STATE OF FLORIDA
DIVISION OF ADMINISTRATIVE HEARINGS

RE IN: FUEL AND PURCHASED POWER COST RECOVERY CLAUSE WITH GENERATING PERFORMANCE INCENTIVE FACTOR,

Petitioner,

vs. CASE NO. 19-6022

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Respondent.
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VOLUME 2

PAGES 157 - 290

PROCEEDINGS: Administrative Hearing

BEFORE: Honorable Lawrence P. Stevenson

DATE: February 4, 2020

TIME: Commenced: 8:55 A.M.

LOCATION: Division of Administrative Hearings
1230 Apalachee Parkway
The DeSoto Building,
Tallahassee, Florida

REPORTED BY: DEBRA R. KRICK
Court Reporter

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INDEX TO WITNESSES

*Huh-uh is a negative response
*Uh-huh is a positive response

P R O C E E D I N G S

THE COURT: Mr. Rehwinkel, whenever you are ready, I think we are all set.

MR. REHWINKEL: Okay. Thank you, Your Honor.

BY MR. REHWINKEL:

Q I want to take you back to the drafts that we called -- that's Exhibit 115. If you can go to that. I think we will spend most of the rest of the time on that document.

A I am there.

Q And I want to take you to Document 2, which is at Bates 19.

A Okay. I am there.

Q Now, the file name for this document says P Crimi comments, do you agree with that?

A I do.

Q And also it says above the text on the upper right-hand side, REV 10-15-16 HMC, do you see that in the -- just above the -- well, do you see --

A I do see that, yes.

Q Okay. Would it be a reasonable conclusion that this is a document that was at least originally generated by Harry Carbone --

A Yes, I would agree with that.

Q -- on October 15th?

Okay. And would it be also reasonable to assume, based on the Duke file name, that Paul Crimi made some comments or edits to this document?

A It would. And one correction, I don't know that Mr. Carbone would have created it, but he certainly, by the revision date, it appears that he edited it.

Q Okay. We wouldn't know necessarily when he did it, but it would have been on or after the 15th of October of 2016, is that right?

A I would say on or before.

Q Okay. Now, Mr. Crimi was a consultant to Duke and also a member of the root cause team, is that correct?

A Yes.

Q Okay. And he is a former employee of Duke and Progress, right?

A Yes, that's correct.

Q And at some point, he was also an employee probably of GE?

A He was, yes.

Q Okay. And would it be fair to say he is a subject matter expert with steam turbines?

A He is.

Q Okay. So let's go down to the second

paragraph -- and just so we understand what these documents are, I mean, the night janitor wouldn't be able to go and make changes to these things? These are -- these changes are all by authorized engineers, right?

A That's correct.

Q Okay. So there is a statement here that starts "it is important" -- could you read that full paragraph there with those edits?

A Yes, sir.

"It is important to note that this turbine was originally designed for another project and built by the OEM but not shipped. It was subsequently reapplied to the Bartow project with the limitations and turbine outputs shown on the heat balances and other documentation provided. However, it was much less clear about the exhaust flow limit the output limit implied since this pressure and flow limit is not clearly stated on the documentation given."

Q Okay. Now, is that -- isn't that true?

MR. HERNANDEZ: Objection, Your Honor, compound.

MR. REHWINKEL: I'll ask you this --

THE COURT: Overruled. Yeah, you can break it down, I guess.

BY MR. REHWINKEL:

Q The first sentence is true, is it not?

A Yes, it is true.

Q The second sentence is true, is it not?

A Yes.

Q And the third sentence is true?

A That one is difficult to say a true or false. It was much less clear about the exhaust flow limit the output limit implied -- again, it's a working document of a root cause team. You are just asking me if that statement is true or false, that sentence?

Q Well, I am asking you if you agreed with that, let me ask it that way.

A I would say I generally agree with that.

The operating parameters to operate the steam turbine are really on -- you know, we, like -- for instance, we don't have, as I stated earlier, a low pressure inlet instrument, so exhaust flow limit, there is no way to measure that, so I think that's what this sentence is getting at.

Q Okay. But there is no expression of a lack of clarity about what the heat balances represent by Mr. Crimi here, is there?

A No, that's correct.

Q And if we go to page 27 --

A Okay.

Q -- in the keynote section under Period 1.

A Yes.

Q It says MHPSA was hired to evaluate ST design conditions, parentheses, original design was for Tenaska 3-x-1 heat balance and continue the warranty. Do you see that?

A I do.

Q Okay. And even though it has an A in there, there is no -- that's still Mitsubishi?

A It is. The A, I believe, stands for America.

Q All right. So somebody, when they developed Appendix A, put 450 megawatts as the steam turbine rating in 2016, do you see that, for Period 1?

A I do see that.

Q And that turned out to be an error?

A Are you asking me if that was an error?

Q Yes.

A It appears it was an error.

Q Okay. But if we go back -- let's go back to page 175 now. Let's go -- go out a year in time.

A 175?

Q Yes, sir.

And this Appendix A here, we see in the line -- or the row that's headed "Operating

Restrictions", do you see that caption?

A I do.

Q All right. And for Period 1, it says none, dash, MHPS intent was to follow heat balance diagrams, do you see that?

A I do.

Q Okay. So that's consistent, is it not, with Mitsubishi's contention that the heat balances were limitations that -- for operating the steam turbine, correct?

A Again, calling heat balances limitations I do not believe is accurate. They are predictions based on a certain set of criteria, and so what this is saying is the intent was to follow those predictions.

Q And that's what Mr. Crimi said a year earlier in his statement, right, that the heat balances were limitations in turbine output, back on page 19, right?

A There is a reference to the heat balances in the sentence -- in the paragraph I read.

Q As a limitation, right?

A The limitations in turbine output shown on the heat balances, yes.

Q Okay.

A Now, again, that's with other operating variables, okay. So a limitation is according to

whatever the other variables are for that specific heat case, which there are dozens, as we've seen.

Q So let's go to page 195, and this is -- it's got the draft water mark on it. So I am going to refer to this as the final draft, is that fair?

A I am almost there.

Q Okay. Sorry, this is Document 18.

A Yes, that's fair.

Q All right. So Table A is here, and we see -- if you go back to -- what did I have you look at? 175. Why don't you keep your finger on 195.

A Okay.

Q So this document here, we saw that says operating restrictions, right? For -- on 175 for the one, two, three, fourth column -- for the fourth row down.

A Oh, yes, I see where, yes.

Q Okay. And then if we flip back over to 195, it now says MHPS IP exhaust pressure operating limits.

A Yes.

Q And then for Period 1, it now says machine control to HP, IP and condenser design limits; do you see that?

A I do.

Q Okay. Now, isn't what's happened between the

October 11th draft and February 6th draft is that the question has been changed?

A What question?

Q Well, what the operating restrictions are.

A I think it's pretty clear on page 175, it refers to the heat balance diagrams. And on page 195, it refers to the HP, IP and condenser design limits. I am not sure I understand the question.

Q So if I'm looking at Table A on page 195 -- and let's just go back to page five of the exhibit, which is the final --

A Table A of JS-2?

Q Yes, JS-2. It's identical, it appears, to page 195, right?

A Yes.

Q Okay. So now just working off of this one, this heading seems to ask what are the Mitsubishi IP exhaust pressure operating limits. And then the answer given is different than on the October 11th draft. It says machine control to HP, IP and condenser design limits. It doesn't refer to heat balances, right?

A Correct.

Q Okay. And Mitsubishi never said that these were the operating limits, these meaning what's in column one on page five here. They never said these

were the operating limits. They said 420 was the operating limit, right?

A No, that's not correct.

Q For Period 1?

A That is not correct.

Q In all of their documents that they provided that you provided us, they don't ever say that's the operating limit for Period 1, do they?

A 420 is a predicted megawatt output if a whole bunch of variables, dozens of variables are controlled at certain points, 420 was predicted as the generator output at a power factor of .949, or a power factor of .9.

You have to look at each heat case specifically. That is not an operating limit. 420 was the minimum contractual amount that Mitsubishi had to achieve in order to avoid liquidated damages on the project.

Q I mean, that's your opinion, right?

A That's not my -- I believe it to be a fact.

Q Okay.

A I think we've looked at several pages that show it's a fact.

Q Well, in the RCA process, Duke Engineering didn't see it that way, did they, until you got to the

final document?

A I disagree with that. I don't see how you can draw that conclusion.

Q Let's go back and look at Document 3, which is at Bates 23.

A Document -- I am sorry, JS-3?

Q No. No, sir. Document 3 in 115.

A Oh, okay. I am sorry.

Q That's okay.

A Okay.

Q And just so I understand, this is a document that you have agreed you edited, right -- or you had an opportunity to edit?

A Yes, that's correct.

Q Okay. And at the time you edited this document, you had both access to both the heat balances and the contract and the IP, HP and condenser limits, correct?

A I could have had those available, yes.

Q Okay. I mean, none of that was new information. That all existed back in 2006?

A Right.

Q Okay. So if I look at on page 24, if I could get you to turn to that.

A Okay.

Q In the first paragraph, about halfway down, there is a sentence on the far right that starts MHPS, do you see that?

A Yes.

Q So it says: MHPS Engineering indicated that Bartow Unit 4S was an outlier relative to the Mitsubishi 40-inch L0 fleet with several operating hours above the design limit of 15,000 -- I am stumbling over that -- foot pounds per hour squared, parenthesis, the Mitsubishi 40-inch L0 fleet average was closer to 12,000 foot pounds squared per hour, close parenthesis; do you see that?

A I do.

Q Okay. You didn't propose to make a change to that in your edit, did you?

A It does -- no, I did not.

Q Is that because it's factual?

A I don't believe it to be factual. Remember, this is a draft document, and there is a lot of people looking at it, and I wasn't privy to all the conversations that took place over a long period of time with this root cause team, but I have not seen any Mitsubishi documentation that calls it a design limit. I have seen documentation from Mitsubishi that refers to their fleet -- maybe their fleet average or their

normal -- their fleet operating experience, but that the 15,000 and 17,000 pounds per hour per square foot was beyond their fleet experience and put them in a zone of uncertainty.

Q You -- okay. The next sentence -- I mean, the next paragraph, it starts, "While Duke Engineering", do you see that?

A Yes.

Q So would you be considered part of Duke Engineering for purposes of the RCA?

A Would I be?

Q Yes. I mean, you are an engineer. This is in your area. You were overseeing the root cause team?

A We can assume that. Technically I am not and never have been part Duke Engineering, but, yes, I can see -- I was overseeing the process.

Q Right. And I accept that. Just to -- for the judge to understand, Duke, big Duke that serves multiple states has a centralized engineering area, which you call Central Engineering, right?

A Correct.

Q And you also have engineers that are in your direct chain of command that report to you, up the chain to you, right?

A That is correct, yes.

Q Okay. Those two groups of engineers and some outside consultant engineers and yourself would have been all part of bigger Duke Engineering, right?

A Yes.

Q Okay. So this sentence says: While Duke Engineering agrees that back-end loading should be considered a significant contributing factor toward root cause, one cannot definitively conclude that it has been the root cause of all five of the documented L0 events.

You didn't propose to change that sentence?

A Correct.

Q Do you believe it to be true?

A Well, I know that there is some issues with that sentence. For example, there were really four L0 events. And then there was a fifth iteration where we replaced blades proactively to try to get a new design that would provide more megawatt output of the generator, just to make that part clear.

Q Okay. Well, that's sort of a detail, isn't it? It's not really that material to what's going on here, is it? It would cover Period 1, and it would cover Period 5, right?

A Right.

Q Okay. And, in fact, just so we can understand, let's go to page one of this document, and I

just want to ask you something that struck me curious about this sentence.

It says: Duke Engineering concluded that there was no correlation between any one of the above listed factors and the five failure periods, is that accurate?

A Could you show me where on page one that --

Q Oh, I am sorry. I apologize. It's in the next to the last paragraph.

A Oh, page one of JS-1?

Q Yes, sir.

A I am sorry. I was on the wrong document.

THE COURT: I was on -- yeah, final report.

THE WITNESS: Could you point to that sentence again, please?

BY MR. REHWINKEL:

Q Okay. Go to the second to the last paragraph.

A Okay.

Q And it says: Duke Engineering concluded that there was no correlation between any one of the above listed factors and the five failure periods.

Is it events or periods that you are looking at here? I mean, just to go to your point about there were only four events, five periods, but --

A Yeah. Well, I think it's both, right? There

was four events where we found damage, but there were five operating periods. One of the periods came after an iteration where we didn't have an event that caused us to shut down, or we didn't find something on an inspection that led us to change out blades, but we shut down in order to install a new design of blade, so that began Period 3. But you can't do the root cause on just periods or just events. It's all-encompassing.

Q Okay. So in that context -- well -- so going back to page 24 now that I understand how you are looking at it.

MS. BROWNLESS: Excuse me, of which document? Of JS-2?

MR. REHWINKEL: I'm just working in Exhibit 115.

MS. BROWNLESS: Okay. So you are on 18?

MR. REHWINKEL: So when I say a page, I mean the Bates number.

THE COURT: Bates stamp, right?

MR. REHWINKEL: Yeah. I am not worried about how the document is numbered.

BY MR. REHWINKEL:

Q So you said there was really four events instead of five events. Apart from that, what other problems are there with this sentence?

A Well, I think the key part of the paragraph that you are pointing to is the sentence that starts, as Appendix A illustrates, Periods 2, 4 and 5 saw operating hours in the avoidance zone of one hour, 1.5 hours and zero hours respectively. This indicates that back-end loading was not the cause of any of the reported blade indications failures during those periods of operation.

Q So you are saying that that undermines, or it takes out any agreement that Duke Engineering had that back-end loading should be considered a significant contributing factor toward root cause?

A Again, this is not the root cause document. This is notes, draft notes of a team. So there is no conclusion here.

Q So why would people have put stuff in here it if they didn't believe it to be true?

A I think it's a process, as we've talked about before, working through probable, possible things that could impact the blades that could cause the damage that we saw.

The -- I think what this says is that Duke agrees that back-end loading needs to be looked at, but then when you look at the real-life operating experience in these periods when we ran lower than even Mitsubishi's fleet experience on steam flow loading on

blades, we still had damage with the blades. So that clearly shows the lack of design margin.

Q Let me ask you about page seven of Exhibit 115.

Before I ask you the questions here, you agree that no other Mitsubishi L0 40-inch blade steam turbine experienced the kind of blade failures that you had in Bartow; is that correct?

A I am not 100 percent sure that's accurate. It's -- I just don't know.

THE COURT: Did Mitsubishi make that representation during all this?

THE WITNESS: They did.

THE COURT: Okay.

THE WITNESS: Mitsubishi made that representation, yes, Your Honor. In fact, it was very -- more than that. They talked about how the typical problems in their fleet of low pressure turbines with L0 blades was due to erosion, which is not surprising. That's the same problem across the industry with all equipment manufacturers of turbines.

As the steam travels through a turbine and uses its energy, it gets lower and lower pressure and gets closer to the saturation point where it

might turn into water. The blades aren't designed to have water impinge upon them. They are designed for steam. The water can cause erosion, which can lead to cracking and failure. That's what Mitsubishi told us was the issue that they had seen.

We did not see this issue here, but there had been some other indications through user groups, not from Mitsubishi, that there, perhaps, were some issues around the Mitsubishi fleet that Mitsubishi did not report to us.

BY MR. REHWINKEL:

Q Now, I asked you in the deposition for any information from users groups, and you said there was none, correct?

A We have information from users groups.

Q I asked you in a late-filed Exhibit No. 11 to provide it, did you?

A Oh, I don't know that we have documents. We have people who have attended user groups, and we have -- so they've had conversations with people at users groups --

Q Okay.

A -- so that's information.

Q So isn't it true that one of those

conversations was you gave a presentation, and somebody came up to you afterwards and said I am interested in what you are talking about?

A That is true.

Q Okay. But that person never said that that utility had any problems with Mitsubishi that were the same as yours?

A He indicated that they had similar issues.

Q Did he give you any information?

A No.

Q Okay. And did you present any of that information in the root cause analysis?

A No.

Q And you had that information before 2018, right?

A I don't know the relative dates of that user group meeting compared to the root cause.

Q If I asked you that in your deposition and you said it was, do we need to go look at it?

A Okay, then --

Q Okay.

A -- I agree.

Q And there was an inci -- there was a situation in Louisiana where someone came up to Mr. Salvarezza and said he was interested, right, in what was going on at

Bartow?

A Yes.

Q But he didn't say that they had L0 blade problems, that they had failures like you had with excessive vibration, right?

A That's correct.

Q Okay. And that was before 2018, correct?

A Yes.

Q And that didn't show up in the RCA or any of the documentation that we were provided other than that Q&A in the depo, right?

A We tried to verify through various means. The fleet operating experience is obviously very important. We rely on our OEMs for that information typically, whether it's GE or Siemens or Mitsubishi. User groups are also important, but we couldn't find any documentation that there were similar failures to what we've experienced at Bartow.

Q Now, would you agree with me that there are 32 Mitsubishi L0 40-inch blade steam turbines out there in the world? I don't know if that includes you or not.

A I think at the time of this document, that was the number that was used, right.

Q So you are one of 32 or you are one of 33?

A I don't know. There is probably more than

that now. In fact, I know there are more than that now.

Q But at that time, there was 32 or 33?

A Yes. Yes.

Q And that was, like, 55 or 57 rows of blades among all those units?

A Oh, yes, that's -- it was in the fifties.

Q Okay. And you have provided no evidence that any unit other than Bartow among that fleet had blade failures based on excessive vibration like you experienced?

A That's accurate.

Q Okay. And you also agree, I think we just talked about it in that draft, is that Duke Bartow was an outlier compared to all of the other Mitsubishi L0 40-inch blade steam turbines?

A It was an outlier on steam flow pounds per hour per square foot, right.

Q Wasn't it also an outlier in blade failure experience?

A Yes.

Q Okay. Now, just to be clear in the R -- in the -- if we go back to JS-2, the word outlier has been taken out of the root cause analysis. In other words, it doesn't show up in there with respect to how you compare to Mitsubishi, right?

A How the Bartow plant compares to Mitsubishi?

Q Yes.

A I will take your word for it.

Q Okay. I mean, isn't it also true that in these documents that were -- that preceded the final draft, there was a reference to the Mitsubishi experience and that got converted to industry experience. So you took out the comparison of Mitsubishi plants with respect to the blade failure experience comparison, right?

MR. HERNANDEZ: Objection, Your Honor. We are talking about a lot of documents. He is referencing specific language in those documents. If the witness could see the documents to answer the question specifically.

THE COURT: Sure.

MR. REHWINKEL: Sure. I mean, we can go through it.

BY MR. REHWINKEL:

Q Let's go to page 125. Just pick one. And this is Document 13 under the tabs.

A Okay. I am there.

Q And if you go back to 123, it looks like it was a October 12th document.

A Okay.

Q And back on page 125, and the one, two, third full paragraph there, halfway down it starts on the right-hand side, the number of blade failures and problems with ST L0 blade performance is not typical, i.e., these issues are outliers among the Duke CC fleet as well as the Mitsubishi 40-inch L0 fleet.

Did I read that right?

A Yes.

Q And that's true, isn't it?

A As far as I know, that is true.

Q Okay. Now, is it fair to say -- and if you go back to JS-2, which is Document 1, that sentence does not reappear, does it -- or let me withdraw that and say that sentence does not appear?

A It doesn't, but I don't -- again, we talked about this before. All these documents you are going through are drafts of a working team. There is notes. They are not a final root cause, and I wouldn't expect the final root cause to be identical to any of these documents.

Q Well, let's look at page two of Exhibit 15, it's also JS-2.

MR. BERNIER: So two of JS-2?

MR. REHWINKEL: Yes.

MR. BERNIER: Thank you.

BY MR. REHWINKEL:

Q In the second full paragraph it starts "based on", do you see that?

A I do.

Q This is your ultimate conclusion, right?

A It is. We discussed that before.

Q And this doesn't mention a comparison to elsewhere in the industry, but elsewhere in the industry referenced there is really Mitsubishi, right?

A No, that's not accurate. If you look at the footnote at the end of that paragraph, that refers down to the -- I will read it to you.

The most commonly reported issue with the 40-inch L0 blade design elsewhere is water erosion, which both Duke and MHP also agree is not a contributing factor to the Bartow failures. So I really was referencing the industry in general.

Q Okay. So -- but the outlier language and the comparison to Mitsubishi and those other 32 plants, experience is not contained in the final report that the Public Service Commission gets to see, right?

A It's not in the root cause. And by agreeing to what you just said, I am agreeing that these are various drafts of root cause documents, which I don't agree with that.

Q Wait, now, you don't agree that Bartow and Period 1 was an outlier compared to the rest of the Mitsubishi L0 40-inch steam turbine fleet?

A An outlier from the standpoint of steam flow, and an outlier from the blade, the snubber and Z-lock damage we talked about, yes, I agree that it was an outlier.

Q Okay. All right. So now I started this line of questioning by asking you to go to page seven, and look at footnote six.

MR. BERNIER: Seven of which? I am sorry.

MR. REHWINKEL: Of 115.

MR. BERNIER: Got you.

MR. REHWINKEL: It's the same as --

THE WITNESS: Okay. I am there.

BY MR. REHWINKEL:

Q You are there. And you see footnote six down there?

A I do.

Q Would you mind reading that aloud? And I am going to ask you about the last sentence.

A Okay. Even though the L0 blades are no longer in the ST and the pressure plate has been installed, MHPS Engineering does not have enough technical data to support releasing Duke to operate the machine beyond the

current IP turbine exhaust pressure operating limits because of potential impacts to upstream blading. That is the L1 blade sets. This suggests that MHPS is unsure what effect, if any, is created by its avoidance zone, and more importantly, points to a design flaw that affect more than the L0 blades.

Q Now, this statement about a design flaw, is there an analysis that was conducted to determine that there was a design flaw in the L -- in the Mitsubishi steam turbine that you bought?

A I think this statement is pointing to the fact that Mitsubishi couldn't relieve the operating constraints that were in place. Even after we took the L0 blades out and put a pressure plate in, Mitsubishi still said you need to operate at a more conservative -- or the more conservative operating parameter led Duke to believe that there is more concern on Mitsubishi's standpoint that perhaps it's not just an L0 issue, perhaps it's an issue elsewhere in the low pressure turbine, and that perhaps they are questioning their own design.

Q Well, what is elsewhere in your opinion? The upstream blades? The nozzles? Anything?

A Well, technically, thousands of blades are the same thing, but, yes, the -- so the -- well, let me show

this picture.

So upstream would be -- so remember the steam goes in the middle of the turbine and then goes this way and this way. So here's the L0 blade, the largest blades. Upstream of that would be this row of blades and this row of blades.

So there was concern that perhaps we need to continue operating at that lower pressure limit because maybe there would be damage to other blades that Mitsubishi appeared to be questioning their own design, and that perhaps those rows of blades might become damaged.

Q But beyond this footnote, there is no analysis where you determine that there was something wrong with the turbine, is there?

A There is not. But I can tell you we obviously very concerned every time we opened up this machine, and we had multiple opportunities to do very detailed inspections on the steam turbine, many more so times than is the norm.

At the end of Period 1, we did an inspection. At the end of Period 2 -- at the end of every single period, we did a very detailed inspection of those blades, so we had to gather that information.

Q How many 4-x-1 combined cycle units did Duke

have experience with before you commissioned Bartow?

A This is Duke's only 4-x-1.

Q Okay. And how many 4-x-1 -- so would it be fair to say that you did not have robust operating experience with a 4-x-1 combined cycle unit?

A Yes.

Q Are you familiar with Exhibit 106 -- it's the August 13, 2018 -- called the settlement.

MR. BERNIER: 106?

MR. REHWINKEL: Yeah, 106.

THE WITNESS: Yes, I am.

BY MR. REHWINKEL:

Q Okay. Now, is it --

MR. BERNIER: Give us one second, Charles. I am trying to find it.

MR. REHWINKEL: Oh, I am sorry.

MR. BERNIER: Okay.

BY MR. REHWINKEL:

Q So if we go to the back, page 11, we see Tony Salvarezza signed this thing on October 13, 2018?

A Yes, I do.

Q And you would agree that Duke was having discussions and trying to either work -- well, trying to work out a resolution of these matters with Mitsubishi at sometime not long after the RCA was completed?

MR. BERNIER: Judge, I am going to have to object to this. I am not sure how any resolution Duke was trying to work out with Mitsubishi has anything to do with how the unit was operated leading up to 2017, or after 2017 when the pressure plates were put in. And I think those are the two issues that we are here to talk about today. And I am not sure how a settlement agreement is relevant.

THE COURT: Well, you are going to show us it's relevant?

MR. REHWINKEL: Yes.

THE COURT: Okay.

BY MR. REHWINKEL:

Q And my question is: You signed -- you provided -- you finalized an RCA and you filed it with the Public Service Commission on March 1st, right?

A I don't know that that was the date of filing, but yes.

Q Sometime in March?

A It was done in February -- it requires it's finalized in February, so that makes sense.

Q And you filed testimony in March of 2018?

A Yes. Yes. Yes. March 1st, you are right. Thank you.

Q Okay. And in this document, it says there was

a design flaw in the turbine, right?

A Could you point to where you are looking at?

Q I am sorry. When I say this document, I am pointing to your root cause analysis at page seven.

A Page seven of the root cause analysis?

Q Yeah, footnote six that we were just talking about.

A So, yes, it says it suggests that Mitsubishi is unsure, and that there may be a design issue.

Q And it says, more importantly, points to a design flaw that may affect more than the L0 blades, right?

A Yeah.

Q Okay. So my question to you is, you just said there was a design flaw in February. In August you signed an agreement where you gave up all your rights to sue under the contract that you bought the unit for, isn't that right?

MR. BERNIER: I'm going to go back to objecting, Your Honor. I just don't see how that's relevant to how we operated the unit, how Duke operated the unit in 2017, the decision whether or not to settle any potential contract claim. I just don't see the relevance to the two issues we've got identified here today.

MR. REHWINKEL: My response to that, Your Honor, is that the root cause analysis we established early on today that this is their principle evidence to meet their burden of proof. This root cause analysis purports to be what happened, and they are asking the Public Service Commission to rely on it to absolve them of any liability to the customers for replacement power.

One the problems that we've raised is that the way they ran the unit in the first period has caused problems in later periods. They have -- and part of our case is that their explanations about the blade are inconsistent with the experience other units have had.

Now, in the root cause analysis, they are saying that there may be a design fault with the turbine itself, not the blades, which is what their whole case is about, but the turbine itself; and they are asking the Commission to rely on that while they are settling with Mitsubishi to give up their right to sue for a design flaw.

It doesn't -- so we are offering this as impeachment to the conclusions in the RCA because the RCA is submitting that there is a design flaw while, at the same time, they are giving up their

right to sue. That's an inconsistency that we would like you to consider in your fact-finding.

THE COURT: I am going to allow it, but -- I mean, it's without prejudice. I mean, you can continue to argue that it's not relevant. I am not sure that you are totally tying it up, but I am going to at least let them present it.

MR. BERNIER: Understood.

BY MR. REHWINKEL:

Q Okay. So my question to you was is that what happened?

A Well, I think there is more to this agreement that you are not talking about that's pretty important, and you need to also think about the whole timeline of events and what the warranty provisions were in the contract, which I don't know specifically, but typically, there is about a three-year warranty period. It's typically one year for some pieces. It may be two years, three years if you are lucky, all right. So that's from '09 when we first started operating. This agreement was in 2018, six years later. So I don't know is that we had any warranty claim left on the original blades, and I think that's what you are inferring.

Q Well, if you are saying there is a design defect?

A Even for a design defect.

Q Okay. And we don't know -- and I am not asking you to resolve that question because I know you are not an attorney, right. But the -- my original question that started this line is what analysis did you do to demonstrate that there was a design flaw in the turbine? And I don't think there was one, was there?

A I think we are -- well, what we are saying is that there was inadequate design margin at the very least.

Q That was for the blades, right?

A Well, you are -- I think you are misinterpreting something. So look back at the point that -- the wording that you are pointing to is on page seven of JS-1 and JS-2, correct?

Q Page seven, footnote six.

A Right. So the last sentence, this suggests that MHPS is unsure what effect, if any, is created by its avoidance zone, and more importantly points to a design flaw that may affect more than the L0 blades. So what do you mean when you say the turbine?

Q Well, the part of the turbine that's not the L0 blades, everything else that you showed the judge on the picture.

A So -- which would be the L1 blades, the other

sets of blades, which we know from very detailed examination didn't have any damage. We looked way more times than we should have, but we gained a lot of information doing those inspections.

Q And is there -- did you present any evidence in this RCA concurrent with this assertion here in this footnote that any other Mitsubishi L0 40-inch steam turbine units were having the same kind of problems, or had a design defect or flaw in them?

A That wasn't the question of the root cause. The question of the root cause is why did these snubbers and these Z-locks fail?

And so, yes, you take into consideration what is that fleet experience? And the root cause shows, or says we reviewed, the team knew that the fleet experience at the Bartow plant was an outlier compared to the Mitsubishi fleet from a damage standpoint. But when you go back and look at what caused the Bartow failure, that's what the root cause is about. It's not about -- we didn't do a root cause on Mitsubishi's issues. We did a root cause on Duke Energy's issues.

Q But if there was a design flaw, it wouldn't have been just -- not a manufacturing flaw, you are saying it's a design flaw. That would have applied to the other 32 units, right?

MR. HERNANDEZ: Objection, Your Honor, foundation.

THE COURT: Overruled. I mean, I think it's understandable.

THE WITNESS: Potentially it could be applicable to the other units. And you have to look at the design conditions, the operating parameters of each of those 30-some units, or 50-some rows of blades that we talked about. And if any of those other 50 blades were operated the same way as Bartow within the guidelines established by the OEM, I would be pretty worried if I owned one of those other sets of blades.

BY MR. REHWINKEL:

Q Well, you agreed you are an outlier, and they didn't have any of the same kind of problems, right?

A Correct.

Q So why wouldn't -- isn't that just as correlative that there is not a design flaw in there because they are not having any problems and only you are?

A Not necessarily. That's a factor that you have to take into account, but the operating parameters at Bartow -- we just talked about how Bartow is a 4-on-1 combined cycle. We talked about how it's an outlier

compared to the Mitsubishi fleet. It's about 15 -- the calculation is about 15,000 pounds per hour per square foot of impact on the last stage blades, which is an outlier to the Mitsubishi fleet, but we operated within the design parameters given by Mitsubishi.

They didn't say, don't operate beyond 15,000 or 17,000. There is no way to measure that. They said, don't operate beyond this operating pressure. Don't operate besides this -- beyond this operating temperature, which we did.

Q Would you agree with me that Exhibit 106 covers claims that dated back to Period 1?

A Yes.

Q Okay. And what -- basically what you did here, I -- and tell me if I am oversimplifying it, is you had -- they had a claim against you for, like, $10.2 million and you had a claim against them for $6 million, and you settled it where you gave them $3 million and they gave you a $2 million credit on the next set of blades, is that --

A That's a fair summary.

Q Okay. So I just want to ask you about --

A I am sorry, with one exception. I am sorry.

Q Sure.

A The credit could have been used in many

different ways. Not necessarily at Bartow.

Q Right. It specifically mentioned you could use it on the blades, but you could use it elsewhere under other conditions, right?

A Correct.

Q Okay. And it can be read in here, right?

A Yes.

Q So let's just go to page one, and I just want you to read for the record the last two whereas clauses aloud, please.

A Okay. Whereas, after the steam turbine was commissioned in June 2009, MHPS designed enhanced L0 blades that would endeavor to allow Bartow station to increase its output from 420 megawatts to 450 megawatts, and whereas, the parties entered into purchase order 718383 on February 10th, 2014, whereby MHPS was to design and install such enhanced design L0 blades at a $6 million cost to DEF, which amount DEF has paid.

Q Okay. So this is a document that Mr. Salvarezza signed on behalf of the company, right?

A Yes.

Q So he agreed to what is stated in these two whereas clauses, correct?

A Yes.

Q And doesn't that say that, reading these two

together, that the output of the steam turbine was 420 megawatts and you wanted to increase it to 450, right?

A Generally that's correct.

Q And that specifically is in Period 1 that it's 420, right?

A Yes.

MR. REHWINKEL: Your Honor, I believe if we take a short break here, I can substantially shorten the day at least from what I am contributing to it.

THE COURT: How long do you need?

MR. REHWINKEL: Just five minutes.

THE COURT: Five minutes. Sure, we will take five.

(Brief recess.)

THE COURT: Back on.

Whenever you are ready, Mr. Rehwinkel.

MR. REHWINKEL: Thank you for that, Your Honor. And I think it did help a great deal. Thank you.

THE COURT: Yep.

BY MR. REHWINKEL:

Q Let's go to -- we are still on Exhibit 115, and go to page two.

A Okay.

Q And if you wouldn't mind reading the second paragraph above where it says historical overview, where it says for Bartow, just that sentence.

A Starting with the words "for Bartow"?

Q Yes, sir.

A For Bartow, the long-term solution is to replace the L0 blades with blades of a different design and/or to retrofit the LP steam path and/or continue operation with pressure plate.

Q All right. Would you mind explaining, so that -- to the judge what is referred to there as the LP steam path?

A Yes, sir.

May I stand up, Your Honor?

THE COURT: Sure.

THE WITNESS: So the three options are essentially replace the L0 row again, the two rows with another design of blades, or when we say the whole low pressure steam path, it would basically be lifting this section of the overall turbine generator out and putting a different low pressure turbine in.

So that would entail all rows of blades, all rows of fixed diaphragms in between the blades, the

casing, everything associated with the low pressure turbine.

BY MR. REHWINKEL:

Q Thank you.

And it says and/or there, is that correct?

A It does.

Q Now, I am not trying to -- just for factual purposes, in October, November of this year, you actually put in the solution that you chose, which was we call the Period 7 blades?

A We are on Period 7. Yeah, we put in another iteration of blades redesigned that had very significant testing done at a facility in Japan that we witnessed. Those blades were installed November, December timeframe. I can't remember the date we started up, but it was in, I think, early December. So we are operating with those -- that generation of blades right now.

Q Okay. So is it fair to say that -- well, so now Mitsubishi has installed the fourth set of blades on this -- on that low pressure turbine, is that fair, or a different set?

A Well, we installed one end at the start of Period 2, then both ends at the start of Period 3, both ends at the start of Period 4, both ends at the start of Period 5. The start of period six had pressure plates.

So to your point, this is really the start of Period 7 with new blades, but I think it's more than four.

Q So it's five sets?

A Yes.

Q Now, this is just a hypothetical, because I am not suggesting that it's not going to work. But if there is a problem with this set of blades, will you replace the steam path for certain?

MR. BERNIER: I'm going to object. Again, we are going back to the two issues of operation, and now we are dealing with a hypothetical about what could happen in the future.

THE COURT: That's -- well, I will overrule it again. I mean, Mr. Swartz, if you have any notion, you can answer.

THE WITNESS: Well, let me start by saying one big difference in this iteration is we've installed a permanently-mounted blade vibration monitoring system along with the new sets of L0 blades. So as we increase load, we can take data.

It's very much like the temporary system that was used at the beginning of Period 3, where we came up with the avoidance zones. This is a permanently mounted system, much more robust, so it's made so it's not going to come apart and

potentially cause what we would call domestic object damage inside the turbine.

That gives us much greater confidence that we will find an issue prior to any type of vibration that would lead to component failure. So I think that's a really significant difference with what we did with this iteration of blades.

You know, the hypothetical, what would we do if this set of blades failed? Really, we would have to -- like, how would they fail? I mean -- and I am not trying to be funny, but was it an erosion issue? Was it high cycle fatigue? Was it a snubber? Was it a shroud?

I think it depends on the type of failure. If it's an erosion issue, for instance, there are ways to deal with that. So it really depends.

I think where you are going, though, is, you know, our appetite -- my personal appetite for putting in more sets of blades is very low, you know, that's why we put a pressure plate in at the start of Period 6. No more trying. We've got to figure something else out, and our customers can't stand that.

And I think that was a really good decision, a very sound decision, because once we put that

pressure plate in in the spring of 2017, we finally had two-and-a-half years of nothing happening. Yes, we ran about 40 megawatts lower from the total output. Instead of a 1,200-ish megawatt site, it was 40 megawatts lower than that. But we didn't have any issues where we had to shut down for the low pressure turbine, and I think that was really good for customers.

It was the right decision while we were figuring out what we could do for the next iteration, which I do believe will be the long-term solution, but Period 7 is going to go on for a long time.

BY MR. REHWINKEL:

Q Just on your blade vibration monitor point, it is true, as is stated in the next sentence, that even had you replaced the steam path, you still would have insisted on a blade vibration monitor as a part of anything that was done, right?

A That was Duke Energy's position. We wanted to make sure that that was part of the solution. Not all the -- not all vendors agreed to that.

Q All right.

A So it actually disqualified some from the -- from that project.

Q And GE was a close second to the solution that you put in in the fall of '19, right?

A They were.

Q Okay. And the fact that it says and/or means that you still haven't completely given up on maybe replacing the steam path, right?

A I think the and/or is really just trying to show that there were three options, that they're not mutually exclusive, right? Let me get back to the sentence and read it again.

Right. So it might require new designed L0 blades and a new steam path. That's what the root cause is showing. But at the point of this root cause, we didn't know what the long-term solution was. So we're just leaving all options open while the team studied what the ultimate long-term solution would be, which we then decided, you know, long after, months after this.

Q Okay. When you did your industry experience research, you didn't find any instance of an L 40 -- an L0 40-inch steam turbine in the Mitsubishi fleet having to replace even one set of blades in 11 -- after only 11 years of operation, did you?

A I am not sure. I actually suspect that there were issues, but likely caused by erosion.

Q Okay. I should have added based on a

vibration-induced damage?

A Right. No snubber or shroud issues like we've experienced at Bartow.

Q Okay. So with that clarification, your research didn't reveal --

A Correct.

Q And you did not, likewise, turn up any industry experience that showed that a L0 40-inch Mitsubishi steam turbine operator had to replace a steam path?

A Correct, we did not find anything of that.

Q Okay. All right. I have just have a couple of sort of clarification questions to ask you on -- I am still on 115, and I want to take you back to page 17 of 18, which is Exhibit 17 --

A Okay.

Q -- exhibit page 17.

Can you tell me why Citrus L0 on the far right-hand side is the header for that column?

A I may be on the wrong page.

Q I apologize. It's the one -- it's the Appendix A in your JS-2. It's page 17, and it says Appendix A.

A I am sorry, I was on page seven.

Q Sorry.

A All right. I am there.

Q So my question to you is: Can you tell me why Citrus L0 is the header for the far-right column?

A I don't know specifically, but what I do know is that Duke had -- Duke Energy had some concerns over the Citrus L0 blades.

Citrus combined cycle is our newest plant. It's two 2-on-1 combined cycles on one site, and it does have Mitsubishi equipment, Mitsubishi combustion turbines and Mitsubishi steam turbines. So there is two steam turbines, and it does have 40-inch steel blades, so there is a similarity there.

The design at Citrus is such that the calculated steam flow -- we've been talking about this pounds per hour per square foot number. It's less than 11,000, or around 11,000 at Citrus. So because of that, Mitsubishi doesn't not think that there is any issues, but I believe they are similar to Type 5 blades, or they are Type 5 -- Mitsubishi Type 5 blades, which don't mistake that with period, right. So they are different style of blades than any of the iterations at Bartow, but they are similar in that they are 40-inch steal L0 blades, if that makes sense.

Q Okay. I just wanted to understand whether this was supposed to be an identical comparison of what

you are putting on as a type -- as a Period 5 blade, and that's --

A I know we obviously had concern with this Citrus project because of what were finding out, or what we found out here. So we are just showing for comparison purposes what is installed at Citrus.

Q Okay. I understand that.

And can you tell me, do you know at what point in any of the periods any of the damage to your L0 blades occur at Bartow?

A We do know. If we could look -- if we look at that same exhibit and go to -- just because it's going to help me remember some things. If we go to page five. It's Table A.

During Period 4, we were able to pinpoint when some of the damage occurred. We had -- if you look at the keynotes from period row and go over to that Period 4 column, it said -- it shows the two separate step changes that were actually reductions, decreases in vibration, led Duke Engineering recommendation to remove the steam turbine from service for inspection.

So there was discussion with Mitsubishi after we noticed these reductions in vibration. It's interesting, Mitsubishi believed it to be bearing settling in, just some normal course of action after an

outage on a steam turbine, which we had just had an outage at the start of Period 4. Our Duke Engineering wasn't convinced.

It's -- an unexplained change in vibration, you know, typically -- well, you monitor vibration for increases. If there is an increase in vibration, you need to understand why, and if you can't figure it out, if it gets beyond a certain point, you typically stop operation and go conduct inspections, because that can lead to damage very significant issues in multiple components.

In this case, there were slight changes and there were reductions, but after inspection, we -- when what we found, we found, looking at row broken snubbers in the row that's titled "Broken Z-locks", we found one broken snubber on the generator end of the machine, one broken Z-lock on the turbine end of the machine, and two broken Z-locks on the generator end of the machine, and so that's one, two -- that's four pieces of metal. Small pieces of metal. Remember, we are talking about the snubbers and the Z-lock. But two of those instances were almost certainly the times we saw the slight reductions in vibration.

So the fact that we shut down to do an inspection and take a look was the right thing to do,

the prudent thing to do. Before we could operate any more, we had to replace blades yet again.

Q So is that the only --

A That's not the only time. I am sorry. Back to your question.

In Period 5, if you look at the same row, keynotes from period, it doesn't show the date, but we do know same -- similar type of thing. It wasn't vibration in this case, but we had two things happen simultaneously.

We had a decrease in pressure of vacuum. We are losing vacuum in the condenser. And we also, all of a sudden, have indications of sodium in the condenser.

The cooling water that flows through the condenser is saltwater. It's from Tampa Bay. So sodium is much easier to monitor than chloride level, so we monitor for sodium. Any indication of sodium above very, very minute traces is a large alarming. If you get sodium, or especially chlorides into your pure water that you are going to just turn back into steam and reuse it in the process again, that causes all kinds of issues in the system, and potentially turbine issues in the long-term.

So we got an alarm that we had high sodium. We have an alarm that there is reduction in vacuum, so

we shut down the turbine immediately. So we know when that failure occurred as well. So Period 4 and 5, we do know when those happened.

Period 1, we don't know when that happened. Period 3, we don't know when that happened.

Q Okay. And for Period 1, 2, 3, 4 and 5, can you tell me what pressures were on the blades at the time damage occurred?

A By pressures on the blades, you mean this mass flow rate that we've been discussing?

Q Yes.

A I don't know that number. Again, it's a calculated number. What I can tell you is that we were operating below whatever the LP turbine or IP exhaust pressure limitation was at the time.

Q Okay. Mr. Swartz, those are all the questions I have for you today?

MR. REHWINKEL: Thank you, Your Honor.

THE COURT: Who's next?

EXAMINATION

BY MR. MOYLE:

Q Good afternoon. I am Jon Moyle, I am representing the Florida Industrial Power Users Group.

You have been in the electric world a long time, have you not?

A Yes, sir, I have.

Q Okay. Are you familiar with the U.S. Energy Information Administration?

A Not really. No, sir.

Q EIA, you have never --

A It's somewhat familiar, but I wouldn't say I am -- the acronym is, rather, but I am not familiar with what it does.

MR. MOYLE: I have a document if I can just show him?

THE COURT: Sure.

THE WITNESS: Thank you.

BY MR. MOYLE:

Q Sir, I have handed you a document from U.S. Energy Information Administration. It's a glossary of terms under the letter G, right?

A Yes.

Q Okay. I might have handed you my copy that had a little star on it.

A Oh, it has the answer on it.

Q The generator nameplate capacity, which is on page three of six, do you see that?

A Generator nameplate capacity?

Q Right.

A Yes, sir.

Q Would you mind just reading that into the record?

A Generator nameplate capacity installed. The maximum rated output of a generator, prime mover, or other electric power production equipment under specific conditions designated by the manufacturer -- designated by the manufacturer. Installed generator nameplate capacity is commonly expressed in megawatts and is usually indicated on a nameplate physically attached to the generator.

Q Okay. Are you comfortable with that definition for generator nameplate capacity?

A I am.

Q Okay. And a couple of follow-ups on that.

Does the unit that we are talking about here have a, you know, have a nameplate on it?

A I don't know.

Q If you were to show me around, you could you say, Mr. Moyle, let me show you our nameplate, and it would be right there, and I would see 420?

A I wish I could tell you. I don't know if it has a physical nameplate or not.

Q So you just don't know one way or the other on that?

A I don't. But what I can tell you is in the

contract -- we looked a little bit earlier today at the generator capability curves, and that does include the nameplate ratings of the generator.

Q Right. And there is nameplate -- I mean, we have it throughout these documents, right? You looked a it, and that chart you were looking at it says 420, right, in your root cause analysis?

A Right.

Q And I just want to get your understanding on the record with respect to nameplate and what it means.

Also, with respect to when Duke or others announce a project, don't they typically announce it by using the megawatts that are expected from the nameplate?

A Yes, I would agree with that.

Again, we typically -- that's our product. That's what people are familiar with, and that would make sense to make announcements in that manner.

Q Okay. I am wanting to ask you some questions about the root cause analysis.

If I understand -- I mean, the history of this generator is, is that it's referred to in some of your documents as it got picked up on the gray market, right? You have to say yes or no.

A Yes, I am sorry, yes.

Q The court reporter needs to put nodding head yes.

A Sorry.

Q Anyway, that's all right.

And so the gray market is, you know, kind of an interesting term. What does that mean, the gray market for generators?

A So the gray market would mean it wasn't bought -- or a piece of equipment isn't bought from the original equipment manufacturer. In this case, the steam turbine that was installed at the Bartow project was purchased -- it was originally manufactured for a different company for a different project, and so -- and that project fell through. I don't know why it didn't come to fruition. And so instead of going to the original equipment manufacturer and buying something directly from them, it was this one that was already there that was really owned by a company called Tenaska, and we purchased that one. So that would be the gray market.

Q Yeah. Would it be somewhat analogous to if I was going to buy a Ford F150 truck, I can buy it from the dealership and nobody had owned it before, or I could buy it from somebody who bought it from a dealership and then drove it home and then said, you

know, I don't really like it and left it in his garage for a few years and I bought it from him in his garage after a few years; is that fair?

A I don't think it's exactly fair.

In this case, the turbine was never delivered to Tenaska. It was kept in storage at Mitsubishi, so it was subject to the same -- whenever Mitsubishi or any turbine manufacturer makes a product, they are manufacturing it and they are storing it under a certain set of conditions. So this one was stored in those same sets of conditions as a regular new turbine, never left Mitsubishi, but stayed -- or never -- yeah, never left Mitsubishi, so it -- yeah, it didn't go to that other person's garage in your --

Q Yeah. And so you -- as we sit here today, you know for sure it didn't get in a warehouse somewhere else. It stayed on Mitsubishi grounds and stayed in their warehouse, or you are not sure of that?

A No. It's my understanding Mitsubishi had possession, and we've actually looked at -- well, the project team involved in the project looked at all kinds of documentation of the storage conditions from manufacture to the date of purchase and to inspections as well.

Q How long from date of manufacture to date of

purchase for you all, how long did it stay in the warehouse?

A I am sorry, I don't know that number.

Q It was more than a year, was it not?

A It was more than a year, yes.

Q Do you know if it was more than five years?

A I don't think it was more than five. It may have been around four, if I remember correctly.

Q Yeah. Are -- I have a boat. And people tell me on my boat that the best thing you can do for it is use it, run the engine, that you need to run the engine to make it operate okay. Have you ever heard anything like that being an engineer, it helps to run things?

A I have heard similar things like that, but I would also tell you that that engine then is going to need more frequent maintenance intervals because you put on run hours.

Q Yeah. Yeah. The engine -- the turbine you bought, it was not run while it was in the warehouse, correct?

A Correct.

Q Okay. And if things are not run, there are issues that can arise from an engineering standpoint, correct?

A Not necessarily. Again, you have to think

about how this turbine is stored, and it was actually stored under inert gas pressure in casings with the pressure monitored so the regular atmosphere that we are breathing now never even got to the turbine, so that prevented corrosion, for example.

Q Was the plant near the sea? I mean, Japan is surrounded by a lot of water, is it not?

A I don't know.

Q You don't know where it was?

A I don't know where the plant was.

Q There have been a lot of questions about root cause analysis, or RCA, and let me just make sure I got this right. You all, Duke, did a root cause analysis, correct?

A Correct.

Q And that was comprised of seven people who are all Duke employees, correct?

A I think that's what this says. One of them was actually a consultant, as Mr. Rehwinkel pointed out, a former Duke employee, that at the time of the root cause was actually a consultant back for the company.

Q Okay. So you had six Duke employees and some person who was a Duke employee for a number of years that recently left and came back in?

A Yes, sir.

Q Okay. And you were not on that seven-member team?

A That's correct.

Q Okay. So some of the questions that Mr. Rehwinkel asked you, you were struggling a little bit and surmising, and there were a couple of objections from your lawyer about I don't want you to have to guess. I assume that's because you weren't involved in drafting the report, correct?

A That's correct.

Q All right. Mitsubishi, they also did a root cause analysis, did they not?

A They did. In fact, I think they've done multiple root causes.

Q Right. And their first take at it, their first take at it was essentially too much steam is being put through the process, correct?

A Too much steam to the low pressure turbine, yes.

Q Right. And your -- your being Duke -- root cause analysis, you spent a lot of time with Mr. Rehwinkel on it. I am going to try to characterize it at a high level and see if I can get you to agree that you are comfortable with this, but that there were identified a number of possible causes for the problems

that happened to the turbines, correct?

A Correct.

Q And you all couldn't really come to 100 percent conclusion, decisive conclusion as to what caused the problem, but you said, here are what we think are our best ideas as to what caused the problem, correct?

A That's correct. And we are able to conclude based on in-depth analysis that that lack of blade design margin was the root cause.

Q Right. And it struck me a little bit as, like, well, you couldn't figure out exactly what it was, so it was, like, well, it wasn't designed right. But I am -- I was a little curious about how you all followed up on that, and you -- I think Mr. Rehwinkel asked you what was the design flaw. I think you said, well, it wasn't designed within the right margins, is that right?

A I don't know if that's what I said, but as far as follow-up, it's difficult at that point because essentially Duke Energy is saying, Mitsubishi, we believe you have an inadequate lack of design margin in your blades. The OEM does not want to admit to that. They did admit in their later presentation in the fall of 2017 that the blade flutter was caused by -- or that the failures were caused by blade flutter in all of the

periods.

Q Yeah. And blade flutter, that's like vibration, right?

A It is. Same thing.

Q And you can get vibrations caused by a whole bunch of things, correct?

A Yes.

Q Yeah. Including putting too much steam through. If you are putting too much steam and it's not designed for that, that can cause vibration or flutter, correct?

A That's correct.

Q All right. And it could be some other things?

A Yes.

Q Okay. But in terms of Duke looking at it, you all never came to a conclusion with respect to -- I wrote it down -- the margin. You said they didn't design it and they didn't have enough design margin, I think; is that right?

A Right.

Q And design margin, what is design margin? I assume it's like a level of tolerance. They say, oh, well we can, you know, do this or do that. Is that right?

A It is. For many pieces of equipment, they may

be designed for a certain level, but there is an engineering design margin or extra capacity that's built in, or design factor that if someone were to go above or if the limit is low or below, then there won't be a failure or an issue with that particular component.

Q Yeah. And that wouldn't make a lot of sense, would it, if somebody was operating an expensive piece of equipment that you had, you know, zero tolerance, right?

A It would not make sense, right.

Q And wouldn't it make sense for a manufacturer also to make sure that the equipment is not torn up to say, here, y'all should operate it, you know, at this level, you know, give you some good parameters in which to operate the piece of equipment?

A Yes.

Q All right. And given the definition we just read, you know, the federal government with respect to their definition of generator nameplate capacity, they call it the maximum out -- maximum rated output of a generator is what that 420 would be, right?

A That's what that said, yes.

Q Okay. And when you were doing your investigation, or your critical -- your root cause analysis and you said, well, we don't think it was

designed within the right amount of tolerances, can you tell me anything about that? Like, did you say, oh, you only gave it a five-percent tolerance, or a 20-percent tolerance? I mean, do you have anything substantively more than a conclusionary statement that it wasn't designed within a range of tolerance?

A Well, I think --

Q If you give the answer yes, no, and then explain it, that would be great.

A Well, it's difficult to say yes or no because it's a complicated issue, and I think it's most important to go back and look at what happened across all the periods. So you keep talking about steam flow and operating above a certain amount of steam flow.

Starting with Period 2, the operating pressures that we ran the steam turbine at were reduced, and then throughout Period 2, 3, 4 and 5. In fact, in Period 5, they were very low, but yet the blades still had damage to the snubbers or the airfoil tips even with lower steam flows, even with lower steam flows than what the Mitsubishi fleet had experienced. I think that that shows that there wasn't enough design margin in the blades.

Q And can you describe the failure of design margin in any order of magnitude?

A I don't have a percentage for that. No.

Q Or any narrative description for it?

A I think it would be difficult to do that without testing with instrumentation and breaking them on purpose with instrumentation hooked up so that you could see when they break, and you know what all the different parameters were at the point of the failure occurring.

Q I want to shift a little bit and talk about the blade a little bit. You guys were running a blade which I have gone over and looked at. It is pretty heavy.

A It is.

Q Do you know if Mitsubishi made that blade or whether they had it made by a subcontractor and had it casted by a third party?

A It's my understanding that Mitsubishi does that themselves.

Q Okay. Are you aware that in the turbine business, that some turbine blades are made by third parties?

A I am.

Q But you got affirmation that Mitsubishi said, no, it's on us, this is our blade?

A That's my understanding.

Q Okay. And do you know if that blade was cast in a single casting? Do you know what I mean by single casting?

A I do. I don't know the specifics of the manufacturing process.

Q Right. So just to make sure we are on the same page. Like a single casting is you got a form and you put in the metal, and then it hardens and that's it, and you don't have to weld anything else on to it, correct?

A Oh, so I do know the answer then. It's not a single casting.

Q And the things that were breaking off, I looked at that, they looked to me like they were welded on; is that right?

A I believe they are, yes. And there is other pieces like the tip of the airfoil, I believe, is not part of the forge, the original forging.

Q Right. So from the engineering standpoint, when you weld something on and you have a single form that's cast, the weakest part is where something has been welded on, all other things being equal; correct?

A There are certainly stress risers that at the heat affected zone of a weld. That doesn't mean necessarily that it's the weakest point, though. And in

the case of these blades, it didn't fail at the heat affected zone in the weld. The snubbers and the Z-locks failed near the tips, not near the welds.

Q So when you say the snubbers and -- just can you go point just so we know exactly what --

MR. MOYLE: If I could approach, Your Honor?

THE COURT: Sure.

THE WITNESS: So the mid-span snubbers, this being the span of the blade, the mid-span snubbers are these pieces, and then the airfoil tips, or the Z-locks, are these pieces up here, the tips.

BY MR. MOYLE:

Q Okay. And the mid what do you call them?

A Mid-span snubbers.

Q Yeah. They look like they are welded on, right?

A I believe they are, yes.

Q The same with the ones on the top?

A Yes.

Q All right. So is that -- in your business, is that maybe not such a big surprise, that the piece is welded on?

A That is not a surprise. That's correct.

Q That happens?

A That's right.

Q And all other things being equal, wouldn't you think it's more likely that for that to happen if you are running at a higher frequency rate than at a lower frequency rate?

A That what would happen?

Q That you would have a failure just with respect to vibration?

A If something were welded on?

Q Or not, just in terms of, you know, if you are running something, you know, at 150 percent of its capacity compared to 80 percent of its capacity, all other things being equal, isn't it more likely that something being run at 150 percent of its capacity is more likely to have a problem?

A That could lead to problems, I agree, but I don't agree with the idea that the heat affected zone of a weld makes it necessarily the weak point. I think you went back to that.

Q Okay. And just so we have a clear record, I mean, the operations of the unit in question during Period 1, those were run for a pretty extended period of time. They were run more often over the 420-megawatt nameplate rating as compared to other periods in time, correct?

A That's correct.

Q I saw something in one of the documents that said about 15 percent of the time. Does that sound about right to you?

A It does, yes.

Q Yeah, okay. What's blending?

A Blending operation in a combined cycle -- remember that there is inherent flexibility in a combined cycle operation, and Bartow is a 4-on-1. So the transition between operating in 4-on-1 or 3-on-1 to 2-on-1 to 1-on-1, any time you do that, you have to -- let's use an example.

If you are going from 2-on-1 configuration to 3-on-1 configuration, so that means two combustion turbines operating with a steam turbine in service. You start up the third combustion turbine. You are generating electricity with the combustion turbine generator. The exhaust, remember, is going out the stack. It's not going to the HRSG yet. When you start -- then you start warming up the heat recovery steam generator. You start generating steam. You don't immediately put the steam into the turbine. You have to wait for certain conditions to be met on the steam. You don't want to put water in the steam turbine.

So what you do is you bypass steam to the condenser, and then once steam conditions are met, you

start slowly blending. You start increasing the percentage of steam that's input to the steam turbine, so more to the steam turbine, less to the condenser until all of it is going into the steam turbine.

If you are going from 3-on-1 to 2-on-1 configuration, it's just the opposite. You start taking it out of the steam turbine and bypassing steam to the condenser, and then you shut down the HRSG and start exhausting out to the atmosphere.

Q And this is a 4-on-1, right?

A This is a 4-on-1.

Q But you can run it 3-on-1, 2-on-1?

A We can run it in any of those other combinations.

Q So if you are not blending, you know, the way you are supposed to do it, the way you described it, what are the consequences of that?

A Well, that's something we looked at in the root cause. In fact, Duke Energy made up our own definition of what a high-energy blend was because that's a possibility that that could exert more energy on the L0 blades because, as I described, there is steam flow that's being put into the condenser. It goes into the condoner nearby the L0 blades, so that's something we needed to look at.

Because there is no industry standard for the amount of energy that's put in the condenser during a blend, we looked at a lot of data. We came up with a method for classifying and a definition for high energy, and it was just based on the change in temperature over a certain period of time. More than a certain change in temperature in a minute's time, we said, let's just call that high energy, and it happens so many times over -- if you have this many blends, we see that -- this many of the blends, a percentage of the blend.

And then we were, because we made that definition, we were able to look around industry at both our -- at our combined -- other combined cycles, Mitsubishi or non-Mitsubishi units, and compare, is the energy of the blends at Bartow out of line with the rest of the unit -- what we see in the rest of our fleet? Is that change in temperature over a period of time greater, which could put in more energy into the condenser which could be negatively impacting the blades? And what we found is about consistent at Bartow with other units.

Q Yeah. And when you did that analysis, a lot of people are running combined cycle units, right?

A Oh, yes.

Q I mean, if we were to hazard a guess in this

country how much of the energy is supplied by combined cycle units, what would you say, 40, 50 percent?

A It's growing. It's probably 40-ish percent, plus or minus.

Q Yeah. There was something that caught my eye in one of the documents Mr. Rehwinkel was discussing with you, and I will refer it to you. It's on his Exhibit 115, and it's on Tab No. 6, and it's on Bates number 49.

A Okay. I am there.

Q And there is -- about middle of the page there it says, blending operation, do you see that?

A Yes.

Q Just read the quote, if you would, underneath there.

A It says: We've had bad blends during all five periods of operation.

Q Yeah. And you said you came up with a definition for the energy. I mean, what's a bad blend? I assume that's something that's not good just by the term, right?

A Yeah. I would say this is a good example of why this is a draft document, and why we go through a lot of iterations before putting out a final document. But I believe that the term bad is being used here in

place of high-energy.

During the course of this root cause, we were developing this high energy blend definition. Maybe we didn't have it at this time. I don't know. I don't want to speculate, but I believe it means the same thing as a high-energy blend.

Q Do you know who came up with that word, which member of the seven-member team?

A I do not.

Q Did you ever talk to anybody about what that meant, or are you just kind of saying, oh, I think it means high-energy and surmising that?

A I don't know.

Q Yeah.

A I didn't have that discussion.

Q And that's fair, because you didn't, you know, you didn't work on the report. You weren't in all those meetings.

A Correct.

Q Okay. I just want to make sure the record is clear. When these problems occurred, you opted to just run the Bartow facility on the simple cycle, not combined cycle, right?

A During the periods when we were replacing blades, we were running in simple cycle mode. I don't

know how many of the simple cycles were in operation. It changes the economics of those units. They are much less efficient obviously in simple cycle mode. So they are placed in our dispatch order changes. And then based on what the system load is on any given day, they may or may not be asked to run, but there is always at least one in service, I know, during all these time periods.

Q Yeah. So just in terms of the impact on efficiency, just give the judge an idea about the negative effect on efficiency if you are only running it in simple cycle and not using the heat recovery system, the HRSG system, which you have done as a result of some of these issues, correct?

A Correct.

Q So just is it about a third -- is the heat recovery system about a third? Use the 420 nameplate, what would you not realize not being able to run it in the combined cycle mode?

A Well, from a production standpoint, it was about -- oh, when the steam turbine was not in service?

Q Right.

A When the steam turbine was not in service, we are missing that 380 to 420 megawatts, depending on where we were running at the time. The combustion

turbines, the four combustion turbines are nominally around 200 megawatts. Again, as I have described, they can do more than that depending on the ambient conditions in the heat of the summer they may not make that much. But let's say they are 200-megawatt units, we had about 200 megawatts capacity instead of about 1,200 megawatts of capacity.

Q Okay. So about a third is knocked out?

A During the outages.

Q Right.

A During the outages, right.

Q Okay. And then for that third, you had to go find that power somewhere else, either run it on your system or buy it in the market; is that right?

A That's correct. If it was needed.

Q So with respect to -- you got on -- you testified on this a little bit with Mr. Rehwinkel about the status of Mitsubishi blades in the market. Duke has a lot of other Mitsubishi blades, do they not?

A I don't believe Duke has a lot of other Mitsubishi blades. In steam -- well, I mean, correct that. So in steam turbines, we do have other combustion turbines that are Mitsubishi. Combustion turbines have blading. I am not aware of any other Mitsubishi steam turbines other than what's installed at Bartow and the

two that we have at Citrus.

Q Okay. And you haven't had any similar problems with the turbines at those other Duke units that you have experienced at Bartow, correct?

A Well, the two Citrus steam turbines didn't start up until late in 2018.

Q Yeah. And we are not looking for problems, it's okay to say there are no problems?

A Yeah, no problems.

Q I am not disappointed, you know.

A The operating experience is limited to about a year-and-a-half.

Q Right. Right.

And you have no personal knowledge with respect to anybody else having any problems with Mitsubishi blades of the ilk that are at your Bartow unit, correct?

A Other than what we had discussed earlier. There is some discussion at user group meetings and some interest in our issues, but nothing that I can show you in documents.

Q Yeah. In these administrative proceedings, we treat hearsay a certain way, so if I ask you have personal knowledge if somebody told you I am having something going on, correct? That's the only

information you have that somebody else may have an issue?

A That's correct. That's correct.

Q Yeah. And the -- what company was that? Do you remember the company that --

A I don't remember. Mr. Rehwinkel thought it was in Louisiana, I think he said. I have no reason to doubt that.

Q I'm asking you the name of the company, like energy or somebody from energy?

A I don't remember.

Q You don't remember who it was?

A I don't.

MR. MOYLE: Okay. I think that's -- Judge, if I could just get one quick second?

THE COURT: Sure.

MR. MOYLE: Thank you. That's all I have.

THE COURT: Mr. Brew.

MR. BREW: May I approach the witness, Your Honor?

THE COURT: Sure.

EXAMINATION

BY MR. BREW:

Q Good afternoon. These are the two exhibits I want to show you. Your Honor, you have them there. I

am going to talk about this one.

A Okay.

Q Thanks.

Good afternoon, Mr. Swartz, one of the advantages of going at the tail end is that many of my questions have been answered. The downside is that I will be jumping all over the place.

First, I want to just really quickly run through some stuff that's been covered in different pieces about the function and operation of Bartow.

A Yes, sir.

Q It was originally designed and built for a 3-x-1 configuration, right?

A That's correct.

Q Okay. And Duke decided when it did its repowering program that it might be better do a 4-x-1 operation, right?

A That's correct.

Q And that's eventually what was built?

A Yes.

Q Okay. And so we have 4 CTs, combustion turbines, that produce electricity and exhaust gas that run through the heat recovery steam generators, right?

A Yes.

Q And then the steam from those steam generators

run down to the steam turbine?

A Yes, sir.

Q We've gone through where the steam goes in through the middle, goes out both sides and into the condensers?

A From the low pressure turbine.

Q From the low pressure turbine eventually, yes. And you can run any one of those sets 1-x-1, 2-x-1, 3-x-1, 4-x-1?

A Yes.

Q Okay. You can -- for any of the CTs, you can do duct firing, which is to add gas to the combustion gas, much like an afterburner on a jet?

A Yes, sir. That's right.

Q Okay. And so you can do that for short periods for peaking because it gives you real punch on your output, but it's not particularly efficient?

A That's accurate.

Q Okay. And you also can divert steam, I think, from the intermediate pressure to the CT itself for what you call power augmentation?

A Correct.

Q Okay. And that's sort of like supercharging a car. You smoosh more stuff into the combustion zone and you get more power out of it?

A Yes, sir. That's right.

Q Again, that's not the most efficient way to do it either in terms of heat rate in the operational plant, right?

A Yes, sir.

Q Okay. So when -- the Bartow unit went into service in June of '09, right?

A Yes.

Q And in your 2010 10-year site plan filed with the Public Service Commission, you listed the max generation capability in megawatts of the unit is 1,253 megawatts; is that right?

A I would have to look at that. I am not familiar with that document.

Q Okay. But that would be about right, 1,200 megawatts?

A That's about right, yes.

Q And of that 1,200 megawatts, about 420 megawatts would have been ascribed to the steam turbine, right?

A That's about right.

Q Okay. Now, the different modes of operation, the plant does not simply run 4-x-4 all the time, right?

A Correct -- 4-x-1, right.

Q It could be 4-x-4-x-1, it could be in any

possible combinations --

A Yes, sir. That's right.

Q -- as you ramp it up and ramp it down?

A Yes.

Q And as you're ramping up it up, if you are adding another heat recovery system to the steam, as you said, you would bypass that steam to the condenser to blend it before introducing it into the steam turbine, right?

A Yes.

Q Okay. So you have a number of ongoing systems -- normal operation is, in fact, a constant set of dynamic changes, where you are going up, you are going down, you are ramping up, you are ramping down, you are taking parts off, you are adding parts on; is that right?

A Yes, part of the value of the Bartow combined cycle is the operational flexibility that it provides so that we can change the operation as you described to meet the customer needs.

Q And so when the units first -- well, let me back up a little bit, I guess. You have been asked this question around-about, but I want to ask it directly.

The company's position on what is wrong with the zero blades is captured in your root cause analysis,

right?

A Yes.

Q JS-1, JS-2, whatever one we want to refer to?

A Yes.

Q Is it the company's position that the zero level blades were insufficiently designed for 450 megawatts or the originally promised 420?

A It's actually neither. The inadequate design for the operating pressures and temperatures that we were given as operating parameters.

Q Okay. So are you saying -- is the company saying that the blades as designed were not sufficient to meet the specifications per your agreement with what Mitsubishi had to do?

A Yes.

Q Okay. And the company's proposal is that ratepayers be insurers for that design defect by paying for all the replacement power costs?

A I am not sure what you mean by insurers.

Q You want us to pay the bill?

A Well, our company's position is that we prudently operated the equipment within the parameters provided to us from the equipment manufacturers, and we did that each period of operation and we took action each period of operation.

Q That wasn't my question. Are you asking consumers to pay the bill or are you asking Mitsubishi to pay the bill?

A Well, as far as asking Mitsubishi to pay the bill, I think that goes back to contract language that we have found it's very unlikely, if not impossible to get manufacturers or vendors to agree to clauses that would include lost business. It simply will back out of that contract before agreeing to that.

Q You said that in your direct testimony. Would you refer to it for a minute on page seven? I am pointing to the answer that begins on line nine. This is of your original direct testimony, because that's what we are talking about right now.

A Page seven?

Q Page seven. The answer on lines nine to 13.

A Okay. I am there.

Q Okay. Actually above that, the answer on lines one through three, where you talk about the unwillingness of original equipment manufacturers to accept the risk of paying consequential damages; do you see that?

A I must be on the wrong document. I do not see that.

Q I am looking at your March 19th -- March 1 --

March 1, 2019, direct testimony.

A Okay. I was looking at the March 18 testimony.

Q Okay. You have a question: In your experience, do DEF's agreements with OEMs usually include a similar disclaimer of liability? You are talking about consequential damages, do you see that?

A Yes, I do. That's row 22, or line 22?

Q Yeah, that's --

A I don't have page numbers on mine.

Q Okay. I am looking at the answer that you gave there --

A Okay.

Q -- that starts with the word yes.

A Right.

Q Okay. You say: To my knowledge, this is the case throughout the industry. What industry do you mean?

A The utility industry.

Q The utility --

A Well, to clarify, so I have experience in the utility industry, obviously, but also in the pulp and paper manufacturing industry, and then before that in the Navy. But in my 35 years of experience in those entities, I have not experienced a company willing to

take on business interruption risk.

Q So for a combined cycle unit that's sold to a merchant generator, to the extent that they can't recover consequential damages for a design defect from the OEM, that becomes the responsibilities of their investors?

A I am not familiar with exactly the financing of a merchant generator. I have not worked in that business, but that sounds plausible.

Q Okay. Somebody that can't recover their cost of operations through regulated rates?

A Right.

(Discussion off the record.)

BY MR. BREW:

Q You had talked about on a number of occasions that, I don't know if it's common, but a typical failure mode of L0 blades elsewhere in the industry was erosion?

A Yes, sir.

Q Which basically in the turbine and gas, excessive moisture in the blade areas and the water starts pounding in at 3,600, but you and Mitsubishi agreed that in this case that the root cause was too much vibration, or flutter, that was affecting the zero level blades; is that right?

A Yes, that's correct.

Q Okay. And when you went to Mitsubishi in 2012 and asked them to look into going to 450 megawatts, or higher steam loading levels, you had described it as their initial response is that they didn't have any experience with the loadings at that level in their steam turbines; is that right?

A I don't know that that was their original response. I think what I said is when they first -- when we first experienced the damage, or discovered the damage in 2012, that was one of Mitsubishi's responses, is that the calculated steam flow on your L0 blades at Bartow is beyond our industry experience.

Q Okay. So it was beyond their experience. Isn't it true that it was also beyond yours, because as you noted, Bartow is only 4-x-4-x-1 combined cycle, right?

A It is our only 4-on-1 combined cycle, but I don't know what the pounds per hour per square foot is on L0 blades on any other units.

Q Okay. All right. And you did the comparison and your root cause analysis for blending counts, particularly with your Lee and Hines combined cycles?

A Yes.

Q Now, the Lee combined cycle is a 3-x-1, right?

A Correct.

Q And the Hines a series of 2-x-1s?

A Correct.

Q Okay. So neither one of them would operate at a same energy levels as, say, going from a 3-x-4 operation -- blending operation at Bartow?

A Well, when you talk about energy we probably need to define that. But I also would say that the reason H.F. Lee and Hines we are using for comparison is because those are the installations that have 40-inch L0 blades. Other installations have different sized blades, so we wanted to make sure we used installations that had similar blades. But the pressure -- the energy that you are stating really goes back to the pressure and temperature of the steam, and that's the pressure that equates to the mass flow rate.

So whether you are in 2-on-1 or 3-on-1, it depends on the design of the heat recovery steam generators. It might be a heat recovery steam generator that's capable of producing twice as much steam as the ones at Bartow at much higher pressures. And then even though it's a 2-on-1, it could be more energy into the low pressure turbine than a 4-on-1 at lower pressures.

Q Is that the case in Hines 2-x-1 steam pressures?

A I don't know that the exact steam pressures.

I would say they are likely very similar to Bartow, but I wanted to characterize your -- it's an oversimplification to say a 4-on-1 has more energy than a 3-on-1.

Q Okay. But you don't know what the steam pressures were -- for Lee are?

A Correct.

Q Okay. After the -- I get hung up on the period statements, but after the, I guess the third period failure in 2014 is when Duke and Mitsubishi agreed to actually test for vibration levels by doing the telemetry test and installing the vibration monitor?

A Well, not exactly. It was during Period 2 when we were running with the second set of blades in one end of the machine and still had original blades in the generator end of the machine when we contracted with Mitsubishi to make a new design of blade called a Type 3 blade that was installed during that outage between Period 2 and Period 3.

So when we started up in Period 3, we had this new design blade. Part of that project was also to install the temporary blade vibration monitoring system and take data at the very beginning of Period 3 so that we could come up with any additional operating parameters that we may need to protect the system.

Q Okay. With that clarification, Duke and Mitsubishi jointly agreed to install the temporary vibration monitoring telemetry to get actual information using string gauges on the stresses at the zero level blades, right?

A Yes, that's correct.

Q Okay. And is there any part of the design of the testing and installation that Duke was not onboard with for the vibration limit?

A Not that I am aware of.

Q Okay. And you got the result of that vibration monitoring testing, and it was at that point that Mitsubishi recommended establishing the avoidance zone?

A That's correct.

Q Okay. And so -- and specifically what we're talking about is you had two other data points. You had the outlet pressure from the intermediate turbine -- turbine pressure area, and you had condenser vacuum or back pressure?

A Correct.

Q Okay. And the problem with the condenser is that if you put too much steam energy in there, it can lose vacuum and that's when you get back pressure and this can cause other problems?

A That's an issue with the condenser, right.

Q Okay. So you had that information, and if I can ask you to take a look at the document that I showed you, the one-pager, that is a diagram that's listed bypass connection locations, do you see that?

A Yes, I do.

Q Are you familiar with this diagram?

A I have seen it before, yes.

Q Okay. It's in one of Mr. Polich's exhibits. It's in JS-4. It appears in a number of places on the exhibits. And I will represent to you that it's a diagram for where the, I guess you call them spargers or dump tubes go when you are sending steam to the condensers in bypass mode?

A Yes, that's correct.

Q And that the C and D hot reheat tubes are located closer to the exhaust, right?

A I don't know if that's correct or not. I can't tell from this diagram.

Q Isn't it true that Mitsubishi found that when you were engaging the D and C tubes is when they experienced more vibration in the zero level blades?

A I do believe that there as document that shows that. I know our concern and what we saw in operation was that alpha and delta concerned us more actually, A

and D.

Q A and D.

A I'm sorry, I default to the phonetic. And the reason why is A and D are physically farther from the condenser than B and C, and so there is more likelihood of water entrainment in the A and D lines.

Q Okay. And so my question, then, is there is nothing about the final fix that's been implemented that has changed the design or the configuration within the condenser, right?

A Not for the sparger tubes that you are talking about.

Q Right. That's what I am talking about.

A Yeah. I believe there were some other minor changes, but not to what we are looking at here to my knowledge.

MR. BREW: Okay. We are sticking to direct right, not rebuttal?

MR. BERNIER: That's correct. Mr. Swartz is excited to come back for rebuttal.

MR. BREW: All right. Then I will wait.

THE COURT: So there is no redirect, is that -- or is there?

MR. BERNIER: Typically we do redirect after staff would go through, or actually after the

Commissioners would, but then he will come back and do his rebuttal testimony.

THE COURT: Okay. I just want to be sure. I don't want to --

MS. BROWNLESS: Can I just ask a question? Most of the testimony filed by Mr. Swartz is rebuttal testimony, and many of the questions that have been asked today concern those areas. So just so I am clear, would it not be appropriate to allow us to ask our questions about all of Mr. Swartz's testimony, subject to, of course, you being able to go at the very end and do redirect?

MR. BERNIER: After Mr. Polich testifies? Because I thought that was the agreement that we had set up in the agenda.

MS. BROWNLESS: That's fine. I'm sorry. Perhaps I was confused.

MR. BERNIER: That's okay. I understand that we have strayed around a little bit, but we have stayed really close to the root cause analysis.

MS. BROWNLESS: Thank you.

MR. MOYLE: Just to be clear, then, the plan will be he will retake the stand and talk about rebuttal and we will have a chance to ask questions about his rebuttal?

MR. BERNIER: That's correct.

MR. MOYLE: Okay.

MR. BERNIER: Unless when he gets done y'all want to let him go.

MS. BROWNLESS: Thank you.

THE COURT: Was there anything from the Commission?

MS. BROWNLESS: No, sir. I am good. Thank you, sir.

MR. BERNIER: Can we have one minute?

THE COURT: Sure. Take 10.

MS. BROWNLESS: Oh, I am sorry.

MR. BREW: I'm not finished.

THE COURT: Oh, I am sorry. I thought you were done.

MS. BROWNLESS: Yeah.

MR. BREW: No. No. I had an exhibit --

THE COURT: I knew you never got to this one.

MR. BREW: Right.

THE COURT: I thought you were waiting for rebuttal.

MR. BREW: Well, I am waiting for rebuttal on that one, but that's why I asked a clarifying question.

THE COURT: The floor is yours.

BY MR. BREW:

Q You talked a little bit with Mr. Rehwinkel about what happened after Period 5, but I just wanted to clarify that, too.

What we will call Period 6 is when you installed the pressure plate beginning around April of 2017?

A Yes, sir. That's right.

Q And you finally removed that with the outage that occurred fourth quarter of last year?

A Correct.

Q And so during that entire time, your max generation was confined to about 380 megawatts from the steam turbine?

A That's accurate.

Q Okay. And did you experience any ancillary damage from the use of the pressure plate?

A We did experience some damage. Nothing to the steam turbine itself, or the steam -- the centerline turbine components. What we found during a routine inspection, we didn't shut down in a forced manner for this, but during a routine inspection, we found that some, like, ladders, some supports for different things inside the casing of the low pressure turbine had been damaged.

We suspect that the pressure plate caused some pressure waves or vibration inside the casing that was different than operation with blades. So we had to do extra stiffeners in some locations, and we actually removed some unnecessary things like ladders that were attached to the inside of the casing.

So nothing that impacted the operation, and the stiffeners worked well because in subsequent inspections, we didn't see any issues.

Q So running with the pressure plate for two-and-a-half years, it was noisy and vibrated a lot because of the impingement of steam and stuff through the pressure plate hold?

A Well, it's all relative. When you say vibrating a lot, there was no turbine centerline vibration. The unit ran very well at low vibration levels. There was obviously vibration in the casing. And, yes, it was louder operating with a pressure plate than with a set of blades in the L0 position. To be honest, it was not as loud as what we had thought it might be.

Q And the new redesigned Level 0 blades were installed in December, and the unit is now back in operation for what we now call Period 7?

A Yes, sir.

Q And it's too early to tell whether that is -- has any results to speak of, or are you operating at 450 or 420?

A There are some results so far, and this is somewhat of a -- understand why we haven't run it there yet, during that same fall outage where we installed the blades, we also did maintenance on the combustion turbines. Two of the combustion turbines were at their major maintenance interval and two of the combustion turbines generators were at their major maintenance interval. During testing of one of those generators, we experienced a generator failure that we had to rewind the stator, which is the bars that go around the rotating part of the generator. We just finished that project about two weeks ago, so we didn't have the capability to run it 4-on-1 configuration until about two weeks ago.

We didn't immediately go to 4-on-1. In fact, we still haven't gone to 4-on-1. We wanted to coordinate with Mitsubishi. We have this permanently installed blade vibration monitoring system. When we first operated with the steam turbine in December, we did a lot of testing with Mitsubishi, and we operated in a lot of different combinations, 1-on-1, 2-on-1, 3-on-1, duct burners, no duct burners, made sure we were looking

at the response, or lack thereof, on the blade vibration monitor, and everything looked really good for up to 3-on-1 operation with full duct burners.

We will continue that testing protocol starting this coming Monday as a matter of fact. Mitsubishi will be on site and will be stepping through in 4-on-1 configuration.

Q Okay. So you mentioned it earlier, but the blade vibration monitoring system has now been made permanent?

A Correct.

Q And to this date, you haven't gone back up to full power operation?

A Correct.

MR. BREW: Thank you. That's all I have.

THE COURT: Still nothing?

MS. BROWNLESS: I will pass these out.

THE COURT: Oh, okay.

MR. BERNIER: I am sorry, James, did you want to mark this?

MR. BREW: That was marked for identification as I believe 113.

THE COURT: It's already been marked?

MR. BERNIER: Yes.

THE COURT: Are we talking about the

one-pager?

MR. BREW: The one-pager was marked as 113. The other one was actually marked as 112.

THE COURT: Okay.

EXAMINATION

BY MS. BROWNLESS:

Q Good afternoon.

A Good afternoon.

Q It's been a long day.

I want to start by asking some pretty basic questions. The original --

MR. REHWINKEL: Is your mic on? I think there is -- look underneath, there as button.

MS. BROWNLESS: It's green.

THE COURT: You need to really lean into it maybe.

MS. BROWNLESS: Oh, thank you, Judge.

MR. REHWINKEL: Okay. I just couldn't hear you down there.

BY MS. BROWNLESS:

Q The original Tenaska contract, an excerpt of which I provided as Exhibit 111.

A Okay.

Q The original Tenaska plan was to connect three M501F CTs to the steam turbine, is that correct?

A Could I ask which page you are referring to just so I make sure I verify? That does sound correct, I just want to verify the type of combustion.

Q If you look at the very last page, it says M501F cast turbine.

A Yes, that's correct. I see it.

Q And the original Tenaska configuration was to produce gross steam turbine output of 420 megawatts, is that correct?

A That's correct.

Q The type of steam turbine that you have connected that's 401 is also a 501F type CT, right?

A The four combustion turbines, yes, they are also 501 technology.

Q Okay. And I am curious as to why you were willing to accept -- well, let me refer you to Exhibit 110. If I look on page -- let me -- it's Bates page 12432, and the page 3-2-1; do you see it, sir?

A I do.

Q It's under 3.2, guaranteed performance and other guarantees of acceptance tests?

A I see that.

Q Okay. It indicates here under the liquidated damage performance guarantees that the MPS net steam turbine maximum electrical output would be 420.07

megawatts, is that correct?

A Yes, it is.

Q And so I guess I am curious why the 3-on-1 configuration with F type combustion turbines would produce 420 and Mitsubishi is saying that your 4-on-1 configuration would also produce 420.07?

A Well, I don't know the specifics about the Tenaska 3-on-1 that was originally considered or contemplated for that contract. It could have had -- it may not have had duct burners installed, which makes a very significant difference whether they have duct burners installed or not. That's one variable that could be different. But I just -- not knowing the specifics of that Tenaska contract, I don't know that I can explain that contract.

Q Okay. Well, I guess if there were duct burners on the Tenaska contract, then that would make it comparable to your contract where there were duct burners, correct?

A It would, yes.

Q Okay. And if there were no duct burners, wouldn't that result in potentially a lower megawatt maximum electrical output?

A Well, the maximum electrical output really goes back to the generator, the electrical generator.

And so the generator is the same for the Tenaska project, we bought that generator for the Progress Energy project. And at a power factor of .90, as we looked at in the generator capability curve, the maximum electrical output is 420 megawatts, approximately. Actually the generator performance curve shows 421.2 megawatts.

Q And I guess what you are saying is that there could be other -- well, let me make sure I understand what you are saying.

You are telling me that the generator that's connected to your system is the same as the generator which was going to be connected to the Tenaska system?

A Correct.

Q So that's identical, and that you have the same type of combustion turbine, F?

A Well, I don't know. They are F, 501F machines, but there has been multiple generations of 501F machines in the industry. F -- I don't know specifically what we have at Bartow, but they go by FD1, FD2, FD3, each subsequent generation has some improved capabilities.

I don't know exactly what model the Tenaska 501F was compared to the Bartow 501F. They may have been different models of combustion turbine with

different characteristics, probably pretty close to the same, but every time they make a new model, much like a car, a Honda Accord in 2002, when this machine was built, is still different than the Honda Accord in 2009. There has been many generations. It's still a Honda Accord, it's still the same type of machine so I just don't know.

Q So your testimony is that the details between those two units could be different and, therefore --

A Yes, ma'am, that's correct.

Q -- they wouldn't be exactly comparable?

Okay. In 2009, Mitsubishi was aware that you were going to run this in a 4-on-1 configuration, correct?

A Yes.

Q Did Mitsubishi provide operating parameters, pressure temperature, steam volume for each of the three sections of the combustion turbines? Did you get those parameters for the high pressure section?

A We did. The parameters for the steam turbine are typically provided for the high pressure section and not for the entire turbine.

Q And you had -- you were given a parameter, were you given a measuring device to measure that parameter?

A Yes.

Q Okay. And did you have parameters and measuring devices for the intermediate pressure section?

A We had measure -- some measuring devices, but the parameters -- remember the HP/IP turbine is one machine. And so the operating limits are really the HP, the high pressure steam is the limit.

Q Okay. Were you given specific operating parameters for the low pressure section of the turbine?

A We were given specific parameters that applied to the exhaust of the low pressure turbine, which is into the condenser, which is very important. You have to know the energy of the steam at the inlet and the energy of the steam at the exhaust of the whole system helps you determine flows and the energy of the product, the substance.

Q So the intermediate turbine exhaust pressure was used as a proxy for the low pressure section inlet pressure, is that correct?

A Only after the -- it is correct, but that wasn't an operating parameter provided in 2009, but in 2012. After we discovered damage in the spring outage, that's when Mitsubishi lowered -- made a recommendation that we don't exceed 118 pounds in the exhaust of the intermediate pressure turbine to be used as a proxy of

what steam was being emitted to the low pressure turbine.

Q And I guess I want to understand this. Initially in June of 2009, were you given a number for the IP exhaust pressure?

A No.

Q No number?

A Correct.

Q Did you have a measuring device at the IP exhaust?

A I believe we did, yes.

Q Okay. But you were not given a pounds per square inch or --

A It would have been a pounds per square inch gauge, but not an operating parameter for that measurement.

Q Okay. And can you show me where that was, please?

A So the -- this -- the exhaust of the intermediate pressure turbine is shown in this pipe right here, and then the steam would flow up and over and into the middle of the low pressure turbine.

Q So where was the exhaust low pressure -- intermediate pressure exhaust gauge?

A It would be somewhere in this vicinity. I

don't know exactly where, and this obviously isn't to scale, but it would be close to the -- right at the outlet of the IP turbine.

Q Would it be before the inlet where steam from the HRSG would enter the system?

A I don't know for sure, but, yes, I believe it would be. So there is also some low pressure steam called admission steam that's coming through this line right here from the low pressure drum on the HRSGs, and that comes into this line right here. So I believe it is before, yes.

Q Okay. And would it also take into account any steam that was being recycled from the high pressure to the intermediate pressure, from the intermediate pressure to the --

A That would be the -- most of the steam would be coming from that direction, yes.

Q Okay. Is it possible that the pressure measured at the IP exhaust could deviate from the pressure measured at the low pressure inlet?

A I think it's possible. It's unlikely that it would be a lot different. The pressure dropped through this pipe isn't very much, and I do believe Mitsubishi made calculations taking into account potential pressure drop across that pipe.

So they would give us -- like, let's use an example. It was 118 pounds here on the start of Period 2. That may have meant they didn't want to exceed 117 pounds here. I am just making that number up. I don't know. But when they used this as a proxy, they took into account the pressure drop possible through that pipe.

Q Okay. When you installed a low pressure gauge, where did you put it?

A Again, I don't know specifically, but it would be in this vicinity right here.

Q Once you installed that low pressure gauge, did you make any comparisons between the pressure recorded at the IP exhaust and the pressure recorded at the low pressure inlet?

A I don't know. I suspect our engineers did that comparison. It would make perfect sense, but I just -- I am not aware of that.

Q So you don't know how reliable the low pressure exhaust --

A The intermediate pressure?

Q -- intermediate pressure exhaust readings were compared to the actual?

A I am pretty confident that had they been -- had we found an issue there, that that would have come

out during the root cause, during our analysis. And I didn't hear -- there was nothing that indicated that once we put this pressure gauge here on the LP inlet, that it showed any inconsistencies with what we were using at the IP exhaust.

Q Okay. Thank you.

When you first purchased this unit, I assume all the parts get sent to Bartow and you put them all together, and that there is a period of testing for that unit prior to your acceptance of the unit, is that correct?

A That is correct.

Q So when you are doing this initial testing, are you doing the testing to make sure that the guarantees given in the contract can actually be met?

A That's a piece of the testing. There is a lot of testing that goes on, and the contractual guarantee testing would be part of the later tests that are conducted.

At first, you want to make sure that, first of all, the equipment operates the way it's supposed to operate; that it can operate over a certain period of time. So typically, there might be a 96-hour run where you monitor conditions and make sure that the equipment is doing what it's supposed to do over a longer run.

There would be tests where you would cycle off and on to make sure that valves and dampers and different pieces of equipment operate the way they are supposed to when you shut down and when you start up a process because those put more stress on equipment when you do startups and shutdowns. So those are all part of the performance tests.

Eventually, you would get to contractual testing, just to make sure from the contract that we can execute the contract effectively, and prove that the guarantee was met or not.

Q Okay. And I want to go back to Exhibit 110. And look on page 12432, which is 3.2 of the agreement.

A Okay. I am there.

MR. BERNIER: I am sorry, which page? I am sorry.

MS. BROWNLESS: 3-2.1. It's 12432.

MR. BERNIER: Thank you.

MS. BROWNLESS: Its section 3.2, guaranteed performance.

MR. BERNIER: Thanks.

MS. BROWNLESS: Are you good?

MR. BERNIER: Yep. Thank you.

MS. BROWNLESS: Sure.

BY MS. BROWNLESS:

Q Okay. So I am going to turn to the very next page, 33, and ask about the figures that are on eight, nine and 10 there, LP admission steam pressure, LP admission steam temperature, LP exhaust pressure.

A Yes.

Q These are in the contract, but if I understand your testimony previously, you had no way to measure any of that directly, is that correct?

A Well, these are different points, so let's take one at a time, if we could.

No. 8, LP admission steam pressure, let me do eight and nine together, and if I could, I would like to approach the chart again.

So LP admission steam pressure and LP admission steam temperature, what this shows is a certain value -- at No. 8 it says, at LP SV inlet. So that's the low pressure stop value inlet --

Q Where is that?

A -- and it's admission pressure.

So remember, this is the LP admission line, okay. This is not -- this is not the -- it's this. So the stop valve is right here. So there is instrumentation -- or there was at that time, and I have no reason to doubt it's not still there. So the LP admission steam pressure was at this point right here,

at this valve. The LP admission steam temperature -- well, it doesn't say, but I am assuming it's that same line. So it's the admission line.

Q Okay.

A And then the LP exhaust pressure, it says it's at LP casing outlet. So that's basically in the condenser. The outlet at the low pressure turbine dumps down into the condenser. So there is a measurement of pressure in the condenser.

Q Okay. And so were these parameters that you were adhering to throughout your operation in Period 1?

A These aren't operating limits. These are from a contractual standpoint in order to achieve the output of, in this case -- it was 420 in case 48. It was 389 in case 24. These are the measurements that were likely when you are achieving that 420 megawatts. It's not thou shalt not exceed this temperature. Thou shalt not exceed this pressure. This is the likely pressure at that production limit.

Q Okay. And when you were testing this unit prior to purchase and you met these temperature and pressure limits, did, in fact, you produce the megawatts that were anticipated?

A Well, again, I wouldn't call these limits. These are the predicted pressures and temperatures for

the heat cases that were used in the contract. It wasn't a limit that we had to stay below or stay above. It was the predicted outcome.

So I am sorry, could you repeat the rest of that question?

Q Here's what I am trying to figure out, you were --

A Oh, I think -- so did we achieve 420 megawatts?

Q Yes.

A Yes, we did achieve 420 megawatts, with some corrections. There is errors in every instrument, or potential errors in every instrument. And so just like everything else, any time you take a measurement in a complex environment like this, there is debate. There is discussion.

I think when they first measured -- in fact, I think Mr. Rehwinkel pointed out a document earlier. When we first measured the performance test, I think we were achieving 402 megawatts. But then with some corrections to get to what the data should have been that we calculated it would have been 420 megawatts.

Q Were you ever given by Mitsubishi a -- in your operating manual or anything, something that said for the IRP RSV -- or the LP SV inlet, you cannot exceed X?

A Not that I am aware of. No.

Q Okay. Basically, then what you are telling me this says is if you have these conditions in eight, nine and 10, we guarantee that the output will be --

A At least 420 megawatts.

Q At least 420 megawatts?

A Yes.

Q And in your testing, that, in fact, proved to be true?

A Correct.

Q Okay. Now, can you tell me the difference between the numbers on the guaranteed performance and guaranteed acceptance test that we just discussed, and on the very next page, the liquidated damages guarantee?

A If you give me just one moment to look at the difference. So the difference between one 12433 and 12434?

Q Yes.

A Oh, yes, ma'am. So page 12433 is heat balance case 24, which is 4-on-1 configuration with no duct firing. And page 12434 is heat balance case 48, which is 3-on-1 configuration with no duct. So those get different steam flows, pressures, temperatures that were predicted, different megawatt output at the generator predicted.

Q Did Duke personnel believe that knowing the manufacturer's parameters for the LP section of the steam turbine was necessary for operating the unit at 420 before March of 2012?

A No, it did not.

Q And how did you go about establishing parameters for the LP pressure before the planned outage? Is that only parameter you had was the exhaust pressure from the IP?

A Before the 2012 outage? Well, it was as a result of the damage we found in 2012. That's when we came up with the new limit measured at that IP exhaust, and that was the best instrument that we had to use for LP in that pressure.

Q And before that, you just didn't have any?

A Correct.

Q Okay. After the March 2014 outage, did DEF personnel bring operating parameters for the LP part of the steam turbine to the attention of DEF's management?

A After the spring of 2014 outage, there was much discussion of those parameters, yes. That's when we started operating with an avoidance zone in place, the recommended avoidance zone from Mitsubishi, and so that had a great deal of discussion.

Q And so, again, you are measuring it at the IP

exhaust?

A No. The avoidance zone was a combination of -- yes. I am sorry. Yes. That's one of the pressures --

Q You are measuring -- that's --

A -- one of the pressures was measured there, yes.

Q And at that time, you are not only bringing it to the attention of your own management, you are bringing it to the attention of Mitsubishi, correct?

A Well, Mitsubishi is the one that calculated the avoidance zone and presented it to Duke Energy as a recommendation. So it really worked the other way. Mitsubishi said, in this combination of intermediate pressure, turbine exhaust and condenser vacuum, in these areas, avoid operating.

Q Okay. In Period 1, when you were increasing the output of the unit, in your -- in the time that you were testing the unit before you accepted it, was the plant -- did you ever -- let me start over.

When the Bartow Unit 4 combined cycle plant was tested prior to its commercial operation in June of 2009, was the plant tested in a configuration that reflected commercial operation of the unit in a maximum total megawatt output scenario?

A I am confident it was, but I don't have that data available. I can't show you a document that shows that we did that.

Q Do you know how many combustion turbines were operational during the preliminary testing period?

A Well, during the preliminary testing -- the testing goes on for a long period of time, maybe even months, and with four combustion turbines being installed, and so I don't have any personal knowledge of that construction project. But having been involved with other construction projects, the likelihood is that as combustion turbines were finished, they were tested while other combustion turbines still had work ongoing.

So it's a sequence of events, and then the steam turbine comes on, and then you start testing in combined cycle mode. So I just don't know exactly what time period each different piece of equipment was ready for testing during that construction project.

Q And I guess what I am trying to ask is during the preliminary testing period, was there ever a point in time in which all four CTs and all four HRSGs with all the bells and whistles were tested?

A I don't know. I suspect there was, but I just don't know.

Q And do you have any information here today

what the megawatt output of that full-blown testing was?

A I don't.

Q Or what megawatt output of just the steam turbine was?

A I don't.

Q Would that type of testing been used to determine the 420-megawatt nameplate capacity of the unit?

A No. The testing would be an agreement between the EPC constructor, the owner of Progress Energy and the various OEMs on which heat balance case to use, and then replicate those conditions and see if those minimum contractual numbers were met.

Q Got it.

Was your assumption in Period 1, your Period 1 operation, that if you stayed within the parameters given to you by Mitsubishi, whatever those parameters were, that any -- that the flow limits of the low pressure section, turbine section, would be okay, that it would take care of itself?

A Yes. That was the assumption.

Q Did your operating engineer at the time think that he should know any flow limits for the low pressure section or the inlet pressure for the LP turbine before returning the plant to service in April of 2012?

A When you say operating engineer.

Q The guy on the ground. The Mr. Wayne Tom's equivalent?

A Okay. Well, there was a lot of discussion between Mitsubishi and Duke Energy during that outage between Periods 1 and 2. And the plant manager and the operating staff at Bartow were part of those conversations when the 118-pound limit on the IP exhaust was recommended by Mitsubishi and we agreed to install that as an operating limit at that point, and we did. So yes, there was discussion around that point.

Q When we discussed where the gauges were located before, does your one gauge that you had reflect any additional pressure that comes from the HRSGs?

A The one gauge that we had being the IP exhaust that we talked about?

Q Yes.

A I don't know specifically. I suspect it did not. As we talked about, I think the gauge was likely located between the IP turbine and the point where the admission flow, the LP admission flow enters that line.

Q And so that could have caused additional pressure that wouldn't have been reflected?

A It could have. Now, there are -- and I don't know the operating pressures, but there are mechanical

constraints within the HRSG to make sure that we don't go above certain pressures in each section; safety valves, for instance; sky valves; vent valves that are operated as part of startups and shutdowns that are safeguards against over-pressurizing those lines. So I just want you to understand, there are other safeguards involved with that.

Q In 2009, did Mitsubishi provide any operational instructions for blending the steam produced by the four CTs prior to introduction into the steam turbine?

A I don't know if Mitsubishi provided blending instructions, or if they were provided. They were more likely provided by the EPC contractor of the project, because the HRSGs were manufactured by a different equipment manufacturer, so the EPC more than likely gave those operating procedures.

Q Okay. In other words, the manufacturer of the HRSGs themselves?

A Gave them to the consortium of Bibb and TIC that I talked about and became Kiewit, and so it probably would have come from Kiewit.

Q Okay. In 2009, did Mitsubishi provide any operating instructions for blending the steam produced by each HRSG with the steam removed from each of the

steam turbine sections?

A When you say steam removed from each of the steam turbine sections?

Q Recycled to each of the -- because you had exhaust steam from the high pressure that goes into the intermediate pressure, that then goes into -- were there any type of blending instructions for that?

A Well, again, any instructions like that likely would have come from the Kiewit the EPC.

Could I approach the chart again?

THE COURT: Sure.

THE WITNESS: This is a point that I think you need to understand.

The exhaust of the high pressure turbine -- let me get the exact line here. So here is the inlet steam to the high pressure turbine. It goes through the high pressure turbine in this direction, exits here, and now it's called cold reheat steam. We need to reheat it, get the temperature back up and increase the energy in that steam.

So it's sent back to the HRSG and it's reheated. It's made into intermediate pressure steam, which is then -- comes down in that admission line we talked about before.

So again, you are -- we are mixing up the HRSG with the steam turbine operation, so any procedures having to do with blending steam in and out of different sections would be --

BY MS. BROWNLESS:

Q Between those sections would have to he come from the HRSG?

A Right. So the EPC, the Kiewit entity would be taking input from the HRSG manufacturer and the steam turbine manufacturer to provide those type of procedures.

Q Okay. In 2009, was there an exhaust system in place with pressure if the low pressure area rose above a certain level?

A Yes.

Q And can you show me where that is?

A Would you ask that again? If pressure -- I am sorry.

Q Was there an exhaust system in place if pressure in the low pressure area rose above a certain level?

A Well, there is multiple points where there is protection. There is protection -- you can't really see it on here, but there are rupture diaphragms. They are just a thin piece of material much like a porthole on a

ship or a submarine, but manufactured so that when they -- they will burst and relieve pressure or relieve vacuum. You might really want to relieve vacuum and let air come in. But there are rupture discs around the casing of the low pressure turbine. There are safety valves on the low pressure turbine -- on the admission steam line. And there are --

Q On the HRSG?

A Yes. And there are things called sky valves which are automatically operated valves that the operator controls to raise or lower pressure as needed to make sure that the pressures are suitable for admission into the system.

Q Okay. If I look at what's Exhibit 80, which is the chart, the Table A, do you have that?

A Exhibit 80?

Q It's Table A.

A Oh, Table A. I am sorry. Yes, I have that right in front of me.

Q Okay. When was the request made of Mitsubishi to figure out a way to increase the megawatt output of the Bartow steam turbine to 450 megawatts?

A That request was made during Period 2, when it became apparent with the 118-pound limit we had placed on the IP turbine exhaust would not allow us to even get

to 420 megawatts. We certainly were far away from the generator's capability of 468 megawatts, and so we started discussions with Mitsubishi on what, if anything, could be done to rectify that.

Q Okay. And who made that request? Y'all made it to them? Who made it?

A Yes. I don't know specifically who, but Duke Energy made that request to Mitsubishi.

Q And why did you decide that you wanted to ramp it up to 450 at that time?

A We felt that there was capability in that 4-on-1 power block at Bartow that we weren't able to use that we should be able to use specifically with the generator. We knew we could generate steam flow.

Think about this for a minute, in case 48, heat balance 48 is three HRSGs -- three combustion turbines, three HRSGs, duct firing in the HRSG on the steam turbine and we achieved a corrected value of 420 point something megawatts in order for the contractual minimum to be met.

At that time, everybody involved with the project knew there is more steam flow available. We weren't even using one of the combustion turbines and HRSGs. So we have this expensive power block that we know that there is more capability.

I know it's expensive replacing rows of blades, but when you think about a several-hundred-million-dollar project or power block being held up by perhaps the $3 million row of blades, if there is a way to get all of the output -- all the capability out of the power block, then that's the prudent thing to do to make sure we can operate as efficiently as possible and as much output as possible for our customers.

Q Wasn't the excess capability available when you first accepted the unit? I guess what I am trying to understand is was there anything in the design substantially different from the time you did the initial testing until 2012, when you decided to ask for more megawatts? What was different?

A Well, during Period 1, we weren't operating with that 118-pound limit on the intermediate pressure turbine exhaust. So we were adhering to the other operating parameters, making sure we didn't exceed anything that had been provided by the OEM, and trying to take advantage of the full capability of the steam generator.

Q Right. And I gets my question is --

A I am sorry, the electrical generator.

Q There was nothing different -- you didn't add any additional equipment, you didn't do anything, there

was nothing different between when you started out in Period 1 and you made this request to increase the nameplate capacity by another 30 megawatts?

A That's correct. It was the same set of equipment with just a different operating parameter.

Q Right. And the operating parameters had to do with the amount of steam that you were putting through the system?

A Ultimately, yes.

Q Okay. Because you would have expected that a 4-on-1 configuration would give you a higher nameplate capacity than a 3-on-1 configuration?

A Well, we would have expected that 4-on-1, if we had at least as much duct firing as the 3-on-1 case, yes, as long as we are staying within the capability of the generator, we should be able to do better than the 420 megawatts.

Q Okay. And I guess that gets me back to my original question, was why did you think 420 megawatts was acceptable in the first place if you knew you had another combustion turbine available?

A So when you mean acceptable, why did we test at 420?

Q Why did you accept 420 megawatts from the get-go and not a higher nameplate rating?

A Yeah. So I don't know the specifics of why case -- heat balance case No. 28 and heat balance case No. 48 were selected between the consortium building the project and Progress Energy. Probably it's because we wanted to test or make sure that where we would normally operate the system runs efficiently at that normal operation range.

It wasn't a maximum operation. You typically don't run the Bartow combined cycle at maximum output. In fact, we can look at the data and there is many more hours not at maximum output than there are at maximum output.

We are following the load of the system and making sure we have the most efficient economic low-cost units in service. Bartow is one of the more efficient units, but we have other units that are more efficient and lower cost than Bartow. So we typically don't operate flat-out high -- highest load possible.

So I am speculating, but that's perhaps why it was tested at those levels. But remember, the 420 megawatts for heat balance case No. 48 was the minimum that Mitsubishi had to achieve. It didn't mean that was a limit, or that was a maximum. We should be and were pleased that we could get more than 420 megawatts if we still adhered to the operating

pressures that we were given, and temperatures.

Q And this may be redundant, but again I just want to make sure I understand.

Do you agree that Mitsubishi concluded in its September 22nd, 2017, analysis that excessive blade loading was the cause of the blade failure?

A I don't agree with that. Could you show me where that's -- the document that shows that?

MR. BREW: That's the rebuttal exhibit.

THE WITNESS: Actually, if we could look at JS-4. It's attached to my testimony.

MR. BERNIER: Judge, for what it's worth this is getting into rebuttal.

MS. BROWNLESS: Oh, I am sorry if it is.

MR. BERNIER: That's okay.

MS. BROWNLESS: I will stop.

MR. BERNIER: We are pointing it out. I was hearing it over here, and that's correct.

MS. BROWNLESS: No problem. No problem.

And if you give me just a minute.

THE COURT: Just wait for the next question.

THE WITNESS: Okay.

MS. BROWNLESS: Can I have a minute, please?

THE COURT: Sure.

MS. BROWNLESS: That's all I have, Your Honor.

Thank you.

THE COURT: Okay. Mr. Swartz, to plug on, all we have left is redirect.

MR. BERNIER: We do, and we need to consult real quick to see what we have for redirect, and it may be more than a half-hour set of questions, so maybe I don't know if we would want to do it in the morning.

THE COURT: I will leave that the will the group here. I mean, do we want to put off until tomorrow morning? I am just not sure -- I mean, I want to make sure we finish this in two days. I mean, is -- do we expect Mr. Polich to take as long as this did today?

MR. BERNIER: I can assure you I do not have as much for Mr. Polich as we have had for Mr. Swartz.

THE COURT: Okay. I mean, I am happy to recess if everybody wants to do that, but I was thinking if it's a half hour of questions, we may as well wrap it up and then start fresh in the morning.

MR. REHWINKEL: Yeah, I think that would be a good break.

THE COURT: We can take five. We can take

five.

MR. BERNIER: We can take some time.

THE COURT: Let's take a recess for about five.

(Brief recess.)

THE COURT: Okay, redirect.

MR. BERNIER: Thank you, Judge. And I appreciate that break. That was helpful. I think we were able to streamline this some.

FURTHER EXAMINATION

BY MR. BERNIER:

Q Mr. Swartz, you have been asked a good number of questions today primarily by Mr. Rehwinkel, but by others, about whether or not Mitsubishi in Period 1 specifically ever provided any documentation to Duke Energy stating it was okay to operate over 420 megawatts. Do you recall those questions?

A Yes.

Q Okay. Let me ask this in another way.

Did Mitsubishi in Period 1 specifically ever provide Duke Energy a document or any instructions saying do not operate over 420 megawatts?

A No.

MR. BERNIER: Okay. I think Mr. Hernandez has some questions for you.

MR. HERNANDEZ: I do.

EXAMINATION

BY MR. HERNANDEZ:

Q Mr. Swartz, let's stay with Period 1. During Period 1, did Duke operate the steam turbine at less than 420 megawatts?

A Yes, for considerable periods of time.

Q Can you give us an approximate percentage of the time that it operated under 420?

A About half, I think. And how I achieve that is there is a part of Mr. Polich's testimony actually, Exhibit RAP-5, tabulates the number of hours that were over 420 megawatts. So if you just look at that and think about the number of operating hours in that period, which can be found on JS-1 on the Table A on page five and do the math, it's about half of the hours were above and about half of the hours were below 420 megawatts.

Q Okay. Thank you.

You spoke in your testimony about pounds per hour per square footage. Is that something that Duke could have measured while operating the steam turbine?

A No. That's a calculated number.

Q So that's not a operating parameter that Duke could have followed while operating the steam turbine?

A That's correct.

Q Okay. Did Mitsubishi participate in any of the inspections that you testified about that Duke conducted as it was replacing blades?

A Yes, in fact, every one. Each iteration of installing different L0 blades, Mitsubishi was the execution arm of that outage. We had Mitsubishi personnel, engineers on site each time inspecting blades with us, inspecting the entire low pressure turbine.

Q And I know that you testified that Duke found no irregularities, no abnormalities, no damage to the steam turbine components aside from the blades, but did Mitsubishi find anything?

A Nothing was found. The rest of the low pressure turbine blading diaphragms was all good in each one of those inspections.

Q During Period 1, was there any way for Duke to know that it operated within the avoidance zone during Period 1?

A No. The avoidance zone wasn't actually calculated until the beginning of Period 3, after we had done testing using the temporary blade vibration monitoring system. And it was only at that time that Mitsubishi provided, or recommended avoidance zone.

The only reason that Table A in the Exhibit

JS-1 has hours in the avoidance zone and other periods is because we back calculated that. If it had been in existence, that's how many hours, but it didn't exist until the beginning of Period 3.

Q Okay. I want to get some clarification on heat balance testing. Is that something that is actually -- you use the term testing, but is that testing actually performed when the steam turbine is a attached to the generator?

A No. The heat balance cases are actually generated -- in this case, they were generated years prior to construction of the power block. And they are engineering predictions of output and other variables based on different combinations of equipment and operating parameters that may be in place when you get to operation. So it's all theoretical.

Q So when actual testing was performed after the steam turbine was actually installed, part of the purpose of that was to determine whether or not the steam turbine would perform in accordance with the heat balance prediction?

A That's correct. And that's really important from an efficiency standpoint especially. We want to make sure we are getting the efficiency -- achieving the efficiency of converting fuel into our product of

megawatts as designed. The long-term operation, 40 years operation of any power plant, that's really the most important thing for the sake of the customer. So that's why --

Q I am sorry. I think you testified that there were approximately 300 heat balance predictions. During the course of actual testing of the steam turbine, not all of those prediction models were tested, correct?

A That's correct. There were over 300 heat balance cases that were generated years before construction, and then two were included in the contract for liquidated damages purposes.

Q And there were some questions regarding the settlement agreement, and the fact that within the settlement agreement there was language indicating that the parties negotiated an increase of megawattage from 420 to 450.

Can you tell me the significance of those numbers, 420 and 450, in the context of the settlement agreement, why were they put in there?

A Sure. They are good reference numbers. And just like the 420 was a minimum that Mitsubishi had to meet to get full payment on the original project, the 450 was what we wanted to achieve as a minimum with a redefine of the blades.

Q So the 450 in the context of the settlement agreement was similar to the 420 guaranteed amount set forth in the contract by Mitsubishi, is that correct?

A Yes, that's accurate.

MR. HERNANDEZ: No further questions, Judge.

MR. MOYLE: I was going to say so much for the relevancy of the settlement agreement, to tweak my friend Mr. Bernier.

THE COURT: I am assuming there is no point starting with another witness this evening. I take it we are all in agreement we should stand in recess until nine o'clock in the morning?

MR. MOYLE: Yes. Thank you, Your Honor.

THE COURT: See you then.

(Whereupon, the proceedings adjourned for the day at 4:50 p.m., and the transcript continues in sequence in Volume 3.)

CERTIFICATE OF REPORTER

STATE OF FLORIDA)
COUNTY OF LEON)

I, DEBRA KRICK, Court Reporter, do hereby certify that the foregoing proceeding was heard at the time and place herein stated.

IT IS FURTHER CERTIFIED that I stenographically reported the said proceedings; that the same has been transcribed under my direct supervision; and that this transcript constitutes a true transcription of my notes of said proceedings.

I FURTHER CERTIFY that I am not a relative, employee, attorney or counsel of any of the parties, nor am I a relative or employee of any of the parties' attorney or counsel connected with the action, nor am I financially interested in the action.

DATED this 18th day of February, 2020.

DEBRA R. KRICK
NOTARY PUBLIC
COMMISSION #GG015952
EXPIRES JULY 27, 2020