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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

\*\*,

Respondent.

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  
APPEARANCES: (As heretofore noted.)  
PREMIER REPORTING  
114 W. 5TH AVENUE  
TALLAHASSEE, FLORIDA  
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9 \*Huh-uh is a negative response  
\*Uh-huh is a positive response

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1 P R O C E E D I N G S

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

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

5 BY MR. REHWINKEL:

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

10 A I am there.

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

13 A Okay. I am there.

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

16 A I do.

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

20 A I do see that, yes.

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

24 A Yes, I would agree with that.

25 Q -- on October 15th?

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

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

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

11          A     I would say on or before.

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

15          A     Yes.

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

18          A     Yes, that's correct.

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

21          A     He was, yes.

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

24          A     He is.

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

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

6 A That's correct.

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

10 A Yes, sir.

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

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

21 MR. HERNANDEZ: Objection, Your Honor,  
22 compound.

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

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

1 BY MR. REHWINKEL:

2 Q The first sentence is true, is it not?

3 A Yes, it is true.

4 Q The second sentence is true, is it not?

5 A Yes.

6 Q And the third sentence is true?

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

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

14 A I would say I generally agree with that.

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

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

24 A No, that's correct.

25 Q And if we go to page 27 --

1           A     Okay.

2           Q     -- in the keynote section under Period 1.

3           A     Yes.

4           Q     It says MHPSA was hired to evaluate ST design  
5     conditions, parentheses, original design was for Tenaska  
6     3-x-1 heat balance and continue the warranty. Do you  
7     see that?

8           A     I do.

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

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

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

15          A     I do see that.

16          Q     And that turned out to be an error?

17          A     Are you asking me if that was an error?

18          Q     Yes.

19          A     It appears it was an error.

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

22          A     175?

23          Q     Yes, sir.

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



1     **Restrictions", do you see that caption?**

2           A     I do.

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

6           A     I do.

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

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

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

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

20          **Q     As a limitation, right?**

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

23          **Q     Okay.**

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

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

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

6 A I am almost there.

7 Q Okay. Sorry, this is Document 18.

8 A Yes, that's fair.

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

12 A Okay.

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

17 A Oh, yes, I see where, yes.

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

20 A Yes.

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

24 A I do.

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

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

3             A     What question?

4             Q     Well, what the operating restrictions are.

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

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

12            A     Table A of JS-2?

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

15            A     Yes.

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

22            A     Correct.

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

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

3           A     No, that's not correct.

4           **Q     For Period 1?**

5           A     That is not correct.

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

9           A     420 is a predicted megawatt output if a whole  
10    bunch of variables, dozens of variables are controlled  
11    at certain points, 420 was predicted as the generator  
12    output at a power factor of .949, or a power factor of  
13    .9.

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

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

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

21           **Q     Okay.**

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

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

1     **final document?**

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

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

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

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

8           A     Oh, okay.  I am sorry.

9           Q     **That's okay.**

10          A     Okay.

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

14          A     Yes, that's correct.

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

19          A     I could have had those available, yes.

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

22          A     Right.

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

25          A     Okay.

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

4           A     Yes.

5           Q     So it says: MHPS Engineering indicated that  
6     Bartow Unit 4S was an outlier relative to the Mitsubishi  
7     40-inch L0 fleet with several operating hours above the  
8     design limit of 15,000 -- I am stumbling over that --  
9     foot pounds per hour squared, parenthesis, the  
10    Mitsubishi 40-inch L0 fleet average was closer to 12,000  
11    foot pounds squared per hour, close parenthesis; do you  
12    see that?

13          A     I do.

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

16          A     It does -- no, I did not.

17          Q     Is that because it's factual?

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

1 normal -- their fleet operating experience, but that the  
2 15,000 and 17,000 pounds per hour per square foot was  
3 beyond their fleet experience and put them in a zone of  
4 uncertainty.

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

8 A Yes.

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

11 A Would I be?

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

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

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

21 A Correct.

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

25 A That is correct, yes.

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

4           A     Yes.

5           Q     Okay. So this sentence says: While Duke  
6 Engineering agrees that back-end loading should be  
7 considered a significant contributing factor toward root  
8 cause, one cannot definitively conclude that it has been  
9 the root cause of all five of the documented L0 events.  
10                You didn't propose to change that sentence?

11          A     Correct.

12          Q     Do you believe it to be true?

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

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

23          A     Right.

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



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

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

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

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

10 A Oh, page one of JS-1?

11 Q Yes, sir.

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

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

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

16 BY MR. REHWINKEL:

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

18 A Okay.

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

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

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

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

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

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

14 MR. REHWINKEL: I'm just working in Exhibit  
15 115.

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

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

19 THE COURT: Bates stamp, right?

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

22 BY MR. REHWINKEL:

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

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

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

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

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

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

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

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

3 Q Let me ask you about page seven of Exhibit  
4 115.

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

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

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

13 THE WITNESS: They did.

14 THE COURT: Okay.

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

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

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

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

12       BY MR. REHWINKEL:

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

16               A     We have information from users groups.

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

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

23               **Q     Okay.**

24               A     -- so that's information.

25               **Q     So isn't it true that one of those**

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

4             A     That is true.

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

8             A     He indicated that they had similar issues.

9             Q     Did he give you any information?

10            A     No.

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

13            A     No.

14            Q     And you had that information before 2018,  
15    right?

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

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

20            A     Okay, then --

21            Q     Okay.

22            A     -- I agree.

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

1     **Bartow?**

2           A     Yes.

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

6           A     That's correct.

7           **Q     Okay. And that was before 2018, correct?**

8           A     Yes.

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

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

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

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

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

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

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

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

3           A     Yes. Yes.

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

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

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

11          A     That's accurate.

12          **Q     Okay. And you also agree, I think we just**  
13    **talked about it in that draft, is that Duke Bartow was**  
14    **an outlier compared to all of the other Mitsubishi L0**  
15    **40-inch blade steam turbines?**

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

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

20          A     Yes.

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



1           A       How the Bartow plant compares to Mitsubishi?

2           **Q       Yes.**

3           A       I will take your word for it.

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

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

16               THE COURT: Sure.

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

19   BY MR. REHWINKEL:

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

22           A       Okay. I am there.

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

25           A       Okay.

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

7                     Did I read that right?

8           A     Yes.

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

10          A     As far as I know, that is true.

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

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

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

23                     MR. BERNIER: So two of JS-2?

24                     MR. REHWINKEL: Yes.

25                     MR. BERNIER: Thank you.

1 BY MR. REHWINKEL:

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

4 A I do.

5 Q This is your ultimate conclusion, right?

6 A It is. We discussed that before.

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

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

13 The most commonly reported issue with the  
14 40-inch L0 blade design elsewhere is water erosion,  
15 which both Duke and MHP also agree is not a contributing  
16 factor to the Bartow failures. So I really was  
17 referencing the industry in general.

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

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

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

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

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

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

12               MR. REHWINKEL: Of 115.

13               MR. BERNIER: Got you.

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

15               THE WITNESS: Okay. I am there.

16          BY MR. REHWINKEL:

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

19           A     I do.

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

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

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

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

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

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

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

1 this picture.

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

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

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

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

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

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

1     **have experience with before you commissioned Bartow?**

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

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

6           A     Yes.

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

9                   MR. BERNIER: 106?

10                  MR. REHWINKEL: Yeah, 106.

11                  THE WITNESS: Yes, I am.

12     BY MR. REHWINKEL:

13           Q     Okay. Now, is it --

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

16                  MR. REHWINKEL: Oh, I am sorry.

17                  MR. BERNIER: Okay.

18     BY MR. REHWINKEL:

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

21           A     Yes, I do.

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

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

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

11 MR. REHWINKEL: Yes.

12 THE COURT: Okay.

13 BY MR. REHWINKEL:

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

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

19 Q Sometime in March?

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

22 Q And you filed testimony in March of 2018?

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

24 Thank you.

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



1     **a design flaw in the turbine, right?**

2           A     Could you point to where you are looking at?

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

5           A     Page seven of the root cause analysis?

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

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

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

13          A     Yeah.

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

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

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

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

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

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

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

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

8 MR. BERNIER: Understood.

9 BY MR. REHWINKEL:

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

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

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

1           A       Even for a design defect.

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

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

11          Q       That was for the blades, right?

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

16          Q       Page seven, footnote six.

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

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

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

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

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

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

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

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

1           MR. HERNANDEZ:  Objection, Your Honor,  
2           foundation.

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

5           THE WITNESS:  Potentially it could be  
6           applicable to the other units.  And you have to  
7           look at the design conditions, the operating  
8           parameters of each of those 30-some units, or  
9           50-some rows of blades that we talked about.  And  
10          if any of those other 50 blades were operated the  
11          same way as Bartow within the guidelines  
12          established by the OEM, I would be pretty worried  
13          if I owned one of those other sets of blades.

14  BY MR. REHWINKEL:

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

17           A     Correct.

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

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

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

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

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

13 A Yes.

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

21 A That's a fair summary.

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

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

24 **Q Sure.**

25 A The credit could have been used in many

1 different ways. Not necessarily at Bartow.

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

5 A Correct.

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

7 A Yes.

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

11 A Okay. Whereas, after the steam turbine was  
12 commissioned in June 2009, MHPS designed enhanced L0  
13 blades that would endeavor to allow Bartow station to  
14 increase its output from 420 megawatts to 450 megawatts,  
15 and whereas, the parties entered into purchase order  
16 718383 on February 10th, 2014, whereby MHPS was to  
17 design and install such enhanced design L0 blades at a  
18 \$6 million cost to DEF, which amount DEF has paid.

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

21 A Yes.

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

24 A Yes.

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



1     **together, that the output of the steam turbine was**  
2     **420 megawatts and you wanted to increase it to 450,**  
3     **right?**

4           A     Generally that's correct.

5           Q     **And that specifically is in Period 1 that it's**  
6     **420, right?**

7           A     Yes.

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

12                   THE COURT: How long do you need?

13                   MR. REHWINKEL: Just five minutes.

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

16                   (Brief recess.)

17                   THE COURT: Back on.

18                   Whenever you are ready, Mr. Rehwinkel.

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

22                   THE COURT: Yep.

23    BY MR. REHWINKEL:

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

1           A     Okay.

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

5           A     Starting with the words "for Bartow"?

6           **Q     Yes, sir.**

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

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

14          A     Yes, sir.

15                 May I stand up, Your Honor?

16                 THE COURT:  Sure.

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

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

1 casing, everything associated with the low pressure  
2 turbine.

3 BY MR. REHWINKEL:

4 Q Thank you.

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

6 A It does.

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

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

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

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

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

3 Q So it's five sets?

4 A Yes.

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

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

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

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

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

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

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

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

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

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

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

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

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

14   BY MR. REHWINKEL:

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

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

23           **Q     All right.**

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

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

3           A     They were.

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

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

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

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

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

25          Q     Okay. I should have added based on a

1     **vibration-induced damage?**

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

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

6           A     Correct.

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

11          A     Correct, we did not find anything of that.

12          Q     Okay.  All right.  I have just have a couple  
13    **of sort of clarification questions to ask you on -- I am**  
14    **still on 115, and I want to take you back to page 17 of**  
15    **18, which is Exhibit 17 --**

16          A     Okay.

17          Q     -- exhibit page 17.

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

20          A     I may be on the wrong page.

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

24          A     I am sorry, I was on page seven.

25          Q     **Sorry.**



1           A     All right. I am there.

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

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

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

13                    The design at Citrus is such that the  
14 calculated steam flow -- we've been talking about this  
15 pounds per hour per square foot number. It's less than  
16 11,000, or around 11,000 at Citrus. So because of that,  
17 Mitsubishi doesn't not think that there is any issues,  
18 but I believe they are similar to Type 5 blades, or they  
19 are Type 5 -- Mitsubishi Type 5 blades, which don't  
20 mistake that with period, right. So they are different  
21 style of blades than any of the iterations at Bartow,  
22 but they are similar in that they are 40-inch steal L0  
23 blades, if that makes sense.

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

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

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

7           **Q     Okay. I understand that.**

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

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

15                 During Period 4, we were able to pinpoint when  
16     some of the damage occurred. We had -- if you look at  
17     the keynotes from period row and go over to that Period  
18     4 column, it said -- it shows the two separate step  
19     changes that were actually reductions, decreases in  
20     vibration, led Duke Engineering recommendation to remove  
21     the steam turbine from service for inspection.

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

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

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

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

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

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

3 **Q So is that the only --**

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

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

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

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

24 So we got an alarm that we had high sodium.

25 We have an alarm that there is reduction in vacuum, so

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

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

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

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

11 **Q Yes.**

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

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

18 MR. REHWINKEL: Thank you, Your Honor.

19 THE COURT: Who's next?

20 EXAMINATION

21 BY MR. MOYLE:

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

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

1           A     Yes, sir, I have.

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

4           A     Not really. No, sir.

5           **Q     EIA, you have never --**

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

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

11                   THE COURT: Sure.

12                   THE WITNESS: Thank you.

13 BY MR. MOYLE:

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

17           A     Yes.

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

20           A     Oh, it has the answer on it.

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

23           A     Generator nameplate capacity?

24           **Q     Right.**

25           A     Yes, sir.

1           **Q     Would you mind just reading that into the**  
2     **record?**

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

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

13          A     I am.

14          **Q     Okay. And a couple of follow-ups on that.**  
15                **Does the unit that we are talking about here**  
16    **have a, you know, have a nameplate on it?**

17          A     I don't know.

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

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

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

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

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

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

8 A Right.

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

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

15 A Yes, I would agree with that.

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

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

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

25 A Yes, I am sorry, yes.



1           **Q     The court reporter needs to put nodding head**  
2   **yes.**

3           A     Sorry.

4           **Q     Anyway, that's all right.**

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

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

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

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

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

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

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

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

25           Q       **How long from date of manufacture to date of**

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

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

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

5 A It was more than a year, yes.

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

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

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

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

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

21 A Correct.

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

25 A Not necessarily. Again, you have to think

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

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

8 A I don't know.

9 **Q You don't know where it was?**

10 A I don't know where the plant was.

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

15 A Correct.

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

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

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

25 A Yes, sir.

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

3           A     That's correct.

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

10          A     That's correct.

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

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

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

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

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

1     that happened to the turbines, correct?

2           A     Correct.

3           Q     And you all couldn't really come to  
4     100 percent conclusion, decisive conclusion as to what  
5     caused the problem, but you said, here are what we think  
6     are our best ideas as to what caused the problem,  
7     correct?

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

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

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

1 periods.

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

4 A It is. Same thing.

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

7 A Yes.

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

12 A That's correct.

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

14 A Yes.

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

20 A Right.

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

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

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

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

10 A It would not make sense, right.

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

16 A Yes.

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

22 A That's what that said, yes.

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



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

7 A Well, I think --

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

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

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

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

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

2           **Q       Or any narrative description for it?**

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

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

13          A       It is.

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

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

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

22          A       I am.

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

25          A       That's my understanding.

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

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

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

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

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

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

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

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

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

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

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

7 THE COURT: Sure.

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

12 BY MR. MOYLE:

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

14 A Mid-span snubbers.

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

17 A I believe they are, yes.

18 **Q The same with the ones on the top?**

19 A Yes.

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

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

24 **Q That happens?**

25 A That's right.

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

5           A     That what would happen?

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

8           A     If something were welded on?

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

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

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

25          A     That's correct.

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

4           **A**     It does, yes.

5           **Q**     **Yeah, okay. What's blending?**

6           **A**     Blending operation in a combined cycle --  
7     remember that there is inherent flexibility in a  
8     combined cycle operation, and Bartow is a 4-on-1. So  
9     the transition between operating in 4-on-1 or 3-on-1 to  
10    2-on-1 to 1-on-1, any time you do that, you have to --  
11    let's use an example.

12                   If you are going from 2-on-1 configuration to  
13    3-on-1 configuration, so that means two combustion  
14    turbines operating with a steam turbine in service. You  
15    start up the third combustion turbine. You are  
16    generating electricity with the combustion turbine  
17    generator. The exhaust, remember, is going out the  
18    stack. It's not going to the HRSG yet. When you  
19    start -- then you start warming up the heat recovery  
20    steam generator. You start generating steam. You don't  
21    immediately put the steam into the turbine. You have to  
22    wait for certain conditions to be met on the steam. You  
23    don't want to put water in the steam turbine.

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

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

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

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

11 A This is a 4-on-1.

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

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

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

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

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

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

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

24           A     Oh, yes.

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



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

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

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

10 A Okay. I am there.

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

13 A Yes.

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

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

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

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

1 place of high-energy.

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

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

9 A I do not.

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

13 A I don't know.

14 Q Yeah.

15 A I didn't have that discussion.

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

19 A Correct.

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

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

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

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

15 **A Correct.**

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

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

22 **Q Right.**

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

1 turbines, the four combustion turbines are nominally  
2 around 200 megawatts. Again, as I have described, they  
3 can do more than that depending on the ambient  
4 conditions in the heat of the summer they may not make  
5 that much. But let's say they are 200-megawatt units,  
6 we had about 200 megawatts capacity instead of about  
7 1,200 megawatts of capacity.

8 **Q Okay. So about a third is knocked out?**

9 A During the outages.

10 **Q Right.**

11 A During the outages, right.

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

15 A That's correct. If it was needed.

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

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

1 two that we have at Citrus.

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

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

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

9 A Yeah, no problems.

10 Q I am not disappointed, you know.

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

13 Q Right. Right.

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

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

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

1 information you have that somebody else may have an  
2 issue?

3 A That's correct. That's correct.

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

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

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

11 A I don't remember.

12 Q You don't remember who it was?

13 A I don't.

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

16 THE COURT: Sure.

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

18 THE COURT: Mr. Brew.

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

21 THE COURT: Sure.

22 EXAMINATION

23 BY MR. BREW:

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

1 am going to talk about this one.

2 A Okay.

3 Q Thanks.

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

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

11 A Yes, sir.

12 Q It was originally designed and built for a  
13 3-x-1 configuration, right?

14 A That's correct.

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

18 A That's correct.

19 Q And that's eventually what was built?

20 A Yes.

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

24 A Yes.

25 Q And then the steam from those steam generators

1 run down to the steam turbine?

2 A Yes, sir.

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

6 A From the low pressure turbine.

7 Q From the low pressure turbine eventually, yes.  
8 And you can run any one of those sets 1-x-1,  
9 2-x-1, 3-x-1, 4-x-1?

10 A Yes.

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

14 A Yes, sir. That's right.

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

18 A That's accurate.

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

22 A Correct.

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



1           A     Yes, sir. That's right.

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

5           A     Yes, sir.

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

8           A     Yes.

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

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

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

17          A     That's about right, yes.

18          Q     And of that 1,200 megawatts, about  
19    420 megawatts would have been ascribed to the steam  
20    turbine, right?

21          A     That's about right.

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

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

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

1 possible combinations --

2 A Yes, sir. That's right.

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

4 A Yes.

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

10 A Yes.

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

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

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

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

1     **right?**

2           A     Yes.

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

4           A     Yes.

5           **Q     Is it the company's position that the zero**  
6     **level blades were insufficiently designed for**  
7     **450 megawatts or the originally promised 420?**

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

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

15          A     Yes.

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

19          A     I am not sure what you mean by insurers.

20          **Q     You want us to pay the bill?**

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

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

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

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

15          A     Page seven?

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

17          A     Okay. I am there.

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

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

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

1     **March 1, 2019, direct testimony.**

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

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

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

9           Q     Yeah, that's --

10          A     I don't have page numbers on mine.

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

13          A     Okay.

14          Q     -- that starts with the word yes.

15          A     Right.

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

19          A     The utility industry.

20          Q     **The utility --**

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

1 take on business interruption risk.

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

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

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

12 A Right.

13 (Discussion off the record.)

14 BY MR. BREW:

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

18 A Yes, sir.

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

25 A Yes, that's correct.

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

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

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

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

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

23          A     Yes.

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

25          A     Correct.

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

2           A     Correct.

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

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

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

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

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



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

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

7 A Correct.

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

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

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

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

6           A     Yes, that's correct.

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

10          A     Not that I am aware of.

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

15          A     That's correct.

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

21          A     Correct.

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

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

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

6           A       Yes, I do.

7           Q       Are you familiar with this diagram?

8           A       I have seen it before, yes.

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

15          A       Yes, that's correct.

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

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

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

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

1 and D.

2 **Q A and D.**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

21          MS. BROWNLESS:  Thank you.

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

1 MR. BERNIER: That's correct.

2 MR. MOYLE: Okay.

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

5 MS. BROWNLESS: Thank you.

6 THE COURT: Was there anything from the  
7 Commission?

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

10 MR. BERNIER: Can we have one minute?

11 THE COURT: Sure. Take 10.

12 MS. BROWNLESS: Oh, I am sorry.

13 MR. BREW: I'm not finished.

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

16 MS. BROWNLESS: Yeah.

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

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

19 MR. BREW: Right.

20 THE COURT: I thought you were waiting for  
21 rebuttal.

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

25 THE COURT: The floor is yours.

1 BY MR. BREW:

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

5 What we will call Period 6 is when you  
6 installed the pressure plate beginning around April of  
7 2017?

8 A Yes, sir. That's right.

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

11 A Correct.

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

15 A That's accurate.

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

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

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

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

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

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

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

25          A     Yes, sir.



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

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

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

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

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

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

11 A Correct.

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

14 A Correct.

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

16 THE COURT: Still nothing?

17 MS. BROWNLESS: I will pass these out.

18 THE COURT: Oh, okay.

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

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

23 THE COURT: It's already been marked?

24 MR. BERNIER: Yes.

25 THE COURT: Are we talking about the

1 one-pager?

2 MR. BREW: The one-pager was marked as 113.

3 The other one was actually marked as 112.

4 THE COURT: Okay.

5 EXAMINATION

6 BY MS. BROWNLESS:

7 Q Good afternoon.

8 A Good afternoon.

9 Q It's been a long day.

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

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

14 MS. BROWNLESS: It's green.

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

17 MS. BROWNLESS: Oh, thank you, Judge.

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

20 BY MS. BROWNLESS:

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

23 A Okay.

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

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

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

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

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

10          A       That's correct.

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

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

15          Q       Okay. And I am curious as to why you were  
16       willing to accept -- well, let me refer you to Exhibit  
17       **110. If I look on page -- let me -- it's Bates page**  
18       **12432, and the page 3-2-1; do you see it, sir?**

19          A       I do.

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

22          A       I see that.

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

1     **megawatts, is that correct?**

2           A     Yes, it is.

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

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

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

20          A     It would, yes.

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

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

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

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

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

14 **A Correct.**

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

17 **A Well, I don't know. They are F, 501F**  
18 **machines, but there has been multiple generations of**  
19 **501F machines in the industry. F -- I don't know**  
20 **specifically what we have at Bartow, but they go by FD1,**  
21 **FD2, FD3, each subsequent generation has some improved**  
22 **capabilities.**

23 **I don't know exactly what model the Tenaska**  
24 **501F was compared to the Bartow 501F. They may have**  
25 **been different models of combustion turbine with**

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

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

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

11 **Q -- they wouldn't be exactly comparable?**

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

15 A Yes.

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

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

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

1           A     Yes.

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

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

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

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

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

20          A     Only after the -- it is correct, but that  
21 wasn't an operating parameter provided in 2009, but in  
22 2012. After we discovered damage in the spring outage,  
23 that's when Mitsubishi lowered -- made a recommendation  
24 that we don't exceed 118 pounds in the exhaust of the  
25 intermediate pressure turbine to be used as a proxy of



1     what steam was being emitted to the low pressure  
2     turbine.

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

6           A     No.

7           **Q     No number?**

8           A     Correct.

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

11          A     I believe we did, yes.

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

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

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

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

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

25          A     It would be somewhere in this vicinity. I

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

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

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

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

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

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

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

1           So they would give us -- like, let's use an  
2   example. It was 118 pounds here on the start of Period  
3   2. That may have meant they didn't want to exceed  
4   117 pounds here. I am just making that number up. I  
5   don't know. But when they used this as a proxy, they  
6   took into account the pressure drop possible through  
7   that pipe.

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

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

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

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

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

21          A     The intermediate pressure?

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

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

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

6 **Q Okay. Thank you.**

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

12 **A That is correct.**

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

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

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

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

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

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

14           A     Okay. I am there.

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

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

18           MR. BERNIER: Thank you.

19           MS. BROWNLESS: Its section 3.2, guaranteed  
20   performance.

21           MR. BERNIER: Thanks.

22           MS. BROWNLESS: Are you good?

23           MR. BERNIER: Yep. Thank you.

24           MS. BROWNLESS: Sure.

25   BY MS. BROWNLESS:

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

5           A     Yes.

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

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

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

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

18           Q     Where is that?

19           A     -- and it's admission pressure.

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

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

4 **Q Okay.**

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

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

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

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

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

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

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

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

8 A Oh, I think -- so did we achieve  
9 420 megawatts?

10 **Q Yes.**

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

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

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



1           A     Not that I am aware of.  No.

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

5           A     At least 420 megawatts.

6           Q     At least 420 megawatts?

7           A     Yes.

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

10          A     Correct.

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

15          A     If you give me just one moment to look at the  
16     difference.  So the difference between one 12433 and  
17     12434?

18          Q     Yes.

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

1           **Q     Did Duke personnel believe that knowing the**  
2           **manufacturer's parameters for the LP section of the**  
3           **steam turbine was necessary for operating the unit at**  
4           **420 before March of 2012?**

5           A     No, it did not.

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

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

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

16          A     Correct.

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

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

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

1     **exhaust?**

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

5           **Q     You are measuring -- that's --**

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

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

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

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

21                   **When the Bartow Unit 4 combined cycle plant**  
22 **was tested prior to its commercial operation in June of**  
23 **2009, was the plant tested in a configuration that**  
24 **reflected commercial operation of the unit in a maximum**  
25 **total megawatt output scenario?**

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

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

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

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

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

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

25           **Q       And do you have any information here today**

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

2           A     I don't.

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

5           A     I don't.

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

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

14          Q     **Got it.**

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

21          A     Yes. That was the assumption.

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

1           A       When you say operating engineer.

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

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

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

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

17          **Q       Yes.**

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

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

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

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

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

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

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

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

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

1     **steam turbine sections?**

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

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

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

10           Could I approach the chart again?

11           THE COURT:   Sure.

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

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

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



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

5   BY MS. BROWNLESS:

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

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

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

15          A     Yes.

16          **Q     And can you show me where that is?**

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

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

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

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

8 **Q On the HRSG?**

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

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

16 A Exhibit 80?

17 **Q It's Table A.**

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

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

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

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

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

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

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

11 A We felt that there was capability in that  
12 4-on-1 power block at Bartow that we weren't able to use  
13 that we should be able to use specifically with the  
14 generator. We knew we could generate steam flow.

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

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

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

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

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

22          **Q     Right. And I gets my question is --**

23          A     I am sorry, the electrical generator.

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

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

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

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

9           A     Ultimately, yes.

10          Q     Okay. Because you would have expected that a  
11     4-on-1 configuration would give you a higher nameplate  
12     capacity than a 3-on-1 configuration?

13          A     Well, we would have expected that 4-on-1, if  
14     we had at least as much duct firing as the 3-on-1 case,  
15     yes, as long as we are staying within the capability of  
16     the generator, we should be able to do better than the  
17     420 megawatts.

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

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

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

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

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

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

19                  So I am speculating, but that's perhaps why it  
20    was tested at those levels. But remember, the  
21    420 megawatts for heat balance case No. 48 was the  
22    minimum that Mitsubishi had to achieve. It didn't mean  
23    that was a limit, or that was a maximum. We should be  
24    and were pleased that we could get more than  
25    420 megawatts if we still adhered to the operating

1 pressures that we were given, and temperatures.

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

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

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

9           MR. BREW: That's the rebuttal exhibit.

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

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

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

15          MR. BERNIER: That's okay.

16          MS. BROWNLESS: I will stop.

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

19          MS. BROWNLESS: No problem. No problem.

20          And if you give me just a minute.

21          THE COURT: Just wait for the next question.

22          THE WITNESS: Okay.

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

24          THE COURT: Sure.

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

1 Thank you.

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

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

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

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

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

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

25 THE COURT: We can take five. We can take



1 five.

2 MR. BERNIER: We can take some time.

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

5 (Brief recess.)

6 THE COURT: Okay, redirect.

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

10 FURTHER EXAMINATION

11 BY MR. BERNIER:

12 Q Mr. Swartz, you have been asked a good number  
13 of questions today primarily by Mr. Rehwinkel, but by  
14 others, about whether or not Mitsubishi in Period 1  
15 specifically ever provided any documentation to Duke  
16 Energy stating it was okay to operate over  
17 420 megawatts. Do you recall those questions?

18 A Yes.

19 Q Okay. Let me ask this in another way.

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

23 A No.

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

1 MR. HERNANDEZ: I do.

2 EXAMINATION

3 BY MR. HERNANDEZ:

4 Q Mr. Swartz, let's stay with Period 1.

5 During Period 1, did Duke operate the steam  
6 turbine at less than 420 megawatts?

7 A Yes, for considerable periods of time.

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

10 A About half, I think. And how I achieve that  
11 is there is a part of Mr. Polich's testimony actually,  
12 Exhibit RAP-5, tabulates the number of hours that were  
13 over 420 megawatts. So if you just look at that and  
14 think about the number of operating hours in that  
15 period, which can be found on JS-1 on the Table A on  
16 page five and do the math, it's about half of the hours  
17 were above and about half of the hours were below  
18 420 megawatts.

19 Q Okay. Thank you.

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

23 A No. That's a calculated number.

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

1           A     That's correct.

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

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

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

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

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

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

25                     The only reason that Table A in the Exhibit

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

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

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

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

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

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

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

9 A That's correct. There were over 300 heat  
10 balance cases that were generated years before  
11 construction, and then two were included in the contract  
12 for liquidated damages purposes.

13 **Q And there were some questions regarding the**  
14 **settlement agreement, and the fact that within the**  
15 **settlement agreement there was language indicating that**  
16 **the parties negotiated an increase of megawattage from**  
17 **420 to 450.**

18 **Can you tell me the significance of those**  
19 **numbers, 420 and 450, in the context of the settlement**  
20 **agreement, why were they put in there?**

21 A Sure. They are good reference numbers. And  
22 just like the 420 was a minimum that Mitsubishi had to  
23 meet to get full payment on the original project, the  
24 450 was what we wanted to achieve as a minimum with a  
25 redefine of the blades.

1           Q     So the 450 in the context of the settlement  
2     agreement was similar to the 420 guaranteed amount set  
3     forth in the contract by Mitsubishi, is that correct?

4           A     Yes, that's accurate.

5           MR. HERNANDEZ: No further questions, Judge.

6           MR. MOYLE: I was going to say so much for the  
7     relevancy of the settlement agreement, to tweak my  
8     friend Mr. Bernier.

9           THE COURT: I am assuming there is no point  
10    starting with another witness this evening. I take  
11    it we are all in agreement we should stand in  
12    recess until nine o'clock in the morning?

13          MR. MOYLE: Yes. Thank you, Your Honor.

14          THE COURT: See you then.

15          (Whereupon, the proceedings adjourned for the  
16    day at 4:50 p.m., and the transcript continues in  
17    sequence in Volume 3.)

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## 1 CERTIFICATE OF REPORTER

2 STATE OF FLORIDA )  
COUNTY OF LEON )

3

4

5 I, DEBRA KRICK, Court Reporter, do hereby  
6 certify that the foregoing proceeding was heard at the  
7 time and place herein stated.8 IT IS FURTHER CERTIFIED that I  
9 stenographically reported the said proceedings; that the  
10 same has been transcribed under my direct supervision;  
11 and that this transcript constitutes a true  
12 transcription of my notes of said proceedings.13 I FURTHER CERTIFY that I am not a relative,  
14 employee, attorney or counsel of any of the parties, nor  
15 am I a relative or employee of any of the parties'  
16 attorney or counsel connected with the action, nor am I  
17 financially interested in the action.

18 DATED this 18th day of February, 2020.

19

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21



22

23

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DEBRA R. KRICK  
NOTARY PUBLIC  
COMMISSION #GG015952  
EXPIRES JULY 27, 2020

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CONFIDENTIAL

1 STATE OF FLORIDA  
2 DIVISION OF ADMINISTRATIVE HEARINGS  
3  
4 RE IN: FUEL AND PURCHASED POWER  
5 COST RECOVERY CLAUSE WITH  
6 GENERATING PERFORMANCE INCENTIVE  
7 FACTOR,  
8  
9 Petitioner,  
10 vs. CASE NO. 19-6022  
11 \*\*,  
12 Respondent. /  
13  
14 VOLUME 2  
15 PAGES 157 - 290  
16  
17 PROCEEDINGS: Administrative Hearing  
18 BEFORE: Honorable Lawrence P. Stevenson  
19 DATE: February 4, 2020  
20 TIME: Commenced: 8:55 A.M.  
21 LOCATION: Division of Administrative Hearings  
22 1230 Apalachee Parkway  
23 The DeSoto Building,  
24 Tallahassee, Florida  
25 REPORTED BY: DEBRA R. KRICK  
Court Reporter  
APPEARANCES: (As heretofore noted.)  
PREMIER REPORTING  
114 W. 5TH AVENUE  
TALLAHASSEE, FLORIDA  
(850) 894-0828

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9 \*Huh-uh is a negative response  
10 \*Uh-huh is a positive response  
11  
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1 P R O C E E D I N G S  
2 THE COURT: Mr. Rehwinkel, whenever you are  
3 ready, I think we are all set.  
4 MR. REHWINKEL: Okay. Thank you, Your Honor.  
5 BY MR. REHWINKEL:  
6 Q I want to take you back to the drafts that we  
7 called -- that's Exhibit 115. If you can go to that. I  
8 think we will spend most of the rest of the time on that  
9 document.  
10 A I am there.  
11 Q And I want to take you to Document 2, which is  
12 at Bates 19.  
13 A Okay. I am there.  
14 Q Now, the file name for this document says P  
15 Crimi comments, do you agree with that?  
16 A I do.  
17 Q And also it says above the text on the upper  
18 right-hand side, REV 10-15-16 HMC, do you see that in  
19 the -- just above the -- well, do you see --  
20 A I do see that, yes.  
21 Q Okay. Would it be a reasonable conclusion  
22 that this is a document that was at least originally  
23 generated by Harry Carbone --  
24 A Yes, I would agree with that.  
25 Q -- on October 15th?

1 Okay. And would it be also reasonable to  
2 assume, based on the Duke file name, that Paul Crimi  
3 made some comments or edits to this document?  
4 A It would. And one correction, I don't know  
5 that Mr. Carbone would have created it, but he  
6 certainly, by the revision date, it appears that he  
7 edited it.  
8 Q Okay. We wouldn't know necessarily when he  
9 did it, but it would have been on or after the 15th of  
10 October of 2016, is that right?  
11 A I would say on or before.  
12 Q Okay. Now, Mr. Crimi was a consultant to Duke  
13 and also a member of the root cause team, is that  
14 correct?  
15 A Yes.  
16 Q Okay. And he is a former employee of Duke and  
17 Progress, right?  
18 A Yes, that's correct.  
19 Q And at some point, he was also an employee  
20 probably of GE?  
21 A He was, yes.  
22 Q Okay. And would it be fair to say he is a  
23 subject matter expert with steam turbines?  
24 A He is.  
25 Q Okay. So let's go down to the second



1 paragraph -- and just so we understand what these  
 2 documents are, I mean, the night janitor wouldn't be  
 3 able to go and make changes to these things? These  
 4 are -- these changes are all by authorized engineers,  
 5 right?  
 6 A That's correct.  
 7 Q Okay. So there is a statement here that  
 8 starts "it is important" -- could you read that full  
 9 paragraph there with those edits?  
 10 A Yes, sir.  
 11 "It is important to note that this turbine was  
 12 originally designed for another project and built by the  
 13 OEM but not shipped. It was subsequently reapplied to  
 14 the Bartow project with the limitations and turbine  
 15 outputs shown on the heat balances and other  
 16 documentation provided. However, it was much less clear  
 17 about the exhaust flow limit the output limit implied  
 18 since this pressure and flow limit is not clearly stated  
 19 on the documentation given."  
 20 Q Okay. Now, is that -- isn't that true?  
 21 MR. HERNANDEZ: Objection, Your Honor,  
 22 compound.  
 23 MR. REHWINKEL: I'll ask you this --  
 24 THE COURT: Overruled. Yeah, you can break it  
 25 down, I guess.

1 BY MR. REHWINKEL:  
 2 Q The first sentence is true, is it not?  
 3 A Yes, it is true.  
 4 Q The second sentence is true, is it not?  
 5 A Yes.  
 6 Q And the third sentence is true?  
 7 A That one is difficult to say a true or false.  
 8 It was much less clear about the exhaust flow limit the  
 9 output limit implied -- again, it's a working document  
 10 of a root cause team. You are just asking me if that  
 11 statement is true or false, that sentence?  
 12 Q Well, I am asking you if you agreed with that,  
 13 let me ask it that way.  
 14 A I would say I generally agree with that.  
 15 The operating parameters to operate the steam  
 16 turbine are really on -- you know, we, like -- for  
 17 instance, we don't have, as I stated earlier, a low  
 18 pressure inlet instrument, so exhaust flow limit, there  
 19 is no way to measure that, so I think that's what this  
 20 sentence is getting at.  
 21 Q Okay. But there is no expression of a lack of  
 22 clarity about what the heat balances represent by  
 23 Mr. Crimi here, is there?  
 24 A No, that's correct.  
 25 Q And if we go to page 27 --

1 A Okay.  
 2 Q -- in the keynote section under Period 1.  
 3 A Yes.  
 4 Q It says MHPSA was hired to evaluate ST design  
 5 conditions, parentheses, original design was for Tenaska  
 6 3-x-1 heat balance and continue the warranty. Do you  
 7 see that?  
 8 A I do.  
 9 Q Okay. And even though it has an A in there,  
 10 there is no -- that's still Mitsubishi?  
 11 A It is. The A, I believe, stands for America.  
 12 Q All right. So somebody, when they developed  
 13 Appendix A, put 450 megawatts as the steam turbine  
 14 rating in 2016, do you see that, for Period 1?  
 15 A I do see that.  
 16 Q And that turned out to be an error?  
 17 A Are you asking me if that was an error?  
 18 Q Yes.  
 19 A It appears it was an error.  
 20 Q Okay. But if we go back -- let's go back to  
 21 page 175 now. Let's go -- go out a year in time.  
 22 A 175?  
 23 Q Yes, sir.  
 24 And this Appendix A here, we see in the  
 25 line -- or the row that's headed "Operating

1 Restrictions", do you see that caption?  
 2 A I do.  
 3 Q All right. And for Period 1, it says none,  
 4 dash, MHPS intent was to follow heat balance diagrams,  
 5 do you see that?  
 6 A I do.  
 7 Q Okay. So that's consistent, is it not, with  
 8 Mitsubishi's contention that the heat balances were  
 9 limitations that -- for operating the steam turbine,  
 10 correct?  
 11 A Again, calling heat balances limitations I do  
 12 not believe is accurate. They are predictions based on  
 13 a certain set of criteria, and so what this is saying is  
 14 the intent was to follow those predictions.  
 15 Q And that's what Mr. Crimi said a year earlier  
 16 in his statement, right, that the heat balances were  
 17 limitations in turbine output, back on page 19, right?  
 18 A There is a reference to the heat balances in  
 19 the sentence -- in the paragraph I read.  
 20 Q As a limitation, right?  
 21 A The limitations in turbine output shown on the  
 22 heat balances, yes.  
 23 Q Okay.  
 24 A Now, again, that's with other operating  
 25 variables, okay. So a limitation is according to

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

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

6 A I am almost there.

7 Q Okay. Sorry, this is Document 18.

8 A Yes, that's fair.

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

12 A Okay.

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

17 A Oh, yes, I see where, yes.

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

20 A Yes.

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

24 A I do.

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

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

3 A What question?

4 Q Well, what the operating restrictions are.

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

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

12 A Table A of JS-2?

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

15 A Yes.

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

22 A Correct.

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

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

3 A No, that's not correct.

4 Q For Period 1?

5 A That is not correct.

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

9 A 420 is a predicted megawatt output if a whole  
10 bunch of variables, dozens of variables are controlled  
11 at certain points, 420 was predicted as the generator  
12 output at a power factor of .949, or a power factor of  
13 .9.

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

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

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

21 Q Okay.

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

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

1 final document?

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

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

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

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

8 A Oh, okay. I am sorry.

9 Q That's okay.

10 A Okay.

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

14 A Yes, that's correct.

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

19 A I could have had those available, yes.

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

22 A Right.

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

25 A Okay.

1 Q In the first paragraph, about halfway down,  
2 there is a sentence on the far right that starts MHPS,  
3 do you see that?  
4 A Yes.  
5 Q So it says: MHPS Engineering indicated that  
6 Bartow Unit 4S was an outlier relative to the Mitsubishi  
7 40-inch L0 fleet with several operating hours above the  
8 design limit of 15,000 -- I am stumbling over that --  
9 foot pounds per hour squared, parenthesis, the  
10 Mitsubishi 40-inch L0 fleet average was closer to 12,000  
11 foot pounds squared per hour, close parenthesis; do you  
12 see that?  
13 A I do.  
14 Q Okay. You didn't propose to make a change to  
15 that in your edit, did you?  
16 A It does -- no, I did not.  
17 Q Is that because it's factual?  
18 A I don't believe it to be factual. Remember,  
19 this is a draft document, and there is a lot of people  
20 looking at it, and I wasn't privy to all the  
21 conversations that took place over a long period of time  
22 with this root cause team, but I have not seen any  
23 Mitsubishi documentation that calls it a design limit.  
24 I have seen documentation from Mitsubishi that refers to  
25 their fleet -- maybe their fleet average or their

1 normal -- their fleet operating experience, but that the  
2 15,000 and 17,000 pounds per hour per square foot was  
3 beyond their fleet experience and put them in a zone of  
4 uncertainty.  
5 Q You -- okay. The next sentence -- I mean, the  
6 next paragraph, it starts, "While Duke Engineering", do  
7 you see that?  
8 A Yes.  
9 Q So would you be considered part of Duke  
10 Engineering for purposes of the RCA?  
11 A Would I be?  
12 Q Yes. I mean, you are an engineer. This is in  
13 your area. You were overseeing the root cause team?  
14 A We can assume that. Technically I am not and  
15 never have been part Duke Engineering, but, yes, I can  
16 see -- I was overseeing the process.  
17 Q Right. And I accept that. Just to -- for the  
18 judge to understand, Duke, big Duke that serves multiple  
19 states has a centralized engineering area, which you  
20 call Central Engineering, right?  
21 A Correct.  
22 Q And you also have engineers that are in your  
23 direct chain of command that report to you, up the chain  
24 to you, right?  
25 A That is correct, yes.

1 Q Okay. Those two groups of engineers and some  
2 outside consultant engineers and yourself would have  
3 been all part of bigger Duke Engineering, right?  
4 A Yes.  
5 Q Okay. So this sentence says: While Duke  
6 Engineering agrees that back-end loading should be  
7 considered a significant contributing factor toward root  
8 cause, one cannot definitively conclude that it has been  
9 the root cause of all five of the documented L0 events.  
10 You didn't propose to change that sentence?  
11 A Correct.  
12 Q Do you believe it to be true?  
13 A Well, I know that there is some issues with  
14 that sentence. For example, there were really four L0  
15 events. And then there was a fifth iteration where we  
16 replaced blades proactively to try to get a new design  
17 that would provide more megawatt output of the  
18 generator, just to make that part clear.  
19 Q Okay. Well, that's sort of a detail, isn't  
20 it? It's not really that material to what's going on  
21 here, is it? It would cover Period 1, and it would  
22 cover Period 5, right?  
23 A Right.  
24 Q Okay. And, in fact, just so we can  
25 understand, let's go to page one of this document, and I

1 just want to ask you something that struck me curious  
2 about this sentence.  
3 It says: Duke Engineering concluded that  
4 there was no correlation between any one of the above  
5 listed factors and the five failure periods, is that  
6 accurate?  
7 A Could you show me where on page one that --  
8 Q Oh, I am sorry. I apologize. It's in the  
9 next to the last paragraph.  
10 A Oh, page one of JS-1?  
11 Q Yes, sir.  
12 A I am sorry. I was on the wrong document.  
13 THE COURT: I was on -- yeah, final report.  
14 THE WITNESS: Could you point to that sentence  
15 again, please?  
16 BY MR. REHWINKEL:  
17 Q Okay. Go to the second to the last paragraph.  
18 A Okay.  
19 Q And it says: Duke Engineering concluded that  
20 there was no correlation between any one of the above  
21 listed factors and the five failure periods.  
22 Is it events or periods that you are looking  
23 at here? I mean, just to go to your point about there  
24 were only four events, five periods, but --  
25 A Yeah. Well, I think it's both, right? There

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

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

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

14 MR. REHWINKEL: I'm just working in Exhibit  
15 115.

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

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

19 THE COURT: Bates stamp, right?

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

22 BY MR. REHWINKEL:

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

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

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

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

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

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

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

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

3 **Q Let me ask you about page seven of Exhibit**  
4 **115.**

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

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

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

13 THE WITNESS: They did.

14 THE COURT: Okay.

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

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

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

7 We did not see this issue here, but there had  
8 been some other indications through user groups,  
9 not from Mitsubishi, that there, perhaps, were some  
10 issues around the Mitsubishi fleet that Mitsubishi  
11 did not report to us.

12 BY MR. REHWINKEL:

13 **Q Now, I asked you in the deposition for any**  
14 **information from users groups, and you said there was**  
15 **none, correct?**

16 A We have information from users groups.

17 **Q I asked you in a late-filed Exhibit No. 11 to**  
18 **provide it, did you?**

19 A Oh, I don't know that we have documents. We  
20 have people who have attended user groups, and we  
21 have -- so they've had conversations with people at  
22 users groups --

23 **Q Okay.**

24 A -- so that's information.

25 **Q So isn't it true that one of those**

1 conversations was you gave a presentation, and somebody  
 2 came up to you afterwards and said I am interested in  
 3 what you are talking about?  
 4 A That is true.  
 5 Q Okay. But that person never said that that  
 6 utility had any problems with Mitsubishi that were the  
 7 same as yours?  
 8 A He indicated that they had similar issues.  
 9 Q Did he give you any information?  
 10 A No.  
 11 Q Okay. And did you present any of that  
 12 information in the root cause analysis?  
 13 A No.  
 14 Q And you had that information before 2018,  
 15 right?  
 16 A I don't know the relative dates of that user  
 17 group meeting compared to the root cause.  
 18 Q If I asked you that in your deposition and you  
 19 said it was, do we need to go look at it?  
 20 A Okay, then --  
 21 Q Okay.  
 22 A -- I agree.  
 23 Q And there was an inci -- there was a situation  
 24 in Louisiana where someone came up to Mr. Salvarezza and  
 25 said he was interested, right, in what was going on at

1 Bartow?  
 2 A Yes.  
 3 Q But he didn't say that they had L0 blade  
 4 problems, that they had failures like you had with  
 5 excessive vibration, right?  
 6 A That's correct.  
 7 Q Okay. And that was before 2018, correct?  
 8 A Yes.  
 9 Q And that didn't show up in the RCA or any of  
 10 the documentation that we were provided other than that  
 11 Q&A in the depo, right?  
 12 A We tried to verify through various means. The  
 13 fleet operating experience is obviously very important.  
 14 We rely on our OEMs for that information typically,  
 15 whether it's GE or Siemens or Mitsubishi. User groups  
 16 are also important, but we couldn't find any  
 17 documentation that there were similar failures to what  
 18 we've experienced at Bartow.  
 19 Q Now, would you agree with me that there are 32  
 20 Mitsubishi L0 40-inch blade steam turbines out there in  
 21 the world? I don't know if that includes you or not.  
 22 A I think at the time of this document, that was  
 23 the number that was used, right.  
 24 Q So you are one of 32 or you are one of 33?  
 25 A I don't know. There is probably more than

1 that now. In fact, I know there are more than that now.  
 2 Q But at that time, there was 32 or 33?  
 3 A Yes. Yes.  
 4 Q And that was, like, 55 or 57 rows of blades  
 5 among all those units?  
 6 A Oh, yes, that's -- it was in the fifties.  
 7 Q Okay. And you have provided no evidence that  
 8 any unit other than Bartow among that fleet had blade  
 9 failures based on excessive vibration like you  
 10 experienced?  
 11 A That's accurate.  
 12 Q Okay. And you also agree, I think we just  
 13 talked about it in that draft, is that Duke Bartow was  
 14 an outlier compared to all of the other Mitsubishi L0  
 15 40-inch blade steam turbines?  
 16 A It was an outlier on steam flow pounds per  
 17 hour per square foot, right.  
 18 Q Wasn't it also an outlier in blade failure  
 19 experience?  
 20 A Yes.  
 21 Q Okay. Now, just to be clear in the R -- in  
 22 the -- if we go back to JS-2, the word outlier has been  
 23 taken out of the root cause analysis. In other words,  
 24 it doesn't show up in there with respect to how you  
 25 compare to Mitsubishi, right?

1 A How the Bartow plant compares to Mitsubishi?  
 2 Q Yes.  
 3 A I will take your word for it.  
 4 Q Okay. I mean, isn't it also true that in  
 5 these documents that were -- that preceded the final  
 6 draft, there was a reference to the Mitsubishi  
 7 experience and that got converted to industry  
 8 experience. So you took out the comparison of  
 9 Mitsubishi plants with respect to the blade failure  
 10 experience comparison, right?  
 11 MR. HERNANDEZ: Objection, Your Honor. We are  
 12 talking about a lot of documents. He is  
 13 referencing specific language in those documents.  
 14 If the witness could see the documents to answer  
 15 the question specifically.  
 16 THE COURT: Sure.  
 17 MR. REHWINKEL: Sure. I mean, we can go  
 18 through it.  
 19 BY MR. REHWINKEL:  
 20 Q Let's go to page 125. Just pick one. And  
 21 this is Document 13 under the tabs.  
 22 A Okay. I am there.  
 23 Q And if you go back to 123, it looks like it  
 24 was a October 12th document.  
 25 A Okay.

1 Q And back on page 125, and the one, two, third  
2 full paragraph there, halfway down it starts on the  
3 right-hand side, the number of blade failures and  
4 problems with ST L0 blade performance is not typical,  
5 i.e., these issues are outliers among the Duke CC fleet  
6 as well as the Mitsubishi 40-inch L0 fleet.

7 Did I read that right?

8 A Yes.

9 Q And that's true, isn't it?

10 A As far as I know, that is true.

11 Q Okay. Now, is it fair to say -- and if you go  
12 back to JS-2, which is Document 1, that sentence does  
13 not reappear, does it -- or let me withdraw that and say  
14 that sentence does not appear?

15 A It doesn't, but I don't -- again, we talked  
16 about this before. All these documents you are going  
17 through are drafts of a working team. There is notes.  
18 They are not a final root cause, and I wouldn't expect  
19 the final root cause to be identical to any of these  
20 documents.

21 Q Well, let's look at page two of Exhibit 15,  
22 it's also JS-2.

23 MR. BERNIER: So two of JS-2?

24 MR. REHWINKEL: Yes.

25 MR. BERNIER: Thank you.

1 BY MR. REHWINKEL:

2 Q In the second full paragraph it starts "based  
3 on", do you see that?

4 A I do.

5 Q This is your ultimate conclusion, right?

6 A It is. We discussed that before.

7 Q And this doesn't mention a comparison to  
8 elsewhere in the industry, but elsewhere in the industry  
9 referenced there is really Mitsubishi, right?

10 A No, that's not accurate. If you look at the  
11 footnote at the end of that paragraph, that refers down  
12 to the -- I will read it to you.

13 The most commonly reported issue with the  
14 40-inch L0 blade design elsewhere is water erosion,  
15 which both Duke and MHP also agree is not a contributing  
16 factor to the Bartow failures. So I really was  
17 referencing the industry in general.

18 Q Okay. So -- but the outlier language and the  
19 comparison to Mitsubishi and those other 32 plants,  
20 experience is not contained in the final report that the  
21 Public Service Commission gets to see, right?

22 A It's not in the root cause. And by agreeing  
23 to what you just said, I am agreeing that these are  
24 various drafts of root cause documents, which I don't  
25 agree with that.

1 Q Wait, now, you don't agree that Bartow and  
2 Period 1 was an outlier compared to the rest of the  
3 Mitsubishi L0 40-inch steam turbine fleet?

4 A An outlier from the standpoint of steam flow,  
5 and an outlier from the blade, the snubber and Z-lock  
6 damage we talked about, yes, I agree that it was an  
7 outlier.

8 Q Okay. All right. So now I started this line  
9 of questioning by asking you to go to page seven, and  
10 look at footnote six.

11 MR. BERNIER: Seven of which? I am sorry.

12 MR. REHWINKEL: Of 115.

13 MR. BERNIER: Got you.

14 MR. REHWINKEL: It's the same as --

15 THE WITNESS: Okay. I am there.

16 BY MR. REHWINKEL:

17 Q You are there. And you see footnote six down  
18 there?

19 A I do.

20 Q Would you mind reading that aloud? And I am  
21 going to ask you about the last sentence.

22 A Okay. Even though the L0 blades are no longer  
23 in the ST and the pressure plate has been installed,  
24 MHPS Engineering does not have enough technical data to  
25 support releasing Duke to operate the machine beyond the

1 current IP turbine exhaust pressure operating limits  
2 because of potential impacts to upstream blading. That  
3 is the L1 blade sets. This suggests that MHPS is unsure  
4 what effect, if any, is created by its avoidance zone,  
5 and more importantly, points to a design flaw that  
6 affect more than the L0 blades.

7 Q Now, this statement about a design flaw, is  
8 there an analysis that was conducted to determine that  
9 there was a design flaw in the L -- in the Mitsubishi  
10 steam turbine that you bought?

11 A I think this statement is pointing to the fact  
12 that Mitsubishi couldn't relieve the operating  
13 constraints that were in place. Even after we took the  
14 L0 blades out and put a pressure plate in, Mitsubishi  
15 still said you need to operate at a more conservative --  
16 or the more conservative operating parameter led Duke to  
17 believe that there is more concern on Mitsubishi's  
18 standpoint that perhaps it's not just an L0 issue,  
19 perhaps it's an issue elsewhere in the low pressure  
20 turbine, and that perhaps they are questioning their own  
21 design.

22 Q Well, what is elsewhere in your opinion? The  
23 upstream blades? The nozzles? Anything?

24 A Well, technically, thousands of blades are the  
25 same thing, but, yes, the -- so the -- well, let me show

1 this picture.

2 So upstream would be -- so remember the steam  
3 goes in the middle of the turbine and then goes this way  
4 and this way. So here's the L0 blade, the largest  
5 blades. Upstream of that would be this row of blades  
6 and this row of blades.

7 So there was concern that perhaps we need to  
8 continue operating at that lower pressure limit because  
9 maybe there would be damage to other blades that  
10 Mitsubishi appeared to be questioning their own design,  
11 and that perhaps those rows of blades might become  
12 damaged.

13 **Q But beyond this footnote, there is no analysis  
14 where you determine that there was something wrong with  
15 the turbine, is there?**

16 A There is not. But I can tell you we obviously  
17 very concerned every time we opened up this machine, and  
18 we had multiple opportunities to do very detailed  
19 inspections on the steam turbine, many more so times  
20 than is the norm.

21 At the end of Period 1, we did an inspection.  
22 At the end of Period 2 -- at the end of every single  
23 period, we did a very detailed inspection of those  
24 blades, so we had to gather that information.

25 **Q How many 4-x-1 combined cycle units did Duke**

1 have experience with before you commissioned Bartow?

2 A This is Duke's only 4-x-1.

3 **Q Okay. And how many 4-x-1 -- so would it be  
4 fair to say that you did not have robust operating  
5 experience with a 4-x-1 combined cycle unit?**

6 A Yes.

7 **Q Are you familiar with Exhibit 106 -- it's the  
8 August 13, 2018 -- called the settlement.**

9 MR. BERNIER: 106?

10 MR. REHWINKEL: Yeah, 106.

11 THE WITNESS: Yes, I am.

12 BY MR. REHWINKEL:

13 **Q Okay. Now, is it --**

14 MR. BERNIER: Give us one second, Charles. I  
15 am trying to find it.

16 MR. REHWINKEL: Oh, I am sorry.

17 MR. BERNIER: Okay.

18 BY MR. REHWINKEL:

19 **Q So if we go to the back, page 11, we see Tony  
20 Salvarezza signed this thing on October 13, 2018?**

21 A Yes, I do.

22 **Q And you would agree that Duke was having  
23 discussions and trying to either work -- well, trying to  
24 work out a resolution of these matters with Mitsubishi  
25 at sometime not long after the RCA was completed?**

1 MR. BERNIER: Judge, I am going to have to  
2 object to this. I am not sure how any resolution  
3 Duke was trying to work out with Mitsubishi has  
4 anything to do with how the unit was operated  
5 leading up to 2017, or after 2017 when the pressure  
6 plates were put in. And I think those are the two  
7 issues that we are here to talk about today. And I  
8 am not sure how a settlement agreement is relevant.

9 THE COURT: Well, you are going to show us  
10 it's relevant?

11 MR. REHWINKEL: Yes.

12 THE COURT: Okay.

13 BY MR. REHWINKEL:

14 **Q And my question is: You signed -- you  
15 provided -- you finalized an RCA and you filed it with  
16 the Public Service Commission on March 1st, right?**

17 A I don't know that that was the date of filing,  
18 but yes.

19 **Q Sometime in March?**

20 A It was done in February -- it requires it's  
21 finalized in February, so that makes sense.

22 **Q And you filed testimony in March of 2018?**

23 A Yes. Yes. Yes. March 1st, you are right.  
24 Thank you.

25 **Q Okay. And in this document, it says there was**

1 a design flaw in the turbine, right?

2 A Could you point to where you are looking at?

3 **Q I am sorry. When I say this document, I am  
4 pointing to your root cause analysis at page seven.**

5 A Page seven of the root cause analysis?

6 **Q Yeah, footnote six that we were just talking  
7 about.**

8 A So, yes, it says it suggests that Mitsubishi  
9 is unsure, and that there may be a design issue.

10 **Q And it says, more importantly, points to a  
11 design flaw that may affect more than the L0 blades,  
12 right?**

13 A Yeah.

14 **Q Okay. So my question to you is, you just said  
15 there was a design flaw in February. In August you  
16 signed an agreement where you gave up all your rights to  
17 sue under the contract that you bought the unit for,  
18 isn't that right?**

19 MR. BERNIER: I'm going to go back to  
20 objecting, Your Honor. I just don't see how that's  
21 relevant to how we operated the unit, how Duke  
22 operated the unit in 2017, the decision whether or  
23 not to settle any potential contract claim. I just  
24 don't see the relevance to the two issues we've got  
25 identified here today.



1 MR. REHWINKEL: My response to that, Your  
 2 Honor, is that the root cause analysis we  
 3 established early on today that this is their  
 4 principle evidence to meet their burden of proof.  
 5 This root cause analysis purports to be what  
 6 happened, and they are asking the Public Service  
 7 Commission to rely on it to absolve them of any  
 8 liability to the customers for replacement power.  
 9 One the problems that we've raised is that the  
 10 way they ran the unit in the first period has  
 11 caused problems in later periods. They have -- and  
 12 part of our case is that their explanations about  
 13 the blade are inconsistent with the experience  
 14 other units have had.  
 15 Now, in the root cause analysis, they are  
 16 saying that there may be a design fault with the  
 17 turbine itself, not the blades, which is what their  
 18 whole case is about, but the turbine itself; and  
 19 they are asking the Commission to rely on that  
 20 while they are settling with Mitsubishi to give up  
 21 their right to sue for a design flaw.  
 22 It doesn't -- so we are offering this as  
 23 impeachment to the conclusions in the RCA because  
 24 the RCA is submitting that there is a design flaw  
 25 while, at the same time, they are giving up their

1 right to sue. That's an inconsistency that we  
 2 would like you to consider in your fact-finding.  
 3 THE COURT: I am going to allow it, but -- I  
 4 mean, it's without prejudice. I mean, you can  
 5 continue to argue that it's not relevant. I am not  
 6 sure that you are totally tying it up, but I am  
 7 going to at least let them present it.  
 8 MR. BERNIER: Understood.  
 9 BY MR. REHWINKEL:  
 10 Q Okay. So my question to you was is that what  
 11 happened?  
 12 A Well, I think there is more to this agreement  
 13 that you are not talking about that's pretty important,  
 14 and you need to also think about the whole timeline of  
 15 events and what the warranty provisions were in the  
 16 contract, which I don't know specifically, but  
 17 typically, there is about a three-year warranty period.  
 18 It's typically one year for some pieces. It may be two  
 19 years, three years if you are lucky, all right. So  
 20 that's from '09 when we first started operating. This  
 21 agreement was in 2018, six years later. So I don't know  
 22 is that we had any warranty claim left on the original  
 23 blades, and I think that's what you are inferring.  
 24 Q Well, if you are saying there is a design  
 25 defect?

1 A Even for a design defect.  
 2 Q Okay. And we don't know -- and I am not  
 3 asking you to resolve that question because I know you  
 4 are not an attorney, right. But the -- my original  
 5 question that started this line is what analysis did you  
 6 do to demonstrate that there was a design flaw in the  
 7 turbine? And I don't think there was one, was there?  
 8 A I think we are -- well, what we are saying is  
 9 that there was inadequate design margin at the very  
 10 least.  
 11 Q That was for the blades, right?  
 12 A Well, you are -- I think you are  
 13 misinterpreting something. So look back at the point  
 14 that -- the wording that you are pointing to is on page  
 15 seven of JS-1 and JS-2, correct?  
 16 Q Page seven, footnote six.  
 17 A Right. So the last sentence, this suggests  
 18 that MHPS is unsure what effect, if any, is created by  
 19 its avoidance zone, and more importantly points to a  
 20 design flaw that may affect more than the L0 blades. So  
 21 what do you mean when you say the turbine?  
 22 Q Well, the part of the turbine that's not the  
 23 L0 blades, everything else that you showed the judge on  
 24 the picture.  
 25 A So -- which would be the L1 blades, the other

1 sets of blades, which we know from very detailed  
 2 examination didn't have any damage. We looked way more  
 3 times than we should have, but we gained a lot of  
 4 information doing those inspections.  
 5 Q And is there -- did you present any evidence  
 6 in this RCA concurrent with this assertion here in this  
 7 footnote that any other Mitsubishi L0 40-inch steam  
 8 turbine units were having the same kind of problems, or  
 9 had a design defect or flaw in them?  
 10 A That wasn't the question of the root cause.  
 11 The question of the root cause is why did these snubbers  
 12 and these Z-locks fail?  
 13 And so, yes, you take into consideration what  
 14 is that fleet experience? And the root cause shows, or  
 15 says we reviewed, the team knew that the fleet  
 16 experience at the Bartow plant was an outlier compared  
 17 to the Mitsubishi fleet from a damage standpoint. But  
 18 when you go back and look at what caused the Bartow  
 19 failure, that's what the root cause is about. It's not  
 20 about -- we didn't do a root cause on Mitsubishi's  
 21 issues. We did a root cause on Duke Energy's issues.  
 22 Q But if there was a design flaw, it wouldn't  
 23 have been just -- not a manufacturing flaw, you are  
 24 saying it's a design flaw. That would have applied to  
 25 the other 32 units, right?



1 MR. HERNANDEZ: Objection, Your Honor,  
2 foundation.  
3 THE COURT: Overruled. I mean, I think it's  
4 understandable.

5 THE WITNESS: Potentially it could be  
6 applicable to the other units. And you have to  
7 look at the design conditions, the operating  
8 parameters of each of those 30-some units, or  
9 50-some rows of blades that we talked about. And  
10 if any of those other 50 blades were operated the  
11 same way as Bartow within the guidelines  
12 established by the OEM, I would be pretty worried  
13 if I owned one of those other sets of blades.

14 BY MR. REHWINKEL:

15 Q Well, you agreed you are an outlier, and they  
16 didn't have any of the same kind of problems, right?

17 A Correct.

18 Q So why wouldn't -- isn't that just as  
19 correlative that there is not a design flaw in there  
20 because they are not having any problems and only you  
21 are?

22 A Not necessarily. That's a factor that you  
23 have to take into account, but the operating parameters  
24 at Bartow -- we just talked about how Bartow is a 4-on-1  
25 combined cycle. We talked about how it's an outlier

1 compared to the Mitsubishi fleet. It's about 15 -- the  
2 calculation is about 15,000 pounds per hour per square  
3 foot of impact on the last stage blades, which is an  
4 outlier to the Mitsubishi fleet, but we operated within  
5 the design parameters given by Mitsubishi.  
6 They didn't say, don't operate beyond 15,000  
7 or 17,000. There is no way to measure that. They said,  
8 don't operate beyond this operating pressure. Don't  
9 operate besides this -- beyond this operating  
10 temperature, which we did.

11 Q Would you agree with me that Exhibit 106  
12 covers claims that dated back to Period 1?

13 A Yes.

14 Q Okay. And what -- basically what you did  
15 here, I -- and tell me if I am oversimplifying it, is  
16 you had -- they had a claim against you for, like, \$10.2  
17 million and you had a claim against them for \$6 million,  
18 and you settled it where you gave them \$3 million and  
19 they gave you a \$2 million credit on the next set of  
20 blades, is that --

21 A That's a fair summary.

22 Q Okay. So I just want to ask you about --

23 A I am sorry, with one exception. I am sorry.

24 Q Sure.

25 A The credit could have been used in many

1 different ways. Not necessarily at Bartow.

2 Q Right. It specifically mentioned you could  
3 use it on the blades, but you could use it elsewhere  
4 under other conditions, right?

5 A Correct.

6 Q Okay. And it can be read in here, right?

7 A Yes.

8 Q So let's just go to page one, and I just want  
9 you to read for the record the last two whereas clauses  
10 aloud, please.

11 A Okay. Whereas, after the steam turbine was  
12 commissioned in June 2009, MHPS designed enhanced L0  
13 blades that would endeavor to allow Bartow station to  
14 increase its output from 420 megawatts to 450 megawatts,  
15 and whereas, the parties entered into purchase order  
16 718383 on February 10th, 2014, whereby MHPS was to  
17 design and install such enhanced design L0 blades at a  
18 \$6 million cost to DEF, which amount DEF has paid.

19 Q Okay. So this is a document that Mr.  
20 Salvatorezza signed on behalf of the company, right?

21 A Yes.

22 Q So he agreed to what is stated in these two  
23 whereas clauses, correct?

24 A Yes.

25 Q And doesn't that say that, reading these two

1 together, that the output of the steam turbine was  
2 420 megawatts and you wanted to increase it to 450,  
3 right?

4 A Generally that's correct.

5 Q And that specifically is in Period 1 that it's  
6 420, right?

7 A Yes.

8 MR. REHWINKEL: Your Honor, I believe if we  
9 take a short break here, I can substantially  
10 shorten the day at least from what I am  
11 contributing to it.

12 THE COURT: How long do you need?

13 MR. REHWINKEL: Just five minutes.

14 THE COURT: Five minutes. Sure, we will take  
15 five.

16 (Brief recess.)

17 THE COURT: Back on.

18 Whenever you are ready, Mr. Rehwinkel.

19 MR. REHWINKEL: Thank you for that, Your  
20 Honor. And I think it did help a great deal.  
21 Thank you.

22 THE COURT: Yep.

23 BY MR. REHWINKEL:

24 Q Let's go to -- we are still on Exhibit 115,  
25 and go to page two.

1 A Okay.

2 Q And if you wouldn't mind reading the second

3 paragraph above where it says historical overview, where

4 it says for Bartow, just that sentence.

5 A Starting with the words "for Bartow"?

6 Q Yes, sir.

7 A For Bartow, the long-term solution is to

8 replace the L0 blades with blades of a different design

9 and/or to retrofit the LP steam path and/or continue

10 operation with pressure plate.

11 Q All right. Would you mind explaining, so

12 that -- to the judge what is referred to there as the LP

13 steam path?

14 A Yes, sir.

15 May I stand up, Your Honor?

16 THE COURT: Sure.

17 THE WITNESS: So the three options are

18 essentially replace the L0 row again, the two rows

19 with another design of blades, or when we say the

20 whole low pressure steam path, it would basically

21 be lifting this section of the overall turbine

22 generator out and putting a different low pressure

23 turbine in.

24 So that would entail all rows of blades, all

25 rows of fixed diaphragms in between the blades, the

1 casing, everything associated with the low pressure

2 turbine.

3 BY MR. REHWINKEL:

4 Q Thank you.

5 And it says and/or there, is that correct?

6 A It does.

7 Q Now, I am not trying to -- just for factual

8 purposes, in October, November of this year, you

9 actually put in the solution that you chose, which was

10 we call the Period 7 blades?

11 A We are on Period 7. Yeah, we put in another

12 iteration of blades redesigned that had very significant

13 testing done at a facility in Japan that we witnessed.

14 Those blades were installed November, December

15 timeframe. I can't remember the date we started up, but

16 it was in, I think, early December. So we are operating

17 with those -- that generation of blades right now.

18 Q Okay. So is it fair to say that -- well, so

19 now Mitsubishi has installed the fourth set of blades on

20 this -- on that low pressure turbine, is that fair, or a

21 different set?

22 A Well, we installed one end at the start of

23 Period 2, then both ends at the start of Period 3, both

24 ends at the start of Period 4, both ends at the start of

25 Period 5. The start of period six had pressure plates.

1 So to your point, this is really the start of Period 7

2 with new blades, but I think it's more than four.

3 Q So it's five sets?

4 A Yes.

5 Q Now, this is just a hypothetical, because I am

6 not suggesting that it's not going to work. But if

7 there is a problem with this set of blades, will you

8 replace the steam path for certain?

9 MR. BERNIER: I'm going to object. Again, we

10 are going back to the two issues of operation, and

11 now we are dealing with a hypothetical about what

12 could happen in the future.

13 THE COURT: That's -- well, I will overrule it

14 again. I mean, Mr. Swartz, if you have any notion,

15 you can answer.

16 THE WITNESS: Well, let me start by saying one

17 big difference in this iteration is we've installed

18 a permanently-mounted blade vibration monitoring

19 system along with the new sets of L0 blades. So as

20 we increase load, we can take data.

21 It's very much like the temporary system that

22 was used at the beginning of Period 3, where we

23 came up with the avoidance zones. This is a

24 permanently mounted system, much more robust, so

25 it's made so it's not going to come apart and

1 potentially cause what we would call domestic

2 object damage inside the turbine.

3 That gives us much greater confidence that we

4 will find an issue prior to any type of vibration

5 that would lead to component failure. So I think

6 that's a really significant difference with what we

7 did with this iteration of blades.

8 You know, the hypothetical, what would we do

9 if this set of blades failed? Really, we would

10 have to -- like, how would they fail? I mean --

11 and I am not trying to be funny, but was it an

12 erosion issue? Was it high cycle fatigue? Was it

13 a snubber? Was it a shroud?

14 I think it depends on the type of failure. If

15 it's an erosion issue, for instance, there are ways

16 to deal with that. So it really depends.

17 I think where you are going, though, is, you

18 know, our appetite -- my personal appetite for

19 putting in more sets of blades is very low, you

20 know, that's why we put a pressure plate in at the

21 start of Period 6. No more trying. We've got to

22 figure something else out, and our customers can't

23 stand that.

24 And I think that was a really good decision, a

25 very sound decision, because once we put that

1 pressure plate in in the spring of 2017, we finally  
2 had two-and-a-half years of nothing happening.  
3 Yes, we ran about 40 megawatts lower from the total  
4 output. Instead of a 1,200-ish megawatt site, it  
5 was 40 megawatts lower than that. But we didn't  
6 have any issues where we had to shut down for the  
7 low pressure turbine, and I think that was really  
8 good for customers.

9 It was the right decision while we were  
10 figuring out what we could do for the next  
11 iteration, which I do believe will be the long-term  
12 solution, but Period 7 is going to go on for a long  
13 time.

14 BY MR. REHWINKEL:

15 Q Just on your blade vibration monitor point, it  
16 is true, as is stated in the next sentence, that even  
17 had you replaced the steam path, you still would have  
18 insisted on a blade vibration monitor as a part of  
19 anything that was done, right?

20 A That was Duke Energy's position. We wanted to  
21 make sure that that was part of the solution. Not all  
22 the -- not all vendors agreed to that.

23 Q All right.

24 A So it actually disqualified some from the --  
25 from that project.

1 Q And GE was a close second to the solution that  
2 you put in in the fall of '19, right?

3 A They were.

4 Q Okay. And the fact that it says and/or means  
5 that you still haven't completely given up on maybe  
6 replacing the steam path, right?

7 A I think the and/or is really just trying to  
8 show that there were three options, that they're not  
9 mutually exclusive, right? Let me get back to the  
10 sentence and read it again.

11 Right. So it might require new designed L0  
12 blades and a new steam path. That's what the root cause  
13 is showing. But at the point of this root cause, we  
14 didn't know what the long-term solution was. So we're  
15 just leaving all options open while the team studied  
16 what the ultimate long-term solution would be, which we  
17 then decided, you know, long after, months after this.

18 Q Okay. When you did your industry experience  
19 research, you didn't find any instance of an L 40 -- an  
20 L0 40-inch steam turbine in the Mitsubishi fleet having  
21 to replace even one set of blades in 11 -- after only 11  
22 years of operation, did you?

23 A I am not sure. I actually suspect that there  
24 were issues, but likely caused by erosion.

25 Q Okay. I should have added based on a

1 vibration-induced damage?

2 A Right. No snubber or shroud issues like we've  
3 experienced at Bartow.

4 Q Okay. So with that clarification, your  
5 research didn't reveal --

6 A Correct.

7 Q And you did not, likewise, turn up any  
8 industry experience that showed that a L0 40-inch  
9 Mitsubishi steam turbine operator had to replace a steam  
10 path?

11 A Correct, we did not find anything of that.

12 Q Okay. All right. I have just have a couple  
13 of sort of clarification questions to ask you on -- I am  
14 still on 115, and I want to take you back to page 17 of  
15 18, which is Exhibit 17 --

16 A Okay.

17 Q -- exhibit page 17.

18 Can you tell me why Citrus L0 on the far  
19 right-hand side is the header for that column?

20 A I may be on the wrong page.

21 Q I apologize. It's the one -- it's the  
22 Appendix A in your JS-2. It's page 17, and it says  
23 Appendix A.

24 A I am sorry, I was on page seven.

25 Q Sorry.

1 A All right. I am there.

2 Q So my question to you is: Can you tell me why  
3 Citrus L0 is the header for the far-right column?

4 A I don't know specifically, but what I do know  
5 is that Duke had -- Duke Energy had some concerns over  
6 the Citrus L0 blades.

7 Citrus combined cycle is our newest plant.  
8 It's two 2-on-1 combined cycles on one site, and it does  
9 have Mitsubishi equipment, Mitsubishi combustion  
10 turbines and Mitsubishi steam turbines. So there is two  
11 steam turbines, and it does have 40-inch steel blades,  
12 so there is a similarity there.

13 The design at Citrus is such that the  
14 calculated steam flow -- we've been talking about this  
15 pounds per hour per square foot number. It's less than  
16 11,000, or around 11,000 at Citrus. So because of that,  
17 Mitsubishi doesn't not think that there is any issues,  
18 but I believe they are similar to Type 5 blades, or they  
19 are Type 5 -- Mitsubishi Type 5 blades, which don't  
20 mistake that with period, right. So they are different  
21 style of blades than any of the iterations at Bartow,  
22 but they are similar in that they are 40-inch steel L0  
23 blades, if that makes sense.

24 Q Okay. I just wanted to understand whether  
25 this was supposed to be an identical comparison of what

1 you are putting on as a type -- as a Period 5 blade, and  
2 that's --

3 A I know we obviously had concern with this  
4 Citrus project because of what were finding out, or what  
5 we found out here. So we are just showing for  
6 comparison purposes what is installed at Citrus.

7 Q Okay. I understand that.

8 And can you tell me, do you know at what point  
9 in any of the periods any of the damage to your L0  
10 blades occur at Bartow?

11 A We do know. If we could look -- if we look at  
12 that same exhibit and go to -- just because it's going  
13 to help me remember some things. If we go to page five.  
14 It's Table A.

15 During Period 4, we were able to pinpoint when  
16 some of the damage occurred. We had -- if you look at  
17 the keynotes from period row and go over to that Period  
18 4 column, it said -- it shows the two separate step  
19 changes that were actually reductions, decreases in  
20 vibration, led Duke Engineering recommendation to remove  
21 the steam turbine from service for inspection.

22 So there was discussion with Mitsubishi after  
23 we noticed these reductions in vibration. It's  
24 interesting, Mitsubishi believed it to be bearing  
25 settling in, just some normal course of action after an

1 outage on a steam turbine, which we had just had an  
2 outage at the start of Period 4. Our Duke Engineering  
3 wasn't convinced.

4 It's -- an unexplained change in vibration,  
5 you know, typically -- well, you monitor vibration for  
6 increases. If there is an increase in vibration, you  
7 need to understand why, and if you can't figure it out,  
8 if it gets beyond a certain point, you typically stop  
9 operation and go conduct inspections, because that can  
10 lead to damage very significant issues in multiple  
11 components.

12 In this case, there were slight changes and  
13 there were reductions, but after inspection, we -- when  
14 what we found, we found, looking at row broken snubbers  
15 in the row that's titled "Broken Z-locks", we found one  
16 broken snubber on the generator end of the machine, one  
17 broken Z-lock on the turbine end of the machine, and two  
18 broken Z-locks on the generator end of the machine, and  
19 so that's one, two -- that's four pieces of metal.  
20 Small pieces of metal. Remember, we are talking about  
21 the snubbers and the Z-lock. But two of those instances  
22 were almost certainly the times we saw the slight  
23 reductions in vibration.

24 So the fact that we shut down to do an  
25 inspection and take a look was the right thing to do,

1 the prudent thing to do. Before we could operate any  
2 more, we had to replace blades yet again.

3 Q So is that the only --

4 A That's not the only time. I am sorry. Back  
5 to your question.

6 In Period 5, if you look at the same row,  
7 keynotes from period, it doesn't show the date, but we  
8 do know same -- similar type of thing. It wasn't  
9 vibration in this case, but we had two things happen  
10 simultaneously.

11 We had a decrease in pressure of vacuum. We  
12 are losing vacuum in the condenser. And we also, all of  
13 a sudden, have indications of sodium in the condenser.

14 The cooling water that flows through the  
15 condenser is saltwater. It's from Tampa Bay. So sodium  
16 is much easier to monitor than chloride level, so we  
17 monitor for sodium. Any indication of sodium above  
18 very, very minute traces is a large alarming. If you  
19 get sodium, or especially chlorides into your pure water  
20 that you are going to just turn back into steam and  
21 reuse it in the process again, that causes all kinds of  
22 issues in the system, and potentially turbine issues in  
23 the long-term.

24 So we got an alarm that we had high sodium.  
25 We have an alarm that there is reduction in vacuum, so

1 we shut down the turbine immediately. So we know when  
2 that failure occurred as well. So Period 4 and 5, we do  
3 know when those happened.

4 Period 1, we don't know when that happened.  
5 Period 3, we don't know when that happened.

6 Q Okay. And for Period 1, 2, 3, 4 and 5, can  
7 you tell me what pressures were on the blades at the  
8 time damage occurred?

9 A By pressures on the blades, you mean this mass  
10 flow rate that we've been discussing?

11 Q Yes.

12 A I don't know that number. Again, it's a  
13 calculated number. What I can tell you is that we were  
14 operating below whatever the LP turbine or IP exhaust  
15 pressure limitation was at the time.

16 Q Okay. Mr. Swartz, those are all the questions  
17 I have for you today?

18 MR. REHWINKEL: Thank you, Your Honor.

19 THE COURT: Who's next?

20 EXAMINATION

21 BY MR. MOYLE:

22 Q Good afternoon. I am Jon Moyle, I am  
23 representing the Florida Industrial Power Users Group.  
24 You have been in the electric world a long  
25 time, have you not?

1 A Yes, sir, I have.

2 Q Okay. Are you familiar with the U.S. Energy

3 Information Administration?

4 A Not really. No, sir.

5 Q EIA, you have never --

6 A It's somewhat familiar, but I wouldn't say I

7 am -- the acronym is, rather, but I am not familiar with

8 what it does.

9 MR. MOYLE: I have a document if I can just

10 show him?

11 THE COURT: Sure.

12 THE WITNESS: Thank you.

13 BY MR. MOYLE:

14 Q Sir, I have handed you a document from U.S.

15 Energy Information Administration. It's a glossary of

16 terms under the letter G, right?

17 A Yes.

18 Q Okay. I might have handed you my copy that

19 had a little star on it.

20 A Oh, it has the answer on it.

21 Q The generator nameplate capacity, which is on

22 page three of six, do you see that?

23 A Generator nameplate capacity?

24 Q Right.

25 A Yes, sir.

1 Q Would you mind just reading that into the

2 record?

3 A Generator nameplate capacity installed. The

4 maximum rated output of a generator, prime mover, or

5 other electric power production equipment under specific

6 conditions designated by the manufacturer -- designated

7 by the manufacturer. Installed generator nameplate

8 capacity is commonly expressed in megawatts and is

9 usually indicated on a nameplate physically attached to

10 the generator.

11 Q Okay. Are you comfortable with that

12 definition for generator nameplate capacity?

13 A I am.

14 Q Okay. And a couple of follow-ups on that.

15 Does the unit that we are talking about here

16 have a, you know, have a nameplate on it?

17 A I don't know.

18 Q If you were to show me around, you could you

19 say, Mr. Moyle, let me show you our nameplate, and it

20 would be right there, and I would see 420?

21 A I wish I could tell you. I don't know if it

22 has a physical nameplate or not.

23 Q So you just don't know one way or the other on

24 that?

25 A I don't. But what I can tell you is in the

1 contract -- we looked a little bit earlier today at the

2 generator capability curves, and that does include the

3 nameplate ratings of the generator.

4 Q Right. And there is nameplate -- I mean, we

5 have it throughout these documents, right? You looked a

6 it, and that chart you were looking at it says 420,

7 right, in your root cause analysis?

8 A Right.

9 Q And I just want to get your understanding on

10 the record with respect to nameplate and what it means.

11 Also, with respect to when Duke or others

12 announce a project, don't they typically announce it by

13 using the megawatts that are expected from the

14 nameplate?

15 A Yes, I would agree with that.

16 Again, we typically -- that's our product.

17 That's what people are familiar with, and that would

18 make sense to make announcements in that manner.

19 Q Okay. I am wanting to ask you some questions

20 about the root cause analysis.

21 If I understand -- I mean, the history of this

22 generator is, is that it's referred to in some of your

23 documents as it got picked up on the gray market, right?

24 You have to say yes or no.

25 A Yes, I am sorry, yes.

1 Q The court reporter needs to put nodding head

2 yes.

3 A Sorry.

4 Q Anyway, that's all right.

5 And so the gray market is, you know, kind of

6 an interesting term. What does that mean, the gray

7 market for generators?

8 A So the gray market would mean it wasn't

9 bought -- or a piece of equipment isn't bought from the

10 original equipment manufacturer. In this case, the

11 steam turbine that was installed at the Bartow project

12 was purchased -- it was originally manufactured for a

13 different company for a different project, and so -- and

14 that project fell through. I don't know why it didn't

15 come to fruition. And so instead of going to the

16 original equipment manufacturer and buying something

17 directly from them, it was this one that was already

18 there that was really owned by a company called Tenaska,

19 and we purchased that one. So that would be the gray

20 market.

21 Q Yeah. Would it be somewhat analogous to if I

22 was going to buy a Ford F150 truck, I can buy it from

23 the dealership and nobody had owned it before, or I

24 could buy it from somebody who bought it from a

25 dealership and then drove it home and then said, you

1 know, I don't really like it and left it in his garage  
2 for a few years and I bought it from him in his garage  
3 after a few years; is that fair?  
4 A I don't think it's exactly fair.  
5 In this case, the turbine was never delivered  
6 to Tenaska. It was kept in storage at Mitsubishi, so it  
7 was subject to the same -- whenever Mitsubishi or any  
8 turbine manufacturer makes a product, they are  
9 manufacturing it and they are storing it under a certain  
10 set of conditions. So this one was stored in those same  
11 sets of conditions as a regular new turbine, never left  
12 Mitsubishi, but stayed -- or never -- yeah, never left  
13 Mitsubishi, so it -- yeah, it didn't go to that other  
14 person's garage in your --

15 Q Yeah. And so you -- as we sit here today, you  
16 know for sure it didn't get in a warehouse somewhere  
17 else. It stayed on Mitsubishi grounds and stayed in  
18 their warehouse, or you are not sure of that?

19 A No. It's my understanding Mitsubishi had  
20 possession, and we've actually looked at -- well, the  
21 project team involved in the project looked at all kinds  
22 of documentation of the storage conditions from  
23 manufacture to the date of purchase and to inspections  
24 as well.

25 Q How long from date of manufacture to date of

1 purchase for you all, how long did it stay in the  
2 warehouse?  
3 A I am sorry, I don't know that number.  
4 Q It was more than a year, was it not?  
5 A It was more than a year, yes.  
6 Q Do you know if it was more than five years?  
7 A I don't think it was more than five. It may  
8 have been around four, if I remember correctly.  
9 Q Yeah. Are -- I have a boat. And people tell  
10 me on my boat that the best thing you can do for it is  
11 use it, run the engine, that you need to run the engine  
12 to make it operate okay. Have you ever heard anything  
13 like that being an engineer, it helps to run things?

14 A I have heard similar things like that, but I  
15 would also tell you that that engine then is going to  
16 need more frequent maintenance intervals because you put  
17 on run hours.

18 Q Yeah. Yeah. The engine -- the turbine you  
19 bought, it was not run while it was in the warehouse,  
20 correct?

21 A Correct.

22 Q Okay. And if things are not run, there are  
23 issues that can arise from an engineering standpoint,  
24 correct?

25 A Not necessarily. Again, you have to think

1 about how this turbine is stored, and it was actually  
2 stored under inert gas pressure in casings with the  
3 pressure monitored so the regular atmosphere that we are  
4 breathing now never even got to the turbine, so that  
5 prevented corrosion, for example.

6 Q Was the plant near the sea? I mean, Japan is  
7 surrounded by a lot of water, is it not?

8 A I don't know.

9 Q You don't know where it was?

10 A I don't know where the plant was.

11 Q There have been a lot of questions about root  
12 cause analysis, or RCA, and let me just make sure I got  
13 this right. You all, Duke, did a root cause analysis,  
14 correct?

15 A Correct.

16 Q And that was comprised of seven people who are  
17 all Duke employees, correct?

18 A I think that's what this says. One of them  
19 was actually a consultant, as Mr. Rehwinkel pointed out,  
20 a former Duke employee, that at the time of the root  
21 cause was actually a consultant back for the company.

22 Q Okay. So you had six Duke employees and some  
23 person who was a Duke employee for a number of years  
24 that recently left and came back in?

25 A Yes, sir.

1 Q Okay. And you were not on that seven-member  
2 team?

3 A That's correct.

4 Q Okay. So some of the questions that Mr.  
5 Rehwinkel asked you, you were struggling a little bit  
6 and surmising, and there were a couple of objections  
7 from your lawyer about I don't want you to have to  
8 guess. I assume that's because you weren't involved in  
9 drafting the report, correct?

10 A That's correct.

11 Q All right. Mitsubishi, they also did a root  
12 cause analysis, did they not?

13 A They did. In fact, I think they've done  
14 multiple root causes.

15 Q Right. And their first take at it, their  
16 first take at it was essentially too much steam is being  
17 put through the process, correct?

18 A Too much steam to the low pressure turbine,  
19 yes.

20 Q Right. And your -- your being Duke -- root  
21 cause analysis, you spent a lot of time with Mr.  
22 Rehwinkel on it. I am going to try to characterize it  
23 at a high level and see if I can get you to agree that  
24 you are comfortable with this, but that there were  
25 identified a number of possible causes for the problems

1 that happened to the turbines, correct?

2 A Correct.

3 Q And you all couldn't really come to

4 100 percent conclusion, decisive conclusion as to what

5 caused the problem, but you said, here are what we think

6 are our best ideas as to what caused the problem,

7 correct?

8 A That's correct. And we are able to conclude

9 based on in-depth analysis that that lack of blade

10 design margin was the root cause.

11 Q Right. And it struck me a little bit as,

12 like, well, you couldn't figure out exactly what it was,

13 so it was, like, well, it wasn't designed right. But I

14 am -- I was a little curious about how you all followed

15 up on that, and you -- I think Mr. Rehwinkel asked you

16 what was the design flaw. I think you said, well, it

17 wasn't designed within the right margins, is that right?

18 A I don't know if that's what I said, but as far

19 as follow-up, it's difficult at that point because

20 essentially Duke Energy is saying, Mitsubishi, we

21 believe you have an inadequate lack of design margin in

22 your blades. The OEM does not want to admit to that.

23 They did admit in their later presentation in the fall

24 of 2017 that the blade flutter was caused by -- or that

25 the failures were caused by blade flutter in all of the

1 periods.

2 Q Yeah. And blade flutter, that's like

3 vibration, right?

4 A It is. Same thing.

5 Q And you can get vibrations caused by a whole

6 bunch of things, correct?

7 A Yes.

8 Q Yeah. Including putting too much steam

9 through. If you are putting too much steam and it's not

10 designed for that, that can cause vibration or flutter,

11 correct?

12 A That's correct.

13 Q All right. And it could be some other things?

14 A Yes.

15 Q Okay. But in terms of Duke looking at it, you

16 all never came to a conclusion with respect to -- I

17 wrote it down -- the margin. You said they didn't

18 design it and they didn't have enough design margin, I

19 think; is that right?

20 A Right.

21 Q And design margin, what is design margin? I

22 assume it's like a level of tolerance. They say, oh,

23 well we can, you know, do this or do that. Is that

24 right?

25 A It is. For many pieces of equipment, they may

1 be designed for a certain level, but there is an

2 engineering design margin or extra capacity that's built

3 in, or design factor that if someone were to go above or

4 if the limit is low or below, then there won't be a

5 failure or an issue with that particular component.

6 Q Yeah. And that wouldn't make a lot of sense,

7 would it, if somebody was operating an expensive piece

8 of equipment that you had, you know, zero tolerance,

9 right?

10 A It would not make sense, right.

11 Q And wouldn't it make sense for a manufacturer

12 also to make sure that the equipment is not torn up to

13 say, here, y'all should operate it, you know, at this

14 level, you know, give you some good parameters in which

15 to operate the piece of equipment?

16 A Yes.

17 Q All right. And given the definition we just

18 read, you know, the federal government with respect to

19 their definition of generator nameplate capacity, they

20 call it the maximum out -- maximum rated output of a

21 generator is what that 420 would be, right?

22 A That's what that said, yes.

23 Q Okay. And when you were doing your

24 investigation, or your critical -- your root cause

25 analysis and you said, well, we don't think it was

1 designed within the right amount of tolerances, can you

2 tell me anything about that? Like, did you say, oh, you

3 only gave it a five-percent tolerance, or a 20-percent

4 tolerance? I mean, do you have anything substantively

5 more than a conclusionary statement that it wasn't

6 designed within a range of tolerance?

7 A Well, I think --

8 Q If you give the answer yes, no, and then

9 explain it, that would be great.

10 A Well, it's difficult to say yes or no because

11 it's a complicated issue, and I think it's most

12 important to go back and look at what happened across

13 all the periods. So you keep talking about steam flow

14 and operating above a certain amount of steam flow.

15 Starting with Period 2, the operating

16 pressures that we ran the steam turbine at were reduced,

17 and then throughout Period 2, 3, 4 and 5. In fact, in

18 Period 5, they were very low, but yet the blades still

19 had damage to the snubbers or the airfoil tips even with

20 lower steam flows, even with lower steam flows than what

21 the Mitsubishi fleet had experienced. I think that that

22 shows that there wasn't enough design margin in the

23 blades.

24 Q And can you describe the failure of design

25 margin in any order of magnitude?



1 A I don't have a percentage for that. No.

2 Q Or any narrative description for it?

3 A I think it would be difficult to do that

4 without testing with instrumentation and breaking them

5 on purpose with instrumentation hooked up so that you

6 could see when they break, and you know what all the

7 different parameters were at the point of the failure

8 occurring.

9 Q I want to shift a little bit and talk about

10 the blade a little bit. You guys were running a blade

11 which I have gone over and looked at. It is pretty

12 heavy.

13 A It is.

14 Q Do you know if Mitsubishi made that blade or

15 whether they had it made by a subcontractor and had it

16 casted by a third party?

17 A It's my understanding that Mitsubishi does

18 that themselves.

19 Q Okay. Are you aware that in the turbine

20 business, that some turbine blades are made by third

21 parties?

22 A I am.

23 Q But you got affirmation that Mitsubishi said,

24 no, it's on us, this is our blade?

25 A That's my understanding.

1 Q Okay. And do you know if that blade was cast

2 in a single casting? Do you know what I mean by single

3 casting?

4 A I do. I don't know the specifics of the

5 manufacturing process.

6 Q Right. So just to make sure we are on the

7 same page. Like a single casting is you got a form and

8 you put in the metal, and then it hardens and that's it,

9 and you don't have to weld anything else on to it,

10 correct?

11 A Oh, so I do know the answer then. It's not a

12 single casting.

13 Q And the things that were breaking off, I

14 looked at that, they looked to me like they were welded

15 on; is that right?

16 A I believe they are, yes. And there is other

17 pieces like the tip of the airfoil, I believe, is not

18 part of the forge, the original forging.

19 Q Right. So from the engineering standpoint,

20 when you weld something on and you have a single form

21 that's cast, the weakest part is where something has

22 been welded on, all other things being equal; correct?

23 A There are certainly stress risers that at the

24 heat affected zone of a weld. That doesn't mean

25 necessarily that it's the weakest point, though. And in

1 the case of these blades, it didn't fail at the heat

2 affected zone in the weld. The snubbers and the Z-locks

3 failed near the tips, not near the welds.

4 Q So when you say the snubbers and -- just can

5 you go point just so we know exactly what --

6 MR. MOYLE: If I could approach, Your Honor?

7 THE COURT: Sure.

8 THE WITNESS: So the mid-span snubbers, this

9 being the span of the blade, the mid-span snubbers

10 are these pieces, and then the airfoil tips, or the

11 Z-locks, are these pieces up here, the tips.

12 BY MR. MOYLE:

13 Q Okay. And the mid what do you call them?

14 A Mid-span snubbers.

15 Q Yeah. They look like they are welded on,

16 right?

17 A I believe they are, yes.

18 Q The same with the ones on the top?

19 A Yes.

20 Q All right. So is that -- in your business, is

21 that maybe not such a big surprise, that the piece is

22 welded on?

23 A That is not a surprise. That's correct.

24 Q That happens?

25 A That's right.

1 Q And all other things being equal, wouldn't you

2 think it's more likely that for that to happen if you

3 are running at a higher frequency rate than at a lower

4 frequency rate?

5 A That what would happen?

6 Q That you would have a failure just with

7 respect to vibration?

8 A If something were welded on?

9 Q Or not, just in terms of, you know, if you are

10 running something, you know, at 150 percent of its

11 capacity compared to 80 percent of its capacity, all

12 other things being equal, isn't it more likely that

13 something being run at 150 percent of its capacity is

14 more likely to have a problem?

15 A That could lead to problems, I agree, but I

16 don't agree with the idea that the heat affected zone of

17 a weld makes it necessarily the weak point. I think you

18 went back to that.

19 Q Okay. And just so we have a clear record, I

20 mean, the operations of the unit in question during

21 Period 1, those were run for a pretty extended period of

22 time. They were run more often over the 420-megawatt

23 nameplate rating as compared to other periods in time,

24 correct?

25 A That's correct.



1 Q I saw something in one of the documents that  
2 said about 15 percent of the time. Does that sound  
3 about right to you?

4 A It does, yes.

5 Q Yeah, okay. What's blending?

6 A Blending operation in a combined cycle --  
7 remember that there is inherent flexibility in a  
8 combined cycle operation, and Bartow is a 4-on-1. So  
9 the transition between operating in 4-on-1 or 3-on-1 to  
10 2-on-1 to 1-on-1, any time you do that, you have to --  
11 let's use an example.

12 If you are going from 2-on-1 configuration to  
13 3-on-1 configuration, so that means two combustion  
14 turbines operating with a steam turbine in service. You  
15 start up the third combustion turbine. You are  
16 generating electricity with the combustion turbine  
17 generator. The exhaust, remember, is going out the  
18 stack. It's not going to the HRSG yet. When you  
19 start -- then you start warming up the heat recovery  
20 steam generator. You start generating steam. You don't  
21 immediately put the steam into the turbine. You have to  
22 wait for certain conditions to be met on the steam. You  
23 don't want to put water in the steam turbine.

24 So what you do is you bypass steam to the  
25 condenser, and then once steam conditions are met, you

1 start slowly blending. You start increasing the  
2 percentage of steam that's input to the steam turbine,  
3 so more to the steam turbine, less to the condenser  
4 until all of it is going into the steam turbine.  
5 If you are going from 3-on-1 to 2-on-1  
6 configuration, it's just the opposite. You start taking  
7 it out of the steam turbine and bypassing steam to the  
8 condenser, and then you shut down the HRSG and start  
9 exhausting out to the atmosphere.

10 Q And this is a 4-on-1, right?

11 A This is a 4-on-1.

12 Q But you can run it 3-on-1, 2-on-1?

13 A We can run it in any of those other  
14 combinations.

15 Q So if you are not blending, you know, the way  
16 you are supposed to do it, the way you described it,  
17 what are the consequences of that?

18 A Well, that's something we looked at in the  
19 root cause. In fact, Duke Energy made up our own  
20 definition of what a high-energy blend was because  
21 that's a possibility that that could exert more energy  
22 on the L0 blades because, as I described, there is steam  
23 flow that's being put into the condenser. It goes into  
24 the condenser nearby the L0 blades, so that's something  
25 we needed to look at.

1 Because there is no industry standard for the  
2 amount of energy that's put in the condenser during a  
3 blend, we looked at a lot of data. We came up with a  
4 method for classifying and a definition for high energy,  
5 and it was just based on the change in temperature over  
6 a certain period of time. More than a certain change in  
7 temperature in a minute's time, we said, let's just call  
8 that high energy, and it happens so many times over --  
9 if you have this many blends, we see that -- this many  
10 of the blends, a percentage of the blend.

11 And then we were, because we made that  
12 definition, we were able to look around industry at both  
13 our -- at our combined -- other combined cycles,  
14 Mitsubishi or non-Mitsubishi units, and compare, is the  
15 energy of the blends at Bartow out of line with the rest  
16 of the unit -- what we see in the rest of our fleet? Is  
17 that change in temperature over a period of time  
18 greater, which could put in more energy into the  
19 condenser which could be negatively impacting the  
20 blades? And what we found is about consistent at Bartow  
21 with other units.

22 Q Yeah. And when you did that analysis, a lot  
23 of people are running combined cycle units, right?

24 A Oh, yes.

25 Q I mean, if we were to hazard a guess in this

1 country how much of the energy is supplied by combined  
2 cycle units, what would you say, 40, 50 percent?

3 A It's growing. It's probably 40-ish percent,  
4 plus or minus.

5 Q Yeah. There was something that caught my eye  
6 in one of the documents Mr. Rehwinkel was discussing  
7 with you, and I will refer it to you. It's on his  
8 Exhibit 115, and it's on Tab No. 6, and it's on Bates  
9 number 49.

10 A Okay. I am there.

11 Q And there is -- about middle of the page there  
12 it says, blending operation, do you see that?

13 A Yes.

14 Q Just read the quote, if you would, underneath  
15 there.

16 A It says: We've had bad blends during all five  
17 periods of operation.

18 Q Yeah. And you said you came up with a  
19 definition for the energy. I mean, what's a bad blend?  
20 I assume that's something that's not good just by the  
21 term, right?

22 A Yeah. I would say this is a good example of  
23 why this is a draft document, and why we go through a  
24 lot of iterations before putting out a final document.  
25 But I believe that the term bad is being used here in

1 place of high-energy.

2 During the course of this root cause, we were  
3 developing this high energy blend definition. Maybe we  
4 didn't have it at this time. I don't know. I don't  
5 want to speculate, but I believe it means the same thing  
6 as a high-energy blend.

7 Q Do you know who came up with that word, which  
8 member of the seven-member team?

9 A I do not.

10 Q Did you ever talk to anybody about what that  
11 meant, or are you just kind of saying, oh, I think it  
12 means high-energy and surmising that?

13 A I don't know.

14 Q Yeah.

15 A I didn't have that discussion.

16 Q And that's fair, because you didn't, you know,  
17 you didn't work on the report. You weren't in all those  
18 meetings.

19 A Correct.

20 Q Okay. I just want to make sure the record is  
21 clear. When these problems occurred, you opted to just  
22 run the Bartow facility on the simple cycle, not  
23 combined cycle, right?

24 A During the periods when we were replacing  
25 blades, we were running in simple cycle mode. I don't

1 know how many of the simple cycles were in operation.  
2 It changes the economics of those units. They are much  
3 less efficient obviously in simple cycle mode. So they  
4 are placed in our dispatch order changes. And then  
5 based on what the system load is on any given day, they  
6 may or may not be asked to run, but there is always at  
7 least one in service, I know, during all these time  
8 periods.

9 Q Yeah. So just in terms of the impact on  
10 efficiency, just give the judge an idea about the  
11 negative effect on efficiency if you are only running it  
12 in simple cycle and not using the heat recovery system,  
13 the HRSG system, which you have done as a result of some  
14 of these issues, correct?

15 A Correct.

16 Q So just is it about a third -- is the heat  
17 recovery system about a third? Use the 420 nameplate,  
18 what would you not realize not being able to run it in  
19 the combined cycle mode?

20 A Well, from a production standpoint, it was  
21 about -- oh, when the steam turbine was not in service?

22 Q Right.

23 A When the steam turbine was not in service, we  
24 are missing that 380 to 420 megawatts, depending on  
25 where we were running at the time. The combustion

1 turbines, the four combustion turbines are nominally  
2 around 200 megawatts. Again, as I have described, they  
3 can do more than that depending on the ambient  
4 conditions in the heat of the summer they may not make  
5 that much. But let's say they are 200-megawatt units,  
6 we had about 200 megawatts capacity instead of about  
7 1,200 megawatts of capacity.

8 Q Okay. So about a third is knocked out?

9 A During the outages.

10 Q Right.

11 A During the outages, right.

12 Q Okay. And then for that third, you had to go  
13 find that power somewhere else, either run it on your  
14 system or buy it in the market; is that right?

15 A That's correct. If it was needed.

16 Q So with respect to -- you got on -- you  
17 testified on this a little bit with Mr. Rehwinkel about  
18 the status of Mitsubishi blades in the market. Duke has  
19 a lot of other Mitsubishi blades, do they not?

20 A I don't believe Duke has a lot of other  
21 Mitsubishi blades. In steam -- well, I mean, correct  
22 that. So in steam turbines, we do have other combustion  
23 turbines that are Mitsubishi. Combustion turbines have  
24 blading. I am not aware of any other Mitsubishi steam  
25 turbines other than what's installed at Bartow and the

1 two that we have at Citrus.

2 Q Okay. And you haven't had any similar  
3 problems with the turbines at those other Duke units  
4 that you have experienced at Bartow, correct?

5 A Well, the two Citrus steam turbines didn't  
6 start up until late in 2018.

7 Q Yeah. And we are not looking for problems,  
8 it's okay to say there are no problems?

9 A Yeah, no problems.

10 Q I am not disappointed, you know.

11 A The operating experience is limited to about a  
12 year-and-a-half.

13 Q Right. Right.

14 And you have no personal knowledge with  
15 respect to anybody else having any problems with  
16 Mitsubishi blades of the ilk that are at your Bartow  
17 unit, correct?

18 A Other than what we had discussed earlier.  
19 There is some discussion at user group meetings and some  
20 interest in our issues, but nothing that I can show you  
21 in documents.

22 Q Yeah. In these administrative proceedings, we  
23 treat hearsay a certain way, so if I ask you have  
24 personal knowledge if somebody told you I am having  
25 something going on, correct? That's the only

1 information you have that somebody else may have an  
2 issue?  
3 A That's correct. That's correct.  
4 Q Yeah. And the -- what company was that? Do  
5 you remember the company that --  
6 A I don't remember. Mr. Rehwinkel thought it  
7 was in Louisiana, I think he said. I have no reason to  
8 doubt that.  
9 Q I'm asking you the name of the company, like  
10 energy or somebody from energy?  
11 A I don't remember.  
12 Q You don't remember who it was?  
13 A I don't.  
14 MR. MOYLE: Okay. I think that's -- Judge, if  
15 I could just get one quick second?  
16 THE COURT: Sure.  
17 MR. MOYLE: Thank you. That's all I have.  
18 THE COURT: Mr. Brew.  
19 MR. BREW: May I approach the witness, Your  
20 Honor?  
21 THE COURT: Sure.  
22 EXAMINATION  
23 BY MR. BREW:  
24 Q Good afternoon. These are the two exhibits I  
25 want to show you. Your Honor, you have them there. I

1 am going to talk about this one.  
2 A Okay.  
3 Q Thanks.  
4 Good afternoon, Mr. Swartz, one of the  
5 advantages of going at the tail end is that many of my  
6 questions have been answered. The downside is that I  
7 will be jumping all over the place.  
8 First, I want to just really quickly run  
9 through some stuff that's been covered in different  
10 pieces about the function and operation of Bartow.  
11 A Yes, sir.  
12 Q It was originally designed and built for a  
13 3-x-1 configuration, right?  
14 A That's correct.  
15 Q Okay. And Duke decided when it did its  
16 repowering program that it might be better do a 4-x-1  
17 operation, right?  
18 A That's correct.  
19 Q And that's eventually what was built?  
20 A Yes.  
21 Q Okay. And so we have 4 CTs, combustion  
22 turbines, that produce electricity and exhaust gas that  
23 run through the heat recovery steam generators, right?  
24 A Yes.  
25 Q And then the steam from those steam generators

1 run down to the steam turbine?  
2 A Yes, sir.  
3 Q We've gone through where the steam goes in  
4 through the middle, goes out both sides and into the  
5 condensers?  
6 A From the low pressure turbine.  
7 Q From the low pressure turbine eventually, yes.  
8 And you can run any one of those sets 1-x-1,  
9 2-x-1, 3-x-1, 4-x-1?  
10 A Yes.  
11 Q Okay. You can -- for any of the CTs, you can  
12 do duct firing, which is to add gas to the combustion  
13 gas, much like an afterburner on a jet?  
14 A Yes, sir. That's right.  
15 Q Okay. And so you can do that for short  
16 periods for peaking because it gives you real punch on  
17 your output, but it's not particularly efficient?  
18 A That's accurate.  
19 Q Okay. And you also can divert steam, I think,  
20 from the intermediate pressure to the CT itself for what  
21 you call power augmentation?  
22 A Correct.  
23 Q Okay. And that's sort of like supercharging a  
24 car. You smoosh more stuff into the combustion zone and  
25 you get more power out of it?

1 A Yes, sir. That's right.  
2 Q Again, that's not the most efficient way to do  
3 it either in terms of heat rate in the operational  
4 plant, right?  
5 A Yes, sir.  
6 Q Okay. So when -- the Bartow unit went into  
7 service in June of '09, right?  
8 A Yes.  
9 Q And in your 2010 10-year site plan filed with  
10 the Public Service Commission, you listed the max  
11 generation capability in megawatts of the unit is 1,253  
12 megawatts; is that right?  
13 A I would have to look at that. I am not  
14 familiar with that document.  
15 Q Okay. But that would be about right, 1,200  
16 megawatts?  
17 A That's about right, yes.  
18 Q And of that 1,200 megawatts, about  
19 420 megawatts would have been ascribed to the steam  
20 turbine, right?  
21 A That's about right.  
22 Q Okay. Now, the different modes of operation,  
23 the plant does not simply run 4-x-4 all the time, right?  
24 A Correct -- 4-x-1, right.  
25 Q It could be 4-x-4-x-1, it could be in any

1 possible combinations --

2 A Yes, sir. That's right.

3 Q -- as you ramp it up and ramp it down?

4 A Yes.

5 Q And as you're ramping up it up, if you are

6 adding another heat recovery system to the steam, as you

7 said, you would bypass that steam to the condenser to

8 blend it before introducing it into the steam turbine,

9 right?

10 A Yes.

11 Q Okay. So you have a number of ongoing

12 systems -- normal operation is, in fact, a constant set

13 of dynamic changes, where you are going up, you are

14 going down, you are ramping up, you are ramping down,

15 you are taking parts off, you are adding parts on; is

16 that right?

17 A Yes, part of the value of the Bartow combined

18 cycle is the operational flexibility that it provides so

19 that we can change the operation as you described to

20 meet the customer needs.

21 Q And so when the units first -- well, let me

22 back up a little bit, I guess. You have been asked this

23 question around-about, but I want to ask it directly.

24 The company's position on what is wrong with

25 the zero blades is captured in your root cause analysis,

1 right?

2 A Yes.

3 Q JS-1, JS-2, whatever one we want to refer to?

4 A Yes.

5 Q Is it the company's position that the zero

6 level blades were insufficiently designed for

7 450 megawatts or the originally promised 420?

8 A It's actually neither. The inadequate design

9 for the operating pressures and temperatures that we

10 were given as operating parameters.

11 Q Okay. So are you saying -- is the company

12 saying that the blades as designed were not sufficient

13 to meet the specifications per your agreement with what

14 Mitsubishi had to do?

15 A Yes.

16 Q Okay. And the company's proposal is that

17 ratepayers be insurers for that design defect by paying

18 for all the replacement power costs?

19 A I am not sure what you mean by insurers.

20 Q You want us to pay the bill?

21 A Well, our company's position is that we

22 prudently operated the equipment within the parameters

23 provided to us from the equipment manufacturers, and we

24 did that each period of operation and we took action

25 each period of operation.

1 Q That wasn't my question. Are you asking

2 consumers to pay the bill or are you asking Mitsubishi

3 to pay the bill?

4 A Well, as far as asking Mitsubishi to pay the

5 bill, I think that goes back to contract language that

6 we have found it's very unlikely, if not impossible to

7 get manufacturers or vendors to agree to clauses that

8 would include lost business. It simply will back out of

9 that contract before agreeing to that.

10 Q You said that in your direct testimony. Would

11 you refer to it for a minute on page seven? I am

12 pointing to the answer that begins on line nine. This

13 is of your original direct testimony, because that's

14 what we are talking about right now.

15 A Page seven?

16 Q Page seven. The answer on lines nine to 13.

17 A Okay. I am there.

18 Q Okay. Actually above that, the answer on

19 lines one through three, where you talk about the

20 unwillingness of original equipment manufacturers to

21 accept the risk of paying consequential damages; do you

22 see that?

23 A I must be on the wrong document. I do not see

24 that.

25 Q I am looking at your March 19th -- March 1 --

1 March 1, 2019, direct testimony.

2 A Okay. I was looking at the March 18

3 testimony.

4 Q Okay. You have a question: In your

5 experience, do DEF's agreements with OEMs usually

6 include a similar disclaimer of liability? You are

7 talking about consequential damages, do you see that?

8 A Yes, I do. That's row 22, or line 22?

9 Q Yeah, that's --

10 A I don't have page numbers on mine.

11 Q Okay. I am looking at the answer that you

12 gave there --

13 A Okay.

14 Q -- that starts with the word yes.

15 A Right.

16 Q Okay. You say: To my knowledge, this is the

17 case throughout the industry. What industry do you

18 mean?

19 A The utility industry.

20 Q The utility --

21 A Well, to clarify, so I have experience in the

22 utility industry, obviously, but also in the pulp and

23 paper manufacturing industry, and then before that in

24 the Navy. But in my 35 years of experience in those

25 entities, I have not experienced a company willing to

1 take on business interruption risk.

2 Q So for a combined cycle unit that's sold to a  
3 merchant generator, to the extent that they can't  
4 recover consequential damages for a design defect from  
5 the OEM, that becomes the responsibilities of their  
6 investors?

7 A I am not familiar with exactly the financing  
8 of a merchant generator. I have not worked in that  
9 business, but that sounds plausible.

10 Q Okay. Somebody that can't recover their cost  
11 of operations through regulated rates?

12 A Right.

13 (Discussion off the record.)

14 BY MR. BREW:

15 Q You had talked about on a number of occasions  
16 that, I don't know if it's common, but a typical failure  
17 mode of L0 blades elsewhere in the industry was erosion?

18 A Yes, sir.

19 Q Which basically in the turbine and gas,  
20 excessive moisture in the blade areas and the water  
21 starts pounding in at 3,600, but you and Mitsubishi  
22 agreed that in this case that the root cause was too  
23 much vibration, or flutter, that was affecting the zero  
24 level blades; is that right?

25 A Yes, that's correct.

1 Q Okay. And when you went to Mitsubishi in 2012  
2 and asked them to look into going to 450 megawatts, or  
3 higher steam loading levels, you had described it as  
4 their initial response is that they didn't have any  
5 experience with the loadings at that level in their  
6 steam turbines; is that right?

7 A I don't know that that was their original  
8 response. I think what I said is when they first --  
9 when we first experienced the damage, or discovered the  
10 damage in 2012, that was one of Mitsubishi's responses,  
11 is that the calculated steam flow on your L0 blades at  
12 Bartow is beyond our industry experience.

13 Q Okay. So it was beyond their experience.  
14 Isn't it true that it was also beyond yours, because as  
15 you noted, Bartow is only 4-x-4-x-1 combined cycle,  
16 right?

17 A It is our only 4-on-1 combined cycle, but I  
18 don't know what the pounds per hour per square foot is  
19 on L0 blades on any other units.

20 Q Okay. All right. And you did the comparison  
21 and your root cause analysis for blending counts,  
22 particularly with your Lee and Hines combined cycles?

23 A Yes.

24 Q Now, the Lee combined cycle is a 3-x-1, right?

25 A Correct.

1 Q And the Hines a series of 2-x-1s?

2 A Correct.

3 Q Okay. So neither one of them would operate at  
4 a same energy levels as, say, going from a 3-x-4  
5 operation -- blending operation at Bartow?

6 A Well, when you talk about energy we probably  
7 need to define that. But I also would say that the  
8 reason H.F. Lee and Hines we are using for comparison is  
9 because those are the installations that have 40-inch L0  
10 blades. Other installations have different sized  
11 blades, so we wanted to make sure we used installations  
12 that had similar blades. But the pressure -- the energy  
13 that you are stating really goes back to the pressure  
14 and temperature of the steam, and that's the pressure  
15 that equates to the mass flow rate.

16 So whether you are in 2-on-1 or 3-on-1, it  
17 depends on the design of the heat recovery steam  
18 generators. It might be a heat recovery steam generator  
19 that's capable of producing twice as much steam as the  
20 ones at Bartow at much higher pressures. And then even  
21 though it's a 2-on-1, it could be more energy into the  
22 low pressure turbine than a 4-on-1 at lower pressures.

23 Q Is that the case in Hines 2-x-1 steam  
24 pressures?

25 A I don't know that the exact steam pressures.

1 I would say they are likely very similar to Bartow, but  
2 I wanted to characterize your -- it's an  
3 oversimplification to say a 4-on-1 has more energy than  
4 a 3-on-1.

5 Q Okay. But you don't know what the steam  
6 pressures were -- for Lee are?

7 A Correct.

8 Q Okay. After the -- I get hung up on the  
9 period statements, but after the, I guess the third  
10 period failure in 2014 is when Duke and Mitsubishi  
11 agreed to actually test for vibration levels by doing  
12 the telemetry test and installing the vibration monitor?

13 A Well, not exactly. It was during Period 2  
14 when we were running with the second set of blades in  
15 one end of the machine and still had original blades in  
16 the generator end of the machine when we contracted with  
17 Mitsubishi to make a new design of blade called a Type 3  
18 blade that was installed during that outage between  
19 Period 2 and Period 3.

20 So when we started up in Period 3, we had this  
21 new design blade. Part of that project was also to  
22 install the temporary blade vibration monitoring system  
23 and take data at the very beginning of Period 3 so that  
24 we could come up with any additional operating  
25 parameters that we may need to protect the system.

1 Q Okay. With that clarification, Duke and  
2 Mitsubishi jointly agreed to install the temporary  
3 vibration monitoring telemetry to get actual information  
4 using string gauges on the stresses at the zero level  
5 blades, right?

6 A Yes, that's correct.

7 Q Okay. And is there any part of the design of  
8 the testing and installation that Duke was not onboard  
9 with for the vibration limit?

10 A Not that I am aware of.

11 Q Okay. And you got the result of that  
12 vibration monitoring testing, and it was at that point  
13 that Mitsubishi recommended establishing the avoidance  
14 zone?

15 A That's correct.

16 Q Okay. And so -- and specifically what we're  
17 talking about is you had two other data points. You had  
18 the outlet pressure from the intermediate turbine --  
19 turbine pressure area, and you had condenser vacuum or  
20 back pressure?

21 A Correct.

22 Q Okay. And the problem with the condenser is  
23 that if you put too much steam energy in there, it can  
24 lose vacuum and that's when you get back pressure and  
25 this can cause other problems?

1 A That's an issue with the condenser, right.  
2 Q Okay. So you had that information, and if I  
3 can ask you to take a look at the document that I showed  
4 you, the one-pager, that is a diagram that's listed  
5 bypass connection locations, do you see that?

6 A Yes, I do.

7 Q Are you familiar with this diagram?

8 A I have seen it before, yes.

9 Q Okay. It's in one of Mr. Polich's exhibits.  
10 It's in JS-4. It appears in a number of places on the  
11 exhibits. And I will represent to you that it's a  
12 diagram for where the, I guess you call them spargers or  
13 dump tubes go when you are sending steam to the  
14 condensers in bypass mode?

15 A Yes, that's correct.

16 Q And that the C and D hot reheat tubes are  
17 located closer to the exhaust, right?

18 A I don't know if that's correct or not. I  
19 can't tell from this diagram.

20 Q Isn't it true that Mitsubishi found that when  
21 you were engaging the D and C tubes is when they  
22 experienced more vibration in the zero level blades?

23 A I do believe that there as document that shows  
24 that. I know our concern and what we saw in operation  
25 was that alpha and delta concerned us more actually, A

1 and D.

2 Q A and D.

3 A I'm sorry, I default to the phonetic. And the  
4 reason why is A and D are physically farther from the  
5 condenser than B and C, and so there is more likelihood  
6 of water entrainment in the A and D lines.

7 Q Okay. And so my question, then, is there is  
8 nothing about the final fix that's been implemented that  
9 has changed the design or the configuration within the  
10 condenser, right?

11 A Not for the sparger tubes that you are talking  
12 about.

13 Q Right. That's what I am talking about.

14 A Yeah. I believe there were some other minor  
15 changes, but not to what we are looking at here to my  
16 knowledge.

17 MR. BREW: Okay. We are sticking to direct  
18 right, not rebuttal?

19 MR. BERNIER: That's correct. Mr. Swartz is  
20 excited to come back for rebuttal.

21 MR. BREW: All right. Then I will wait.

22 THE COURT: So there is no redirect, is  
23 that -- or is there?

24 MR. BERNIER: Typically we do redirect after  
25 staff would go through, or actually after the

1 Commissioners would, but then he will come back and  
2 do his rebuttal testimony.

3 THE COURT: Okay. I just want to be sure. I  
4 don't want to --

5 MS. BROWNLESS: Can I just ask a question?  
6 Most of the testimony filed by Mr. Swartz is  
7 rebuttal testimony, and many of the questions that  
8 have been asked today concern those areas. So just  
9 so I am clear, would it not be appropriate to allow  
10 us to ask our questions about all of Mr. Swartz's  
11 testimony, subject to, of course, you being able to  
12 go at the very end and do redirect?

13 MR. BERNIER: After Mr. Polich testifies?  
14 Because I thought that was the agreement that we  
15 had set up in the agenda.

16 MS. BROWNLESS: That's fine. I'm sorry.  
17 Perhaps I was confused.

18 MR. BERNIER: That's okay. I understand that  
19 we have strayed around a little bit, but we have  
20 stayed really close to the root cause analysis.

21 MS. BROWNLESS: Thank you.

22 MR. MOYLE: Just to be clear, then, the plan  
23 will be he will retake the stand and talk about  
24 rebuttal and we will have a chance to ask questions  
25 about his rebuttal?

1 MR. BERNIER: That's correct.

2 MR. MOYLE: Okay.

3 MR. BERNIER: Unless when he gets done y'all

4 want to let him go.

5 MS. BROWNLESS: Thank you.

6 THE COURT: Was there anything from the

7 Commission?

8 MS. BROWNLESS: No, sir. I am good. Thank

9 you, sir.

10 MR. BERNIER: Can we have one minute?

11 THE COURT: Sure. Take 10.

12 MS. BROWNLESS: Oh, I am sorry.

13 MR. BREW: I'm not finished.

14 THE COURT: Oh, I am sorry. I thought you

15 were done.

16 MS. BROWNLESS: Yeah.

17 MR. BREW: No. No. I had an exhibit --

18 THE COURT: I knew you never got to this one.

19 MR. BREW: Right.

20 THE COURT: I thought you were waiting for

21 rebuttal.

22 MR. BREW: Well, I am waiting for rebuttal on

23 that one, but that's why I asked a clarifying

24 question.

25 THE COURT: The floor is yours.

1 BY MR. BREW:

2 Q You talked a little bit with Mr. Rehwinkel

3 about what happened after Period 5, but I just wanted to

4 clarify that, too.

5 What we will call Period 6 is when you

6 installed the pressure plate beginning around April of

7 2017?

8 A Yes, sir. That's right.

9 Q And you finally removed that with the outage

10 that occurred fourth quarter of last year?

11 A Correct.

12 Q And so during that entire time, your max

13 generation was confined to about 380 megawatts from the

14 steam turbine?

15 A That's accurate.

16 Q Okay. And did you experience any ancillary

17 damage from the use of the pressure plate?

18 A We did experience some damage. Nothing to the

19 steam turbine itself, or the steam -- the centerline

20 turbine components. What we found during a routine

21 inspection, we didn't shut down in a forced manner for

22 this, but during a routine inspection, we found that

23 some, like, ladders, some supports for different things

24 inside the casing of the low pressure turbine had been

25 damaged.

1 We suspect that the pressure plate caused some

2 pressure waves or vibration inside the casing that was

3 different than operation with blades. So we had to do

4 extra stiffeners in some locations, and we actually

5 removed some unnecessary things like ladders that were

6 attached to the inside of the casing.

7 So nothing that impacted the operation, and

8 the stiffeners worked well because in subsequent

9 inspections, we didn't see any issues.

10 Q So running with the pressure plate for

11 two-and-a-half years, it was noisy and vibrated a lot

12 because of the impingement of steam and stuff through

13 the pressure plate hold?

14 A Well, it's all relative. When you say

15 vibrating a lot, there was no turbine centerline

16 vibration. The unit ran very well at low vibration

17 levels. There was obviously vibration in the casing.

18 And, yes, it was louder operating with a pressure plate

19 than with a set of blades in the L0 position. To be

20 honest, it was not as loud as what we had thought it

21 might be.

22 Q And the new redesigned Level 0 blades were

23 installed in December, and the unit is now back in

24 operation for what we now call Period 7?

25 A Yes, sir.

1 Q And it's too early to tell whether that is --

2 has any results to speak of, or are you operating at 450

3 or 420?

4 A There are some results so far, and this is

5 somewhat of a -- understand why we haven't run it there

6 yet, during that same fall outage where we installed the

7 blades, we also did maintenance on the combustion

8 turbines. Two of the combustion turbines were at their

9 major maintenance interval and two of the combustion

10 turbines generators were at their major maintenance

11 interval. During testing of one of those generators, we

12 experienced a generator failure that we had to rewind

13 the stator, which is the bars that go around the

14 rotating part of the generator. We just finished that

15 project about two weeks ago, so we didn't have the

16 capability to run it 4-on-1 configuration until about

17 two weeks ago.

18 We didn't immediately go to 4-on-1. In fact,

19 we still haven't gone to 4-on-1. We wanted to

20 coordinate with Mitsubishi. We have this permanently

21 installed blade vibration monitoring system. When we

22 first operated with the steam turbine in December, we

23 did a lot of testing with Mitsubishi, and we operated in

24 a lot of different combinations, 1-on-1, 2-on-1, 3-on-1,

25 duct burners, no duct burners, made sure we were looking



1 at the response, or lack thereof, on the blade vibration  
2 monitor, and everything looked really good for up to  
3 3-on-1 operation with full duct burners.

4 We will continue that testing protocol  
5 starting this coming Monday as a matter of fact.  
6 Mitsubishi will be on site and will be stepping through  
7 in 4-on-1 configuration.

8 Q Okay. So you mentioned it earlier, but the  
9 blade vibration monitoring system has now been made  
10 permanent?

11 A Correct.

12 Q And to this date, you haven't gone back up to  
13 full power operation?

14 A Correct.

15 MR. BREW: Thank you. That's all I have.

16 THE COURT: Still nothing?

17 MS. BROWNLESS: I will pass these out.

18 THE COURT: Oh, okay.

19 MR. BERNIER: I am sorry, James, did you want  
20 to mark this?

21 MR. BREW: That was marked for identification  
22 as I believe 113.

23 THE COURT: It's already been marked?

24 MR. BERNIER: Yes.

25 THE COURT: Are we talking about the

1 one-pager?

2 MR. BREW: The one-pager was marked as 113.

3 The other one was actually marked as 112.

4 THE COURT: Okay.

5 EXAMINATION

6 BY MS. BROWNLESS:

7 Q Good afternoon.

8 A Good afternoon.

9 Q It's been a long day.

10 I want to start by asking some pretty basic  
11 questions. The original --

12 MR. REHWINKEL: Is your mic on? I think there  
13 is -- look underneath, there as button.

14 MS. BROWNLESS: It's green.

15 THE COURT: You need to really lean into it  
16 maybe.

17 MS. BROWNLESS: Oh, thank you, Judge.

18 MR. REHWINKEL: Okay. I just couldn't hear  
19 you down there.

20 BY MS. BROWNLESS:

21 Q The original Tenaska contract, an excerpt of  
22 which I provided as Exhibit 111.

23 A Okay.

24 Q The original Tenaska plan was to connect three  
25 M501F CTs to the steam turbine, is that correct?

1 A Could I ask which page you are referring to  
2 just so I make sure I verify? That does sound correct,  
3 I just want to verify the type of combustion.

4 Q If you look at the very last page, it says  
5 M501F cast turbine.

6 A Yes, that's correct. I see it.

7 Q And the original Tenaska configuration was to  
8 produce gross steam turbine output of 420 megawatts, is  
9 that correct?

10 A That's correct.

11 Q The type of steam turbine that you have  
12 connected that's 401 is also a 501F type CT, right?

13 A The four combustion turbines, yes, they are  
14 also 501 technology.

15 Q Okay. And I am curious as to why you were  
16 willing to accept -- well, let me refer you to Exhibit  
17 110. If I look on page -- let me -- it's Bates page  
18 12432, and the page 3-2-1; do you see it, sir?

19 A I do.

20 Q It's under 3.2, guaranteed performance and  
21 other guarantees of acceptance tests?

22 A I see that.

23 Q Okay. It indicates here under the liquidated  
24 damage performance guarantees that the MPS net steam  
25 turbine maximum electrical output would be 420.07

1 megawatts, is that correct?

2 A Yes, it is.

3 Q And so I guess I am curious why the 3-on-1  
4 configuration with F type combustion turbines would  
5 produce 420 and Mitsubishi is saying that your 4-on-1  
6 configuration would also produce 420.07?

7 A Well, I don't know the specifics about the  
8 Tenaska 3-on-1 that was originally considered or  
9 contemplated for that contract. It could have had -- it  
10 may not have had duct burners installed, which makes a  
11 very significant difference whether they have duct  
12 burners installed or not. That's one variable that  
13 could be different. But I just -- not knowing the  
14 specifics of that Tenaska contract, I don't know that I  
15 can explain that contract.

16 Q Okay. Well, I guess if there were duct  
17 burners on the Tenaska contract, then that would make it  
18 comparable to your contract where there were duct  
19 burners, correct?

20 A It would, yes.

21 Q Okay. And if there were no duct burners,  
22 wouldn't that result in potentially a lower megawatt  
23 maximum electrical output?

24 A Well, the maximum electrical output really  
25 goes back to the generator, the electrical generator.



1 And so the generator is the same for the Tenaska  
2 project, we bought that generator for the Progress  
3 Energy project. And at a power factor of .90, as we  
4 looked at in the generator capability curve, the maximum  
5 electrical output is 420 megawatts, approximately.  
6 Actually the generator performance curve shows 421.2  
7 megawatts.

8 Q And I guess what you are saying is that there  
9 could be other -- well, let me make sure I understand  
10 what you are saying.

11 You are telling me that the generator that's  
12 connected to your system is the same as the generator  
13 which was going to be connected to the Tenaska system?

14 A Correct.

15 Q So that's identical, and that you have the  
16 same type of combustion turbine, F?

17 A Well, I don't know. They are F, 501F  
18 machines, but there has been multiple generations of  
19 501F machines in the industry. F -- I don't know  
20 specifically what we have at Bartow, but they go by FD1,  
21 FD2, FD3, each subsequent generation has some improved  
22 capabilities.

23 I don't know exactly what model the Tenaska  
24 501F was compared to the Bartow 501F. They may have  
25 been different models of combustion turbine with

1 different characteristics, probably pretty close to the  
2 same, but every time they make a new model, much like a  
3 car, a Honda Accord in 2002, when this machine was  
4 built, is still different than the Honda Accord in 2009.  
5 There has been many generations. It's still a Honda  
6 Accord, it's still the same type of machine so I just  
7 don't know.

8 Q So your testimony is that the details between  
9 those two units could be different and, therefore --

10 A Yes, ma'am, that's correct.

11 Q -- they wouldn't be exactly comparable?

12 Okay. In 2009, Mitsubishi was aware that you  
13 were going to run this in a 4-on-1 configuration,  
14 correct?

15 A Yes.

16 Q Did Mitsubishi provide operating parameters,  
17 pressure temperature, steam volume for each of the three  
18 sections of the combustion turbines? Did you get those  
19 parameters for the high pressure section?

20 A We did. The parameters for the steam turbine  
21 are typically provided for the high pressure section and  
22 not for the entire turbine.

23 Q And you had -- you were given a parameter,  
24 were you given a measuring device to measure that  
25 parameter?

1 A Yes.  
2 Q Okay. And did you have parameters and  
3 measuring devices for the intermediate pressure section?  
4 A We had measure -- some measuring devices, but  
5 the parameters -- remember the HP/IP turbine is one  
6 machine. And so the operating limits are really the HP,  
7 the high pressure steam is the limit.

8 Q Okay. Were you given specific operating  
9 parameters for the low pressure section of the turbine?

10 A We were given specific parameters that applied  
11 to the exhaust of the low pressure turbine, which is  
12 into the condenser, which is very important. You have  
13 to know the energy of the steam at the inlet and the  
14 energy of the steam at the exhaust of the whole system  
15 helps you determine flows and the energy of the product,  
16 the substance.

17 Q So the intermediate turbine exhaust pressure  
18 was used as a proxy for the low pressure section inlet  
19 pressure, is that correct?

20 A Only after the -- it is correct, but that  
21 wasn't an operating parameter provided in 2009, but in  
22 2012. After we discovered damage in the spring outage,  
23 that's when Mitsubishi lowered -- made a recommendation  
24 that we don't exceed 118 pounds in the exhaust of the  
25 intermediate pressure turbine to be used as a proxy of

1 what steam was being emitted to the low pressure  
2 turbine.

3 Q And I guess I want to understand this.  
4 Initially in June of 2009, were you given a number for  
5 the IP exhaust pressure?

6 A No.

7 Q No number?

8 A Correct.

9 Q Did you have a measuring device at the IP  
10 exhaust?

11 A I believe we did, yes.

12 Q Okay. But you were not given a pounds per  
13 square inch or --

14 A It would have been a pounds per square inch  
15 gauge, but not an operating parameter for that  
16 measurement.

17 Q Okay. And can you show me where that was,  
18 please?

19 A So the -- this -- the exhaust of the  
20 intermediate pressure turbine is shown in this pipe  
21 right here, and then the steam would flow up and over  
22 and into the middle of the low pressure turbine.

23 Q So where was the exhaust low pressure --  
24 intermediate pressure exhaust gauge?

25 A It would be somewhere in this vicinity. I

1 don't know exactly where, and this obviously isn't to  
2 scale, but it would be close to the -- right at the  
3 outlet of the IP turbine.

4 **Q Would it be before the inlet where steam from**  
5 **the HRSG would enter the system?**

6 A I don't know for sure, but, yes, I believe it  
7 would be. So there is also some low pressure steam  
8 called admission steam that's coming through this line  
9 right here from the low pressure drum on the HRSGs, and  
10 that comes into this line right here. So I believe it  
11 is before, yes.

12 **Q Okay. And would it also take into account any**  
13 **steam that was being recycled from the high pressure to**  
14 **the intermediate pressure, from the intermediate**  
15 **pressure to the --**

16 A That would be the -- most of the steam would  
17 be coming from that direction, yes.

18 **Q Okay. Is it possible that the pressure**  
19 **measured at the IP exhaust could deviate from the**  
20 **pressure measured at the low pressure inlet?**

21 A I think it's possible. It's unlikely that it  
22 would be a lot different. The pressure dropped through  
23 this pipe isn't very much, and I do believe Mitsubishi  
24 made calculations taking into account potential pressure  
25 drop across that pipe.

1 So they would give us -- like, let's use an  
2 example. It was 118 pounds here on the start of Period  
3 2. That may have meant they didn't want to exceed  
4 117 pounds here. I am just making that number up. I  
5 don't know. But when they used this as a proxy, they  
6 took into account the pressure drop possible through  
7 that pipe.

8 **Q Okay. When you installed a low pressure**  
9 **gauge, where did you put it?**

10 A Again, I don't know specifically, but it would  
11 be in this vicinity right here.

12 **Q Once you installed that low pressure gauge,**  
13 **did you make any comparisons between the pressure**  
14 **recorded at the IP exhaust and the pressure recorded at**  
15 **the low pressure inlet?**

16 A I don't know. I suspect our engineers did  
17 that comparison. It would make perfect sense, but I  
18 just -- I am not aware of that.

19 **Q So you don't know how reliable the low**  
20 **pressure exhaust --**

21 A The intermediate pressure?

22 **Q -- intermediate pressure exhaust readings were**  
23 **compared to the actual?**

24 A I am pretty confident that had they been --  
25 had we found an issue there, that that would have come

1 out during the root cause, during our analysis. And I  
2 didn't hear -- there was nothing that indicated that  
3 once we put this pressure gauge here on the LP inlet,  
4 that it showed any inconsistencies with what we were  
5 using at the IP exhaust.

6 **Q Okay. Thank you.**

7 **When you first purchased this unit, I assume**  
8 **all the parts get sent to Bartow and you put them all**  
9 **together, and that there is a period of testing for that**  
10 **unit prior to your acceptance of the unit, is that**  
11 **correct?**

12 A That is correct.

13 **Q So when you are doing this initial testing,**  
14 **are you doing the testing to make sure that the**  
15 **guarantees given in the contract can actually be met?**

16 A That's a piece of the testing. There is a lot  
17 of testing that goes on, and the contractual guarantee  
18 testing would be part of the later tests that are  
19 conducted.

20 At first, you want to make sure that, first of  
21 all, the equipment operates the way it's supposed to  
22 operate; that it can operate over a certain period of  
23 time. So typically, there might be a 96-hour run where  
24 you monitor conditions and make sure that the equipment  
25 is doing what it's supposed to do over a longer run.

1 There would be tests where you would cycle off  
2 and on to make sure that valves and dampers and  
3 different pieces of equipment operate the way they are  
4 supposed to when you shut down and when you start up a  
5 process because those put more stress on equipment when  
6 you do startups and shutdowns. So those are all part of  
7 the performance tests.

8 Eventually, you would get to contractual  
9 testing, just to make sure from the contract that we can  
10 execute the contract effectively, and prove that the  
11 guarantee was met or not.

12 **Q Okay. And I want to go back to Exhibit 110.**  
13 **And look on page 12432, which is 3.2 of the agreement.**

14 A Okay. I am there.

15 MR. BERNIER: I am sorry, which page? I am  
16 sorry.

17 MS. BROWNLESS: 3-2.1. It's 12432.

18 MR. BERNIER: Thank you.

19 MS. BROWNLESS: Its section 3.2, guaranteed  
20 performance.

21 MR. BERNIER: Thanks.

22 MS. BROWNLESS: Are you good?

23 MR. BERNIER: Yep. Thank you.

24 MS. BROWNLESS: Sure.

25 BY MS. BROWNLESS:

1 Q Okay. So I am going to turn to the very next  
2 page, 33, and ask about the figures that are on eight,  
3 nine and 10 there, LP admission steam pressure, LP  
4 admission steam temperature, LP exhaust pressure.

5 A Yes.

6 Q These are in the contract, but if I understand  
7 your testimony previously, you had no way to measure any  
8 of that directly, is that correct?

9 A Well, these are different points, so let's  
10 take one at a time, if we could.

11 No. 8, LP admission steam pressure, let me do  
12 eight and nine together, and if I could, I would like to  
13 approach the chart again.

14 So LP admission steam pressure and LP  
15 admission steam temperature, what this shows is a  
16 certain value -- at No. 8 it says, at LP SV inlet. So  
17 that's the low pressure stop value inlet --

18 Q Where is that?

19 A -- and it's admission pressure.

20 So remember, this is the LP admission line,  
21 okay. This is not -- this is not the -- it's this. So  
22 the stop valve is right here. So there is  
23 instrumentation -- or there was at that time, and I have  
24 no reason to doubt it's not still there. So the LP  
25 admission steam pressure was at this point right here,

1 at this valve. The LP admission steam temperature --  
2 well, it doesn't say, but I am assuming it's that same  
3 line. So it's the admission line.

4 Q Okay.

5 A And then the LP exhaust pressure, it says it's  
6 at LP casing outlet. So that's basically in the  
7 condenser. The outlet at the low pressure turbine dumps  
8 down into the condenser. So there is a measurement of  
9 pressure in the condenser.

10 Q Okay. And so were these parameters that you  
11 were adhering to throughout your operation in Period 1?

12 A These aren't operating limits. These are from  
13 a contractual standpoint in order to achieve the output  
14 of, in this case -- it was 420 in case 48. It was 389  
15 in case 24. These are the measurements that were likely  
16 when you are achieving that 420 megawatts. It's not  
17 thou shalt not exceed this temperature. Thou shalt not  
18 exceed this pressure. This is the likely pressure at  
19 that production limit.

20 Q Okay. And when you were testing this unit  
21 prior to purchase and you met these temperature and  
22 pressure limits, did, in fact, you produce the megawatts  
23 that were anticipated?

24 A Well, again, I wouldn't call these limits.

25 These are the predicted pressures and temperatures for

1 the heat cases that were used in the contract. It  
2 wasn't a limit that we had to stay below or stay above.  
3 It was the predicted outcome.

4 So I am sorry, could you repeat the rest of  
5 that question?

6 Q Here's what I am trying to figure out, you  
7 were --

8 A Oh, I think -- so did we achieve  
9 420 megawatts?

10 Q Yes.

11 A Yes, we did achieve 420 megawatts, with some  
12 corrections. There is errors in every instrument, or  
13 potential errors in every instrument. And so just like  
14 everything else, any time you take a measurement in a  
15 complex environment like this, there is debate. There  
16 is discussion.

17 I think when they first measured -- in fact, I  
18 think Mr. Rehwinkel pointed out a document earlier.  
19 When we first measured the performance test, I think we  
20 were achieving 402 megawatts. But then with some  
21 corrections to get to what the data should have been  
22 that we calculated it would have been 420 megawatts.

23 Q Were you ever given by Mitsubishi a -- in your  
24 operating manual or anything, something that said for  
25 the IRP RSV -- or the LP SV inlet, you cannot exceed X?

1 A Not that I am aware of. No.

2 Q Okay. Basically, then what you are telling me  
3 this says is if you have these conditions in eight, nine  
4 and 10, we guarantee that the output will be --

5 A At least 420 megawatts.

6 Q At least 420 megawatts?

7 A Yes.

8 Q And in your testing, that, in fact, proved to  
9 be true?

10 A Correct.

11 Q Okay. Now, can you tell me the difference  
12 between the numbers on the guaranteed performance and  
13 guaranteed acceptance test that we just discussed, and  
14 on the very next page, the liquidated damages guarantee?

15 A If you give me just one moment to look at the  
16 difference. So the difference between one 12433 and  
17 12434?

18 Q Yes.

19 A Oh, yes, ma'am. So page 12433 is heat balance  
20 case 24, which is 4-on-1 configuration with no duct  
21 firing. And page 12434 is heat balance case 48, which  
22 is 3-on-1 configuration with no duct. So those get  
23 different steam flows, pressures, temperatures that were  
24 predicted, different megawatt output at the generator  
25 predicted.

1 Q Did Duke personnel believe that knowing the  
2 manufacturer's parameters for the LP section of the  
3 steam turbine was necessary for operating the unit at  
4 420 before March of 2012?

5 A No, it did not.

6 Q And how did you go about establishing  
7 parameters for the LP pressure before the planned  
8 outage? Is that only parameter you had was the exhaust  
9 pressure from the IP?

10 A Before the 2012 outage? Well, it was as a  
11 result of the damage we found in 2012. That's when we  
12 came up with the new limit measured at that IP exhaust,  
13 and that was the best instrument that we had to use for  
14 LP in that pressure.

15 Q And before that, you just didn't have any?

16 A Correct.

17 Q Okay. After the March 2014 outage, did DEF  
18 personnel bring operating parameters for the LP part of  
19 the steam turbine to the attention of DEF's management?

20 A After the spring of 2014 outage, there was  
21 much discussion of those parameters, yes. That's when  
22 we started operating with an avoidance zone in place,  
23 the recommended avoidance zone from Mitsubishi, and so  
24 that had a great deal of discussion.

25 Q And so, again, you are measuring it at the IP

1 exhaust?

2 A No. The avoidance zone was a combination  
3 of -- yes. I am sorry. Yes. That's one of the  
4 pressures --

5 Q You are measuring -- that's --

6 A -- one of the pressures was measured there,  
7 yes.

8 Q And at that time, you are not only bringing it  
9 to the attention of your own management, you are  
10 bringing it to the attention of Mitsubishi, correct?

11 A Well, Mitsubishi is the one that calculated  
12 the avoidance zone and presented it to Duke Energy as a  
13 recommendation. So it really worked the other way.  
14 Mitsubishi said, in this combination of intermediate  
15 pressure, turbine exhaust and condenser vacuum, in these  
16 areas, avoid operating.

17 Q Okay. In Period 1, when you were increasing  
18 the output of the unit, in your -- in the time that you  
19 were testing the unit before you accepted it, was the  
20 plant -- did you ever -- let me start over.

21 When the Bartow Unit 4 combined cycle plant  
22 was tested prior to its commercial operation in June of  
23 2009, was the plant tested in a configuration that  
24 reflected commercial operation of the unit in a maximum  
25 total megawatt output scenario?

1 A I am confident it was, but I don't have that  
2 data available. I can't show you a document that shows  
3 that we did that.

4 Q Do you know how many combustion turbines were  
5 operational during the preliminary testing period?

6 A Well, during the preliminary testing -- the  
7 testing goes on for a long period of time, maybe even  
8 months, and with four combustion turbines being  
9 installed, and so I don't have any personal knowledge of  
10 that construction project. But having been involved  
11 with other construction projects, the likelihood is that  
12 as combustion turbines were finished, they were tested  
13 while other combustion turbines still had work ongoing.

14 So it's a sequence of events, and then the  
15 steam turbine comes on, and then you start testing in  
16 combined cycle mode. So I just don't know exactly what  
17 time period each different piece of equipment was ready  
18 for testing during that construction project.

19 Q And I guess what I am trying to ask is during  
20 the preliminary testing period, was there ever a point  
21 in time in which all four CTs and all four HRSGs with  
22 all the bells and whistles were tested?

23 A I don't know. I suspect there was, but I just  
24 don't know.

25 Q And do you have any information here today

1 what the megawatt output of that full-blown testing was?

2 A I don't.

3 Q Or what megawatt output of just the steam  
4 turbine was?

5 A I don't.

6 Q Would that type of testing been used to  
7 determine the 420-megawatt nameplate capacity of the  
8 unit?

9 A No. The testing would be an agreement between  
10 the EPC constructor, the owner of Progress Energy and  
11 the various OEMs on which heat balance case to use, and  
12 then replicate those conditions and see if those minimum  
13 contractual numbers were met.

14 Q Got it.

15 Was your assumption in Period 1, your Period 1  
16 operation, that if you stayed within the parameters  
17 given to you by Mitsubishi, whatever those parameters  
18 were, that any -- that the flow limits of the low  
19 pressure section, turbine section, would be okay, that  
20 it would take care of itself?

21 A Yes. That was the assumption.

22 Q Did your operating engineer at the time think  
23 that he should know any flow limits for the low pressure  
24 section or the inlet pressure for the LP turbine before  
25 returning the plant to service in April of 2012?

1 A When you say operating engineer.

2 Q The guy on the ground. The Mr. Wayne Tom's  
3 equivalent?

4 A Okay. Well, there was a lot of discussion  
5 between Mitsubishi and Duke Energy during that outage  
6 between Periods 1 and 2. And the plant manager and the  
7 operating staff at Bartow were part of those  
8 conversations when the 118-pound limit on the IP exhaust  
9 was recommended by Mitsubishi and we agreed to install  
10 that as an operating limit at that point, and we did.  
11 So yes, there was discussion around that point.

12 Q When we discussed where the gauges were  
13 located before, does your one gauge that you had reflect  
14 any additional pressure that comes from the HRSGs?

15 A The one gauge that we had being the IP exhaust  
16 that we talked about?

17 Q Yes.

18 A I don't know specifically. I suspect it did  
19 not. As we talked about, I think the gauge was likely  
20 located between the IP turbine and the point where the  
21 admission flow, the LP admission flow enters that line.

22 Q And so that could have caused additional  
23 pressure that wouldn't have been reflected?

24 A It could have. Now, there are -- and I don't  
25 know the operating pressures, but there are mechanical

1 constraints within the HRSG to make sure that we don't  
2 go above certain pressures in each section; safety  
3 valves, for instance; sky valves; vent valves that are  
4 operated as part of startups and shutdowns that are  
5 safeguards against over-pressurizing those lines. So I  
6 just want you to understand, there are other safeguards  
7 involved with that.

8 Q In 2009, did Mitsubishi provide any  
9 operational instructions for blending the steam produced  
10 by the four CTs prior to introduction into the steam  
11 turbine?

12 A I don't know if Mitsubishi provided blending  
13 instructions, or if they were provided. They were more  
14 likely provided by the EPC contractor of the project,  
15 because the HRSGs were manufactured by a different  
16 equipment manufacturer, so the EPC more than likely gave  
17 those operating procedures.

18 Q Okay. In other words, the manufacturer of the  
19 HRSGs themselves?

20 A Gave them to the consortium of Bibb and TIC  
21 that I talked about and became Kiewit, and so it  
22 probably would have come from Kiewit.

23 Q Okay. In 2009, did Mitsubishi provide any  
24 operating instructions for blending the steam produced  
25 by each HRSG with the steam removed from each of the

1 steam turbine sections?

2 A When you say steam removed from each of the  
3 steam turbine sections?

4 Q Recycled to each of the -- because you had  
5 exhaust steam from the high pressure that goes into the  
6 intermediate pressure, that then goes into -- were there  
7 any type of blending instructions for that?

8 A Well, again, any instructions like that likely  
9 would have come from the Kiewit the EPC.

10 Could I approach the chart again?

11 THE COURT: Sure.

12 THE WITNESS: This is a point that I think you  
13 need to understand.

14 The exhaust of the high pressure turbine --  
15 let me get the exact line here. So here is the  
16 inlet steam to the high pressure turbine. It goes  
17 through the high pressure turbine in this  
18 direction, exits here, and now it's called cold  
19 reheat steam. We need to reheat it, get the  
20 temperature back up and increase the energy in that  
21 steam.

22 So it's sent back to the HRSG and it's  
23 reheated. It's made into intermediate pressure  
24 steam, which is then -- comes down in that  
25 admission line we talked about before.

1 So again, you are -- we are mixing up the HRSG  
2 with the steam turbine operation, so any procedures  
3 having to do with blending steam in and out of  
4 different sections would be --

5 BY MS. BROWNLESS:

6 Q Between those sections would have to be come  
7 from the HRSG?

8 A Right. So the EPC, the Kiewit entity would be  
9 taking input from the HRSG manufacturer and the steam  
10 turbine manufacturer to provide those type of  
11 procedures.

12 Q Okay. In 2009, was there an exhaust system in  
13 place with pressure if the low pressure area rose above  
14 a certain level?

15 A Yes.

16 Q And can you show me where that is?

17 A Would you ask that again? If pressure -- I am  
18 sorry.

19 Q Was there an exhaust system in place if  
20 pressure in the low pressure area rose above a certain  
21 level?

22 A Well, there is multiple points where there is  
23 protection. There is protection -- you can't really see  
24 it on here, but there are rupture diaphragms. They are  
25 just a thin piece of material much like a porthole on a

1 ship or a submarine, but manufactured so that when  
2 they -- they will burst and relieve pressure or relieve  
3 vacuum. You might really want to relieve vacuum and let  
4 air come in. But there are rupture discs around the  
5 casing of the low pressure turbine. There are safety  
6 valves on the low pressure turbine -- on the admission  
7 steam line. And there are --

8 **Q On the HRSG?**

9 A Yes. And there are things called sky valves  
10 which are automatically operated valves that the  
11 operator controls to raise or lower pressure as needed  
12 to make sure that the pressures are suitable for  
13 admission into the system.

14 **Q Okay. If I look at what's Exhibit 80, which  
15 is the chart, the Table A, do you have that?**

16 A Exhibit 80?

17 **Q It's Table A.**

18 A Oh, Table A. I am sorry. Yes, I have that  
19 right in front of me.

20 **Q Okay. When was the request made of Mitsubishi  
21 to figure out a way to increase the megawatt output of  
22 the Bartow steam turbine to 450 megawatts?**

23 A That request was made during Period 2, when it  
24 became apparent with the 118-pound limit we had placed  
25 on the IP turbine exhaust would not allow us to even get

1 to 420 megawatts. We certainly were far away from the  
2 generator's capability of 468 megawatts, and so we  
3 started discussions with Mitsubishi on what, if  
4 anything, could be done to rectify that.

5 **Q Okay. And who made that request? Y'all made  
6 it to them? Who made it?**

7 A Yes. I don't know specifically who, but Duke  
8 Energy made that request to Mitsubishi.

9 **Q And why did you decide that you wanted to ramp  
10 it up to 450 at that time?**

11 A We felt that there was capability in that  
12 4-on-1 power block at Bartow that we weren't able to use  
13 that we should be able to use specifically with the  
14 generator. We knew we could generate steam flow.

15 Think about this for a minute, in case 48,  
16 heat balance 48 is three HRSGs -- three combustion  
17 turbines, three HRSGs, duct firing in the HRSG on the  
18 steam turbine and we achieved a corrected value of 420  
19 point something megawatts in order for the contractual  
20 minimum to be met.

21 At that time, everybody involved with the  
22 project knew there is more steam flow available. We  
23 weren't even using one of the combustion turbines and  
24 HRSGs. So we have this expensive power block that we  
25 know that there is more capability.

1 I know it's expensive replacing rows of  
2 blades, but when you think about a several-hundred-  
3 million-dollar project or power block being held up by  
4 perhaps the \$3 million row of blades, if there is a way  
5 to get all of the output -- all the capability out of  
6 the power block, then that's the prudent thing to do to  
7 make sure we can operate as efficiently as possible and  
8 as much output as possible for our customers.

9 **Q Wasn't the excess capability available when  
10 you first accepted the unit? I guess what I am trying  
11 to understand is was there anything in the design  
12 substantially different from the time you did the  
13 initial testing until 2012, when you decided to ask for  
14 more megawatts? What was different?**

15 A Well, during Period 1, we weren't operating  
16 with that 118-pound limit on the intermediate pressure  
17 turbine exhaust. So we were adhering to the other  
18 operating parameters, making sure we didn't exceed  
19 anything that had been provided by the OEM, and trying  
20 to take advantage of the full capability of the steam  
21 generator.

22 **Q Right. And I gets my question is --**

23 A I am sorry, the electrical generator.

24 **Q There was nothing different -- you didn't add  
25 any additional equipment, you didn't do anything, there**

1 **was nothing different between when you started out in  
2 Period 1 and you made this request to increase the  
3 nameplate capacity by another 30 megawatts?**

4 A That's correct. It was the same set of  
5 equipment with just a different operating parameter.

6 **Q Right. And the operating parameters had to do  
7 with the amount of steam that you were putting through  
8 the system?**

9 A Ultimately, yes.

10 **Q Okay. Because you would have expected that a  
11 4-on-1 configuration would give you a higher nameplate  
12 capacity than a 3-on-1 configuration?**

13 A Well, we would have expected that 4-on-1, if  
14 we had at least as much duct firing as the 3-on-1 case,  
15 yes, as long as we are staying within the capability of  
16 the generator, we should be able to do better than the  
17 420 megawatts.

18 **Q Okay. And I guess that gets me back to my  
19 original question, was why did you think 420 megawatts  
20 was acceptable in the first place if you knew you had  
21 another combustion turbine available?**

22 A So when you mean acceptable, why did we test  
23 at 420?

24 **Q Why did you accept 420 megawatts from the  
25 get-go and not a higher nameplate rating?**

1 A Yeah. So I don't know the specifics of why  
2 case -- heat balance case No. 28 and heat balance case  
3 No. 48 were selected between the consortium building the  
4 project and Progress Energy. Probably it's because we  
5 wanted to test or make sure that where we would normally  
6 operate the system runs efficiently at that normal  
7 operation range.

8 It wasn't a maximum operation. You typically  
9 don't run the Bartow combined cycle at maximum output.  
10 In fact, we can look at the data and there is many more  
11 hours not at maximum output than there are at maximum  
12 output.

13 We are following the load of the system and  
14 making sure we have the most efficient economic low-cost  
15 units in service. Bartow is one of the more efficient  
16 units, but we have other units that are more efficient  
17 and lower cost than Bartow. So we typically don't  
18 operate flat-out high -- highest load possible.

19 So I am speculating, but that's perhaps why it  
20 was tested at those levels. But remember, the  
21 420 megawatts for heat balance case No. 48 was the  
22 minimum that Mitsubishi had to achieve. It didn't mean  
23 that was a limit, or that was a maximum. We should be  
24 and were pleased that we could get more than  
25 420 megawatts if we still adhered to the operating

1 pressures that we were given, and temperatures.

2 Q And this may be redundant, but again I just  
3 want to make sure I understand.

4 Do you agree that Mitsubishi concluded in its  
5 September 22nd, 2017, analysis that excessive blade  
6 loading was the cause of the blade failure?

7 A I don't agree with that. Could you show me  
8 where that's -- the document that shows that?

9 MR. BREW: That's the rebuttal exhibit.

10 THE WITNESS: Actually, if we could look at  
11 JS-4. It's attached to my testimony.

12 MR. BERNIER: Judge, for what it's worth this  
13 is getting into rebuttal.

14 MS. BROWNLESS: Oh, I am sorry if it is.

15 MR. BERNIER: That's okay.

16 MS. BROWNLESS: I will stop.

17 MR. BERNIER: We are pointing it out. I was  
18 hearing it over here, and that's correct.

19 MS. BROWNLESS: No problem. No problem.

20 And if you give me just a minute.

21 THE COURT: Just wait for the next question.

22 THE WITNESS: Okay.

23 MS. BROWNLESS: Can I have a minute, please?

24 THE COURT: Sure.

25 MS. BROWNLESS: That's all I have, Your Honor.

1 Thank you.

2 THE COURT: Okay. Mr. Swartz, to plug on, all  
3 we have left is redirect.

4 MR. BERNIER: We do, and we need to consult  
5 real quick to see what we have for redirect, and it  
6 may be more than a half-hour set of questions, so  
7 maybe I don't know if we would want to do it in the  
8 morning.

9 THE COURT: I will leave that the will the  
10 group here. I mean, do we want to put off until  
11 tomorrow morning? I am just not sure -- I mean, I  
12 want to make sure we finish this in two days. I  
13 mean, is -- do we expect Mr. Polich to take as long  
14 as this did today?

15 MR. BERNIER: I can assure you I do not have  
16 as much for Mr. Polich as we have had for  
17 Mr. Swartz.

18 THE COURT: Okay. I mean, I am happy to  
19 recess if everybody wants to do that, but I was  
20 thinking if it's a half hour of questions, we may  
21 as well wrap it up and then start fresh in the  
22 morning.

23 MR. REHWINKEL: Yeah, I think that would be a  
24 good break.

25 THE COURT: We can take five. We can take

1 five.

2 MR. BERNIER: We can take some time.

3 THE COURT: Let's take a recess for about  
4 five.

5 (Brief recess.)

6 THE COURT: Okay, redirect.

7 MR. BERNIER: Thank you, Judge. And I  
8 appreciate that break. That was helpful. I think  
9 we were able to streamline this some.

10 FURTHER EXAMINATION

11 BY MR. BERNIER:

12 Q Mr. Swartz, you have been asked a good number  
13 of questions today primarily by Mr. Rehwinkel, but by  
14 others, about whether or not Mitsubishi in Period 1  
15 specifically ever provided any documentation to Duke  
16 Energy stating it was okay to operate over  
17 420 megawatts. Do you recall those questions?

18 A Yes.

19 Q Okay. Let me ask this in another way.

20 Did Mitsubishi in Period 1 specifically ever  
21 provide Duke Energy a document or any instructions  
22 saying do not operate over 420 megawatts?

23 A No.

24 MR. BERNIER: Okay. I think Mr. Hernandez has  
25 some questions for you.



1 MR. HERNANDEZ: I do.

2 EXAMINATION

3 BY MR. HERNANDEZ:

4 Q Mr. Swartz, let's stay with Period 1.

5 During Period 1, did Duke operate the steam

6 turbine at less than 420 megawatts?

7 A Yes, for considerable periods of time.

8 Q Can you give us an approximate percentage of

9 the time that it operated under 420?

10 A About half, I think. And how I achieve that

11 is there is a part of Mr. Polich's testimony actually,

12 Exhibit RAP-5, tabulates the number of hours that were

13 over 420 megawatts. So if you just look at that and

14 think about the number of operating hours in that

15 period, which can be found on JS-1 on the Table A on

16 page five and do the math, it's about half of the hours

17 were above and about half of the hours were below

18 420 megawatts.

19 Q Okay. Thank you.

20 You spoke in your testimony about pounds per

21 hour per square footage. Is that something that Duke

22 could have measured while operating the steam turbine?

23 A No. That's a calculated number.

24 Q So that's not a operating parameter that Duke

25 could have followed while operating the steam turbine?

1 A That's correct.

2 Q Okay. Did Mitsubishi participate in any of

3 the inspections that you testified about that Duke

4 conducted as it was replacing blades?

5 A Yes, in fact, every one. Each iteration of

6 installing different L0 blades, Mitsubishi was the

7 execution arm of that outage. We had Mitsubishi

8 personnel, engineers on site each time inspecting blades

9 with us, inspecting the entire low pressure turbine.

10 Q And I know that you testified that Duke found

11 no irregularities, no abnormalities, no damage to the

12 steam turbine components aside from the blades, but did

13 Mitsubishi find anything?

14 A Nothing was found. The rest of the low

15 pressure turbine blading diaphragms was all good in each

16 one of those inspections.

17 Q During Period 1, was there any way for Duke to

18 know that it operated within the avoidance zone during

19 Period 1?

20 A No. The avoidance zone wasn't actually

21 calculated until the beginning of Period 3, after we had

22 done testing using the temporary blade vibration

23 monitoring system. And it was only at that time that

24 Mitsubishi provided, or recommended avoidance zone.

25 The only reason that Table A in the Exhibit

1 JS-1 has hours in the avoidance zone and other periods

2 is because we back calculated that. If it had been in

3 existence, that's how many hours, but it didn't exist

4 until the beginning of Period 3.

5 Q Okay. I want to get some clarification on

6 heat balance testing. Is that something that is

7 actually -- you use the term testing, but is that

8 testing actually performed when the steam turbine is a

9 attached to the generator?

10 A No. The heat balance cases are actually

11 generated -- in this case, they were generated years

12 prior to construction of the power block. And they are

13 engineering predictions of output and other variables

14 based on different combinations of equipment and

15 operating parameters that may be in place when you get

16 to operation. So it's all theoretical.

17 Q So when actual testing was performed after the

18 steam turbine was actually installed, part of the

19 purpose of that was to determine whether or not the

20 steam turbine would perform in accordance with the heat

21 balance prediction?

22 A That's correct. And that's really important

23 from an efficiency standpoint especially. We want to

24 make sure we are getting the efficiency -- achieving the

25 efficiency of converting fuel into our product of

1 megawatts as designed. The long-term operation, 40

2 years operation of any power plant, that's really the

3 most important thing for the sake of the customer. So

4 that's why --

5 Q I am sorry. I think you testified that there

6 were approximately 300 heat balance predictions. During

7 the course of actual testing of the steam turbine, not

8 all of those prediction models were tested, correct?

9 A That's correct. There were over 300 heat

10 balance cases that were generated years before

11 construction, and then two were included in the contract

12 for liquidated damages purposes.

13 Q And there were some questions regarding the

14 settlement agreement, and the fact that within the

15 settlement agreement there was language indicating that

16 the parties negotiated an increase of megawattage from

17 420 to 450.

18 Can you tell me the significance of those

19 numbers, 420 and 450, in the context of the settlement

20 agreement, why were they put in there?

21 A Sure. They are good reference numbers. And

22 just like the 420 was a minimum that Mitsubishi had to

23 meet to get full payment on the original project, the

24 450 was what we wanted to achieve as a minimum with a

25 redefine of the blades.



1 Q So the 450 in the context of the settlement  
2 agreement was similar to the 420 guaranteed amount set  
3 forth in the contract by Mitsubishi, is that correct?

4 A Yes, that's accurate.

5 MR. HERNANDEZ: No further questions, Judge.

6 MR. MOYLE: I was going to say so much for the  
7 relevancy of the settlement agreement, to tweak my  
8 friend Mr. Bernier.

9 THE COURT: I am assuming there is no point  
10 starting with another witness this evening. I take  
11 it we are all in agreement we should stand in  
12 recess until nine o'clock in the morning?

13 MR. MOYLE: Yes. Thank you, Your Honor.

14 THE COURT: See you then.

15 (Whereupon, the proceedings adjourned for the  
16 day at 4:50 p.m., and the transcript continues in  
17 sequence in Volume 3.)  
18  
19  
20  
21  
22  
23  
24  
25

1 CERTIFICATE OF REPORTER


2 STATE OF FLORIDA )  
3 COUNTY OF LEON )  
4

5 I, DEBRA KRICK, Court Reporter, do hereby  
6 certify that the foregoing proceeding was heard at the  
7 time and place herein stated.

8 IT IS FURTHER CERTIFIED that I  
9 stenographically reported the said proceedings; that the  
10 same has been transcribed under my direct supervision;  
11 and that this transcript constitutes a true  
12 transcription of my notes of said proceedings.

13 I FURTHER CERTIFY that I am not a relative,  
14 employee, attorney or counsel of any of the parties, nor  
15 am I a relative or employee of any of the parties'  
16 attorney or counsel connected with the action, nor am I  
17 financially interested in the action.

18 DATED this 18th day of February, 2020.  
19  
20

21   
22 DEBRA R. KRICK  
23 NOTARY PUBLIC  
24 COMMISSION #GG015952  
25 EXPIRES JULY 27, 2020