

FILED 2/18/2020
DOCUMENT NO. 00963-2020
FPSC - COMMISSION CLERK

**FLORIDA PUBLIC SERVICE COMMISSION
OFFICE OF COMMISSION CLERK**



[Handwritten signature] 4/7/2026
DECLASSIFIED

DOCUMENT NUMBER ASSIGNMENT*

FILED DATE: 2/18/2020
DOCKET NO.: 20200001-EI
DOCUMENT NO.: 00963-2020
DOCUMENT DESCRIPTION:

CONFIDENTIAL

TRANSCRIPT (CONFIDENTIAL) - Volume 2, pages 157 to 290, of 2/4/20 final hearing held at DOAH before The Honorable Lawrence P. Stevenson [Case No. 19-006022]. [x-ref DNs 00962-2020, 00964-2020, 00967-2020, 00968-2020, 00969-2020, 00970-2020, 00971-2020, 00972-2020, 00973-2020, 00974-2020, 00975-2020, 00976-2020, 00977-2020, 00978-2020, 00979-2020, 00981-2020, 00982-2020, 00983-2020]

***This document number has been assigned to a confidential document.
For further information, contact the Office of Commission Clerk.**

E-MAIL: CLERK@PSC.STATE.FL.US PHONE No. (850) 413-6770 FAX No. (850) 717-0114

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

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
(850) 894-0828

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

INDEX TO WITNESSES

WITNESS	PAGE
Examination by Mr. Moyle	208
Examination by Mr. Brew	233
Examination by Ms. Brownless	254
Further Examination by Mr. Bernier	284
Examination by Mr. Hernandez	285

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

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 **R**estrictions", 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 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 smosh 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.)

18

19

20

21

22

23

24

25

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

CERTIFICATE OF REPORTER

STATE OF FLORIDA)
COUNTY OF LEON)

I, DEBRA KRICK, Court Reporter, do hereby
certify that the foregoing proceeding was heard at the
time and place herein stated.

IT IS FURTHER CERTIFIED that I
stenographically reported the said proceedings; that the
same has been transcribed under my direct supervision;
and that this transcript constitutes a true
transcription of my notes of said proceedings.

I FURTHER CERTIFY that I am not a relative,
employee, attorney or counsel of any of the parties, nor
am I a relative or employee of any of the parties'
attorney or counsel connected with the action, nor am I
financially interested in the action.

DATED this 18th day of February, 2020.



DEBRA R. KRICK
NOTARY PUBLIC
COMMISSION #GG015952
EXPIRES JULY 27, 2020