contractor essentially -- they removed some risk?

MR. REINER: Yes.

MR. RUBENSTEIN: They took on risk, I guess.

MR. REINER: They took on risk, right.

MR. RUBENSTEIN: So that was the trade-off. And as I understand -- if we go back to the very beginning of determining the RFR contract, as I understand the history of how this works, you went out to market in 2009 and 2010. You did a formal RFP, and two consortiums put in bids?

MR. REINER: We actually started with an expression of interest, and seven entities responded to the expression of interest, and then there was an evaluation process conducted. Also, as we were conducting an evaluation of those seven entities, there were some that exited the process. There were others that merged into partnerships.

When we ran the RFP, there were three entities that

were remaining in the process, and the RFP went to three of them. One of those entities, Atomic Energy of Canada, partway through the process, the entity bidding on the job was acquired by SNC Lavalin. So we were down to two entities, and we took both of those forward and negotiated a contract with both.

MR. RUBENSTEIN: So you picked one based on price, quality, all the things you would expect to pick in an RFP, and you negotiated the agreement. And, in that agreement, it sets out what type of costs? They bid with some idea what the final costs would be?

MR. REINER: The agreement -- the terms and conditions of the agreement essentially were intended from the outset to span both definition and execution-phase work, but -- and there was information provided by the two contractors in regards to how they would execute the work and some costs associated with execution.

The initial contract was very, very focused on definition-phase work, and the outcome of definition phase was to reach an agreement on what the target price is for the contract that would get utilized in execution. So, at that point, there was a potential off-ramp opportunity if we could not get to a target price with the contractor.

MR. RUBENSTEIN: But you set, in the initial at least, execution-phase cost with the idea that, throughout the definition phase, you would negotiate and revise what the execution phase cost would ultimately be. Is that correct?

MR. REINER: There wasn't a -- execution-phase costing

was more about -- not a target price. There wasn't a target price negotiated. There were costs submitted by the contractors in terms of what their fees are, their mark-ups, their project management team. So you could do a build-up recognizing that there are still variables because the job hasn't been completely defined. But those variables would then apply to that job.

So it does give you an ability to look at the two contractors and do some mathematics to see, under different scenarios, where would the execution price land. So there was sufficient information in that process provided to be able to do that.

MR. RUBENSTEIN: And then a memo like tab 123, you amend the agreement with the final costs which you've agreed to through the target -- sorry, through the definition phase, the final target price, any other adjustments you need to make to the contract based on the significant amount of work you had done in the previous year; correct?

MR. REINER: That's correct. Based on the work that was done with the contractor in the definition phase, the key product in definition phase was, in addition to the tooling and getting ready to execute the work, was the price for executing the job. The Class 2 estimate for execution was the key product coming out of the definition phase.

MR. RUBENSTEIN: And when they -- both the parties had bid, did they bid with -- putting aside the cost of mark-

up, did they -- they bid with structures, correct, what the neutral band should be, what the -- how much should be the fixed fee? That was part of their submissions that you looked at? They're putting a structure -- specific structure to you, and you're determining which one is better. That's one part of it; correct?

MR. REINER: This is a bit of a test of my memory here, but I believe we did put out a proposed contract structure, and they bid -- they bid against that proposed contract structure so that we could get an apples-to-apples comparison of it.

MR. RUBENSTEIN: At what level would the structure -- would the structure be target costs --

MR. REINER: Yes. We had -- so part -- before we went to the market with contracts, we did a significant amount of work on assessing what type of contract structures would we utilize, and some of this pre-dates my arrival on the project, but there was a significant amount of work done to look at is there even an entity out there that would bid on a fixed-price basis, what makes sense. How would a target price --

MR. RUBENSTEIN: I'm going to stop you. I recognize -- I meant a little more granular. Was it, "We would like to see it, the structure we have chosen, and we want you to bid on is a target price," or is it more granular? As the target price, this is the percentage of the fixed fee; this is the dead bands? That's the -- that is what I'm asking for.

MR. REINER: I can't recollect off-hand whether we had an exact defined target price structure that they bid against. I would have to go back to look at those bid submissions, but there was definitely quite a bit of detail in terms of cost that they were expected to -- that they both provided, target costs for executing the work, what their fees are, what their overheads are, and details on their cost structures, what their management team make-up would be so that we could build up a comparative cost estimate.

MR. ROSE: So, in essence, we negotiated all the major terms and conditions with both vendors. So they had a bid proposal we negotiated through and got the major terms and conditions in place, but there was an expectation that, as the end result of the planning phase, there would be a target price amendment that would be settled off, so based on the final price, and that's what you're seeing here.

MR. RUBENSTEIN: So from the awarding of the contract to the joint venture, all the way to today, there has been significant variations in the -- it looks very different as you have made changes to the structure. You have obviously -- have much more idea of what the target cost should be. You've made all the adjustments that we have talked about in this exhibit; correct?

MR. REINER: No. The structure actually aligns exactly with what we set out to do. The -- what was done in that definition phase is filling in the precise values associated with dead bands and target cost, but that

structure -- that structure was already there. The target price structure was already there, so that didn't change --

MR. RUBENSTEIN: Let me rephrase it. Let me rephrase it, then. Within the structure of a target cost which was there, that target cost structure and the costs that are embedded in it have changed significantly, understandably, from when they originally bid all through the definition phase up until where we are today with the execution. Fair?

MR. REINER: It needed to be developed, right, because that's part of the definition phase is to develop a Class 2 estimate which informs the target cost. That's how the target cost is built. So you don't start out with a target cost and then change it. It was a build-up of the target cost.

MR. RUBENSTEIN: So all these years later, how do -- what comfort can you give the Board and ratepayers, and ultimately throughout all the changes over the years, you know, the JV was the better consortium to pick than the other one?

MR. REINER: So, you know, cost is not the only factor that goes into that kind of a decision; right? It is a factor, and it is an important factor, and the way you can do cost comparisons to satisfy yourself, you can look at mark-ups; you can look at overheads; you can look at fees associated with the professional services that go into managing the project, and that gives you a very good sense of, from a cost perspective, on how the two will compare.

A significant portion of the cost lies in trades labour. Trades labour is known, because it's unionized labour, and we know the rates. And then mark-ups that go along with that trades labour are part of -- were part of the submission.

So you can do a cost evaluation and pick one over the other, but there are other factors that go into it, and those factors included things like the methodologies that would be used for retubing the reactor, and that was part of the submission. Both contractors were asked, "How would you actually execute this job?" That required them to do some conceptual work in terms of tooling and developing the tooling, the methods by which that work would get executed, and allowed us to do a technical evaluation on their proposed method of executing the work.

And then a third key factor that goes into it is the contractor's capability to actually perform the work. So is it the first time that they've ever retubed a reactor, or have they done this type of work before? And if they have, to what degree and where? And that's another factor that weighed into that.

And, in all of that, there is a risk assessment that gets done in each case that gets utilized in that assessment. So there are several factors outside of just a pure single number that gets utilized in making a selection.

MR. RUBENSTEIN: All right. Thank you very much.

I want to ask -- and it would be helpful if you have

two documents ready. One is tab 116, and one is -- this is the attachment 1 to SEC 14, and the other is tab 134, which is the response to JT1.16.

And tab 116, as I understand it, is a report from Faith (sic) & Gould called:

"Benchmarking Report on Contract Strategy and Overhead and Profit Levels of Large-Scale International Projects."

And as I understand, the report is a benchmarking report you conducted, and it's dated November 2010, when I think you were sort of looking -- you were exploring the market of what's available, and it's, in part, benchmarked profit and overhead levels. Is that your understanding of the report's primary purpose?

MR. ROSE: That is correct.

MR. RUBENSTEIN: All right. If we can turn to page 17 of that report, and what we see is the overall mark-up, which, as I under -- it's a chart showing overall mark-up percentages for nuclear construction, local engineering, and others, and by "overall mark-up," you're talking about the percentage that's overhead and the percentage of profit combined; correct? Is that your understanding of what that means?

MR. ROSE: Yes.

MR. RUBENSTEIN: And what we see for nuclear [redacted]

[redacted]

[redacted] Do you see that?

MR. KEIZER: I'm not sure we have the right page on the screen. So --

MR. RUBENSTEIN: No, you do.

MR. KEIZER: Okay. Thank you.

MR. RUBENSTEIN: When I look under "Nuclear" -- this is on the chart -- the figure, I guess. [redacted]

[redacted]

[redacted]

[redacted]

[redacted] Do you see that?

MR. ROSE: I see that, yes.

MR. RUBENSTEIN: All right. If we go to JT1.16, we had asked you essentially to provide, for your major contract, what is your -- what would be your percentage, that is, profit and overhead.

And for the RFR contract, you say -- this is line 37:

"Overhead for the target cost element represents [redacted] of the overall contract value. Profit for the target cost element represent [redacted] of the overall contract value."

Do you see that?

MR. ROSE: Yes.

MR. RUBENSTEIN: I get that, when you add those two together, you get [redacted].

MR. ROSE: Correct.

MR. RUBENSTEIN: When I look at that compared to

nuclear, that is over the median and mean. Am I correct? You are above the benchmark?

MR. ROSE: So I am looking at page 18 and 19 of the same report [redacted] overhead on page 18 and [redacted] of profit on page 19, which is a [redacted]. The mode, [redacted] is that your reference point?

MR. RUBENSTEIN: No. I'm looking - you're adding those together. I get [redacted] for your RFR. And then I look at the overall, which is the same comparison on [redacted]. I'm not breaking them out. And I get -- you would be above the mode and median; correct?

MR. ROSE: That's correct. Above the mode and mean, but lower than the top, correct.

MR. RUBENSTEIN: If we turn to the turbine generator, JT1.6, and we look at your other large contract, I see -- we can see this at line 17:

> "Overhead for the target cost element represents [redacted] of the overall contract value. Profit for the target cost element represents [redacted] of the overall cost value."

Do you see that?

MR. ROSE: Yes, I do.

MR. RUBENSTEIN: If you combine that, that's [redacted]; correct?

MR. ROSE: Correct.

MR. RUBENSTEIN: And if we go back to page 17 of the benchmarking report, that's, again, above the median and

mode; correct?

MR. ROSE: That is correct.

MR. RUBENSTEIN: Why is that appropriate?

MR. REINER: Maybe I'll start out with the benchmarks. The benchmark population here went outside of the Canadian industry. You cannot take a nuclear qualified contractor that works on reactors in other jurisdictions and just put them to work in Canada. They have to go through a qualification process. The standards aren't significantly different, but the contractors are required to put into place a quality management program that satisfies the Canadian regulatory requirements, and there's a significant cost in doing that.

So when we went to market to bid -- so, for example, the RFR job, it was Canadian companies that had that qualification that responded, because the international companies would not make that investment on a one-time job like this, so there were no respondents.

It was a competitively bid process and they were -- I mean, General Electric, GE -- Nuclear Hitachi Canada was a bidder on one of the projects, but it was a subsidiary of General Electric that was completely isolated through financial means from General Electric global. So the nature of industry doesn't allow you to get to benchmark, because benchmarks look broadly. They certainly inform us in terms of where we strive to get to in the negotiations, but those variations are not unexpected.

In the case of the turbine generator contract, that

was a competitively bid contract with the low bidder selected. Again, the benchmarks are informative, but there is a negotiation process and a bidding process that gets utilized to award the contracts.

MR. RUBENSTEIN: I want to ask about the contractor performance. If we can turn to tab 75, I'm looking at page 16 of that document, and this was a Modus Burns McDonnell oversight report they're providing to the Darlington Refurbishment Committee in November 2015. And as I go down and read in the confidential area in that paragraph, it says:

"E.S. Fox's performance on campus plan provides vital OPEX that the team has considered in identifying risk for these projects. The DR team is aware of these issues [redacted] and are attempting to mitigate those issues. [redacted]

[redacted]

MR. RUBENSTEIN: If we go to tab 78, this is a nuclear external oversight assessment report also by Burns & McDonnell. And if we go to page 11 of that document, so just before that, tab 78? D2, 28, attachment 2. D2, 28, attachment 2. Let me read it to you.

If we go to page 11, as I understand, this is an assessment from November 14 through November 20, 2015. You can see that on page 2, and we don't need to do to that. But if we go to page 11, down under campus plan project risks, you see:

> "As of November 2014, the path of the D2O storage, in particular, was very uncertain, and OPG had just terminated Black & McDonald from D2 storage, [redacted]

[redacted]

MR. ROSE: That gets back to also, Mr. Rubenstein, is late design -- you can't get to a Class 3 estimate if you don't have a design complete, which is the lesson learned that we spoke about earlier this morning. If you don't have -- if your design is coming late, your level of confidence in your estimate is going to be diminished.

[redacted]

MR. REINER: Yes. Now, I'll -- so maybe -- that is correct, yes.

MR. RUBENSTEIN: All right.

MR. REINER: Now, I just want to maybe provide a bit of context here as well. If you -- when you look at a project of the complexity of Darlington refurbishment and you sort of break it down into its elements, you end up in -- there are generally three categories of work that emerge, and there is an alignment in industry with contractors to those categories of work.

There is what we call component-level work, where you take a contractor and you'd say, "We need you to replace this section of pipe. We need you to rewire this piece of switch gear. We need you to replace this set of valves," and that is the nature of the balance of the plant work in the refurbishment project, and that work fits well within what we call a tier 1 contractor, which is a construction contractor. [redacted]

When you go to tier 2, you introduce a level of engineering complexity, and it's work that requires a design to be developed, and that design to be tested, validated, and then constructed and commissioned and put into service. And so projects like the containment filtered venting system and the third emergency power generator fit into that category, and you would go to what's called a tier 2 contractor.

And if you were to construct a brand-new nuclear plant from scratch like the Vogtle project, you would go to a tier 3 contractor. And the profits, the mark-ups, and the players in each of those categories are very, very different.

[redacted]

[redacted]

MR. RUBENSTEIN: All right. If I can ask you to turn to tab 152. This is the confidential version of a document I took panel 1A to, which was the quarterly performance report, as I understand it.

And, as I understand, this was for the period ending March 31, 2016. You see it in the top right-hand corner?

MR. REINER: Yes.

MR. RUBENSTEIN: And I'm correct that this is the quarterly performance report?

MR. REINER: Yes.

MR. RUBENSTEIN: All right. And if we can go to page 8 of that document. And you have a vendor performance scorecard, essentially, where red is not good; green is good; yellow is what yellow is, somewhere in between? Do you see that?

MR. REINER: Yes, that's correct.

[redacted]

[redacted]

MR. REINER: So in -- you know, the first thing that I'll say is: If you saw all green indicators here, that would be a problem for me, because it wouldn't be reflective of issues; right? This is why we set a much lower bar in terms of what we measure, so we can quickly surface issues. And that's the basis for these indicators.

[redacted]

[redacted]

MR. RUBENSTEIN: Now, I understood from panel 1A, when they were asked about the D2O project, [redacted]

[redacted] That's why it's been pulled out of the application. It shouldn't affect the work they're doing on the RFR. Delays in the D2O should not affect the RFR project. Do I understand that correctly?

MR. REINER: I mean, there is no direct relationship between execution of that project and execution of RFR. They are two separate project teams. Now, we are, as we had indicated, going through an assessment as we speak to understand all of the issues that are contributing to a schedule delay on the D2O storage project. To the extent that some of those are management related, there may be a crossover at the management level, and we will need to understand that, and we will look at that.

MR. RUBENSTEIN: If we can turn to tab 89. This was the Burns & McDonnell/Modus report, dated August 2, 2016. If we can turn to page 3 of that document. And, as I read, under "Vendor Capabilities and Readiness," it says:

> "To date, the vendors have struggled performing the F&IP projects and meeting some of the commitments during the refurbishment projects definition phase. This raises several concerns with respect to the refurbishment project, [redacted]

MR. RUBENSTEIN: If we go under the bullet point below that, this is what we heard during Mr. DeRose's review of the Construction Review Board, similar comments, as I recall. It says:

> "The OPG project team has a tendency to help the contractors resolve issues in a manner that imposes unanticipated demands on OPG staff. Care must be taken to ensure that the contractors do not necessarily rely on OPG and shift contractual responsibilities."

Do you see that?

MR. ROSE: Yes, we see the statement.

MR. RUBENSTEIN: As I understand, what they're saying is you're helping out the -- you should be doing other things, and you're helping out the contractors when they get behind or they need help; correct?

MR. REINER: That's correct. And we would always do that because we cannot let the project fail. That's the purpose of why we have an OPG project management team. It's the purpose of why we staff it the way we do and why we've structured the organization the way we do with people overseeing specific project bundles. And that's why, when I was talking previously about the 100 percent cost overrun scenario, that scenario is not realistic in our space, because, when we see issues like this, we immediately look at what's causing the issue, and we immediately augment where we can to rectify the issue until the contractor has a corrective action plan in place that corrects it and

allows then to back out because, for us, the critical thing is that performance of the project continues to progress. Now, that is not done without looking at contractual terms and conditions and costs associated with doing that, and all of that is tracked as well.

MS. LONG: Mr. Rubenstein, I'm doing a time check. Do you think you're almost done?

MR. RUBENSTEIN: Five minutes.

As I understand then, unless a contractor -- let's use the RFR example. The contractor is behind, and OPG staff goes and helps out to make sure they stay on schedule. There is a cost. OPG is incurring cost to do that; correct? And at the same time, there would be no disincentive for the RFR contractor because you haven't hit -- there is no disincentive that gets kicked in?

MR. ROSE: To be clear, the way we set up our structure and our overall project management model is that we have a role to play, which is helping out whether they're ahead or behind. We are an active owner doing a number of things to make sure this project is successful.

MR. RUBENSTEIN: All right.

If I can ask you to turn now to -- I believe this is J1.3 - sorry, J1.2. If we can turn to page 17 of this document, this is, as I understand it, is the updated quarterly performance report, correct, that you provided?

MR. ROSE: That's correct.

MR. RUBENSTEIN: This is the period ending the 30th of September, 2016.

MR. ROSE: Correct.

MR. RUBENSTEIN: We're going to look at what I see -- now we have a white, and I'm not exactly -- what is the white colour that has been put into this form?

MR. REINER: White is good. Green is ahead of plan, essentially. Yellow is behind plan. Red would say we're well below target, or we're above high confidence in cost or above high confidence in schedule.

[redacted]

[redacted]

MR. RUBENSTEIN: Am I correct that, conceptually, safety has an effect on cost and schedule? If someone gets hurt, it's going to take longer to do the project?

MR. REINER: Absolutely. Minor injuries -- now, these are the result of minor injuries; they're not lost time injuries we measure. So what can drive this indicator red is a cut on the finger that requires a doctor's attention to rectify,. And the nature of the injuries that are that type, those don't affect schedule. But what we are always cognizant of is are there underlying things. Is the contractor taking shortcuts, for example, that could result in a serious injury and that would have a significant impact on the schedule?

MR. ROSE: We have this report here also, September 30, 2016, with the quarter ending starting July 1, 2016, in a period where we had a very hot summer, and a number of these medical attentions were related to heat stress.

MR. RUBENSTEIN: Lastly, if we quickly go to J 1.1 --

MS. LONG: Sorry to interject here, but I just want to ask a question about this. [redacted]

[redacted]

MS. LONG: Thank you.

MR. RUBENSTEIN: Lastly, if we can go to J1.1, this was the Modus Burns & McDonnell November 2016 report, the

last one we have on the record. And if we can go to page 4 of that, under "Vendor Performance" again, we see under the first bullet point -- well, we start at the beginning:

> "The performance by some vendors to date presented risk to segment 1 and beyond if not mitigated."

And the first bullet point talks about:

> "E.S. Fox will need to ramp up its weekly earned value production to meet the schedule and then maintain the level of progress through the first half of the unit to DR project. [redacted] Based on performance trends to date, the OTM sees a risk that the BOP and SDLU work could place greater demands on management time if it impacts key milestones. This trend should be monitored closely."

And then the next paragraph talks about SNC-Aecon, the joint venture, and it talks about:

> "It's currently performing the vault turnover unit islanding work and completing the RWBP, all of which support its critical-path retube and feeder replacement work. SNC-Aecon is also performing rehearsal work in the vault mock-up with the goal of testing and improving the

performance. [redacted]

[redacted]

[redacted]

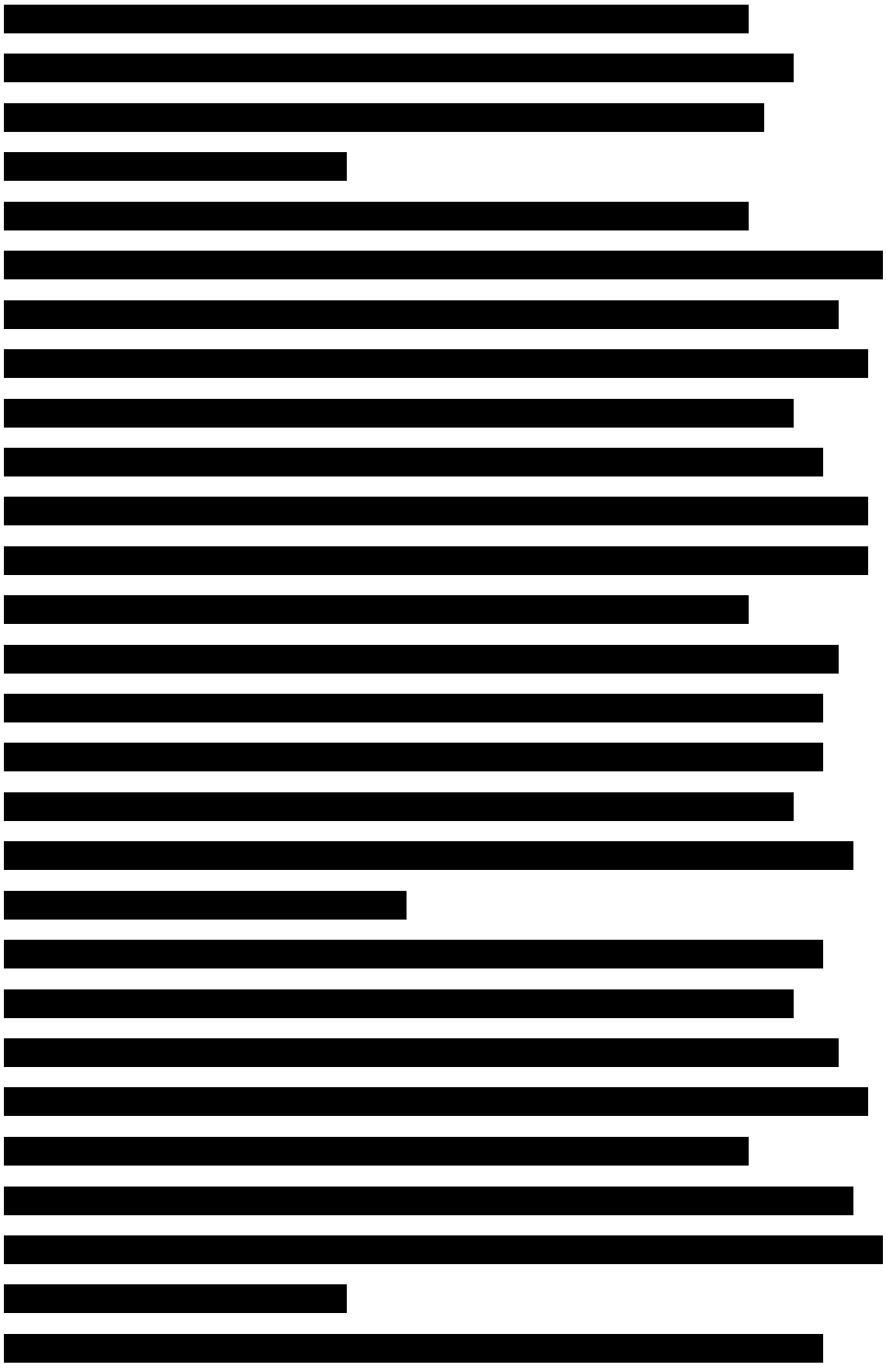
[redacted]

[redacted]

Do you see that?

MR. REINER: Yes.

MR. RUBENSTEIN: [redacted]



[redacted]

MR. RUBENSTEIN: So we're going to get -- there's an undertaking -- when it's provided to the Darlington Refurbishment Committee, the more -- the most updated Burns & McDonnell/Modus, when they present it to them. Is your expectation we're going to see things improving, or are we going to see continuous problems?

MR. REINER: Well, so oversight will always identify problems. That's what oversight is there for. We don't bring in oversight to tell us that everything is going good. The idea is: Are there blind spots that the management team isn't seeing? We ask -- we ask them to be -- you know, these aren't -- these reports aren't about, "Tell us the good news." We want to understand everything that you, in your independent role, see as an issue. Identify it for us.

The Refurbishment Construction Review Board is the same thing. You're always going to see reports with issues. The importance of that is: What is the project management team doing about those? What is OPG doing about the issues to rectify them to ensure there isn't a cost and schedule impact?

Now, in the ideal world, all problems go away, and we never have another problem again, but there are going to be ebbs and flows in this. There are going to be issues. The issues will get identified, and we are going to address

them in the course of execution, and it's going to be this way throughout the project.

MR. RUBENSTEIN: Thank you very much. Those are my questions.

--- On resuming public session at 1:19 p.m.

MS. LONG: Thank you, Mr. Rubenstein. We're going to break for an hour.

--- Luncheon recess taken at 1:19 p.m.

--- On resuming at 2:23 p.m.

MS. LONG: Before we begin, are there any preliminary matters, Mr. Keizer?

MR. KEIZER: We have none.

MS. LONG: Okay. Mr. Yauch, I believe it's you.

CROSS-EXAMINATION BY MR. YAUCH:

MR. YAUCH: Thank you. Good afternoon. I'm going to start on page 24 of my compendium.

MR. RICHLER: Would you like to mark that as an exhibit?

MR. YAUCH: Sure.

MR. RICHLER: K3.2.

EXHIBIT NO. K3.2: COMPENDIUM SUBMITTED BY MR. YAUCH

MR. YAUCH: I was asking about this on the first panel, and Mr. Rubenstein talked about the Monte Carlo model and some intricacies of it. But I was curious. When OPG decided to use this type of analysis to determine contingency, did it look at other nuclear projects that had done a similar type of analysis? I couldn't find any.

MR. ROSE: I'm not certain that we did look at any

other nuclear facilities. We just looked at the fact that preparing a Monte Carlo analysis is best practice per Project Management Institute and the Association for the Advancement of Cost Engineering. It really wasn't a question as to whether or not this was or wasn't good practice. We believe it is good practice, and I believe the industry believes that as well.

MR. YAUCH: There are other ways of looking at megaprojects, how to adjust costs and account for costs; right? Monte Carlo is just one of the options; correct?

MR. ROSE: There are other ways to look at costs related to a megaproject. But when you're dealing with many risks with different probabilities, I believe Monte Carlo is the best way to look at it.

MR. YAUCH: But it's never been used on a nuclear project, so we don't know if the nuclear industry itself is able to -- that the risk can be quantified so clear as a Monte Carlo model would suggest.

MR. ROSE: I can't say it was never used on a Monte Carlo project. I'm just not knowledgeable that it was or was not used in a nuclear project.

MR. YAUCH: Okay. Page 26 please. So within the Monte Carlo model, does that interpret this comment? It says some things -- for example, excusable delay, risk in the OPG risk register and defective work is a risk in a joint venture and internal risk register, and these aren't included in the Monte Carlo model. Are there some risks you don't actually put in there, or does everything go in

there?

MR. ROSE: If you just scroll to the top of this page for a moment, please? This is report prepared by OPG, and it was considering that the work that the joint venture had done in preparing the retube and feeder replacement Class 2 estimate. And what it's really saying there is that there are certain risks -- and we spoke about this earlier today -- there are certain risks that the joint venture hold and would include in their Monte Carlo model. There are certain risks OPG would hold, and we would include in our Monte Carlo model. So this reference is to the joint venture's Monte Carlo model, not ours.

MR. YAUCH: Is there one unified Monte Carlo model, or there are multiple Monte Carlo models amongst different contractors and OPG?

MR. ROSE: Some of the contractors, as we noted this morning, the turbine generator contract and the joint venture RFR contract, have some contingency in their contracts by the nature of the type of contract they are. Our Monte Carlo is done on all the risks that OPG must bear.

MR. YAUCH: There are other risks in the project that aren't in your contingency, but are out there?

MR. ROSE: That's correct. We talked about that this morning. Within the RFR contract and the turbine generator, there is some contingency.

MR. YAUCH: So the 2.002 contingency and escalation that we have, the real contingency is higher than that?

MR. ROSE: We spoke again this morning that, within the contracts, within the target price contract for the RFR contract and within the turbine generator contract, there are contingencies within them, within those contracts that are related to the risks that the contractor must bear.

MR. YAUCH: Do you know what the global figure is? What are we're looking at in total, with everything included, all-in?

MR. ROSE: Give me a second. I'll pull up the reference.

In issue 4.3, schedule 2, AMPCO 72, page 2 of 2, item number F, it's also included in this morning's compendium for the School Energy Coalition. Item F here, so looking at the retube feeder replacement execution phase target cost, there's 371 million of contingency and 2,4 million respectively for the turbine generator, and these are for contingency for risks that each of those contractors are bearing to a P50 amount. The contingency that OPG is carrying is contingency incremental to that each of those contractors are carrying. They're for risks that OPG is accountable to own and manage, and we have contingency for those. So the 1.7 billion plus about 400 would be $2.1 billion worth of contingency approximately before interest and escalation.

MR. YAUCH: So the contingency isn't -- if we look at the project as a whole, it's not 1.7; it's 2.1, just so I'm clear?

MR. ROSE: So it goes on to talk about -- so those are

two contingencies within the contracts that are pulled out. The contingency that OPG is carrying is 1.7. The vendors are also carrying contingency for a total of 2.1 billion approximately.

MR. YAUCH: And then interest and escalation on top of that?

MR. ROSE: That's correct.

MR. YAUCH: Okay. How much would that account for, interest and escalation on that?

MR. ROSE: I have not done that calculation. In fact, I think we were asked to take an undertaking this morning to do that calculation.

MR. RICHLER: It was J3.4, I believe.

MR. ROSE: J3.4.

MR. YAUCH: Okay. If you can go to page 21, please, of my compendium. So part of the this project, even though it's refurbishment, you admit that most of this is done for the first time by the contractors themselves. Within the Monte Carlo model, the way I interpret it, you classify things in three ways: low risk, medium risk, and high risk. Does it break things out as this is being done for the first time contractor, they might not know, or do you roll that into the three levels of risk?

MR. ROSE: Those are always considerations when we look at the risks themselves. So a risk that something that we've done multiple times, the likelihood is the range of uncertainties is going to be tighter than a risk we're doing for the first time.

So the three points would -- when you do a three-point analysis, you look at what it might be, what it optimistically could, what it pessimistically could be. And depending on your experience and the experience of the people evaluating those risks, the outcomes would be different.

MR. YAUCH: Okay. Let's go to the next page, page 22. This is from one of the Modus audits. If you look at the second paragraph that's highlighted, this is three months before you submitted your RQE which established your contingency. You say that, at this point, many of the project managers were going on a gut feel when it came to risk. So I'm curious how, in three months, you went from that kind of risk assessment to three months later being 90 percent confident that you have it right.

MR. ROSE: I'll read what it says here. It says:

> "Over the last year, additional management focus has been placed on developing and rationalizing risks, and management goals are well known to the project manager."

So I think there was lots of time in us preparing and identifying risks and rationalizing those, and it goes on:

> "Some groups have embraced, but other pockets have produced contingency input merely to meet the RQE deadline."

Then it goes on to say that, although we did do the analysis, they're not -- this is again Modus/Burns & McDonnell position -- that some people are not as actively

participating or managing the risks from -- they're just -- they're going through the initiation process, the quantification process, but are not effectively managing or owning and mitigating that. And that is something that we, as a management team and leadership team, through our risk oversight committees, have continued to focus on and ensure that risk management is an active part of each of the project managers' responsibilities.

MR. YAUCH: Right. But three months before you came up with your final number, there were still some -- it said some of the estimates. It doesn't quantify how many. It still says that some of your estimating was basically just people guessing, going on what they thought might be the risk and what's the cost. And that -- how did you rectify that in three months? Was it a big problem? Was it a little problem? How many estimates were done by people just -- by going by their gut?

MR. ROSE: So through the entire process, we had -- you know, I had a risk management team that led the effort. They asked a number of probing questions to get the nature of the risk, to get the clarification and understanding of the three points. And we had a number of challenge meetings leading up to RQE, different levels, project level, and then I think we had at least three challenge meetings at the senior management level to make sure that the ranges in the risk analysis were appropriately put together.

MR. YAUCH: So by the time you had the RQE -- I think

you said October/November that year -- do you think you had flushed out those problems?

MR. ROSE: We did. I mean, the whole process was quite an extensive process. Each of those risks have three-point analysis that are done. The model gets generated. I think that many of the intervenors have looked at this and, in their conclusion of RQE, have stated about the extentitivity (sic) of our process and the reasonableness of the outcomes.

So when you're done that exercise, you get a budget. The budget that we've got are the 1.7 for our owners' costs, and that's the budget that we are standing behind.

MR. YAUCH: Okay. So if we can go to page 31, please. This is the last Modus report you filed in response to IRs. I know you have since filed a couple more. But in the risk management, it says that:

> "Identified a number of concerns regarding the project team use of risk program as a management tool."

So seeing that, up until two months before you did breaker open, this was still a problem, and the auditor was still concerned about it. And so my question is: When you fixed it for the RQE, what was still remaining? Why were there still problems with people not accepting risk or sort of recognizing the importance of it?

MR. ROSE: This speaks to the product managers using their risk management to effectively mitigate those risks and to avoid impacts. It's an issue that's been identified

as something that we continue to reinforce as an expectation with our project managers.

When we -- when a risk that's in our register, for example, one of the things that we make sure that those risks are being routinely reviewed, and if there is a resulting change that comes out of a risk that's in the register and the risk can't be fully mitigated and there's a change that comes to be, we are fully assessing whether or not the risk management process was effective in resolving that change or not.

MR. YAUCH: Okay. So if you go to page 30, and it's in the same report. Under "Risk Management," it comes up again, and you talked earlier -- and I can appreciate this. You kind of described the Monte Carlo model as this living, breathing thing that changes as the program goes on. And it says since RQE -- and this is August 2016 -- you added a bunch of new risks to the program. And it says:

> "without the benefit of the rigour established in RQE".

But when you added those new risks, you didn't actually change the contingency; correct? Earlier you said it stayed the same, so you must have lowered the risk somewhere else; correct?

MR. ROSE: So this is -- what this is identifying is that certain project teams may have gone into the risk register, the RMO tool that we talked about this morning, and added in some risks that haven't been fully assessed or quantified by the central risk management team, and,

therefore, no contingency has been added.

You know, I think that our risk management process goes through a set of questions and -- to understand what the nature of those risks are. And that's when the proper quantification would come -- would be added to the tool. And ultimately, if there's an impact on contingency, it would be included in the contingency forecasts.

MR. YAUCH: Okay. But from the RQE until breaker open or even until now, you still -- even with new risks, you guys are still confident with the original assessment you did back in October?

MR. ROSE: Yeah. There are some risks that close without triggering. There are risks that trigger, that have less exposure than we had planned or a higher exposure, and then there are new risks that are added. So we, in our forecasting process, have to constantly be aware of the changing risk environment and including that in our forecast.

MR. YAUCH: Okay. So if you go to page 29, please. The cost performance section, in sort of the second dot, it talks about your draw-down of contingency, and they raise concerns at the velocity in which you were drawing it down at that point was a concern. But it does say, if this is all just part of finalizing the budget, that's fine. So were you able to slow the $10 million per month velocity of draw-down?

MR. ROSE: So I don't necessarily agree that $61 million is a large velocity, and the reason why I say that

is this is during a period where we were finalizing the unit 2 estimate, and, as we've already spoken to, the contingency did actually go down, and it went down for a couple of reasons. Some risks we had moved into the base plan and other risks diminished and went away, and new risks came in. That's a part of the process.

But even of those $61 million of risk that were drawn down at that point in time, it doesn't necessarily mean that those were funds that were spent. Sometimes risks get drawn down for an event that is going to happen. I know today that the cost of something is higher than I had originally planned, and now those costs may be distributed over unit 2 and other units, so it doesn't mean that that money was spent, because that, in fact, wasn't true.

MR. YAUCH: Can that happen over the life of the entire project? So you have a certain amount of contingency for unit 2. Could you make that same assumption that, in the future, I know we're going to need it, so let's do it now, and then say, "Oh, we think in the future, we won't actually need it"?

MR. ROSE: I mean, if it's validated to be true, we would actually do that, because we want that included in our forecast. So if I have an assumption that it's going to cost me $10 to buy something and I go through the exercise and I need to buy that something for each of the four units, and I go through the exercise and it actually costs us $15 and I have contingency for that, I'm going to true that up then and there, if I have got no better

information. That way, my forecast for future units is also better.

MR. YAUCH: And the auditor was essentially warning of this, that you were pulling it now, but you needed it at that time because you were finalizing the project before breaker open, so it wasn't -- you weren't concerned about it?

MR. ROSE: I think, in this point of time, we were focusing getting ready for unit 2 and making sure that everything we knew was properly captured.

MR. YAUCH: Okay. So if we go to page 32, I'm going to switch for a little bit. From a higher perspective, one of the problems with a lot of the campus plan -- campus projects was that they were done by the P&M organization within OPG, and the auditor said that essentially this organization wasn't prepared to do this kind of work. Is that true? That, at the time you gave them these projects, they didn't have the manpower; they didn't have the expertise to handle this type of work and cost and the type of scheduling needed?

MR. REINER: Certainly the capability within the projects and modifications organization at the time was a contributor to OPG's ability to manage the projects. We had just come through the business transformation at that time that resulted in reductions in staff in a number of areas and freezes internally in filling vacancies, and that did have an impact on the ability of the organization to effectively managing those projects. It wasn't the only

contributor but, yes, it was a contributor.

MR. YAUCH: And the auditor highlights that. They say your push to decrease staff, which I know was part of the business transformation, was actually one of the problems, that you were giving it more work, but giving it less manpower.

MR. REINER: Yes. And, I mean, the auditor recognized this. We also recognized that -- and that organization, in fact, is now undergoing additional reviews and is being augmented with additional project management capability to align it with the volume of work, rather than aligning it with a target that's disconnected from the work.

MR. YAUCH: But they started this work back in 2012 or 2013.

MR. REINER: That's correct.

MR. YAUCH: We're now five years later, and now we're fixing it? Is that how I interpret that, that it was allowed to run like this for five years, and now they're getting more staff?

MR. REINER: No. There has been a transition over the course of time, since the beginning of the campus plan projects. So getting the organization sized to align with the volume of work is one step that has been taken. That continues to be done.

We talked earlier today about some of the process changes that have been made. They've already been implemented. We've made a number systems changes for tracking cost and schedule and standardizing across OPG.

That has already been done. There's additional things related to project management governance still being rolled out. So it's a continuum, all aligned with an internal initiative we're focusing on in OPG that we've called project excellence, to improve our capability across the company related to project management.

MR. YAUCH: Okay. Go to page 35, please. By May 2014, the D2O project had already been problematic, and some of the other campus projects have also been problematic. So the auditor said you need to re-baseline the whole thing, but not only just the ones related to the refurbishment project, you also had to rebase all work that organization is doing.

I know you did some of the DRP stuff; you went and recalculated the cost of D2O in your contingency. But did you end up rebasing all the nuclear work that was under that organization?

MR. ROSE: What we did is -- we had a gated process that we put in place in refurbishment, and what we did is, as each of the projects went through the next gate, we reset their baseline. So the D2O project, at this time -- this is going back some time and was the subject of discussion quite extensively at the last hearing.

We were in the process of negotiating with the current contractor, the joint venture, and they put forward an estimate. We also had estimates updated for our third emergency power generator, a containment filtered venting system, amongst a number of other projects, and we locked

in our estimate for the F&IP and safety improvement opportunity projects at the end of 2014 and actually have been measuring our performance against those ever since.

MR. YAUCH: If you can go to page 36, what was happening in May of 2014 when you did decide to rebase some of it is you could already see these projects were essentially spiralling out of cost control. They were blowing past any sort of estimate you had for them, and that would have raised alarm bells at the company; correct?

MR. ROSE: I'll give you one characterization, and I'll let Deitmar finish up with that. You know, I talked about a gated process and that you can't lock in an estimate until the engineering is sufficiently advanced enough to be able to lock in that estimate. So some of the early estimates that were in our systems were based on some -- when I talk about the third emergency power generators, as an example, was based on preliminary estimates done prior to the completion of engineering.

Our focus was on getting enough planning and getting enough engineering done so that we could put a reliable estimate in place by the end of 2014 and monitor performance to that. And earlier this morning, Mr. Reiner talked about that, when we had that in place, we actually had some projects delivered for lower costs than what those estimates were.

MR. YAUCH: If I remember correctly, the lower cost were in the hundred thousands, maybe a million or two, whereas the overruns were in the hundreds of millions. So

the scale of one as compared to the other are sort of apples and oranges; correct?

MR. REINER: I think if you look in aggregate -- so in 2014 -- and this dates back to 2014, I believe, this particular report. In 2014, the budgets that went into the release quality estimate for these projects was established. That is still the budget we are tracking those projects against today. And, in total, on all projects, we sit now at about 2 percent variance, and I'm expecting that will be about a 3 or 4 percent variance against the budget, so that's --

MR. YAUCH: Against the RQE budget?

MR. REINER: Against the RQE budget, which, for these projects, was set in 2014.

I just want to go back to an earlier comment. I think the characterization of spiralling out of control is not a good characterization. We've said this many times, but I want to say it again. The issue we had is point estimates were put into business cases before sufficient work was done to actually understand what the cost would be. The cost of the projects is directly reflective of the work that's needed. The work that's needed meets the regulatory requirements. It deals with the environmental assessment issues that had to be cleared. It deals with the risks encountered during subterranean work. So it is reflective of the work.

The error that was made is the cost estimates -- point estimate without ranges of uncertainty were introduced for

these projects prior to sufficient work being done to actually know what a realistic cost range around these projects is.

MR. YAUCH: The D2O project in particular, you initially budgeted it at 200 million, and then you lowered it down to 100 million, and then it went back up to 300 million; right? It's been sort of bouncing around both ways through the life of it; right?

MR. REINER: The cost estimate for that project, yes. And, again, a lot of that is history. There are very good reasons associated with that. The initial cost -- and I'll give you a couple of the big items, because it's important to understand what some of the drivers are.

The initial design, the conceptual design for this facility assumed that it could be attached to the original tritium removal society. When that was presented to the Canadian Nuclear Safety Commission, it was identified that that would not meet the seismic requirements. So that facility had to be detached, and essentially what was a three-wall building needed to become a four-wall building and built to a much more stringent set of standards than what the initial contemplated in attaching to an existing facility.

The second big item that was encountered was there was a heavy water spill at Darlington a couple of years prior to the start of construction, in the site where this facility was built. We had to decontaminate all the soil that came out of that facility, and we had to decontaminate

all the water that was extracted as part of doing the dewatering for construction. Those were all costs not initially anticipated. Those were costs that emerged as a result of the requirements to construct this facility.

MR. YAUCH: If you can go to page 67 of my compendium, please. According to the long-term energy plan, in order to adhere to what -- you say:

> "We fully developed engineering and planning of the work so that 100 percent is complete prior to start of construction."

But that didn't actually apply to all the work this project -- there should be an asterisk there that campus projects don't actually align with the long-term energy plan the way in which they were done.

MR. REINER: You're right. For the campus projects, the engineering was not completed prior to commencement of construction. And so that learning -- plus we observed similar things on previous refurbishment projects. For the Darlington refurbishment, the design modifications were all completed prior to start of construction.

MR. YAUCH: If you go back to page 38, this lists the contingency per each one of the projects. At this point, you say the estimate for the facilities infrastructure is a Class 1 to 3. And, as we've gone over, Class 1 is the highest and Class 3 is sort of in the middle.

And if you go to the next page, page 39, it lists the difference of the initial full release and the superseding full release, and the difference there is $335 million.

But you're saying the initial full release wasn't actually -- the class estimates that you called them, at the time, they weren't real. So I think at that point, the D2O was classed as a Class 2, but you said, in hindsight, that was erroneous?

MR. ROSE: The heavy water facility was at $110 million. The business case said it was class 2. That was inappropriate. It wasn't Class 2, because the detailed design had not yet been completed. There was a sense at that time that we were embarking on the -- a new contracting model of using engineering procurement construction contracts. And there was an understanding that the bid price contemplated a better classification of estimate than it did.

But the reality of it -- and this is our learning -- that until you've done engineering and have a full understanding of how it is that you're going to execute the work, you can't get to a Class 2 estimate.

MR. YAUCH: So the Class 2 estimate, I don't want to apportion blame, but is it OPG's fault or the contractor's fault, or is it together neither one of you had an idea of what it actually was, the project?

MR. REINER: You know, we're not going to absolve ourselves of blame on this. I mean, OPG's got the accountability, ultimately, of ensuring the work gets done in a predictable fashion. So even when a contractor's estimate doesn't reflect reality, it is -- you know, we do have processes in place to validate estimates and to ensure

that that's an acceptable estimate, and if we see risks, we have the ability to allot contingency for risks. So it is a -- you know, I'd say it's a shared -- it's definitely a shared accountability.

MR. YAUCH: So if you can go to page 44. So as I look at the history of this project in particular, I think you've essentially fired the first contractor, then went with another one, and the new contractor, by August 2015, which again would be three months before you did your RQE, it was also struggling to figure out how much it would cost, and you had a lot of issues with the way the new contractor was doing it; correct?

MR. KEIZER: Sorry, I'd just ask a question, and that is that -- I'm just curious. I mean, we've now removed the D2O project from the case by virtue of the update, and I understand that my friend may have some broader purpose as it relates to the DRP project, but these questions have focused primarily on the execution of the D2O storage project, but I'm struggling, I guess, to see how that relates to the broader issue that's currently before the Board.

MS. LONG: Do you want to comment on that?

MR. YAUCH: I mean, I sort of figured the broader issue is that OPG has struggled to do all the projects pertaining to this DRP already, so I'm kind of curious why, and the auditor has raised questions over three or four years that OPG was struggling to manage this project and they were unable to fix it, and so I was just curious what

went wrong and why they allowed it to go for so long.

But I'm happy to move on to another -- we can look at the heating system, and the same problems are there. And we can look at many other projects, and the problems are still there. So either way, we're probably going to talk about it.

MS. LONG: I think you can ask a few more questions on this, and then I encourage you to move on to something else.

MR. YAUCH: Well, actually, my final question was: Is there an estimate for what it's finally going to cost and when it's going to be done?

MR. REINER: Well, that --

MS. LONG: This being D2O storage?

MR. REINER: -- I think we --

MS. LONG: D2O storage?

MR. YAUCH: Mm-hmm.

MR. REINER: Yes, storage. So this is one we had addressed at panel 1A. At this point, the estimate, as it stands today, is 381 million. It has not been revised, but we do know that that estimate will increase. We don't know by how much. We're just in the midst of doing an assessment on where -- what exactly is needed to complete this project in terms of work, what that would take in terms of time, and then get a comprehensive understanding of what the cost impact might be. We do not yet have that information, which is the contributor to having us remove this from the rate case.

MR. YAUCH: Okay. If you could go to page 46, please. So the auxiliary heating system, as I read, it was initially supposed to cost 45 million. That was your initial estimate. And then it spiralled up to 99 million. And I'm going to ask: Were the same problems that you saw on the D2O project happening here as well?

MR. REINER: On the auxiliary heating system -- and I believe this one will be -- is a subject of discussion of the nuclear panel, because it's not a refurbishment project. But the initial estimate was based on replacing the existing facility at the Darlington site. As that project was being developed, discussions were underway with the Canadian Nuclear Safety Commission, who do have a regulatory requirement here for this facility, and it was determined that the facility was significantly undersized to meet the needs specified by the Nuclear Safety Commission, and it essentially had to be doubled in capacity, and that's what led to the primary cost change on this project. It started as a facility that was half the size of what actually needed to be constructed.

MR. YAUCH: Okay. If you can turn to page 53. It's the last one of these I'll look at. The retube waste processing building. The auditor said, I quote:

> "It's facing some familiar issues to those described above for D20 and HS."

So I guess my question for you -- and, I guess, how is the Board going to believe that, when things go wrong, you're able to fix them? Because the whole point of this

-- of your contingency for this project and how you move to unit 2 and unit 3 and so on is that you're able to make -- learn from your mistakes, but it appears that, in all the buildings -- projects you did before breaker open, you weren't able to learn from them.

MR. REINER: So, you know, all of the projects here that are funded by the refurbishment program are part of the $12.8 billion estimate, and we continued to maintain that our high confidence estimate is inclusive of all of this work. And, yes, you know, you highlighted some cost pushes on certain projects, and we will see some of that as we execute the Darlington refurbishment, which is why we carry contingency. But we are still confident that we will be able to keep this project within the $12.8 billion and within the high confidence estimate for the overall program and within the 4.8 for the unit 2.

MR. ROSE: And I believe I'll just add on to this. I mean, the paragraph itself says it is very preliminary engineering and goes on to talk about the fact that it's very preliminary engineering. This project engineering wasn't completed until sometime in 2015, when we actually locked in the cost estimate and the schedule. And that was done in advance of the release quality estimate as well.

MR. YAUCH: It sort of raises the question that, if you do engineering beforehand, that's good practice. You don't do it beforehand, that's bad practice, and it's going to lead to cost overruns and schedule delays. I mean, it's as simple as that, really.

MR. REINER: That is the key lesson learned.

MR. YAUCH: But you're not lowering what you are adding to rate base for any of these projects even though you didn't do engineering for them when you do them.

MR. ROSE: So, for the RWPB, as an example, the project is going on. There's preliminary work going on. While the detailed engineering work is going on, there was some site preparation going on, so we're putting pylons in the ground to -- for where this facility was going to go, but the -- what we called earlier the full release business case, or when we locked in that execution phase estimate, it was done almost a year after this report.

The lesson learned that we have put in place for unit 2 and -- is that all the engineering was done, and it was the basis of the estimating that occurred to achieve the release quality estimate, and from there, we did the contingency analysis and risk assessments to put in an appropriate contingency for the risks associated with that work.

MR. YAUCH: And the way you've presented the application to the Board is that it's ratepayers that pay for that lesson learned; that OPG isn't actually taking a hit for any of this.

MR. REINER: Well, I mean, we would -- I think, if any of these costs take the unit to a cost above the $4.8 billion, we would expect that the Board would have an interest in understanding why, and we would be here explaining exactly what happened.

MR. YAUCH: Okay. I think I'm at my time, so I'm happy to relinquish my spot. Thank you very much.

MS. LONG: Thank you.

Mr. McLeod, are you next? I think so.

CROSS-EXAMINATION BY MR. MCLEOD:

MR. MCLEOD: I am, indeed. Thank you very much, Madam Chair.

A couple things: The excellent cross-examination that's gone on just before me here has been extremely helpful to me. I'm actually going to be able to take out a fair amount of my line of questioning, and another matter which I thought I was going to be able to chase today, I'm pushing off to the nuclear ops panel, so I have just a few questions. Most of them are clarification, maybe, of a slightly higher level than what we've been drilling down into just now.

My first one deals with -- and I'll ask that the nuclear chart be brought up, because it's a clarification. So that's Staff IR number 48, at L 4.3, schedule 1, attachment 18, page 2.

At the bottom there, the last paragraph says -- and I went through all the charters and the guidelines. It's quite incredible and just shows how important this all is. But the thing that caught our attention is:

> "This charger does not apply to the activities associated with the ‘Darlington new nuclear project.'"

So when we saw that, it put up flags. What's that,

please?

MR. REINER: OPG does -- based on an initiative that was previously undertaken by the Province several years ago to look at the potential of constructing new nuclear facilities, there was a process that was underway. It did not lead to a decision to construct new nuclear facilities.

At the time, though, we had identified, as OPG, that we do have a site available to construct a new plant; it's next door to the Darlington site. We have a construction licence for that site. There is no activity underway. But given that this effort took place, it was captured in the nuclear Charter to make it very, very clear that, if there were construction of a new nuclear facility, it would not be captured within the Charter that governs the operation of the nuclear business in OPG.

MR. MCLEOD: A few years ago, if I can put my head on from way back when, that was the Darlington B project, as I think it was called at that time?

MR. REINER: Way back in the Ontario Hydro days, it was Darlington B, but in the effort undertaken by the Province -- and I don't recall off-hand what the timeline was, but it would have been the 2008 to 2010 time period -- that was an undertaking that the Province did independent of OPG as part of the LTEP efforts, I believe.

MR. MCLEOD: That's great. Thank you. So we won't worry about that.

My next question focuses on -- and it came up with Mr. Lyash and yourself, Mr. Reiner, and we talked about

this being a destiny project. Is this something -- going through all the evidence and the testimony we're going through here, I'm getting a sense -- and I could be wrong -- and given all the efforts in controlling schedules and in controlling contingencies, it's very clear. Would OPG look at this as an opportunity in the future to generate business -- so looking at it from the business side of things here -- to sell this type of reconstruction DRP-type service to other CANDU operators? And I guess they don't have to be CANDU operators; they could be anybody in this business.

MR. REINER: I can't comment in an informative way on what those strategies might be. But, certainly, I think there has been discussion about the reactor mock-up. For example, what happens to that reactor mock-up when OPG is finished with the refurbishment? Because there are others that will be following behind us -- the Romanian CANDU plant, for example. So there would be a potential opportunity to utilize that facility and provide some support and services to the Romanians to undertake a refurbishment of their power plant. So that's certainly an option that I expect would get assessed.

I would also speculate that in the nature of being a destiny project. You know, what that means for us is we need to get it right because there is not going to be a second chance here. If we do get it right, it will be the first one that's ever been done right, and therein are likely other opportunities that OPG might be able to

provide to others and to benefit from. But that's outside of the refurbishment project and would be something that, from a corporate strategic perspective, we would certainly consider.

MR. MCLEOD: Absolutely, thank you. And you answered my mock-up question.

I understand it's slightly outside -- it's just all the work and effort going through the DRP obviously has some spin-off benefits down the road.

MR. REINER: Yes.

MR. MCLEOD: Great. Thank you. Bear with me for a second.

This will be my last one, because everything was pretty much covered off by others. If you're able -- and it's along the same line we're going right now. If you are able to keep within the estimates, and I think everybody -- you fellows and the panel 1 were being pretty clear about staying on track in terms of costs and schedules. If this is a success and you're able to do that, would you consider this your own -- I'm trying to think of a set of words – an internal guarantee look at this, if you're -- what I'm trying to get at is -- and I think you hit on it -- was just that drive for success in this particular project is so important that this is the guarantee, because I'm going to come back to another slightly different question is -- and I'm not asking you to answer, but it's rolling in my head right now is the Board, because of its governance responsibility over this entire exercise, has to be on

board with all this too. So I'm just looking for the strength of this whole decision-making from top to bottom.

So what would I be fair in using the words such as internal guarantee that there is going to be success in this, or am I stretching this a bit?

MR. REINER: You'd have to tell me more about what you mean by "internal."

MR. MCLEOD: I guess what I'm trying to get at is we're spending a lot of time looking at contingency. We're looking at P90. We're looking at all the tests, all the controls trying to keep this thing captured. We don't want it spinning off. We looked at Walsong. We looked at the other ones that have all gone offline. I guess what I'm looking for is that internal business culture that says the entire organization is driven, so focused on this, recognizing that the impacts of ratepayers paying for this, at the end of the day, understanding all that, but the internal cultural drive is getting built in just going by all the layers, the processes, the class, the work packages -- I'm just seeing this all together. So that's what I'm classifying as the internal guarantee.

MR. REINER: So, yes, the answer to that is yes. So if you look at the highest level in OPG, what our strategic imperatives are for the entire company, one of four is project excellence. And project excellence has one big piece underneath it; it's the successful execution of Darlington refurbishment. So that cuts across the entire company.

Ultimately, my team and I have the accountability for managing the day-to-day delivery of this, but there are -- there is a lot of support provided by the entire organization to bring this to fruition, and it sits at the highest level in our company. And certainly not succeeding would put us on a completely different track, and I think Mr. Lyash described that when he was here earlier in the week; it puts our company into a completely different track than we planned for it to be on.

MR. MCLEOD: I think this is where I'm coming from. From our members, if anything went wrong with the kinds of things we're talking about here, like, there are serious consequences to be paid, because they play in a global market. We don't really do that here, and this is a publicly-owned utility owned by the people. So there's two -- like, there's a slightly different way.

But I think one of the common areas, one of the common grounds is that cultural -- if it's ingrained inside the corporation and it's driven from top to bottom, it's trying to give us a bit of sense of security. We don't want to pay any more for power, but we understand the reality of the business world here, and we're looking at this, and then talk about the strength in the business perspective is hugely important to us.

MR. ROSE: If I give you perspective from somebody who has been on this project since 2008, so almost ten years, seeing it from a feasibility business case right through where we are today, having different leaders prior to

Mr. Reiner and different CEOs, I've seen the focus right from, you know, the early days of focusing on ensuring that we do the planning sufficiently enough to have high confidence as project managers, ultimately, which we are, having high confidence as project managers to be able to deliver this project to -- you know, for the benefit of the ratepayers of Ontario for 30 years within the high confidence estimate that we have.

So in order to get to a high cost -- an estimate that we can stand behind for a period of time that we need to stand behind, we had to invest time in planning. Everybody who has come in have looked at the methodology that we've done in planning and said that it's better than they have seen. It's applying best industry practices, and by doing so, our probability of success is higher than they have likely ever seen.

Now, it's incumbent on us now to execute it well, to achieve what we've set up to do, right, but I think the knowledge that we've put in place and the approach that we've taken is something that I think we can be proud of from a project management perspective and ultimately is transferable.

The project leadership initiative that Mr. Reiner spoke of, I am the co-chair of that. So the techniques that we've now deployed in refurbishment over the last three or four years, we are deploying those techniques across the company in a consistent, standard way so that our performance on all projects, not just the

refurbishment, starts to improve. So I think that commitment of the senior executives and down to my level of seeing the desire to drive that and apply that across the company is -- you know, I think bodes us well.

MR. REINER: We also talked, I think, a little bit in the days that Mr. Lyash was here about -- so we also recognize, you know, not only is this a destiny project for OPG; it is an industry destiny project, which I think is the point you're making, that, you know, if this can't be -- we're the first out of the gate, and there are Bruce Power refurbishments that are following ours, and if this one, given everything that we have done here to plan and execute this, if this one doesn't go well, those -- the decisions not to proceed, if that were an outcome, are going to have a huge impact, and that is also what has driven that collaboration between Bruce Power and OPG that we've signed the memorandum of understanding on.

There's also quite a significant collaborative effort with even the vendor community that supports the nuclear industry through OCI, the CANDU owners' group through Canadian Nuclear Association. I think there's a lot of emphasis and focus on this, just given the fact that I think there's a recognition, if this doesn't go right, this goes broadly, not just at OPG, but beyond OPG.

MR. MCLEOD: Thank you very much, panel. Those are my questions, and that's...

MR. REINER: I would like to maybe just make one correction in what I said about new build, and we can get

the facts on this. But I think it's a site preparation licence that we have, not a construction licence.

MR. MCLEOD: Fair enough. Thank you.

MR. KEIZER: And I believe panel 3 is in a position to address...

MS. LONG: To speak to that? Okay. Thank you, Mr. McLeod.

Mr. Stephenson, do you want to start and take us to our afternoon break around 3:30 or a convenient time for you? I would like you to get started.

MR. STEPHENSON: Sure.

MS. LONG: Thanks.

CROSS-EXAMINATION BY MR. STEPHENSON:

MR. STEPHENSON: Thank you, Panel.

And good afternoon, panel. My name is Richard Stephenson. I'm counsel for the Power Workers' Union. I just want to spend a minute talking about the D2O project, and just for the benefit of the reporter, among others, it is D2O. The "O" stands for oxygen, not zero; correct?

MR. REINER: Water is -- in chemical terms is H2O. Deuterium, which is heavy water -- heavy water which contains deuterium is D2O, yes.

MR. STEPHENSON: Okay. Just a small point, and I think this is clear, but I just want to make sure that I'm right about this. The deferral of the D2O project that appears in the second impact statement, that has no impact at all on the unit 2 refurb in-service amount ask that you're making in this application; right? That number, the

4.799 billion, was the same before and after; correct?

MR. SAAGI: That is correct.

MR. STEPHENSON: And the reason for that is that the D2O project was never part of that in-service amount. It's a separate in-service project. It was scheduled to go in-service, in fact, prior to your unit 2 in-service; correct?

MR. SAAGI: Yes. The early in-service project.

MR. STEPHENSON: Right. And even though it's been deferred, you actually still anticipate it's going to go in-service before February 2020; correct?

MR. SAAGI: Correct.

MR. STEPHENSON: Okay. But the bottom line is it's going to be dealt with separately when it goes into service; correct?

MR. SAAGI: Correct.

MR. STEPHENSON: Okay. I just want to talk about schedule a little bit, the schedule for your project. And we saw earlier, with panel 1A, a graphic that showed the delapping of the unit 2 project and the next unit, which I think is Unit 3; right?

MR. ROSE: That is correct.

MR. STEPHENSON: Okay. And so, as I recollect the graphic, you've got unit 2 going into service, at least the schedule or forecast basis, in February of 2020.

MR. ROSE: That is correct. It's February 2020, based on our high confidence schedule.

MR. STEPHENSON: Okay. And you've also got unit 3 going out of service in February 2020; correct?

MR. ROSE: Our sequence is that, once unit 2 goes into service and is producing power and putting power on the grid, we will then take unit 3 and commence the refurbishment of that unit.

MR. STEPHENSON: Okay. And is that literally breaker open then you're talking about?

MR. ROSE: That is correct.

MR. STEPHENSON: Okay. Here's my question. So obviously there's some element of uncertainty as to precisely when the unit 2 project is going to come to a conclusion. Could be sooner; could be later. Does the unit 3 start then just move correspondingly? Is that the plan?

MR. ROSE: Yes. Our plan is to be ready to commence unit 3 as early as September 2019. That coincides with our working schedule. So that way if -- so depending on when unit 2 finishes, we're ready to go on unit 3.

MR. STEPHENSON: Okay. And does that change at all depending upon -- I think you address this a little bit -- the magnitude of the variance in terms of -- let's put it this way. It's more -- if you run late on unit 2 but you have got a green light on unit 3, does it matter how long you run late before you start unit 3?

MR. ROSE: It does. At some point, the units reach their end of life, and so we can't go for five years --

MR. STEPHENSON: Right.

MR. ROSE: -- because the unit would have reached its end of life and would be sitting idle, and that's not good

for OPG or ratepayers.

MR. STEPHENSON: Okay. So, as a consequence of this, subject to, you know, these extreme cases, there is no impact on your production forecast then arising from the precise end date on unit 2. Is that fair?

MR. ROSE: So the production forecast is obviously more -- is with the nuclear panel, but our plan is that we would start unit 3 when unit 2 comes out, so, in essence, we have one unit in a refurbishment state right through the test period.

MR. STEPHENSON: Right. And I appreciate that the capacity on the unit 2 and unit 3 may not be identical and so forth. But there is not a material impact on this issue on the production forecast. There's other production forecast uncertainties, but this isn't one of them.

MR. ROSE: Right.

MR. STEPHENSON: Okay.

MR. ROSE: That's our understanding, that we have one unit in a refurbishment state through the whole period. There may be more details that the other panel could speak to.

MR. STEPHENSON: Okay.

MR. REINER: I just maybe add one point. There are planned outages at Darlington that occur at a certain frequency, and there's a requirement to take units down for maintenance. If there were a delay, a significant delay, we would have to look at does that -- and if there were a significant delay in bringing unit 2 in-service and

deferring the start of unit 3, would that change the cycle of planned outages. So you could think of a hypothetical scenario. If it were a three-year delay, you would have to do another planned outage on unit 3.

MR. STEPHENSON: Right.

MR. REINER: So there would just have to be an assessment. You know, depending on forecasts and how that unfolds, the outage plan would need to be looked at.

MR. STEPHENSON: Let's put it this way. I think Mr. Lyash -- and, Mr. Reiner, you may have also referred to this. OPG has plenty of incentives to get this project done on a timely basis. And one super added incentive it might have is that, to the extent it doesn't, you may have screwing out the outage schedules on other units. That's another incentive to get this thing done in a timely way; correct?

MR. REINER: Yes, yes.

MR. STEPHENSON: I didn't use a technical term in terms of the outage schedule, but I hope everyone understood what I meant.

Mr. Reiner, I think this one is for you. When you appeared on panel 1A and you were asked to give, essentially, an update as to how things were going since breaker open, you gave what I characterized in my mind at least to be a fairly positive description as to how things had gone to date. Is that a fair characterization?

MR. REINER: Yes. So just sort of playing forward what happened since October 15th to now, defuelling went

extremely well; we finished it ahead of the working schedule. We also were able to clear some significant risks that we had in our risk register and in our contingency for defuelling that didn't require an allocation of contingency, so that becomes a general contingency that's now available for the project.

Since the completion of defuelling, we have lost time. We have given back some of those schedule gains, and we're sitting at roughly on the working schedule.

MR. STEPHENSON: Okay. I want to understand those comments in the following context. One of the documents we have received by way of undertaking is undertaking J1.3. I don't think it's necessary for you to turn this up. These are the reports from the Refurb Construction Review Board. I'm not going to ask you any specifics, but in that document, as you would expect, they have identified some issues of concern; correct?

MR. REINER: That's correct, yes.

MR. STEPHENSON: Okay. And for a layperson sitting there reading it, some of these concerns -- they look legitimate, and they have some seriousness about them.

How do you reconcile your overall sort of positive review, so to speak, as to work to date with the concerns raised in those documents?

MR. REINER: So the RCRB reports -- and the same holds for the Burns and McDonnell report and other audit reports -- they are intended to be self-critical. They are intended to focus in on areas where there may be issues

emerging, or there is a potential for issues to have an impact on the project. So that is the nature of those reports. These actually become a management tool for us to utilize to take corrective action to avoid an impact, and that is what we have done since the RCRB has been on-site. They have done three visits, and we log everything that's identified. We take action based on their observations and likewise for the Modus reports. So these are actually a very useful tool for us to ensure that areas that we might not have been sensitive to or where we might not have embarked on the right corrective actions, we've got another body of experts that's there to provide us some advice and provide us input and guidance to help us with the management of the project. So I see these as a helpful tool, not as a third party critiquing our performance. It's a management tool in helping us manage the project.

MR. STEPHENSON: Thank you.

On a different subject, I asked you on the previous panel as well about the staffing challenge question, and you gave us some information about that. I want to ask you a slightly different question about it.

We're talking now about your refurbishment team in terms of the staffing of that. What kind of people are we talking about here? And what I mean by that is are we talking about -- you've got, of course, management people, and you've got Society people, and you've got PWU represented folks. Are we talking about people in all of those categories, or are we talking largely management

people?

MR. REINER: No. Folks in all of those categories. I have, for example, a relatively large engineering department, and the majority of the people in the engineering department are working-level people.

MR. STEPHENSON: So Society related?

MR. REINER: They are Society represented employees.

In Mr. Rose's organization, there are cost and schedule analysts; the majority of the people in Mr. Rose's organization are Society people.

We have an operations and maintenance organization. The majority of those folks are Power Worker represented people. Now we obviously have management as well to manage that, but it is a mix of folks.

MR. STEPHENSON: And when you are bringing on, recruiting and hiring these people, are they coming into your regular complement, or are these people on fixed-term agreements? What's the arrangement? I appreciate for the union people, there's obviously rules regarding that. But I'm now talking more about management.

MR. REINER: We have combinations. Some come on as regular employees, OPG employees, and so that goes with unionized and management. In the case of unionized employees, we also have the opportunity to bring in temporary employees within the rules of what the collective agreements allow to us do. We utilize that vehicle as well.

And then we do also bring in what we call augmented

staff contractors. Those can be at a Society representative level or at a management level. They can come in under both. We did, as part of the -- as part of setting up and planning the refurbishment, we did have to ensure that all the labour agreements were in place with the Society, with the Power Workers, and with the building trades unions to allow for the flexibility we were looking for in staffing. And there are agreements in place that give us the ability to execute a resourcing plan that doesn't require all of the employees to become OPG employees.

MR. STEPHENSON: And I appreciate this is a challenge in terms of getting your staffing correct on this project is going to be an ongoing issue over time. But can you assist us in giving us your sense about the magnitude of the risk around this issue, both as it stands today, because you've had challenges getting staffed up, and the magnitude of the risk around this issue as this project proceeds in terms of maintaining an adequate staff?

MR. REINER: There is -- there's definitely a risk, and we carry that in the risk register. In fact, when we roll up our risk register to the corporate level, there is a risk that shows up that relates to having sufficient resources and the capability required to execute this work. And so, because of that, some of the steps that we take -- ensuring we have development plans in place for people to progress them in the organization, so as we lose people in the management ranks over the course of time, we've got

people ready to step up. We also make use of flexibility that we have to move people around within the nuclear organization. If we have a peak of work, for example, that comes up that requires an engineering effort, I can access the Chief Nuclear Engineers Organization and get support.

So strategies like that are implemented. But it is a risk. That risk comes with the fact that it is a ten-year project. The demographics in the organization, we've got a lot of senior people that are going to retire over that period of time, and we need to be able to fill those retirements with competent and capable people. And then you also -- on projects, there's also a tendency on projects -- and you see this in industry. People don't stay forever in one place, people that are project people. They like the excitement of the project work, and, you know, when they've done a unit of refurbishment, they will probably want to move on and do something else, so it's another factor that we need to incorporate.

And so we have a cross-refurbishment. We integrate this very tightly with the nuclear business. We have a succession planning process in place that looks at all of the roles and ensuring we -- our target is to get two people deep, if you will, in terms of capability that has the potential to succeed, and when we look at below the management level, the development plans for people and the training for people is very important, and everybody has a development plan in place that we execute.

And I would say there's another risk factor that does

get introduced in relation to the building trades, and it ties to, you know, if -- in the economic boom years where there is a lot of construction activity or if the oil -- you know, if the price of oil rises, there is going to be a draw into Alberta, and you do see that at the trades level. And so that's another area of risk that we have to manage, and we are quite active in forums that sort of predict forward what the draws on trades' resources are so that we can factor that into our planning.

MR. STEPHENSON: I actually just have one last question, and maybe I can do this before the break just so I --

MS. LONG: Sure.

MR. STEPHENSON: And I'm not sure if this is for this panel, or it may get deferred. It's about the nexus between your refurbishment team, on the one hand, and the operating staff on the units.

I read in the evidence that it's somewhat counterintuitive that, even though unit 2 is going to be offline for an extended period of time, the actual complement required, operating complement required, doesn't actually get materially affected at all.

MR. REINER: That's correct, yes.

MR. STEPHENSON: And are you the person to talk to about this? I just want to -- it seems counterintuitive, and I just want the explanation.

MR. KEIZER: Probably a question for panel 3.

MR. REINER: I mean, there is an element that ties to

-- I can provide you why, on a refurbishment unit, there is a requirement for operation staff. So even though, you know, we have removed fuel from the reactor and it is no longer a nuclear reactor, what that does is it mitigates the requirement to have authorized licensed operators sitting in front of a control room panel. It does not eliminate the requirement to have operation staff available, because any equipment that gets operated in the power plant -- and a significant amount of equipment even in the refurbishment does need to get operated. There are systems that we're not touching.

And then there are -- as we work through the scopes of work, there are activities that are required in order to safe-state equipment, to do testing and bring things back in-service. That's all operations work. So there's quite a significant impact on operations to support refurbishment.

We also have -- it is a power plant that has equipment that needs to be maintained, and the last thing that we want to do in this -- if we took our eyes off the maintenance that needs to be done to equipment that isn't being taken apart or replaced in refurbishment, we'd essentially run the risk that Bruce Power encountered, where you're starting up a plant; equipment wasn't looked after properly; and then it takes a very long time to correct all of those things as components start to fail when you return the plant in-service. So there is a full maintenance program that gets executed on the refurbishment

unit while it is in the refurbishment state.

MR. STEPHENSON: Thank you. Those are my questions. Thank you, Board, for that indulgence.

MS. LONG: Thank you, Mr. Stephenson.

MR. POCH: Madam Chair, just before you break, I know I'm next up after Mr. Tolmie, and I just -- I was going to slip out now, but if it's helpful to the Board, I can stay around if you think you might want to fill the last few minutes. I know you've had some late evenings. You probably don't want to, but --

MS. LONG: I wasn't sure that you were going today, Mr. Poch.

MR. POCH: No. I'm scheduled first up the next day.

MS. LONG: Oh, are you? Okay.

MR. POCH: But I'm available. That's all -- I was just making that offer if it was --

MS. LONG: Okay. Okay.

MR. POCH: -- convenient, but I'm happy to leave, frankly.

[Laughter.]

MS. LONG: I think that we will end today, actually, with Mr. Tolmie. Okay. Thank you.

So, Mr. Tolmie, you're next up after our 15-minute break. Thank you.

--- Recess taken at 3:39 p.m.

--- On resuming at 4:07 p.m.

MS. LONG: Mr. Tolmie?

MR. TOLMIE: Could we have the compendium on the

screen, perhaps, the one I sent by e-mail a couple days ago? Okay.

MS. LONG: Mr. Tolmie, is this your compendium for panel A2?

MR. TOLMIE: No, 1B. I distributed a copy of it two days ago.

MS. LONG: It starts with the impact statement, 1.0, purpose?

MR. TOLMIE: That's one of the items, yes. I'll just go ahead anyway.

MS. LONG: I'd like to see it before you start, please.

MR. TOLMIE: Yes.

MR. KEIZER: I have in front of me a document, Madam Chair, that says: "Sustainability journal, compendium to panel A2", and begins with the question of the day.

MS. LONG: That's what I have as well.

MR. KEIZER: I believe the panel has a copy of that document. So even if we can't bring it up on the screen, I think they have it. I think we have the exhibits that Mr. Tolmie was --

MR. TOLMIE: I don't.

MR. KEIZER: I may have the e-mail.

MS. LONG: Okay. Mr. Tolmie, does it start "Question of the day"? Is that it?

MR. TOLMIE: That's the one.

MS. LONG: I think we're all working from the same document, so why don't we begin?

MR. RICHLER: Excuse me, Madam Chair. Did you want to mark this as an exhibit?

MS. LONG: Yes.

MR. RICHLER: K3.3. And just to be clear, this is an e-mail. The first line is "Question of the day."

MS. LONG: Correct. That's what we're all working from.

EXHIBIT NO. K3.3: E-MAIL BEGINNING "QUESTION OF THE DAY"

CROSS-EXAMINATION BY MR. TOLMIE:

MR. TOLMIE: The topic of the day has really been risk management, and that's my topic, too. It's been explained how, ordinarily, it was handled by having three different types of contracts. You have fixed price contracts. You have target priced. You have contracts that have a cost plus. But there are, as Mr. Rose pointed out, a couple of categories for which it's hard to make plans. You have known unknowns, and you have unknown unknowns. And it would appear that, basically, you're reliant on dealing with those as they arise in the course of the project. You can't deal with an unknown unknown if you don't even know what it is.

So I have a set of questions that sort of peck at a few of the potential situations that might give rise to dealing with that, and what I'm looking for is just a response to how OPG would manage unknown unknowns that come up in the course of your business.

And the government has handed me a doozey right off

the bat in that they have decided to change the period of amortization for projects like this. So the numbers that apply to what we're discussing all week are presumably going to be changed -- or maybe not. So my question is: What's going to happen with the new procedures the government has put in place for dealing with amortization of the project?

MR. KEIZER: Madam Chair, if I may? I believe what Mr. Tolmie is referring to -- correct me if I'm wrong, Mr. Tolmie -- is the press release today in the press conference by the Premier with respect to the global adjustment charge. Is that what your the inquiry relates to?

MR. TOLMIE: Yes. The news reports, of course, tell us about how this is going to reflect what we pay for power. But the way they're proposing to raise the money for paying power is to simply stretch out the period of repayment for expensive capital items. So that very directly affects -- in fact, the news reports do specifically explain that the refurbishment of Darlington is what they have in mind as one of the principle means of achieving that. So what does that do to your plans?

MR. KEIZER: It's my understanding, if I may, the announcement today related to somehow dealing with the payment for generation and stretching it out over time and amortizing it in respect of generators that are paid pursuant to contracts and otherwise through the global adjustment. And although the details, I guess, are pretty

scant with respect to necessarily how that would apply, with respect to this application, it's our understanding it has no implication with respect to the regulatory aspects of OPG, including this project that's before it, and that it's a non-regulated aspect of OPG. But that's about as far as we can go today.

But in terms of the implications for this project or for the rate case, it's our understanding it has no implication.

MR. TOLMIE: We'll go to the second question, then. In the past, when there have been significant changes, OPG has come back with an impact statement that tries to explain how it will handle the impact of changes. Now, one of the pending problems the government still has to deal with is what it's going to do to meet its obligations for greenhouse gas reductions. And one of the things that they could conceivably do is shut down the gas- and oil-fired generators. If they did that, how would OPG respond?

MR. KEIZER: Sorry, Madam Chair, again, I don't mean to interject, but I think the issue about what the merit order of generation would flow in respect of serving the needs of Ontario would be determined by the IESO as part of its own operations of dispatch and generation and the direction of the power grid and that OPG would continue to run, as it was required to do so, pursuant to whatever the IESO's intentions were as related to the supply mix. But I don't know if it's for this panel to answer that, or whether that's for another panel, I think, as it relates

particularly to the Darlington refurbishment project.

MR. TOLMIE: The panel could perhaps respond to a more general question. If you had some major -- something that required a major change in plans, what elements of your planning procedure would be employed to handle fundamental changes of that nature?

MS. LONG: Can you be more specific, Mr. Tolmie? Because that is a very broad question with respect to any changes. Are you asking about a change in supply source? Are you asking about a change -- I mean, I think you need to be more specific for these witnesses to answer the question.

MR. TOLMIE: I tried to be more specific with the first two questions, and I got too specific apparently.

MS. LONG: You can ask the questions in relation to what this panel can speak to, and that's the execution of the Darlington refurbishment project. When I read your question, I thought that's what you were going to be asking about and whether or not that would have any impact on the plan for the Darlington refurbishment. So perhaps you can rephrase your question in that context, and the witnesses might be able to answer.

MR. TOLMIE: I wasn't asking about the plans for what you're going to do, but for how you're going to explain the cost results -- repercussions of what you'll do plus what the government says that the procedure should be. But this is -- it was only announced today, so I'm not really expecting you to give any great detail on it. But it may

be they do nothing.

MS. LONG: I think you backtracked there, Mr. Tolmie. I was looking at your question here:

> "If Cabinet should decide to quickly shut down the gas/oil-fired generation stations, what impact would that have on Darlington refurbishment?"

I thought that was the question you were asking.

MR. TOLMIE: Yes.

MS. LONG: I think Mr. Keizer answered your first question with respect to the announcements that were made today, so we're moving on to the second question.

MR. TOLMIE: Okay. So do I infer from what you are saying that DRP would continue without being affected by a shutdown of that nature? That's a valid response. I'm not saying it's good or bad. I'm just saying it's --

MR. REINER: Yes, that's correct, Mr. Tolmie. So if gas- or oil-fired generation stations were shut down, we don't anticipate that that would have an impact on our plans. We would continue to execute the Darlington refurbishment as we've presented it here.

MR. TOLMIE: My third question is really quite similar in that one of the projections that the Ministry of Energy has been outlining for their next LTEP anticipated quite a large increase in the demand for power over the same period that we're dealing with for the refurbishments.

Would there be any pressure for the DRP to accelerate its program so the power would be available earlier, or

would you have some other way of dealing with that situation, or would you simply leave it to another department?

MR. REINER: I mean, certainly, an acceleration of the refurbishment schedule in a scenario like that could be beneficial, but one of the things that we're very cognizant of is ensuring that we do not put at risk the performance of the project through schedule pressures that get applied that come from external factors, because that could result in a significant problem in the execution of the refurbishment.

Now, certainly, if we were in the midst of execution, and so as we work through unit 2, if opportunities were to arise that would allow us to do things differently that could benefit schedule, I mean, we are incented to do that regardless. And that would help a situation like this. But certainly in terms of any sort of an external pressure to reduce schedule is not something that we would push back on that.

MR. TOLMIE: Can you give us any guidance at all on what sort of compression of a schedule might be feasible?

MR. REINER: I would not be able to tell you that, because, right now, this is our working schedule and our high-confidence schedule, so without having at least executed the first unit to see what opportunities might arise and what risks might arise, it's too early to tell at this stage what the potential opportunities might be.

MR. TOLMIE: Onward to the next question. I'll try

and be as quick as possible here.

You have procedures for dealing with contingencies, and a lot of those procedures seem to aim at dealing with the fact that engineering estimates have a fairly large degree of uncertainty as a normal thing. Does the contingency provision in the OPG plans cover things like major changes in the market? For example, we've seen a lot of development of new technology for energy, some of which appear to be aiming at delivering electricity at a lower price. And you have other competitive approaches like the one I work on, where you use storage as a substitute for generating more power. I'm just wondering how you would deal with that kind of pressure where you've got a vanishing market for the nuclear power.

MR. REINER: So that sort of a scenario would fall into the category that we talked about, that we called management reserve; right? Maybe it's sort of an opposite of management reserve. But it would be -- it would be a risk outside of the control of the project to deal with. So it is not something that we have included contingency for in the refurbishment project.

Should a scenario unfold that changes the demand picture significantly, we would expect that the IESO, in their analysis and in concert with the Province, would then make some decision that could impact our plans, and we would -- we would respond accordingly with options on how we would deal with that circumstance. But that would be dealt with outside of the execution of the project. It

isn't something that we build into our contingencies.

MR. TOLMIE: I think generally what I'm asking about is: What are your internal provisions for dealing with all of these unknown unknowns that come up? Do you have a department that looks after that sort of thing, or do you have specific elements of the overall plan that are intended to cope with these unknown unknowns?

MR. REINER: I mean, the organization does have -- we do have a chief risk officer in the organization, in OPG, and that chief risk officer looks at all risks across the company related to its operations and external risks that could impact those operations. And so it would be through that process that the company would respond to a situation like that.

MR. TOLMIE: Okay. Thank you. I think I'm down to one question now.

The object of the hearing here is to establish some rates for the future. There's a schedule here from $65 to $99 for future payment amounts. So, if something major happens -- and it could be -- an example would be the CNRC turning down Pickering -- it would have quite a major impact on the general planning. What would the specific impacts be on OPG if an event like that were to happen? How would it affect the payment rate calculations?

MR. KEIZER: I think this question in particular is best addressed by panel 3, which is the nuclear operations. That deals with the extension of Pickering, and so they would be able to answer that question.

MS. LONG: I think that's right. Mr. Tolmie, you'll have to wait until that panel is up, and they will be available to answer that question. But this is the Darlington execution panel, so, really, they're not prepared to answer those questions.

MR. TOLMIE: Okay. Thank you. That's all I had.

MS. LONG: Thank you, Mr. Tolmie.

Mr. Keizer, I note from the schedule that Ms. Binette has given me -- we have a bit of time on Monday afternoon, and I was wondering if we could have a presentation of the settlement proposal at that time and deal with it then?

MR. KEIZER: Yes. We would be happy to do that. And if all goes well, subject to my friends, if it's possible, we may be able to do the direct for Pegasus as well, if possible. But certainly we'll be prepared to deal with the settlement on --

MS. LONG: Okay.

MR. KEIZER: -- Monday afternoon.

MS. LONG: That's great.

Is there anything else we need to deal with before we adjourn until tomorrow?

MR. KEIZER: Oh, sorry, just one other matter, sorry: Just to let people know that the Undertakings 2.2 and 3.1 have been filed.

MS. LONG: Excellent. Thank you very much.

Thank you, witness panel. We'll see everyone tomorrow at 9:30.

--- Whereupon the hearing adjourned at 4:26 p.m.