

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 1

PAGES 1 - 156

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 and
Notary Public in and for the
State of Florida at Large

PREMIER REPORTING
114 W. 5TH AVENUE
TALLAHASSEE, FLORIDA
(850) 894-0828

1 APPEARANCES:

2 MATTHEW R. BERNIER, and DIANNE M. TRIPLETT,
3 ESQUIRES, 106 East College Avenue, Suite 800,
4 Tallahassee, Florida 32301-7740, appearing on behalf of
5 Duke Energy Florida, LLC.; and DANIEL HERNANDEZ,
6 ESQUIRE, Shutts & Bowen, Suite 300, 4302 West Boy Scout
7 Boulevard, Tampa, FL 33607, appearing on behalf of Duke
8 Energy.

9 J.R. KELLY, PUBLIC COUNSEL; CHARLES REHWINKEL,
10 DEPUTY PUBLIC COUNSEL; and THOMAS A. (Tad) DAVID,
11 ESQUIRE, Office of Public Counsel, c/o the Florida
12 Legislature, 111 W. Madison Street, Room 812,
13 Tallahassee, Florida 32399-1400, appearing on behalf of
14 the Citizens of the State of Florida.

15 JON C. MOYLE, JR., ESQUIRE, and KAREN A.
16 PUTNAL, ESQUIRE, Moyle Law Firm, P.A., 118 North Gadsden
17 Street, Tallahassee, Florida 32301, appearing on behalf
18 of Florida Industrial Power Users Group.

19 JAMES WALTER BREW, ESQUIRE, Stone Law Firm,
20 Eighth Floor, West Tower, 1025 Thomas Jefferson Street
21 Northwest, Washington, DC 20007, appearing on behalf of
22 White Springs Agricultural Chemicals, PCS Phosphate.

23 SUZANNE BROWNLESS, and BIANCA LHERISSON,
24 ESQUIRES, FPSC General Counsel's Office, appearing on
25 behalf of the Florida Public Service Commission Staff;

1 KEITH HETRICK GENERAL COUNSEL, DEPUTY GENERAL COUNSEL,
2 Florida Public Service Commission, 2540 Shumard Oak
3 Boulevard, Tallahassee, Florida 32399-0850, adviser to
4 the Florida Public Service Commission.

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

1	INDEX TO WITNESSES	
2	WITNESS	PAGE
	JEFF SWARTZ	
3	Examination by Mr. Bernier	37
4	Prefiled direct testimony inserted	39
	Examination by Mr. Rehwinkel	56
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		

1	INDEX TO EXHIBITS			
2	NO.	DESCRIPTION	IDENTIFIED	ADMITTED
3	114	Revised Comprehensive Exhibit List	11	11
4	115	RCA draft	35	
5	116	3/18/2015 40-inch blade telemetry	35	
6				
7				
8				
9				
10	*Huh-uh is a negative response			
11	*Uh-huh is a positive response			
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				

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

2 THE COURT: We will go ahead and call the
3 hearing to order.

4 We are here today in the case styled In Re:
5 Fuel and Purchased Power Cost Recovery Clause with
6 Generating Performance Incentive Factor. It's DOAH
7 case number 19-6022. It's a Public Service
8 Commission case.

9 My name is Lawrence Stevenson. I am the
10 Administrative Law Judge assigned to hear the case.
11 And I guess at the outset, we should get
12 appearances entered. I am just going to go in the
13 order that's in our little -- we've got a little
14 cheat sheet here for how we are going to handle
15 this proceeding.

16 Representing Duke Energy.

17 MR. BERNIER: Good morning, Judge Stevenson,
18 Matt Bernier on behalf of Duke Energy.

19 MR. HERNANDEZ: Good morning, Your Honor.
20 Daniel Hernandez with Shutts & Bowen on behalf of
21 Duke Energy.

22 MR. BERNIER: And, Judge, I would also enter
23 an appearance for Dianne Triplett, who will be here
24 shortly.

25 THE COURT: Okay. I have got her, so that's

1 good.

2 MR. HERNANDEZ: And, Your Honor, seated with
3 us is Mr. Jeff Swartz. He's a representative of
4 the company, and also will be testifying as a
5 witness.

6 MR. SWARTZ: Good morning, Your Honor.

7 THE COURT: A face with all the testimony I
8 have read. That's good.

9 And Office of Public Counsel.

10 MR. REHWINKEL: Good morning, Your Honor,
11 Charles Rehwinkel with the Office of Public
12 Counsel.

13 MR. DAVID: And Thomas A. "Tad" David with the
14 Office of Public Counsel.

15 MR. BREW: I am not with the Office of Public
16 Counsel.

17 THE COURT: Okay. Very good.

18 MR. REHWINKEL: And, Your Honor, I would like
19 to enter an appearance for J.R. Kelly, the Public
20 Counsel, he's here with us.

21 THE COURT: Okay. I have got Mr. Kelly
22 checked off as well.

23 And for -- I still don't have the acronym
24 down. Is it FIPUG?

25 MR. MOYLE: FIPUG, it's Florida Industrial

1 Power Users Group.

2 THE COURT: I am more comfortable saying that.

3 MR. MOYLE: Right, and that's fine. Judge
4 Peterson, we recently had a case and he called us
5 Florida Industrial, and so we will answer to
6 anything, Your Honor.

7 THE COURT: That's good. With me, I think
8 power users, whatever.

9 MR. MOYLE: So I'm Jon Moyle with the Moyle
10 Law Firm representing the industrial users, and
11 Karen Putnal of our firm is also here, I would like
12 to enter an appearance for her as well.

13 THE COURT: Okay. Very good.

14 And PCS Phosphate.

15 MR. BREW: Yes, Your Honor. For White Springs
16 Agricultural Chemicals, PCS Phosphate, I am James
17 Brew from Stone Mattheis Xenopoulos & Brew.

18 THE COURT: Very good.

19 And last but not least, the Public Service
20 Commission.

21 MS. BROWNLESS: Good morning, Your Honor. My
22 name is Suzanne Brownless, appearing on behalf of
23 the Florida Public Service Commission staff. Also
24 appearing is Bianca Lherisson. And we would like
25 to enter a notice of appearance for Keith Hetrick,

1 our General Counsel.

2 THE COURT: Okay. Very good.

3 And our next order of business I guess is to
4 close the hearing. I have to rely on counsel to be
5 my police in this respect. I am assuming that, as
6 of now, everyone is in the room belongs in the
7 room, is that correct?

8 MR. BERNIER: I believe that's correct, and I
9 have asked the counsel for the other
10 representatives to let me know if somebody enters
11 and they are a member of their party so we don't
12 have to disrupt anything.

13 THE COURT: Okay. That's fine.

14 MR. BERNIER: But if somebody does that we
15 don't know, we will let you know.

16 THE COURT: That's fine. I guess I will give
17 you a high sign if I see someone.

18 Mr. Rehwinkel.

19 MR. REHWINKEL: Your Honor, I don't know if
20 our microphones are working. The light is not
21 coming on.

22 THE COURT: Gee. That's not in my bailiwick.
23 I mean, I can hear you fine.

24 MR. REHWINKEL: Okay.

25 THE COURT: We are not -- I just don't know if

1 the court reporter can.

2 COURT REPORTER: I'll let you know.

3 THE COURT: Okay. The first break, I will go
4 talk to somebody about it and see what we can do.

5 MR. DAVID: The switch was off.

6 THE COURT: Oh, is that it?

7 MR. DAVID: Yeah.

8 THE COURT: There is a little green light that
9 comes on.

10 MR. REHWINKEL: Thank you.

11 THE COURT: Okay. Well, we've got exhibits.
12 Did we want to get the exhibits up here at this
13 time?

14 MS. BROWNLESS: Yes, Your Honor.

15 As you know, we've already stipulated to
16 exhibits on the comprehensive exhibit list, Exhibit
17 Nos. 1, 68 through 76, 80 through 82 and 100, and
18 those have been previously provided to the Court
19 and the parties.

20 We have other exhibits on the comprehensive
21 exhibit list that have been marked for
22 identification, and I believe the parties also
23 think that there is no need to authenticate those
24 documents. Do I have that correct?

25 MR. HERNANDEZ: That is correct, Your Honor.

1 MS. BROWNLESS: Okay. And so what we would
2 like to do at this time is hand out a revised
3 comprehensive exhibit list.

4 THE COURT: Okay.

5 MS. BROWNLESS: And at this time, we would
6 like that marked as Exhibit No. 114 and ask that it
7 be admitted into evidence.

8 THE COURT: Hearing no objections, we will
9 mark the exhibit -- the revised comprehensive
10 exhibit list as staff -- Commission staff Exhibit
11 114, and show it admitted.

12 (Whereupon, Exhibit No. 114 was marked for
13 identification and received into evidence.)

14 MS. BROWNLESS: Thank you, Your Honor.

15 THE COURT: And I think that takes care of all
16 of our business up to the opening statements.

17 I went through my usual list of questions that
18 I ask at the beginning of a hearing, and I know
19 this is not a conventional hearing. The only one
20 that I sort of want an answer to, I think I know
21 the answer to this, but I want it on the record is
22 who has the burden, and what is the burden in this
23 proceeding? I sort of assume it's probably Duke
24 Energy and it's probably by a preponderance, but --

25 MR. BERNIER: Yes, sir.

1 THE COURT: -- do we have sort of agreement on
2 that?

3 MR. BERNIER: Yes, sir, we agree with both of
4 those.

5 MR. REHWINKEL: Yes, sir.

6 THE COURT: Okay. That takes care of any
7 concerns that I had.

8 And at this time, I guess we can move on to
9 opening statements. And was there agreement as to
10 who goes first? I am assuming it would be Duke.

11 MR. BERNIER: I think so. So I will go ahead.

12 Thank you. Good morning, again, Judge
13 Stevenson. Matt Bernier for Duke Energy.

14 The issues presented to you today can be
15 boiled down to one overarching question, and is
16 that did Duke Energy prudently operate the Bartow
17 steam turbine? Now, the Public Service
18 Commission's prudent standard asks did DEF act as a
19 reasonable utility manager would given the
20 information it knew or reasonably should have known
21 at the time it acted?

22 And this is not a hindsight review, because
23 with the benefit of hindsight, most reasonable
24 people can identify something that they would do
25 differently.

1 In this case, the preponderance of the
2 evidence shows that DEF acted prudently at all
3 times given the information DEF knew or should have
4 known, because DEF, at all times, operated the
5 machine in compliance with the manufacturer's
6 guidelines, which is the standard industry
7 practice.

8 Now, Duke Energy purchased the Bartow combined
9 cycle steam turbine from Mitsubishi Power Systems.
10 The steam turbine was designed for use by a third
11 party, but that project never came to fruition, and
12 the steam turbine was never delivered to the third
13 party.

14 Prior to the purchase, Mitsubishi was
15 responsible for ensuring the turbine was compatible
16 and acceptable for the use at Bartow. They were
17 also responsible for providing Duke Energy with the
18 operating parameters for the unit. DEF was
19 responsible for operating the unit within those
20 parameters, which it did.

21 Notwithstanding DEF's compliance with the
22 operating guidelines, during a planned outage in
23 the spring of 2012, after approximately three years
24 of operation, damage was discovered on the last
25 stage of blades in the low-pressure turbine. The

1 last stage blades are also referred to as the L0
2 blades. You will hear both, and we have an actual
3 representation of the blade over there on the side
4 of the courtroom for you so you can see it.

5 THE COURT: Oh, okay. I walked right by it.

6 MR. BERNIER: So that's what we will be
7 talking about today.

8 We also have a diagram that staff has provided
9 of the operation and the actual steam turbine with
10 CTs and everything that Mr. Swartz and maybe Mr.
11 Polich will be referring to.

12 Now, DEF discovered the damage during an
13 inspection as part of an unrelated outage and
14 consulted with Mitsubishi, which recommended
15 replacing the L0 blades on the turbine end of the
16 steam turbine prior to restarting operations. The
17 damaged blades were replaced and the operating
18 parameters were also adjusted by Mitsubishi,
19 resulting in the establishment for the first time
20 of a new exhaust pressure limit on the intermediate
21 pressure portion of the turbine.

22 Now, during of this second period of
23 operation -- and you are going to hear us referring
24 to different periods of operation, and those
25 periods are shown on Mr. Swartz's Exhibit JS-2,

1 it's No. 80 on the comprehensive exhibit list, and
2 it's Duke Energy's root cause analysis. That
3 breaks it down into the various periods you are
4 going to hear us discuss throughout this hearing.

5 During the second period of operation, DEF
6 complied with the modified operating parameters,
7 but DEF wanted to return to the output from the
8 machine that it was previously able to provide when
9 operated to its original higher specifications. To
10 be clear, beneficially extracting as much energy
11 from the steam being produced by the combustion
12 turbines benefits Duke Energy's customers.

13 Therefore, during Period 2, DEF contracted for
14 new heavy-duty blades that would allow the machine
15 to produce additional megawatts. When the unit was
16 removed from service to install these new upgraded
17 blades, damage was discovered on the Period 2
18 blades. So at the outset of Period 3, Mitsubishi
19 installed temporary blade vibration monitoring to
20 allow for telemetry testing to better understand
21 what was happening with the blades.

22 As a result of that testing, for the first
23 time, Mitsubishi created an avoidance zone, which
24 is a combination of steam pressure and condenser
25 pressures that should be avoided or minimized

1 during stable operations, and that was communicated
2 to Duke Energy around four months into Period 3.

3 Again, notwithstanding DEF's compliance with
4 these new operating parameters, including avoiding
5 operation in the newly-established avoidance zone,
6 the new upgraded blades again suffered damage. For
7 the first time, however, the damaged areas shifted
8 from the mid-span snubbers, which I believe is
9 right in the middle of the blade, and shifted out
10 to what's called the Z-locks, which are at the end
11 of the blade. And this led DEF to the conclusion
12 that the modifications simply shifted rather than
13 corrected the blade issues.

14 This Period 3 experience led to further blade
15 modifications and reduced operating parameters in
16 addition to the avoidance zone for the Period 4
17 operations.

18 Once again, although DEF complied with the
19 reduction and operating pressures, knowing that
20 those modifications to the operating specifications
21 would result in reduced output for its customers,
22 the Period 4 blades were also found to have damage
23 after approximately five months of operation.

24 At this point, DEF determined the best course
25 of action was to go back to the first iteration of

1 blades, which, coupled with further reduction in
2 steam pressure, was thought to provide the best
3 chance of event-free operation while Duke Energy
4 and Mitsubishi could more fully understand the
5 cause of the damage. However, DEF's operators
6 detected an indication of blade damage in these
7 Period 5 blades after only approximately 1,500
8 hours of operation.

9 Again, the blades were damaged even though the
10 unit was operated pursuant to the most conservative
11 guidelines provided to date. Therefore, DEF
12 determined the prudent intermediate path forward
13 was to replace the last-stage blades altogether
14 with pressure plates. These plates allow steam to
15 pass through the turbine but do not rotate and,
16 therefore, do not contribute to generating power
17 resulting in a reduction in potential generating
18 capacity. However, the pressure plates did allow
19 for event-free operation for the benefit of Duke
20 Energy's customers.

21 It's also important to remember that DEF was
22 able to discover each instant of blade damage --
23 instance, excuse me -- before catastrophic failure
24 could occur.

25 As this course of events was playing out, and

1 in addition to cooperating with Mitsubishi on their
2 various root cause analyses, which I think you will
3 hear about today, DEF was engaged in performing a
4 root cause analysis analyzing the information
5 gleaned from each of the different incidents.

6 DEF's root cause analysis specifically
7 considered six potential failure causes, three
8 operational causes and three design causes.

9 Ultimately, DEF determined that none of the
10 reviewed causes in isolation or in combination
11 could explain the various blade episodes. Thus,
12 DEF was left with one conclusion: The blades' lack
13 of adequate design margin did not allow the blades
14 to operate without incident at even the reduced
15 operating pressures recommended by the equipment
16 manufacturer.

17 Said differently, under normal operating
18 conditions within Mitsubishi's operating
19 guidelines, the blades were not designed to handle
20 the pressures found within the low pressure
21 turbine. DEF had no way of knowing this
22 information. It prudently relied on Mitsubishi and
23 operated the machine according to their
24 instructions, as it would any other machine across
25 its fleet.

1 Now, Public Counsel's witness, Mr. Polich,
2 based on his review of documents, has determined
3 that the cause of the failures is very simple. He
4 believes that DEF ran the steam turbine too hard in
5 the first period of operation. More specifically,
6 Mr. Polich concluded that the operation of the
7 steam turbine in a manner that produced over
8 420 megawatts caused the blade damage, and had the
9 unit not been operated in this manner, the original
10 blades would still be in the machine and operating
11 today.

12 This conclusion is contradicted by the later
13 episodes that occurred without reaching the
14 operation levels Mr. Polich asserts caused the
15 damage.

16 During his deposition, Mr. Polich candidly
17 agreed that DEF operated the unit prudently in each
18 period other than the first.

19 Of course, if DEF operated -- prudently
20 operated the blades in those latter periods, as Mr.
21 Polich agrees, and the blades still suffered
22 damage, there must be a cause, and that cause is
23 the lack of adequate design margin as DEF has
24 concluded.

25 Now, not only does the later operating

1 experience and blade damage at lower operating
2 pressures show that the original blade damage was
3 not caused by operating in excess of 420 megawatts,
4 Mr. Polich also admitted that he does not and
5 cannot know at what point during Period 1 the
6 original blades failed.

7 Because he cannot know when the original
8 blades were damaged, it follows that he does not
9 know how the steam turbine was being operated at
10 the time the damage occurred, or whether the damage
11 occurred when the unit was being operated above or
12 below 420 megawatts of output.

13 Now, obviously this begs the question, how can
14 he be so certain that it was simply operation above
15 420 megawatts that caused this damage?

16 Now, this is important, because under Mr.
17 Polich's definition, operating below 420 megawatts
18 was prudent. And if the damage occurred during
19 prudent operation, the damage is certainly not
20 DEF's fault.

21 And Mr. Swartz will testify that the Bartow
22 plant was operated pursuant to industry standards
23 and in line with the best interest of customers.
24 The goal of plant operators is to maximize the
25 output of generating units. This allows the

1 utilities to avoid building additional generation
2 or operating less cost-effective units to meet
3 demand and, therefore, it saves customers money.
4 Moreover, his testimony demonstrates that the steam
5 turbine was at all times operated by the guidelines
6 provided by Mitsubishi.

7 In short, DEF operated the steam turbine
8 prudently from commissioning up until the
9 February 2017 outage, and prudently installed
10 pressure plates in place of the malfunctioning
11 blades while a long-term solution could be devised,
12 tested and implemented. Therefore, DEF should be
13 permitted to recover its prudently incurred costs.

14 And I apologize for taking so long, that's
15 more than I have ever said. Thank you.

16 THE COURT: I guess Office of Public Counsel
17 goes next.

18 MR. DAVID: Yes, sir. Good morning, Judge
19 Stevenson.

20 My name is Tad David with the Office of Public
21 Counsel, and we represent the customers of Duke
22 Energy Florida. We are here to establish facts,
23 facts that we contend showed Duke Energy made
24 foreseeable errors in the operation of its Bartow
25 plant, errors that cost money, money that Duke

1 Energy now wants its customers to pay.

2 As you will see from the evidence, the
3 sequence that links the customers to these errors
4 is tenuous, but the link between Duke Energy's
5 imprudent decisions and these errors is direct and
6 proximate. Further, we will show that Duke
7 initially concluded that the damage was caused by
8 its operation of the plant.

9 As an investor-owned utility in Florida, Duke
10 has a duty to make prudent and reasonable decisions
11 in operating its generation facilities, and
12 regarding any items that add cost for customers.

13 In this case, Duke had the resources and
14 information that should have informed them of the
15 proper operation of the Bartow plant. They knew or
16 should have known that the way the Bartow plant was
17 being operated was beyond the prudent operation of
18 that plant. Through the exercise of due diligence
19 and prudence, Duke should have understood that the
20 output was entirely too good to be true. Their
21 imprudent operation directly damaged this plant and
22 cost money.

23 In this case, we are asking that the fuel
24 clause recovery requested by Duke be reduced by an
25 amount equal to the additional fuel cost caused by

1 Duke's imprudent operation of the plant, additional
2 costs they are now trying to recover from
3 customers. These costs should not be paid by
4 Duke's customers.

5 No documentation exists that showed shows the
6 manufacturer ever indicated that the steam turbine
7 could generally be operated to produce an output
8 above 420 megawatts during the initial period. The
9 steam turbine was not designed to operate above
10 420 megawatts for any extended period of time. And
11 the contract with Mitsubishi, who was manufacturer
12 of the steam turbine, did not contemplate it
13 operating above 420 megawatts of output.

14 For the period of July 2009 through
15 February 2012, Duke operated the steam turbine
16 above 420 megawatts for a total of 2,972 hours,
17 including 2.4 hours above 450 megawatts, 1,555
18 hours above 440 megawatts and 2,302 hours above 430
19 megawatts.

20 As Mr. Bernier mentioned, in March of 2012,
21 upon a routine inspection of the low pressure
22 section of the steam turbine, Duke discovered that
23 parts of the turbine were damaged. Since that
24 time, for the past eight years, Duke has been
25 trying to fix this steam turbine.

1 The evidence will show that the problems, and
2 more importantly the costs at issue in this case
3 cascade from Duke's operation of the Bartow plant
4 in that initial period of operation from 2009 to
5 2012. This was Duke's fault.

6 The first evidence that Duke requested
7 Mitsubishi consent to run the plant above
8 420 megawatts was in July of 2012, after the damage
9 had been discovered in the first period.

10 The reply to this request was basically, hold
11 on, you know, let's be careful. After the damage
12 was discovered in March of 2012, the steam turbine
13 never again consistently achieved 420 megawatts,
14 except during very limited periods in a testing
15 environment.

16 Later in 2012, Mitsubishi indicated that they
17 could do an analysis of the circumstances that
18 might allow the plant to produce -- to consistently
19 produce 420 megawatts, but this analysis would cost
20 \$232,000 just to perform the analysis. There is no
21 evidence that Duke commissioned Mitsubishi to
22 perform this analysis.

23 In March 2018, Duke completed a root cause
24 analysis of the problems experienced with the steam
25 turbine at the Bartow plant. This root cause

1 analysis was originally initiated to establish the
2 cause of the damage discovered in -- during the
3 first period beginning, you know, in March of 2012.

4 Drafts of this root cause analysis indicate
5 that Duke engineers initially acknowledged that
6 Duke contributed to the damage by introducing
7 excessive steam pressure into the low pressure
8 section of the steam turbine.

9 Over time, Duke's root cause analysis drafters
10 softened the role that the excessive steam pressure
11 played in the damage and focused instead on the
12 blade design issues that followed the initial
13 damage and failures.

14 We do not know the reason behind all the
15 subsequent edits or revisions, however, you know,
16 presumably not because the admitted information
17 strengthens the argument that it was not -- the
18 problems were not Duke's fault.

19 The evidence will show that no similar
20 Mitsubishi steam turbines with the same blades has
21 had blade damage or failures like that experienced
22 at the Bartow plant.

23 Through Mr. Swartz's direct and rebuttal
24 testimony, Duke will try to invert the cause and
25 effect in this case. They will point to situations

1 after they damaged the turbines to support the idea
2 that similar but not identical situations did not
3 damage the turbine during the initial period.

4 The evidence they will try to use, in fact,
5 shows that Duke decided it was easier to ask for
6 forgiveness than permission to increase the output
7 from the steam turbine and that Duke imprudently
8 operated the turbine in such a fashion that it was
9 damaged, potentially irreparably damaged.

10 This case, as you have already heard, revolves
11 around some technical subjects. We will discuss
12 succinctly as possible how this particular type of
13 power plant works; how the operation of the plant
14 affects the components of the plant; and how the
15 operation and the resulting breakdowns have
16 increased the cost of operating the plant.

17 Lastly, we will explain why it is appropriate
18 for only prudently and necessarily incurred fuel
19 expenses to be recovered from ratepayers in the
20 fuel clause.

21 We cannot forget, Duke bears the burden of
22 proof in this case to establish its entitlement to
23 the recovery of replacement power costs as
24 prudently and necessarily incurred. We are
25 certainly not here to suggest that Duke Energy or

1 any of its employees are bad. The bottom line is
2 that someone at Duke made errors, foreseeable
3 errors that cost money, money that Duke Energy now
4 wants its customer to pay.

5 We believe that you will see that Duke, not
6 its customers, should be the one that bear these
7 additional avoidable costs.

8 Thank you.

9 THE COURT: Thank you, Mr. David.

10 Next will be Mr. Moyle.

11 MR. MOYLE: Thank you, Your Honor.

12 Again, Jon Moyle for the Florida Industrial
13 Power Users Group.

14 Your Honor, my client is comprised of a number
15 of entities that use a lot of power 24/7, and the
16 cost of power is important to them. A lot of them
17 compete in markets not only in the United States,
18 but internationally. I characterize them as folks
19 in the pulp and paper business, the phosphate
20 business, the chemical business, metal recycling.
21 There is a wide variety of folks. I just wanted to
22 share that with you to give you a little sense of
23 why I am here and who I represent.

24 I think that, as noted, the burden of proof,
25 obviously, is very important. I don't think there

1 is a disagreement that Duke bears that burden. And
2 they have a tough burden to overcome. As you
3 heard, I don't think it's really in dispute that
4 Duke operated this plant initially when they got it
5 out of a warehouse in Japan.

6 They brought it over, it sat in a warehouse
7 for, I think, a number of years in Japan. And when
8 they brought it here, they ran it beyond its
9 420-megawatt capabilities. And I don't think you
10 will hear disputes about that, that in terms its
11 operation, it was beyond that.

12 So with that fact going in, I think they have
13 a tough hill to climb to show, well,
14 notwithstanding that, we still should recover the
15 monies in dispute.

16 And I think it's also helpful for -- to put in
17 context the monies in dispute here. These issues,
18 as you know, are a couple of issues that in the
19 fuel docket. And the fuel docket is an annual
20 docket that the PSC opens. All of us are in it and
21 participate in it.

22 And in the fuel docket, of which these two
23 issues have been spun off for your consideration,
24 Duke -- the Commission has already ordered that
25 Duke recover, its a big number, 1.3 billion

1 approximately -- for the record, 1,303,329,632 --
2 and that's in an order from the PSC. So what we
3 are arguing about today is give or take
4 approximately one percent of monies that have
5 already been ordered to be recovered by the
6 Commission.

7 And in terms of thinking about how to make the
8 opening point with you, you are going to hear a lot
9 of technical information today. But I think it's
10 important to note that, you know, the ratepayers, I
11 would draw an analogy of the ratepayers maybe to a
12 homeowner who is going to get a new home built.
13 And the homeowner contracts with knowledgeable
14 people, an architect and a general contractor to
15 build a home. And if a construction defect occurs,
16 the homeowner is inclined to say, that's on you
17 all, because I don't have expertise in this. I
18 relied on you. And I think that ratepayers are in
19 a similar position.

20 It's a regulatory compact. These are
21 monopolies, but the ratepayers surely don't have
22 the expertise in these areas. And what you have
23 here is you have Duke kind of pointing the finger
24 at Mitsubishi and saying, well, we think it's a
25 design defect. And why do they say that? I mean,

1 largely because largely because they can't identify
2 the problem that occurred.

3 And Mitsubishi is saying, no, we think you
4 overran the plant at the beginning, that you put
5 too much steam through it, and you all caused the
6 problem.

7 So there is a lot of uncertainty there. These
8 are complicated machines. Overrunning it at the
9 beginning, does that have a downstream effect that
10 these turbine kept breaking?

11 What we do know is that the turbines continued
12 to break and not be operational. And the result
13 was is that they had to go out and get extra power,
14 and that's what we are arguing about today.

15 But I think it's important that the customers,
16 you know, not bear this risk. I don't think Duke
17 can make -- prove the burden. And I am going to
18 spend a little time asking about, well, how is it
19 between Mitsubishi and Duke? I mean, shouldn't you
20 all figure out who is responsible for this?

21 And I think you will hear a little bit from
22 Duke's witness about, well, we really couldn't get
23 them to assume risk because it's too great of a
24 risk for going out and buying power and -- you
25 know, but respectfully, we don't think that risk

1 should fall on the ratepayers, particularly in this
2 case, because we don't believe Duke can carry their
3 burden of proof.

4 So thank you for the opportunity to share
5 those thoughts with you.

6 THE COURT: All right. And PCS.

7 MR. BREW: Thank you, Judge Stevenson.

8 PCS Phosphate operates their phosphate mining
9 operating in Hamilton County. It is by far one of
10 the largest electric loads on the Duke Energy
11 system, and so affordable power is crucial to their
12 operations and fees, quote. That's why we are
13 here.

14 You will find that everyone at these tables
15 will agree that in its roughly 11-year history, the
16 Bartow plant hasn't run as expected, that there are
17 a series of events all involving the last level of
18 blades, the L0 blades and the failures, and you
19 will get a real education on that.

20 What we also agree on is that the manufacturer
21 of the steam turbine, Mitsubishi, has no prior
22 experience anywhere in the world with what has
23 happened at Bartow; that Duke has no prior
24 experience operating a combined cycle facility in
25 the configuration of this plant.

1 And it's important to remember that when the
2 steam turbine is running, it always runs at 3,600
3 RPM when it's connected to the grid. And so you
4 are going to hear a lot about the five initial
5 period that were studied in the root cause
6 analysis. I just want to focus on the last one,
7 which occurred in February 2017, where a fragment
8 of one of the blades flew off at 3,600 RPM, which
9 means that it was carrying a velocity roughly
10 comparable to a speeding bullet through the turbine
11 until it hit something and caused some damage.

12 And that's what we are talking about in terms
13 of replacement fuel is the downtime while they
14 initially decided how to repair from that damage,
15 where the decision was to take all the blades out,
16 all the zero level blades out and put in the
17 pressure plate that Mr. Bernier talked about, which
18 downgraded the unit, so it was -- it lost about
19 10 percent of its production capacity that
20 consumers have had to deal with for almost three
21 years now.

22 It's been our concern on rebuilding the record
23 that we still don't know if the plant is fixed. We
24 still don't know if the real root cause has been
25 addressed; that Duke and Mitsubishi worked together

1 when they finally decided to focus on vibration
2 levels to do some actual telemetry testing for
3 vibration, and they are now insisting that their
4 vibration monitoring be part of the new fix.

5 So to our mind, Duke hasn't really established
6 that it has still figured out how to repair the
7 plant, but clearly the burden lies with them.

8 Thank you.

9 THE COURT: And the Commission.

10 MS. BROWNLESS: We will waive opening
11 statements. Thank you.

12 THE COURT: I don't know whether you are here
13 as a referee or what. Thank you.

14 MR. REHWINKEL: Your Honor --

15 THE COURT: Yes, sir.

16 MR. REHWINKEL: -- if I could interject. I
17 have a housekeeping matter.

18 We have a copy of the documents we were
19 required to bring today. Would you like me to give
20 you those now?

21 THE COURT: Sure. That would be fine.

22 MR. REHWINKEL: Okay. And I also wanted to
23 mention that we've identified exhibits. There are
24 two additional exhibits that we have distributed to
25 all the parties that I would just ask at this

1 time -- oftentimes at the Commission, when we have
2 cross-examination exhibits, we don't normally
3 pre-identify them, but I have done that.

4 One of them is an exhibit that is excerpts
5 from what would be Exhibits 102 and 103, and I have
6 talked to counsel for the company about that.
7 Everyone has it in the red folders that we've
8 distributed, and I would just ask if I could get
9 agreement that that would be admitted into the
10 record under the same conditions that the other
11 documents have and given a number?

12 MR. BERNIER: Which one was the excerpts from
13 102 and 103? Of this?

14 MR. REHWINKEL: It's in the first one. It's
15 got the tabs on it.

16 THE COURT: So you are saying, Mr. Rehwinkel,
17 you want these sort of pulled out and identified as
18 a separate exhibit?

19 MR. REHWINKEL: Yes, Your Honor. They don't
20 have a number at this time, but assuming that we
21 have no objection to it, I think it would be given
22 No. 115.

23 THE COURT: 115.

24 MR. REHWINKEL: It would be called draft --
25 RCA draft exhibit. And then there is one other one

1 which would be 116, and it would be March 18, 2015,
2 40-inch blade telemetry. And that's the other
3 envelope that says telemetry on it.

4 MR. BERNIER: So we have no objection to this
5 being marked at this time. Based on the questions
6 that are being asked, there may be objections at
7 that point. I don't know yet, so I will withhold
8 right to object at that time.

9 THE COURT: Okay. We will just identify them.

10 MR. BERNIER: Identify them for discussion.

11 THE COURT: Identify as 115 and 116.

12 (Whereupon, Exhibit Nos. 115 & 116 were marked
13 for identification.)

14 MR. REHWINKEL: That way we won't have to do
15 that then. I will give you your set.

16 MS. BROWNLESS: Excuse me, Charles, I just
17 want to make sure I am doing this correctly. This
18 RCA draft exhibit is 115?

19 MR. REHWINKEL: Yes.

20 MS. BROWNLESS: And what is 116?

21 MR. REHWINKEL: It's in the other pouch, and
22 it's the last one. It's the last document. No,
23 it's a skinny one.

24 MR. BERNIER: I have another question. Is
25 there a copy for the witness when they are up

1 there?

2 MR. REHWINKEL: I don't have one.

3 MS. BROWNLESS: What does it say on the
4 outside, Charles?

5 MR. HERNANDEZ: It does not have an exhibit
6 number on the top right-hand, so it's blank.

7 MS. BROWNLESS: I'm sorry.

8 MR. REHWINKEL: It has a cover on it.

9 MR. HERNANDEZ: That's it.

10 MS. BROWNLESS: Okay.

11 MR. REHWINKEL: Yeah.

12 MS. BROWNLESS: Thank you for being patient.

13 MR. REHWINKEL: I apologize for going off the
14 schedule there, but I thought it would be better if
15 we just got this taken care of.

16 THE COURT: That's fine. That's perfectly
17 okay.

18 MR. REHWINKEL: Okay.

19 THE COURT: If there is no other
20 preliminaries, I guess we are ready for Mr. Swartz.

21 MR. BERNIER: Thank you. Duke Energy calls
22 Mr. Jeff Swartz.

23 THE COURT: Mr. Swartz. You have already
24 offered testimony, but I will swear you in.

25 Raise your right hand.

1 Whereupon,

2 JEFF SWARTZ

3 was called as a witness, having been first duly sworn to
4 speak the truth, the whole truth, and nothing but the
5 truth, was examined and testified as follows:

6 THE WITNESS: I do.

7 THE COURT: Have a seat.

8 EXAMINATION

9 BY MR. BERNIER:

10 Q Mr. Swartz, could you please provide your name
11 and job title for the record, please?

12 A Jeff Swartz. I am the Vice-President of
13 Generation for Duke Energy Florida.

14 Q Thank you.

15 And on or about March 1st, 2019, did you cause
16 to be filed direct testimony in the 2019 fuel docket
17 before the Florida Public Service Commission?

18 A Yes, I did.

19 Q And do you have a copy of that testimony with
20 you today?

21 A I do.

22 Q If I were to ask you the same questions here
23 today, would your answers be the same?

24 A Yes.

25 MR. BERNIER: Judge, at this time, we would

1 ask that Mr. Swartz's prefiled direct testimony,
2 dated March 1, 2019, be entered into the record as
3 though read.

4 THE COURT: Hearing no objections, we will
5 show that done.

6 (Whereupon, prefiled direct testimony was
7 inserted.)

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

DIRECT TESTIMONY OF

JEFFREY SWARTZ

ON BEHALF OF

DUKE ENERGY FLORIDA

DOCKET NO. 20190001-EI

MARCH 1, 2019

1 **Q. By whom are you employed and in what capacity?**

2 A. I am employed by Duke Energy Florida (“DEF” or the “Company”) as Vice President
3 – Generation.

4
5 **Q. What are your responsibilities in that position?**

6 A. As Vice President of DEF’s Generation organization, my responsibilities include
7 overall leadership and strategic direction of DEF’s power generation fleet. My major
8 duties and responsibilities include strategic and tactical planning to operate and
9 maintain DEF’s non-nuclear generation fleet; generation fleet project and additions
10 recommendations; major maintenance programs; outage and project management;
11 retirement of generation facilities; asset allocation; workforce planning and staffing;
12 organizational alignment and design; continuous business improvements; retention and
13 inclusion; succession planning; and oversight of hundreds of employees and hundreds
14 of millions of dollars in assets and capital and operating budgets.

15

1 **Q. Please describe your educational background and professional experience.**

2 A. I earned a Bachelor of Science degree in Mechanical Engineering from the United
3 States Naval Academy in 1985. I have 17 years of power plant and production
4 experience in various managerial and executive positions within Duke Energy
5 managing Fossil Steam Operations, Combustion Turbine Operations and Nuclear Plant
6 Operations. While at Duke Energy I have managed new unit projects from construction
7 to operation, and I have extensive contract negotiation and management experience.
8 My prior experience also includes nuclear engineering and operations experience in the
9 United States Navy and project management, engineering, supervisory and
10 management experience with a pulp, paper and chemical manufacturing company.

11

12 **Q. What is the purpose of your testimony?**

13 A. The purpose of my testimony is to provide the Commission with information related to
14 the Bartow Steam Turbine (ST) forced outage that occurred from February 9, 2017
15 through April 8, 2017, including background information on the event that led to the
16 outage, an explanation of DEF's responsive actions, a presentation of DEF's root cause
17 analysis and findings, and an explanation of DEF's reasonable and prudent restoration
18 actions.

19

20 **Q. Please provide a summary of your testimony.**

21 A. On February 9, 2017, the Bartow steam turbine was removed from service due to an
22 indication of a sodium leak into the steam water cycle. During this shutdown, DEF
23 discovered a failed LP turbine rupture disk. The disk had been breached by a foreign

1 object that caused a hole in the rupture diaphragm. DEF performed an inspection of the
2 Bartow Steam Turbine (“ST”) and discovered damage to the ST’s L-0 blades (and
3 determined part of an L-0 blade ruptured the LP turbine rupture disk), resulting in a
4 forced outage to the ST that lasted until April 8, 2017 (while the ST was off-line, the
5 Bartow combustion turbines (“CTs”) remained available to run in simple cycle mode).
6 DEF performed a Root Cause Analysis (“RCA”) that determined the failure of the
7 Bartow ST’s L-0 Blades was caused by events beyond DEF’s control, and DEF could
8 not have reasonably prevented the failure from occurring. The results of DEF’s RCA
9 were discussed in more detail in my March 1, 2018 testimony filed in Docket No.
10 20180001-EI, which I adopt and incorporate as if fully set forth herein. DEF’s actions
11 prior to and in the wake of the blade failure were reasonable and prudent.
12

13 **Q. Are you sponsoring any exhibits?**

14 A. Yes. I am sponsoring the DEF RCA Report, attached as Exhibit No. __ (JS-1) to my
15 March 1, 2018 testimony filed in Docket No. 20180001-EI.
16

17 **Q: Is the RCA considered confidential by the Company?**

18 A: Yes. Portions of the RCA’s findings are considered proprietary and confidential by the
19 blades’ manufacturer. In order to protect the OEM’s rights, this information has been
20 treated by the Company as proprietary confidential business information and has not
21 been made publicly available. As part of the stipulation reached on Issue 1B in Docket
22 No. 20180001-EI, DEF committed to work with the OEM to revise the confidentiality
23 request; DEF intends to fully comply with that stipulation.

1

2 **Q. Please summarize the events leading up to the 2017 Bartow event.**

3 A. Bartow is a 4x1 Combined Cycle (“CC”) Station with a ST manufactured by
4 Mitsubishi Hitachi Power Systems (“MHPS”). The ST was purchased from a company
5 that intended to use it for a 3x1 CC with a gross output of 420MW. The ST was never
6 delivered to that third party but instead remained with MHPS in a warehouse in Japan
7 until DEF purchased the unit in 2006.

8 Before the ST was purchased, DEF contracted with MHPS to evaluate the ST design
9 conditions and to update heat balances for a 4x1 CC configuration. CC units blend
10 steam from the CTs as they start-up and/or shut-down with steam to the ST. These
11 blending events result in brief periods of higher steam temperatures and flows into the
12 condenser below the ST L-0 blades, a common occurrence for CC units.

13 Since commissioning of the Bartow ST in 2009, there have been five (5) events
14 involving L-0 blade failures and/or replacements. The latest blade failure occurred
15 when a “loss of mass” event resulted in a blade fragment traveling through the Low-
16 Pressure Turbine rupture disk diaphragm.

17

18 **Q. What actions did DEF take in response to the February 2017 failure?**

19 A. The Company took three primary actions in the wake of the event: a root cause team
20 was established to investigate the incident and prepare a root cause analysis; a
21 restoration team was formed to bring the unit back on-line; and a team was formed to
22 evaluate a long-term solution for Bartow.

23

1 **Q. Please describe the process DEF followed to ascertain the root cause of the event.**

2 A. DEF created a RCA Team consisting of internal experts to investigate and determine
3 the root cause of the event. The RCA Team consisted of seven individuals with
4 expertise in engineering, operations and process, and human performance.

5

6 Following industry standard procedures, the RCA Team employed specific tools used
7 to determine potential root cause(s) including: interviews, event and causal factor
8 review (“E&CF”), flawed barrier analysis, change analysis, component analysis, visual
9 inspections of the equipment, photographs taken following the event, engineering
10 calculations and measurements, and detailed review of outage reports and maintenance
11 logs.

12

13 DEF’s findings are fully set forth in the RCA identified as Exhibit No. __ (JS-1) to my
14 March 1, 2018 testimony in docket No. 20180001-EI and as summarized in my
15 testimony of that date. To avoid unnecessary repetition, those findings will not be
16 rehashed here.

17

18 **Q. What restoration process did DEF follow to bring tl**
19 **service?**

20 A. It’s important to recall that the four Bartow CTs were able to continue operation in
21 simple cycle mode (i.e., without operation of the ST) notwithstanding the blade failure.
22 DEF worked with the OEM to identify and implement an interim solution that would
23 allow the ST to resume operation, ultimately resulting in the installation of a pressure

1 plate in place of the L-0 blades on March 22, 2017. The plate allows the ST to operate
2 increasing the energy output of Bartow above what was possible in simple cycle mode.
3 As mentioned above, the ST returned to service on April 8, 2017.
4

5 **Q. Could DEF have reasonably prevented the event and the ensuing outage at**
6 **Bartow?**

7 A. No, the outage was caused by circumstances beyond DEF's reasonable control, as
8 demonstrated by the RCA. DEF was not at fault.
9

10 **Q. Did DEF act reasonably and prudently to restore Bartow to service in a timely**
11 **fashion?**

12 A. Yes, DEF took reasonable and prudent steps to develop a restoration team and guiding
13 processes to restore the Bartow ST to service. The restoration team followed those
14 processes and the unit was successfully brought back on line in a timely manner.
15

16 **Q. Did DEF's agreement with the OEM include a provision obligating for the OEM**
17 **to contribute funds towards replacement power costs in the event of an outage**
18 **caused by the OEM's product?**

19 A. No; to the contrary, the agreement specifically disclaimed any liability for
20 consequential damages.
21

22 **Q. In your experience, do DEF's agreements with OEMs usually include a similar**
23 **disclaimer of liability?**

1 A. Yes. In my experience OEMs are not willing to accept the risk of agreeing to pay
2 consequential damages (such as replacement power costs) given the uncertain and
3 potentially open-ended liability. To my knowledge, this is the case throughout the
4 industry.

5
6 **Q. Have you or anyone under your supervision engaged in negotiations with a vendor**
7 **that was willing to accept consequential damages as part of a component part**
8 **purchase order?**

9 A. No, in DEF's experience, vendors do not offer to accept consequential damages as part
10 of the terms and conditions of their agreements. Further, when DEF has indicated that
11 such a provision would be a required part of the agreement, vendors have indicated
12 they would withdraw rather than agree to those terms. DEF simply has not found such
13 a provision to be commercially available.

14
15 **Q. Does that conclude your testimony?**

16 A. Yes.

1 BY MR. BERNIER:

2 Q Mr. Swartz, have you prepared a summary of
3 your direct testimony?

4 A I have.

5 Q And could you provide that, please?

6 A Certainly.

7 Good morning, Judge Stevenson. Again, my name
8 is Jeff Swartz. I am the Vice-President of Generation
9 for Duke Energy Florida. I will say DEF in the future.
10 That meanings I have overall responsibility for DEF's
11 generation fleet.

12 My direct testimony provides background
13 regarding the issues that have arisen over the past few
14 years with the Bartow combined cycle plant steam
15 turbine, an explanation of DEF's response to those
16 issues, including a summary of DEF's actions to restore
17 the unit to service as quickly as possible. And finally
18 a presentation of DEF's root cause analysis.

19 In short, after analyzing data from each of
20 the blade failures that I will discuss in a moment, DEF
21 determined that the only causal factor that explains
22 each failure, and accounts for the different conditions
23 attended to each failure, is that the blades lack
24 sufficient design margin to effectively operate in the
25 Bartow steam turbine.

1 Bartow steam turbine was manufactured by
2 Mitsubishi Hitachi Power Systems. The combined cycle
3 was placed into service in the year 2009.

4 And briefly some background. A combined cycle
5 power plant uses both gas and steam turbines together to
6 produce electricity. Combustion of natural gas in the
7 gas turbine turns a generator producing electricity, and
8 the waste heat from the gas turbine is routed to a heat
9 recovery steam generator, or HRSG, producing steam
10 routed to a nearby steam turbine which generates extra
11 power. It is coupled to a generator.

12 Combined cycle plants can be set up in
13 multiple configurations and provide for great
14 operational flexibility. The Bartow combined cycle is
15 called a 4-on-1 plant, meaning there are four natural
16 gas fired combustion turbines, four heat recovery steam
17 generators which provide steam to the one steam turbine.
18 It can operate in a 1-on-1 configuration, a 2-on-1, a
19 3-on-1, a 4-on-1; or, when necessary, the gas turbines
20 can operate in what we call simple cycle mode to
21 generate electricity when the steam turbine is off-line.

22 The steam turbine itself is made up of a high
23 pressure/intermediate pressure section which is a
24 combined section, and a low pressure section as well.
25 Each has a series of blades that, as the steam passes

1 through the blades in the turbine sections, it spins the
2 blades which, in turn, spin the rotor. The rotor is
3 connected to a generator, and the generator is what
4 produces electricity.

5 At issue in this proceeding is the low
6 pressure section, specifically the last stage of blades
7 in the low pressure section. They are called the L0
8 blades. The low pressure turbine at Bartow is a
9 dual-flow unit, meaning the steam is admitted in the
10 middle of the turbine and then flows axially in opposite
11 directions through rows of blade. So thus, there are
12 two rows of L0 blades, one at each end of the machine.

13 And if I could, Your Honor, I think it if I
14 could stand up at this point --

15 THE COURT: Sure.

16 THE WITNESS: -- and use some of these
17 exhibits over here, it might be helpful. I think I
18 am going to move of this out of the way so
19 everybody can see.

20 First, this is a overall plant. This is the
21 combined cycle plant. This is the gas turbine
22 right here. The gas turbine can run on its own.
23 Gas is admitted in the middle. The combustion
24 process of gas and air, compressed air spins a
25 rotor, spins blades, spins a rotor, turns this

1 generator producing electricity.

2 In simple cycle mode, the exhaust gases from
3 that combustion just flow up this stack to the
4 atmosphere. The beauty of combined cycle operation
5 is that we can take that energy that's in that heat
6 and swing a damper and make the gases flow this way
7 instead.

8 All this represents what's called the heat
9 recovery steam generator. It's a boiler. There is
10 water in tubes that heat, and these exhaust gases
11 heat the water in the tubes, and then the water is
12 turned into steam. That steam then is then reused
13 in the turbine generator unit. It's admitted into
14 the high pressure turbine, and then actually sent
15 back to the heat recovery steam generator, reheated
16 to get more energy into the steam. If you raise
17 the temperature of the steam, it raises the energy
18 level. It's then readmitted to the intermediate
19 pressure turbine. But this is really one shaft
20 with blades connected to it.

21 And then the exhaust from this intermediate
22 pressure turbine goes to the low pressure turbine,
23 and some steam from the heat recovery steam
24 generator comes into the low pressure turbine into
25 the middle, flows in both directions, and then is

1 exhausted into a condenser.

2 This, again, is rotating the shaft. This is
3 one common shaft that's bolted together here and
4 bolted together here, and then the generator
5 produces electricity.

6 And like I said, at issue in this proceeding
7 is the last stage of blades in this low pressure
8 turbine. So it would be right here and right here,
9 the longest stage of blades. The blades get
10 successively longer as the steam flows through the
11 machine because the steam is losing energy as it
12 travels through the machine. It's transferring
13 energy to the blades making them rotate. The
14 blades have to be bigger and longer in order for
15 the lower energy steam to have any effect. So the
16 longest blades are the L0 blades.

17 This is an actual L0 blade from the Bartow
18 combined cycle low pressure turbine. There is --
19 you can see it's curved. This is the blade itself.
20 It's very heavy. It's about 60 pounds. A big
21 piece of metal.

22 The issue that we've had is that the mid-span,
23 there is something called snubbers. And at the
24 tip, there is something called Z-locks or a shroud.
25 These blades aren't connected to one another

1 during -- when the turbine is stationary. When the
2 turbine starts spinning, and someone already said,
3 it spins at great speed, 3600 revolutions per
4 minute, so 60 cycles per second.

5 Think about that. It's spinning that rapidly,
6 and this is just one of 64 blades on the low
7 pressure turbine. So it's quite a large diameter
8 machine at this stage of the turbine.

9 These blades, you wouldn't be able to see it,
10 but they untwist a little bit, just a tiny bit, and
11 it makes these mid-span snubbers and these Z-lock
12 tips come together, which strengthens the whole
13 machine.

14 You get a segment in the middle of the blade
15 and a segment at the tip of the blade that helps
16 strengthen the entire machine. If not for that,
17 these blades would vibrate more and potentially
18 crack from high cycle fatigue, and that would be
19 very disastrous and catastrophic if a piece of the
20 blade were to come loose.

21 What we've had happen four different times was
22 a piece of either the snubber or a piece of this
23 Z-lock tip, or pieces have come off, come apart.
24 So when we talk about blade damage, it was limited
25 to the Z-lock tips or the snubbers.

1 And I wanted to make that clear, because
2 through proactive action, we were able to find that
3 damage before the blade itself was damaged, which
4 could have been much more catastrophic.

5 Thank you for allowing me to show that.

6 So since being placed into service, the steam
7 turbine has experienced five separate L0 blade
8 incidents. Importantly, each instance was
9 discovered either, as I said, by proactive
10 inspection or by installed monitoring equipment,
11 and DEF was able to take appropriate action prior
12 to any catastrophic damage to the turbine itself.

13 As we discuss the incidents and throughout
14 these proceedings, you will hear reference to
15 different periods of operation. Period 1 is the
16 time from when the units were first commissioned in
17 year 2009 until discovery of the first blade issue.
18 Period 2 began when the damaged blades were
19 replaced and the unit returned to service, and so
20 on.

21 Each period was accompanied by blade
22 modifications, with one notable exception I will
23 discuss momentarily, as well as modified operating
24 parameters provided by Mitsubishi.

25 Steam turbines are operated within the

1 guidelines provided by the manufacturer. Those
2 guidelines are based on the manufacturer's
3 calculations of permissible steam flows, pressures
4 and temperatures. With one exception in Period 3,
5 when new hardened blades were installed, each
6 operating parameter modification lowered
7 permissible pressures which resulted in a
8 corresponding reduction in electrical output from
9 the generator.

10 Notwithstanding DEF's adherence to these
11 operating instructions, each period concluded with
12 discovery of blade damage. Of particular
13 importance to DEF's root cause analysis was the
14 experience of Period 5. The lessons learned from
15 that period have significant importance because the
16 blades used during that time were of the same
17 design as the original iteration, and L0 blade
18 damage was discovered despite the unit being
19 operated well below the originally provided
20 operating parameters.

21 Therefore, DEF's operation of the unit was not
22 the cause of the iterative blade damage. As
23 mentioned earlier, after analyzing the available
24 data from each of the operational periods, and
25 taking note of the fact that blade damage continued

1 to be discovered even after the operating pressures
2 were curtailed, DEF determined that the ultimate
3 causation had to be the blades' lack of sufficient
4 design margin.

5 With the discovery of the blade damage at the
6 end of Period 5, DEF determined that the most
7 prudent means of returning the steam turbine to
8 service while a long-term solution to the blade
9 issues could be determined, designed and
10 implemented was to replace the last stage blades
11 with what are called pressure plates, as Mr.
12 Bernier said.

13 It's important to remember that while the unit
14 was off-line and the pressure plates were being
15 installed, the four combustion turbines continued
16 to operate in simple cycle mode and provide service
17 to our customers.

18 For reference, a pressure plate is just what
19 it sounds like, it's a non-rotating plate, as Mr.
20 Bernier mentioned. Instead of a blade reducing the
21 pressure and the energy of the steam before it goes
22 into the condenser, there is holes drilled in the
23 pressure plate which reduce the pressure so that
24 the steam then doesn't damage the condenser. So it
25 takes that work out of the steam without the

1 benefit of making extra productive work, a product.

2 So the pressure plate does not use the steam
3 passing through it to produce electricity and,
4 therefore, there is a decrease in efficiency
5 because the unit is not getting all the available
6 energy of the steam passing through it.

7 However, the pressure plate allowed for the
8 unit to return to service quickly and to operate
9 event-free for the past two-and-a-half years.

10 Because DEF did not and could not know that
11 the blades in question did not have the necessary
12 design margin, and because DEF at all times
13 operated the unit within the OEM's operating
14 parameters, DEF's actions leading up to and in
15 response to the February 2017 outage were prudent,
16 and DEF should be permitted recovery of its
17 prudently incurred replacement power costs.

18 I look forward to answering your questions.
19 Thank you.

20 MR. BERNIER: Thank you, Judge. We will
21 tender Mr. Swartz for cross-examination.

22 THE COURT: Is there an agreement as to order
23 of cross? Public Counsel is first?

24 MR. REHWINKEL: Yes.

25 EXAMINATION

1 BY MR. REHWINKEL:

2 Q Good morning, Mr. Swartz.

3 A Good morning.

4 Q Can you tell me your full name, please?

5 A Jeffery Raymond Swartz.

6 Q Okay. And you are the Duke witness alone, who
7 alone is here to provide whatever evidence you feel is
8 most relevant to meet your burden to demonstrate that
9 Duke acted prudently in operating the Bartow steam
10 turbine; is that right?

11 A Yes, sir.

12 Q Would you also agree with me that JS-2 is the
13 principal piece of evidence that Duke submits as your
14 explanation of the cause of the failure of the various
15 sets of blades at the unit?

16 A Yes.

17 Q And just for the record, JS-2 was the same as
18 JS-1, it just has a different level of confidentiality,
19 right?

20 A Correct.

21 Q The RCA -- can you agree with me that if I ask
22 you about an RCA, it means a root cause analysis?

23 A Yes, that's correct.

24 Q Okay. And this RCA is the sum of the evidence
25 that you contend proves that Duke acted prudently at all

1 times; is that right?

2 A Yes.

3 Q And, Mr. Swartz, isn't it also true that
4 sometime after March of 2012, Duke began, at least
5 informally, the process of determining a root cause of
6 the problems that you identified after the March 2012
7 discovery of the blade damage?

8 A Yes, that's correct.

9 Q And am I correct in assuming that a root cause
10 analysis is important to any utility as a way of
11 understanding their operations for and understanding and
12 apply lessons learned and improving processes for safety
13 and efficiency purposes?

14 A Yes. Absolutely.

15 Q And that RCA process is part of the Duke
16 culture?

17 A It is.

18 Q Would you agree with me, to be effective, the
19 RCA process must be objective and honest and designed
20 and executed to get to the truth, even if it's not a
21 flattering view of how the company conducted operations?

22 A Yes.

23 Q Would you also agree with me that a true RCA
24 should not be an advocacy document, that it --

25 A Could you ask that again, please?

1 Q Would you agree with me that a true RCA should
2 not be an advocacy document that is biased in its scope
3 or analysis?

4 A Correct. It should dig into the issues and
5 understand the lessons learned so we can improve.
6 That's the purpose.

7 Q Okay. The RCA should also not be designed to
8 reach predetermined or confirmatory conclusions, should
9 it?

10 A Correct.

11 Q Would you agree with me that the final RCA
12 document that was ultimately prepared was at least in
13 part done so with an eye toward making Duke's case to
14 the Florida Public Service Commission that you believed
15 you were not imprudent in the actions related to the
16 blade failures and the need to buy replacement power?

17 MR. HERNANDEZ: Objection, compound.

18 THE WITNESS: The root cause --

19 THE COURT: Hang on.

20 THE WITNESS: Sorry.

21 THE COURT: Yeah, could you break it down? It
22 was two questions there.

23 MR. REHWINKEL: Okay.

24 BY MR. REHWINKEL:

25 Q Would you agree that the RCA was produced, at

1 **least in part, with an eye toward making your case to**
2 **the Public Service Commission?**

3 A I would not think about it that way. The root
4 cause was truly to dig into what happened, what can we
5 learn from that? How are we going to improve?

6 There are many -- not many, but there are
7 times when we have root causes, or any causal analysis
8 when there is a likelihood that there might be legal
9 proceedings attached to it, and so we will make sure
10 that we follow certain guidelines from an
11 attorney-client privilege standpoint, which we did in
12 this one because we thought that there could be, but it
13 wasn't what you are suggesting. It was truly to get at
14 the issues and learn.

15 Q **Okay. So is it also true that the RCA is your**
16 **final product of an inte -- well, let me ask you this:**
17 **When I ask you about an RCA -- if I ask you about the**
18 **RCA, or the Duke RCA, can you agree with me that we are**
19 **talking about JS-2?**

20 A Yes.

21 Q **Okay. So is it true that the RCA is your**
22 **final product of an iterative and continuous root cause**
23 **analysis process that dates back to 2012?**

24 A Yes, that's correct.

25 Q **And can we also agree that if I ask you about**

1 the September 22nd, 2017, Mitsubishi RCA, that I will
2 specifically refer to that as Mitsubishi's RCA; you
3 understand that?

4 A I understand.

5 Q Okay. And when I ask you -- or when I say
6 Duke, can you agree with me that even though Duke's
7 merger with Progress Energy occurred in July of 2012,
8 that any relevant actions or inactions that transpired,
9 or should have done so, under the control of Progress
10 Energy Florida's management are the same as if those
11 things happened or didn't under Duke's management
12 control?

13 MR. HERNANDEZ: Objection, Judge, calls for a
14 legal conclusion.

15 THE COURT: I will overrule. I mean, if you
16 know.

17 THE WITNESS: Could you ask that again,
18 please?

19 BY MR. REHWINKEL:

20 Q Let me ask it a different way.

21 Will you agree with me that Duke today, in
22 this case, stands in the shoes of Progress Energy for
23 all relevant actions that occurred related to this
24 Bartow steam unit?

25 A Yes.

1 **Q Can you tell me when you first had the**
2 **responsibility of overseeing the Bartow plant?**

3 A It was at the beginning of 2012, when I first
4 actually assumed the position I am still currently in.
5 So just about eight years ago. Prior to that, I wasn't
6 directly involved with the operation of the Bartow site.

7 **Q Okay. So when you said the beginning of 2012,**
8 **you mean you were a Progress Energy employee?**

9 A Yes, as a Progress Energy employee.

10 **Q Okay. And tell me what your role was.**

11 A In January of 2012, I became the vice -- we
12 made some organizational changes at the beginning of
13 2012 while we were still Progress Energy in anticipation
14 of the merger. So prior to that, I was in our nuclear
15 generation group during the year 2011, but in
16 anticipation of the merger closing, we did some
17 reorganization, and I became the Vice-President of
18 Generation for the Florida region --

19 **Q Okay.**

20 A -- the fossil generation and not nuclear.

21 **Q Tell me when your first time was having a role**
22 **or responsibility in the Bartow blade failure RCA**
23 **process?**

24 A When we first found the issues in the spring
25 of 2012, and we needed to know what the causes were.

1 It's a significant issue. And so under my direction, we
2 started what became a very long root cause because we
3 kept learning more as each iteration of failure
4 occurred.

5 Q Okay. Can we agree that when I make a
6 reference to a period like 1, 2, 3, et cetera, that you
7 understand them to be many as they are defined in the
8 first two rows in Table A on page five of the Duke RCA?

9 A Yes.

10 Q Okay. So you were with Duke and had executive
11 oversight over the plant during Period 1, is that right;
12 during the very last few days of Period 1?

13 A That's correct.

14 Q Okay. And I think you just said so, but I
15 want to make sure I understand. You were the person
16 responsible for initiating the RCA process that we are
17 talking about here today?

18 A That's correct.

19 Q Okay. And would that also mean that you were
20 the person most responsible for assigning the employees
21 to conduct the RCA process?

22 A I had an overview of that, and I could weigh
23 in on the team makeup, yes.

24 Q Okay. Now, I think you said in -- before to
25 me that for the RCA team that was -- for the RCA process

1 that was conducted after Period 5, you did assign the
2 members of the team that responsibility with you, is
3 that right?

4 A I didn't specifically assign the people. I
5 could have modified the group. I had input into the
6 team members. I don't remember specifically assigning
7 the individuals.

8 Q Well, let me ask it this way: Isn't it true
9 that the responsibility for assigning the members to the
10 team --

11 A Yes, sir.

12 Q -- was yours?

13 A That's correct.

14 Q Okay. Was that true just after the March 2017
15 events, or all throughout this long RCA process?

16 A All throughout.

17 Q Okay. Now, I think in your testimony you
18 mentioned a long-term solution team, is that right?

19 A Yes.

20 Q And it's fair to say the long-term solution
21 team and the RCA team worked somewhat in concert through
22 the process, at least since Period 5; is that right?

23 A That's correct.

24 Q And would you have had the responsibility of
25 assigning the members to both the RCA and the long-term

1 solution team?

2 A Yes.

3 Q Okay. Throughout the RCA process, going back
4 to 2012, would it be fair to say that you did review and
5 provide edits to some of the drafts in the process?

6 A I know I reviewed some. I don't recall if I
7 provided edits.

8 Q Okay. If I saw a draft that had the initials
9 JRS on either a comment or an edit, you are the only JRS
10 that would have been allowed to make edits to those
11 documents; is that right?

12 A I don't know if I am the only one, but it's
13 likely me, yes.

14 Q You didn't give me names of anybody in the
15 root cause team that had the initials JRS, right?

16 A Not that I recall.

17 Q Okay. Would it be fair to say that even
18 though the engineers that were primarily associated with
19 the RCA worked for what you called Duke's central
20 engineering, in this project, they had at least a dotted
21 line responsibility to you in the RCA process in that
22 you were the highest Florida Power generation executive
23 in charge of the Bartow project?

24 A Yes, that's fair.

25 Q And you would agree with me that the draft

1 documents that were provided to the Public Counsel as a
2 result of late filed Exhibits 4, 5 and 6 of your
3 deposition constituted a part of the work product
4 supporting the document that is JS-2?

5 A I am not sure I understand your question.

6 Q Okay. Let me break it down.

7 You are aware that you -- that as -- at your
8 deposition in August 30th, the Public Counsel asked
9 for -- in various ways, we asked for the draft documents
10 that preceded the Duke RCA, is that right?

11 A Yes, sir.

12 Q Okay. Would you agree with me that those
13 draft documents, and the documents that we received in
14 Exhibits 4, 5 and 6 constitute, at least in part, the
15 work product that supported the RCA that you finally
16 produced?

17 A Yes.

18 MR. HERNANDEZ: Your Honor, could the witness
19 see the documents?

20 THE COURT: It might be helpful.

21 Do you have a clear recollection of what he is
22 referring to?

23 THE WITNESS: I don't. There were a lot of
24 documents involved with the root cause, so I don't
25 know that I have -- I know specifically.

1 THE COURT: It might be helpful to put those
2 in front of him.

3 MR. REHWINKEL: Okay. I was asked to bring
4 eight copies, and I have distributed all my eight
5 copies, so I --

6 THE COURT: Let's see what I have up here.

7 MR. REHWINKEL: The documents I am referring
8 to are exhibit -- what we identified as Exhibit
9 115.

10 MS. BROWNLESS: Charles, you can have --

11 COURT REPORTER: You can use mine.

12 MR. REHWINKEL: Okay. This will be the
13 official copy.

14 BY MR. REHWINKEL:

15 Q If I may. So this is the summary of the
16 synthesis.

17 A This one here is?

18 Q Yes, and then this is Exhibit 4, 5 and 6.

19 MR. BERNIER: And those are marked, okay, in
20 our version?

21 MR. REHWINKEL: Yes.

22 And just for the record, Exhibit 115 is a
23 culling of the root cause drafts that were taken
24 from Exhibits 4, 5 and 6.

25 MR. BERNIER: Okay. Does he have 116 so we

1 can mark that for him?

2 MR. REHWINKEL: Oh, yeah. It would be in
3 here.

4 MR. BERNIER: It would be right here.

5 MR. REHWINKEL: Yeah, this is 116.

6 MR. BERNIER: That way you don't have to mark
7 it later.

8 THE COURT: Let me see -- okay.

9 MR. BERNIER: Which ones should he be looking
10 at?

11 BY MR. REHWINKEL:

12 Q Oh, I am sorry. I thought you were reviewing.
13 Your counsel asked if you could look at the documents.

14 A Okay. So I have reviewed it. I am familiar
15 with what you --

16 Q Okay. So the question -- I think you answered
17 it, but given that the objection came in, if I could
18 just make sure.

19 Those documents that you reviewed in Exhibits
20 102, 103, 104 and 115, with the understanding that 115
21 is culled from 102 and 103, would you agree that they
22 constitute a part of the work product supporting the
23 Duke RCA?

24 A I would.

25 Q Okay. Would you also agree with me that the

1 documents in those four exhibits, 102, 103, 104 and 115,
2 were retained as a matter of company practice?

3 A I think that is our practice, yes.

4 Q Okay. Would you agree with me that an
5 engineer named Jake, Jacob or Jake English was
6 designated to be the primary author of the Duke RCA?

7 A I would.

8 Q Okay. Would you also agree with me that he
9 was the primary custodian or keeper of the documents
10 that supported the RCA?

11 A Yes, I would.

12 Q Okay. Now Mr. English, you would consider him
13 also to have been the lead author of the RCA?

14 A Yes.

15 Q But that didn't mean that he made all the
16 analytical decisions, is that correct?

17 A That's correct.

18 Q He would be sort of like the engineer with the
19 pen, is that fair?

20 A Well, Mr. English is more than that. He is --

21 Q I don't mean he is the scribe. But he was the
22 one that was -- well, I will withdraw the question.

23 He was not the one making all the decisions.

24 He was contributing to it, but somebody had to keep the
25 record; is that right?

1 A He was one of multiple contributors, but he is
2 the one that was the main author.

3 Q Okay. Other engineers, including yourself,
4 were contributors to the RCA, is that fair?

5 A Yes.

6 Q Is it also true that non-engineers, including
7 attorneys, reviewed drafts at some point throughout the
8 process?

9 A Yes.

10 Q And RCA -- the Duke RCA was the only RCA,
11 final RCA report that was produced throughout this whole
12 process, is that correct?

13 A It was the only Duke Energy product.

14 Q That's what I mean. It was -- on your side of
15 the fence, it was the only product that Duke finalized
16 in this -- I think you referred to it before as a big,
17 long root cause analysis, is that right?

18 A Yes, that's accurate.

19 Q Okay. Do you have a copy of your JS-2 with
20 you?

21 A I do.

22 Q And we can do this. I am going to ask you
23 questions from Exhibit 115, and just -- I should clarify
24 something about 115, if you don't mind, Your Honor.

25 There is a table of contents. And the first

1 document actually is JS-2, and then I have put Documents
2 2 through 18 in here, and I have extracted -- I have
3 included a screen shot at the back of this exhibit of
4 the Duke file names that we were provided
5 electronically, and I have extracted -- they say Bartow
6 RCA white paper, pretty much, but there are some
7 distinguishing features such as the date of the file or
8 the author of it on this; do you see that?

9 A I do.

10 Q But you would agree with me that -- I mean,
11 JS-2 is not a draft, it is the final document?

12 A Yes.

13 Q And if I could ask you to look back at
14 Document 18. And this handwriting up at the top of each
15 document is mine. It's not Duke's.

16 Would you agree with me that February 6th,
17 2018 draft, it has a watermark of draft on it, but this
18 document is, in all respects, identical to the final
19 document; is that right?

20 A I would really have to do a page-by-page turn
21 to determine that.

22 Q Okay. But would you accept my representation
23 it is the same document? It's the same date.

24 A It is the same date. I see that. So it's
25 likely the same document, yes.

1 Q Okay. So maybe the easiest thing to do would
2 be just to ask questions about the RCA in this document,
3 because I am going to attempt to ask you questions going
4 back and forth between the final and some of the drafts.

5 So if I could take you to Document 1 -- and
6 one other thing, if you don't mind, as we work through
7 this. In the bottom right-hand page of this Exhibit
8 115, we have a Bates number OPCCR -- RCAEXH dash, and
9 then have the numbers. And those numbers correspond on
10 the table of contents to the documents.

11 The Bates numbers in the upper right-hand
12 corner are Bates numbers that we gave the late filed
13 Exhibits 4, 5 and 6 because they came to us un-Bates, do
14 you understand that?

15 A I think so. Yes.

16 Q All right. We don't need worry about those
17 numbers up there. I am only going to be asking you
18 about Bates numbers on the lower right-hand.

19 A I understand.

20 Q Okay. All right. So back on my questions.

21 On page two of JS-2, is it fair to say that
22 the second full paragraph, starting with the word
23 "based" is the ultimate conclusion of this RCA?

24 A Yes, it is.

25 Q And if we look on page 15 of the RCA, that

1 paragraph is just repeated under the word conclusion, is
2 that right?

3 A Yes, it is.

4 Q Would you mind reading that aloud for the
5 record?

6 A Based on its observations and study, Duke has
7 been and remains of the opinion that the root cause of
8 the failures in the steam turbine L0 40-inch blades is
9 the blade design, lack of blade design margin. That is
10 to say, under expected operating conditions at Bartow's
11 4-on-1 combined cycle unit, the MHPS blades are
12 substantially more fragile than similar 40-inch blades
13 both in Duke's combined cycle fleet and elsewhere in the
14 industry.

15 Q Throughout, when we see MHPS, that's
16 Mitsubishi, right?

17 A Correct.

18 Q Okay.

19 A Mitsubishi Hitachi Power Systems.

20 THE COURT: And OEM in this context also means
21 Mitsubishi, right?

22 THE WITNESS: It does. Original equipment
23 manufacturer.

24 THE COURT: Okay.

25 BY MR. REHWINKEL:

1 **Q** So in this RCA document, with this conclusion,
2 Duke lays all the blame on Mitsubishi and assigns none
3 of the blame to itself for the way the legacy Progress
4 organization operated the plant in the first period; is
5 that right?

6 **A** I think it's very clear we believe that the
7 lack of blade design and the lack of margin in the
8 blades is the root cause of all the failures of the
9 blades.

10 **Q** Okay. Now, we discussed the period naming
11 convention a few minutes ago. Under that Period 1 would
12 generally be from June of 2009 to March of 2012, is that
13 right?

14 **A** Yes, sir. That's correct.

15 **Q** Okay.

16 **A** And there is an easy reference for that on
17 page five --

18 **Q** Right.

19 **A** -- Table A.

20 **Q** Would it be most accurate to say that the
21 beginning of commercial operation of the Bartow plant
22 and the steam turbine was approximately June 1st, 2009?

23 **A** I don't know if it was June 1st, but I know it
24 was the months of June.

25 **Q** Okay. And is it further true that the end of

1 **Period 1 was actually February 28th at 2:00 a.m. in**
2 **2012?**

3 A Subject to check, yes. That sounds like when
4 we would start an outage. Typically, we start when
5 customer demand is low, and it was a planned scheduled
6 outage we started at nighttime.

7 Q **So isn't it Duke's position today that the**
8 **company did nothing wrong in the way it operated the**
9 **steam turbine during the first period?**

10 A It is.

11 Q **Is it also true that you have effectively**
12 **asserted that even if you somehow operated the plant**
13 **improperly with excess steam flow and high back-end**
14 **loading on new L0 blades that you only did so because**
15 **you were just not aware that you were doing anything**
16 **wrong?**

17 A We operated according to the parameters
18 provided by the original equipment manufacturer, so I'm
19 are not sure -- it seemed like there was two
20 different -- a statement and a question there.

21 MR. BERNIER: I am sorry, Charles, are you
22 referencing anywhere in his testimony?

23 MR. REHWINKEL: I am asking about what his
24 root cause analysis shows and doesn't show, so...

25 BY MR. REHWINKEL:

1 Q So does the conclusion that you just read from
2 your RCA mean that Duke's position is that Duke did not
3 operate the steam turbine improperly in Period 1 by
4 introducing excessive steam flow in the low pressure
5 turbine and imposing high back-end loading on the L0
6 blades, and thus, Duke's operation of the steam turbine
7 was not and could not have been a root cause of the
8 blade failures in Periods 1 through 5?

9 A It does.

10 Q Is another way of putting that that the RCA
11 conclusion means that it is Duke's position that even if
12 Duke did run the unit improperly in Period 1 by
13 introducing excessive steam flow into the low pressure
14 turbine and imposing high back-end loading on L0 blades
15 that it did not know that it was doing so, and thus, any
16 harm caused was not its fault?

17 A It's our position that we ran it in accordance
18 with the operating parameters that were provided.

19 Q Well, isn't it true that Duke put excessive
20 steam into the low pressure turbine during Period 1?

21 A It is not true.

22 Q Isn't it true that excessive steam and high
23 back-end loading on L0 blades caused damage to those
24 blades?

25 MR. HERNANDEZ: Objection, Judge. I am

1 objecting on the basis of vague. I don't know what
2 excessive means.

3 THE COURT: Maybe we should be more specific.

4 MR. REHWINKEL: Okay.

5 BY MR. REHWINKEL:

6 Q Well, in the root cause analysis process,
7 didn't Duke engineers decide -- agree that excessive
8 steam flow was introduced into the low pressure turbine?

9 A Could you point that out to me?

10 Q Okay. Do you have exhibit -- okay, let's go
11 to -- let's just look at -- let's just look -- if you
12 could turn to page 75, which is Exhibit 9.

13 A In Tab 9 in Exhibit 115?

14 Q I apologize. Yeah. Tab 9, yes.

15 A And I am sorry, could you say the page again?

16 Q 75.

17 A Okay, I am there.

18 Q And would you agree with me that the file name
19 for this document is October 5, 2017, and it says PBC
20 comments? That will be Paul Crimi, C-R-I-M-I?

21 A Yes.

22 Q And if you look halfway down the page, it
23 says -- would you agree with me that it says: After
24 months of study, Duke Engineering believes the following
25 to be the most significant contributing factors towards

1 root cause of the history of Bartow Unit 4S L0 events,
2 and the first put bullet is low pressure LP turbine
3 excessive steam flow?

4 A Yes, I see that.

5 Q Okay. So the Duke Engineering folks that were
6 drafting these documents accepted at this point in time
7 that there was excessive steam flow introduced in the
8 low pressure turbine, isn't that correct?

9 A I do not believe that to be the case, no.
10 This is a working document that these are -- this is a
11 list of bullet points of things that could have caused
12 the root cause, things that needed to be investigated or
13 analyzed more.

14 So low pressure turbine excessive steam flow
15 is one of multiple items. Thermal distress at the LP
16 turbine exhaust. Pressure pulses during hood or curtain
17 spray operations. Shroud fretting fatigue found through
18 zone analysis. Loss of dampening, blade fitment, those
19 are all potential causes.

20 In fact, it looks to me like the team was
21 zeroing in on the more likely causes that needed more
22 analysis, but this is not a final document, so I would
23 not agree with your statement.

24 Q Well, Duke Engineering wrote this statement,
25 that's correct, isn't it?

1 A It is.

2 Q And Duke Engineering used the term "excessive
3 steam flow", right?

4 A They did use that term.

5 Q Okay. So they had an idea that there was too
6 much steam being introduced into the low pressure
7 turbine, right?

8 A I think they had an idea that that could have
9 been -- that is a potential cause.

10 Q Okay.

11 A That -- to be really clear, Mitsubishi's
12 conclusion at that point in time was that there was
13 excessive steam flow to the low pressure turbine. That
14 fact that Mitsubishi believed that couldn't be ignored,
15 and so that was investigated and analyzed very
16 significantly throughout the course of the long root
17 cause. Ultimately, it's not the root cause.

18 Q Just turn over a couple of pages to page 77
19 within this same document. Well, let me withdraw that
20 question and let me take you -- well, let me ask you
21 this: Mitsubishi said that you were putting too much
22 steam in the low pressure turbine in Period 1, right?

23 A Correct.

24 Q Okay. Is high back-end loading, is that the
25 same as excessive steam flow?

1 A They are related, I would say. If you can
2 picture the steam pipe going into the center of the low
3 pressure turbine on the diagram, if there is too much
4 steam flow going in the middle of the machine, and then
5 it goes axially in both directions, that could lead to
6 high loading throughout the machine, including the back
7 end, which would be the L0 blades.

8 **Q Okay. And when you talk about high back-end**
9 **loading here, just to be clear, you are talking about**
10 **the loading on the blades, not loading on the condenser;**
11 **is that right --**

12 A Correct.

13 **Q -- the way it's being discussed here?**

14 A That's correct.

15 **Q Can you show me in the RCA where you**
16 **affirmatively determine that the introduction of**
17 **excessive steam flow into the low pressure turbine and**
18 **resulted in the position of high back-end loading on L0**
19 **blades in Period 1 did not occur?**

20 A I don't know that I can show you that in the
21 root cause. I think the root cause document -- well,
22 what I know is the root cause document examines likely
23 causes, potential factors operationally and from a
24 design standpoint, and essentially rules each one of
25 them out, concluding that the blades were not designed

1 with an adequate margin for the application at the
2 Bartow.

3 The root cause document, if we wrote in there
4 everything that was not found, it would be an extremely
5 long document, so I don't think I can point to what you
6 just stated.

7 **Q Well, you said that Mitsubishi said you put**
8 **too much steam into the low pressure turbine, right,**
9 **excessive steam?**

10 A Yes, let me make sure, from a technical
11 standpoint it's the pounds per hour per surface area on
12 the blade that Mitsubishi was concerned about on the L0
13 blades. The units -- the engineering units are pounds
14 per hour per square foot. And if you put -- you can
15 calculate that number. It's not a measured number. But
16 it's related to steam flow, but it has to do with the
17 impact on the blade for steam flow on a certain surface
18 area of the blade.

19 That was Mitsubishi's concern when we first
20 had the issue. In fact, for quite some time, it was
21 their concern, because the calculated pounds per hour
22 per square foot of steam flow impinging on the L0 blades
23 was higher than what their experience was. It wasn't
24 higher than any limit. It wasn't exceeding any pressure
25 limit. It wasn't exceeding any temperature limit. It

1 wasn't exceeding any flow limit. It was higher than
2 their experience, and that made them concerned. And so
3 they concluded that there was too much steam flow that
4 caused that higher loading on the back-end blade.

5 **Q Well, specifically Mitsubishi said that**
6 **running the unit above 420 caused excessive steam to**
7 **impact the L0 blades, and that caused damage, isn't that**
8 **correct? That's exactly what they said.**

9 A Not really. The -- there is something we
10 really need to talk about here.

11 So the 420 megawatts is the product of the
12 generator. And as we have discussed, the electrical
13 generator is coupled to the steam turbine. When you
14 talk about a steam turbine, you talk about parameters
15 like pressures, flows, temperatures.

16 The steam turbine is what is then spinning the
17 rotor. The rotor is connected to the generator. The
18 generator produces megawatts, or more precisely
19 kilovolt-amperes, which then, in order to talk about the
20 entire unit, it's very common in the industry. We
21 produce megawatts. We produce kilovolt-amperes. So
22 it's common throughout industry to talk in terms of the
23 product that you are making to get a relative feel of
24 the size of the unit.

25 So many times, people talk about sizes of

1 combined cycle plants by the amount that the generator
2 can produce. The amount that the generator can produce
3 is dependent on many factors that are separate,
4 actually. There is many factors that are part of the
5 steam turbine output, but there is other factors that
6 are in play as far as what a generator could produce.

7 So there is really -- in technical terms,
8 Mitsubishi wasn't saying you exceeded 420, that was it.
9 It was always all about the pounds per hour per square
10 foot of steam flow impinging that last stage blade.

11 Q Do you have a copy of Exhibit 116 in front of
12 you?

13 A I know I do somewhere. Yes, I do.

14 Q Okay. And this is -- are you familiar with
15 this document?

16 A Yes.

17 Q Okay. And it's dated March 18, 2015, and it
18 says, Duke Energy Bartow Report of Telemetry Test for
19 40-inch L0, right?

20 A Correct.

21 Q And if we turn to slide No. 4. This is what
22 Mitsubishi says in the last bullet point: Mitsubishi
23 estimated the cause of cracking was overloading of LP
24 section based on 450-megawatt operation, which is over
25 the design point of 420 megawatts, correct?

1 A Yes, that's what it says.

2 **Q And that's what Mitsubishi said pretty much**
3 **consistently throughout with respect to Period 1, right?**

4 A They did. They were technical discussions,
5 and I can point to other documents where they really
6 talked about the steam flow, in particular the steam
7 flow per surface area impacting the last stage blade.
8 The use of the 420 here is just really a proxy for that
9 steam flow.

10 **Q Okay. But this phenomenon that I just read in**
11 **that bullet point is what you mentioned that Mitsubishi**
12 **said was going on, that that's why the Duke engineers**
13 **put it in their RCA drafts before the final result**
14 **was -- the final document was produced; is that correct?**

15 A I am sorry, I am not sure what you are asking.

16 **Q All right. Let me ask it this way: Because**
17 **Mitsubishi said what I just read in that bullet on page**
18 **four of Exhibit 116, that's the reason why that item is**
19 **in the document that we looked at?**

20 A Right. I see what you are saying.

21 So more correctly, I would say because
22 Mitsubishi was talking about the steam flow that I have
23 been stating was an issue, that's why we looked at it in
24 the root cause.

25 **Q Okay. So it wasn't just something off the**

1 street that you had to deal with that would have made
2 the document long. This was a significant central
3 contention of Mitsubishi, correct?

4 A Correct.

5 Q This being the excessive steam flow and
6 loading on the blades.

7 A At this point in time. Remember, this is
8 without Period 3, 4 and 5 information available.

9 Q All right. But a document that was drafted in
10 October 2017 would have been after Period 5, right?

11 A Yes.

12 Q Okay. So I guess what I am asking is you
13 didn't affirmatively study the issue of high back-end
14 loading on the L0 blades and reach a conclusion on that.
15 Instead, you found that you couldn't study it, so you
16 removed it from the final RCA, is that fair?

17 A I don't know if that -- I don't know all the
18 details of every single thing that the root cause team
19 studied or didn't study, so I don't know the answer to
20 that question.

21 Q Well, let's look, if you will, on page one of
22 the RCA.

23 Would you read for me the last full paragraph,
24 because I want to ask your understanding of what that
25 means?

1 A Starting with, Duke also studied?

2 **Q I am sorry, starting with the second to the**
3 **last paragraph.**

4 A Duke Engineering?

5 **Q Yes.**

6 A Duke Engineering concluded that there was no
7 correlation between any one of the above-listed factors
8 in the five failure periods. Notably, Duke was only
9 able to study each factor independently based on
10 available data. In the absence of one, blade telemetry,
11 two, duplication of the factors in various combinations,
12 and three, operation in varying but normal conditions,
13 it is not possible to study how each factor relates to
14 and interacts with any other factor, if at all.

15 **Q So doesn't that say that with respect to the**
16 **early contentions that were even included in Duke**
17 **Engineering's drafts about excessive steam flow and high**
18 **back-end loading on the L0 blades, that you were unable**
19 **to study it, and thus, you could not make a correlation**
20 **and include it as an RCA conclusion; is that right?**

21 A I don't believe that's what that is saying at
22 all, actually. I think what this is saying is the root
23 cause analysis is looking at things that happened in
24 hindsight. If you had the ability to vary some
25 variables and keep some others constant and do

1 repetitive testing, you would be able to test out
2 whether conclusions were valid or invalid.

3 Obviously, we couldn't do that. We are
4 looking at data. We are looking at combinations of
5 variables at specific points in time without the ability
6 to change those. And that's what this paragraph is
7 saying.

8 **Q Well, let's go back to Document 9. It was**
9 **written down in this document, and would you agree with**
10 **me -- and we can go through many of these documents and**
11 **see that this language, after months of study Duke**
12 **Engineering believes --**

13 A I am sorry, which page are you on?

14 **Q I apologize. I am back on page 75.**

15 A 75. Okay, thank you.

16 **Q This -- after months of student, Duke**
17 **Engineering believes the following to be the most**
18 **significant contributing factors towards root cause of**
19 **the history of Bartow Unit 4S L0 event. That language**
20 **is replete throughout these drafts, would you agree with**
21 **that?**

22 A I would have to look at all the drafts.

23 **Q Okay. So let's turn to page 123, which is**
24 **Document 13, and we see halfway down the page there,**
25 **same -- with the same bullet point, low pressure LP**

1 turbine excessive steam flow?

2 A I do.

3 Q And then we could go to -- and that was dated
4 October 12th, 2017, and you accept my representation
5 that that's what the file name said?

6 A I do.

7 Q Okay. And then we see on 137, which is --
8 this is a document that appears to be dated the same
9 day, but it has a different set of initials, BWM, is
10 that Ben Meissner?

11 A Likely it is Ben Meissner, yes.

12 Q He is your Charlotte-based steam turbine
13 expert, right?

14 A He is one of our subject-matter experts,
15 right.

16 Q Now, this document purports to be his edits to
17 the RCA draft, right, if the file name is correct?

18 A That's what it appears to be, yes.

19 Q And this has the same -- I mean, there are
20 some edits here, but there is no edits to this -- this
21 thing we are talking about, this comparable sentence,
22 right?

23 A That's correct.

24 Q And then we go to Document 15, it's just dated
25 10/13/17. It doesn't identify who, but there is no --

1 **the words are the same here, right?**

2 A They are.

3 Q **Okay. And then if we go to Document 16, this**
4 **is dated 10/17/2017, we see the same verbiage, right?**

5 A I am sorry, which page?

6 Q **I apologize, page 165. This is Document 16.**

7 A I seem to be missing that page from my copy.
8 That tab 16 starts, unfortunately, with page 167.

9 MR. BERNIER: I will show him mine, Charles.

10 THE COURT: I'll check mine. To cut to the
11 chase, this is 165.

12 THE WITNESS: Yes, it says the same thing.

13 MR. REHWINKEL: Okay. Thank you.

14 THE WITNESS: Thank you, Your Honor.

15 BY MR. REHWINKEL:

16 Q **All right. And then we have a differently**
17 **styled, but on Tab 17 at 179, we see the same language;**
18 **is that right?**

19 A Yes.

20 Q **Now, if you turn over to Tab 18, this is the**
21 **RCA draft that we agree that, in all likelihood, is**
22 **identical to the final, right?**

23 A Yes.

24 Q **That sentence, that phrase falls out. It's**
25 **not in the corresponding portion of the RCA; is that**

1 **right?**

2 A That's correct.

3 Q **Okay. So between October 2017, assuming this**
4 **file date is correct, and February 6, 2018, we have no**
5 **draft documents, but that falls out -- that meaning the**
6 **statement that Duke Engineering believes the following**
7 **to be the most significant contributing factors toward**
8 **blade failure, et cetera, that concept is not in the**
9 **filing document; is that right?**

10 A It is. I think you are making an assumption
11 that each of these documents you are referring to are
12 drafts of the final root cause, and I don't believe that
13 to be the case. Now, I don't know -- again, I don't
14 know all the details of what the root cause team was
15 doing during the long period of time they were working,
16 but if you examine what you are showing here in all of
17 these Tabs 9 through 17 and compare it to 18, there are
18 many differences between all those working documents and
19 the final root cause analysis, and you just happen to be
20 pointing to one of many, many differences between
21 working copies and the final root cause document.

22 Q **Okay. Well, let's look at page 188, which is**
23 **in Document 17, and this -- it says Appendix A, Bartow**
24 **L0 Event Summary, right?**

25 A It does.

1 **Q Now, in the root cause, it's called Table A,**
2 **on page five, right?**

3 A It looks to be very similar to, if not
4 identical, to Table A, yes.

5 **Q Right. They are not identical.**

6 A Okay.

7 **Q This table -- Appendix A and Table A appear to**
8 **be -- have common genealogy in this process, right?**

9 A Yes.

10 **Q All right. So I don't understand now your**
11 **assertion that documents 2 through 17 are not drafts of**
12 **the final RCA?**

13 A I -- what I am saying is I don't know if they
14 are or not, but to me, it does not appear that they are.
15 There are so many differences between 2 through 17. And
16 then when you compare it to how the root cause on Tab 18
17 reads, there are many, many differences.

18 I would classify all these documents as
19 working papers that summarize what the root cause team
20 is doing; what they are finding; what they are
21 analyzing, but it's not a draft of the root cause, in my
22 opinion.

23 **Q Well, let's go back to Document 3, and it's**
24 **dated -- it's on page 23.**

25 A Okay.

1 Q It's dated June 26th, 2017, do you see that?

2 A I do.

3 Q Now, if you turn to page 25, we see a comment
4 by JRS1, is that you?

5 A It is me.

6 Q Okay. So it would be fair to assume that you
7 reviewed this document?

8 A Yes, sir. That's correct.

9 Q I mean, you wouldn't just review this one
10 little paragraph here. You would have read the whole
11 thing, right?

12 A That's right.

13 Q Okay. So this indicates -- and if we go to
14 page 27, we see an early version of Appendix A, right?

15 A I see that.

16 Q Okay. Now, is it your testimony here today in
17 court that this is not part of the process that
18 developed the RCA?

19 A No, it absolutely is part of the process.

20 Q Okay. So let's go over to Document 6 now. I
21 have included Document 6 in here because there on page
22 49 to 58, there were some stray documents that were in
23 the file that was submitted, and I want to ask you if
24 you are familiar with or recognize the document on page
25 49?

1 A I am familiar with the information. I don't
2 know -- I can't say whether I saw this document before
3 or not.

4 Q Is it fair to say that this document is sort
5 of a template for how to put together the root cause
6 analysis that you are going to be producing through this
7 technical paper process?

8 A I really -- again, I don't know the details of
9 how the root cause team decided they would gather
10 information and make a final report. I can read it and
11 tell you what I think if you can give me a minute, but I
12 really don't know.

13 Q Well, if we look at -- let's just look, if we
14 can, the top line says Bartow 4S root cause analysis and
15 evaluation of contributing factors, right?

16 A Yes, it does.

17 Q That's kind of what you would do if you were
18 going to get a root cause analysis process under way,
19 right?

20 A It is. It's also something -- notes of the
21 team, things that they need to analyze and investigate,
22 absolutely.

23 Q Okay. And it says a little bit down there,
24 brief history, copy/paste and add to what Ben wrote in
25 his summary to Jeff Swartz/Tony Salvarezza, 3/29, right?

1 A Yes.

2 Q So this is -- this -- Ben, again, is probably
3 Ben Meissner?

4 A Yes, I agree.

5 Q All right. And he wrote you a memo, I guess
6 on March 29, we don't have it, but obviously there was
7 something that probably explained what had happened from
8 the steam turbine expert's point of view?

9 MR. HERNANDEZ: Objection, Your Honor, calls
10 for speculation.

11 THE COURT: To the extent you know,
12 Mr. Swartz, I mean, you can explain.

13 THE WITNESS: Yes, Your Honor.

14 I don't remember specifically what Ben
15 Meissner wrote, but it appears he wrote some -- an
16 email, a note, something pertaining to the steam
17 turbine, yes. It's not surprising. He is one of
18 our technical experts.

19 BY MR. REHWINKEL:

20 Q Right. So I don't know, and I can't represent
21 to you that the next page, which is 51, which is a
22 one-page document, that's dated 8/24/2017, is related or
23 not to this document. Would you know? This document
24 being page 49.

25 A If 51 is related to 49, is that what you are

1 asking?

2 Q Yeah, I don't know if it is. I'm telling you
3 I put together stray documents that were in the same
4 area of the file.

5 A It appears to me that page 51 is actually some
6 notes from a meeting, a working meeting. And I do agree
7 with you that on 49, it looks like they are starting to
8 put together things that would go into how you might
9 want to format a root cause so that it would be clear
10 and understandable.

11 Q Okay. So going back to page 49, it says: LP
12 turbine back-end loading greater than 15,000 -- I forget
13 how to say that.

14 A Pounds per hour per square foot.

15 Q Okay. And does this talk about how this has
16 had an effect or not on the unit across the different
17 periods of operation, right?

18 A That's what it says, yes.

19 Q So it would be reasonable to assume these
20 documents that were maintained by the company, that
21 there was an instruction to evaluate this as a part of
22 the root cause process, right?

23 A Well, it looks to me like they were starting
24 to build what would be in a final report out. And at
25 that section, it appears that they were planning on

1 having some statement on that subject.

2 Q Okay.

3 MR. BERNIER: Charles, I am sorry, could I ask
4 you what the first word before draft is up at the
5 top?

6 MR. REHWINKEL: It says "miscellaneous".

7 MR. BERNIER: Oh, thanks.

8 MR. REHWINKEL: I am sorry.

9 MR. BERNIER: That's okay.

10 MR. REHWINKEL: I think I had brackets around
11 it.

12 THE COURT: Would this be a good time to take
13 five?

14 MR. REHWINKEL: Yes.

15 THE COURT: We have been at it for a while and
16 give Mr. Swartz and everybody else a stretch.

17 (Brief recess.)

18 THE COURT: I think we can resume, Mr.
19 Rehwinkel.

20 MR. REHWINKEL: Thank you.

21 MR. BREW: Excuse me, Your Honor, before we
22 start, just to save time, I circulated copies of
23 the two exhibits that we may eventually get to.

24 All the parties should have it.

25 THE COURT: Okay. Very good. I have it.

1 MR. BREW: And there is copies on the desk for
2 the witness when he gets to it.

3 COMMISSIONER GRAHAM: Thank you.

4 MS. BROWNLESS: Excuse me, Mr. Brew. I don't
5 see any exhibits. Oh, got it. Thank you, sir.

6 THE COURT: All these red folders, they all
7 look alike.

8 MS. BROWNLESS: Yeah.

9 BY MR. REHWINKEL:

10 **Q So, Mr. Swartz, are you saying that Duke did**
11 **study the impact of high back-end loading on the L0**
12 **blades, or did you say because of what happened with the**
13 **blade failures in Periods 3, 4 and 5, you didn't study**
14 **it, you just took it out of the RCA?**

15 A Well, I don't think I am saying either of
16 those things. The loading is a calculated value. It's
17 really based on Mitsubishi's experience with their
18 fleet, and it's a parameter that Mitsubishi just uses to
19 help look at what is the forces -- what are the forces
20 on a turbine blade.

21 You know, as far as studying that, again, with
22 hindsight, you can only look at what happened. You
23 can't run experiments to try to determine if you run a
24 certain amount of steam flow, you will get a certain
25 response. In fact, you may not want to run that. So,

1 you know, I don't think it's either of the choices you
2 gave me.

3 **Q Well, did you study whether the introduction**
4 **of excessive steam flow into the low pressure turbine**
5 **and the resulting imposition of high back-end loading on**
6 **the L0 blades was not a significant contributing factor**
7 **to the root cause of the L0 blade failures?**

8 A I believe that was considered as -- I mean,
9 it's obvious in all these documents that the root cause
10 team considered that as a potential cause. The steam
11 flow -- what's the exact wording? Let me read it
12 exactly here. Excessive steam flow.

13 The turbine parameters, the operating
14 parameters are pressures and temperatures. And
15 pressures really are what dictate the flow.

16 What we are saying is that we did operate in
17 accordance with the design pressures of the unit.
18 Mitsubishi is saying that they are not disputing that,
19 actually. What Mitsubishi is saying is that operating
20 at those pressures ends up having a higher pounds per
21 hour per foot square of loading on the back end on the
22 L0 blade than what they are used to, and that that's
23 unknown to them. It's uncertain.

24 In fact, there is certain documents. In fact,
25 if you look at RAP-6, and even in Mr. Pollock's exhibit

1 attached to his testimony, it talks about how Mitsubishi
2 is just uncertain of what will happen in that zone.

3 So it's not known. I think that actually
4 lends credence to the fact that the lack of blade design
5 margin is the root cause. It's uncertain. The margin
6 is not built in, and when you look at what happened over
7 each successive period of time, even with lower
8 operating pressures -- and again, the pressures are what
9 dictates the flow through the turbine. Higher pressure,
10 you are going to get more flow through the turbine.

11 As we went from Period 1 through Period 5, it
12 wasn't successively lower, because Period 3 we actually
13 raised the pressure at first in order to do some
14 testing. But then during that testing, we realized we
15 had something called an avoidance zone and we had --
16 which we had to avoid during operation, but we put
17 specific pressure limits in place to make sure that we
18 didn't have vibration on the last stage blades.

19 And that's really the issue. Whether it's
20 steam flow, whether it's hardening on blade -- on the
21 snubber or the tip, the shroud; whether it's blade
22 fitment. It may be too loose. That means that there is
23 not enough -- there is too much tolerance, perhaps,
24 between the snubbers and the Z-locks. All those things
25 lead to vibration or flutter in the blades, which then

1 could cause a failure. And that's what we are trying to
2 avoid. In fact, we did avoid that.

3 Again, I can't emphasize this enough. We
4 found proactively four times that there were issues with
5 the snubbers and with the Z-locks, and we were able to
6 take the unit out of service, continue operating for our
7 customers with the combustion turbine generators, but we
8 took the unit out of service before that damage migrated
9 into the blade itself, which that would have been a
10 catastrophic failure that could have taken months or
11 years, and many, many millions of dollars to fix. But
12 we were able to avoid that because we found these issues
13 proactively.

14 So, again, the steam flow is just one of a
15 number of things that can cause vibration in a blade.
16 And ultimately, the root cause is that there is not
17 enough design margin in the blades to prevent that
18 vibration from happening. Even Mitsubishi agrees with
19 that in their later root cause, that the root cause in
20 every period is too much vibration.

21 Now -- so that's -- that's what I think this
22 is saying.

23 **Q Mitsubishi doesn't agree that they designed a**
24 **blade that caused a vibration in every period, do they?**

25 A I am sorry, could you ask that again?

1 **Q Mitsubishi doesn't agree that they had an**
2 **inadequately designed blade that caused the vibration,**
3 **do they?**

4 A They are in agreement that high -- that
5 flutter, vibration, was the cause of blade failures in
6 each of the five periods.

7 Now, I think it's a debate whether or not the
8 blade should have put up with the atmosphere at Bartow,
9 the operating conditions at Bartow, pressures and
10 temperatures, and able to vibrate without having damage
11 or, you know, obviously they vibrated and had damage. I
12 don't think Mitsubishi would ever admit to a design
13 weakness.

14 **Q Okay. I just wanted to make it clear, they**
15 **didn't admit that they have an inadequate design, right?**

16 A Correct.

17 **Q Just along that line, the blades in Period 5,**
18 **they are called Type 1 blades, right?**

19 A Correct.

20 **Q Were they identical to the blades in Period 1?**

21 A There was one slight difference. They were --
22 so let's talk about type for a minute. The type of the
23 blade is the, by far the most important thing. And
24 could I -- could I stand up, Your Honor, again?

25 THE COURT: Sure.

1 THE WITNESS: So again, we have some other
2 folks in here, too, but the type of the blade is
3 the curvature of the blade, and it's really talking
4 about this blade itself, which is the structure you
5 are trying to protect. You don't want that to come
6 apart. You don't want it to crack. All of our
7 issues were either with this snubber at the
8 mid-span, or with this shroud at the tip.

9 But Type 1 blades have a certain geometry of
10 the blade and a certain manufacturer. Type 3
11 blades are different. I don't know the specific --
12 I am not a turbine engineer, but the curvature is
13 different. The thickness might be different. It's
14 a different style of blade.

15 When we went back to Type 1 blades at the end
16 in Period 5, it's the exact same blade. It's the
17 same snubber, and it's the same Z-lock with one
18 small change. There was a change in the geometry,
19 just a softening of the edges, so to speak, to
20 prevent some potential stress riser spots on the
21 Z-lock and on the snubber. And that was the only
22 difference.

23 Both Mitsubishi and Duke Energy concluded that
24 based on all of the different data that they saw
25 from other periods, that those small geometry

1 changes would be helpful to prevent future failures
2 of either the shroud, the Z-locks or the snubbers.

3 BY MR. REHWINKEL:

4 Q The snubber was in exactly the same spot on
5 the Period 5 blade as in Period 1?

6 A Yes, it was.

7 Q Do you know whether the manufacturing was
8 exactly the same from the Period 1 blades that were made
9 sometime before 2008 and the Period 5 blades that were
10 made in 2012?

11 A Well, when you say the manufacturing, what do
12 you -- how do you define that?

13 Q Well, how they are made, who they were made
14 by, and the materials in them, were they exactly the
15 same?

16 A I know the materials are exactly the same. I
17 know that they are Mitsubishi blades, so we are really
18 relying on Mitsubishi. They are a certain definition.
19 They are Type 1 blades, so for what I know, yes, they
20 are the same blades.

21 Q But you don't have any personal knowledge that
22 they were -- that the manufacturing process was exactly
23 the same, do you?

24 A Not any personal knowledge, no.

25 Q Okay. And did you have any evidence that they

1 **were exactly the same? Did you go back and compare the**
2 **manufacturing process in Period 1 blades and Period 5**
3 **blades?**

4 A Not to my knowledge.

5 Q **Okay. When -- at any point during this L0**
6 **blade event process, did Duke ever change any of the**
7 **components in the low pressure turbine other than the L0**
8 **blades?**

9 A Not to my knowledge, no. It wouldn't be
10 surprising -- I mean, when you say any. There's many
11 components inside a steam turbine, and every time you
12 open it up, there is probably some sort of sealing
13 surface that has to be changed. So I don't want to be
14 wrong on a technicality, but -- actually, Mr. Bernier
15 has a picture that might be really valuable if I could
16 show it.

17 Q **Sure. Just to be clear, I am not asking you**
18 **about whether there was any ordinary maintenance that**
19 **you did that affected any other component. My question**
20 **was, and I think you understood it this way, did you**
21 **make any other changes inside the L -- inside the low**
22 **pressure turbine as a result of what you found in any of**
23 **those damage events?**

24 MR. HERNANDEZ: May I approach, Your Honor?

25 THE COURT: Yes.

1 BY MR. REHWINKEL:

2 Q Do you understand that?

3 A I do. And to answer, we did not make any
4 others changes, and I think I can explain.

5 So this is the actual low pressure turbine at
6 Bartow. Again, the steam goes in the middle and travels
7 axially in both directions. You can see the blades get
8 bigger as the steam travels through the turbine because
9 the steam is losing energy and it needs more surface
10 area to spin the turbine.

11 What you can't see in this picture is that
12 there is fixed blades, called diaphragms, that fit in
13 between each of these rows. So when you encase the
14 turbine, those diaphragms are fitting in between. So as
15 the steam travels through these nozzles, or blades, to
16 spin the turbine, the diaphragms then redirect the steam
17 so that they impinge on just the right angle to get the
18 most work out of these blades as they travel through.

19 So they work in the second stage. Then they
20 are redirected through diaphragms here, and then again
21 redirected through the third stage. They are redirected
22 into fixed blades here and redirected into the L0 stage.

23 And I think it's pretty important to
24 understand that each iteration we had, we were able to
25 inspect this whole turbine, and there were no other

1 issues with the turbine. There were no other issues
2 with the diaphragms. It was only with the L0 blades.
3 And it wasn't with the blade itself, it was with the
4 snubbers and the tips. And we took the blades out of
5 service before there was damage to the blade, which
6 would be much more significant and could cause damage to
7 the whole turbine if an L0 blade failed.

8 It's such a massive weight going at such a
9 high speed, that if a blade itself failed, it would be
10 catastrophic, and that's what we were trying to prevent,
11 and we did prevent through this process.

12 I think that's good for now.

13 **Q So beyond inspection, you didn't do any study**
14 **that determined that the upstream blades, or the nozzles**
15 **or any other components in the low pressure turbine were**
16 **unaffected by the pressures that were imposed in Period**
17 **1?**

18 A Oh, I would say we have a great deal of
19 information from these iterative inspections we did.
20 You know, it's unfortunate that we had do so many
21 inspections. The regular maintenance interval on a
22 turbine would be maybe 100,000 operating hours, or
23 80,000 operating hours. It would be measured in years
24 before you actually open up the casing of a turbine and
25 look at it.

1 Because we proactively worked to prevent a
2 blade failure, we had opportunity to look at the whole
3 low pressure turbine multiple times over five years.
4 Every time you open up a turbine, turbine engineers were
5 all looking at it, taking measurements, doing
6 nondestructive examination, making sure we don't have
7 any other issues.

8 It was a concern. If we had issues in the
9 last stage of blade, maybe there is issues in other
10 stages, and so we did extensive examination, but we did
11 not find any issues with any other stages or rows of
12 blades.

13 **Q And you didn't put that in the RCA, because**
14 **you didn't feel that needed to be in there, that you**
15 **determined that the rest of the turbine was fine?**

16 A I am not sure why we didn't decide to put that
17 piece of information in, but it's very clear we had so
18 many opportunity for that inspection, and I know we did
19 not have any other issues.

20 **Q So looking at page six of the RCA, do you see**
21 **a discussion under the heading "Operational Factors**
22 **Potentially Impacting MHPS Blades", and then it has a**
23 **subheading, "Low Pressure (LP) turbine Excessive Steam**
24 **Flow - Running In The Avoidance Zone", right?**

25 A Yes.

1 Q And these three paragraphs here are basically
2 how you disposed of the issue of excessive steam flow,
3 is that fair?

4 A It is.

5 Q Okay. And there is a reference here to the --
6 it says in the middle of that first paragraph: Based on
7 hindsight, MHPS Engineering claimed at the time of the
8 first failure (Period 1) Bartow Unit 4S exceeded the
9 back-end loading limitation of 15,000 foot pounds per
10 hour squared, is that the way to say it?

11 A The way I say it. There is actually a couple
12 different ways, but pounds per hour per square foot.

13 Q Okay -- by many hours, and that the MHPS
14 40-inch L0 fleet average for back-end loading was closer
15 to 12,000, whatever that is?

16 A Right.

17 Q Okay. And you don't disagree with those
18 factual recitations about those numbers, either the L0
19 fleet average or the exceeding 15,000 foot pounds per
20 hour squared?

21 A Yeah. What that represents is Mitsubishi's
22 concern. So Mitsubishi's concern was that we were up in
23 the 15,000 range with these blades, but the Mitsubishi
24 fleet experience with 40-inch L0 blades was closer to
25 12,000 pounds per hour per foot squared. And that's

1 what led Mitsubishi to conclude that, oh, it must be
2 that back-end loading. So that's the concern that's
3 stated.

4 I am not sure if I answered your question.

5 **Q Well, do you disagree that you were operating**
6 **above 15,000 foot pounds per hour squared in Period 1?**

7 **A** I don't disagree with that calculation.

8 **Q In fact, when you were at 450, you were more**
9 **at, like, 17,000, right?**

10 **A** I think that he is a good approximation, yes.

11 **Q And you don't disagree that the -- you don't**
12 **have any basis to disagree with the Mitsubishi fleet**
13 **experience, right?**

14 **A** That's correct.

15 **Q Okay. So there is a statement in the middle**
16 **of the next paragraph about how many hours in Period 1**
17 **you were in exceedance of the avoidance zone you talked**
18 **about, right --**

19 **A** Yes.

20 **Q -- 2,466?**

21 **You agree with Mr. Pollock's testimony that**
22 **for Period 1, you operated the turbine at, was it 2,972**
23 **or 73 hours above 420 megawatts?**

24 **A** I do.

25 What's really important to understand about

1 these hours and avoidance zone in Period 1 is they are
2 back-calculated. This thing called the avoidance zone
3 didn't exist until after the telemetry testing was done
4 at the start of Period 3. And with the value gained
5 from that telemetry testing, which then derived this
6 avoidance zone, we said, well, why don't we look back at
7 the other operating periods and see where are we
8 operating in that avoidance zone during the other
9 periods.

10 So it wasn't as if we were violating some kind
11 of limit during Period 1. We back-calculated that we
12 were in the avoidance zone for that many hours during
13 Period 1.

14 **Q Well, Mitsubishi never said that operating in**
15 **the avoidance zone in Period 1 was a problem. They said**
16 **operating above 420 in Period 1 was a problem, didn't**
17 **they?**

18 A No. See, again, technically, this is -- 420
19 is really a proxy for the 15,000 pounds per hour per
20 foot squared, or maybe even 17,000 pounds per hour per
21 foot squared, which is the calculated steam flow for the
22 surface area on the L0 blade.

23 That was Mitsubishi's concern. It was not an
24 operating limit. It was beyond their experience. It
25 was an area of uncertainty and that they did not know

1 about, and so they said that's what they believed.

2 There was too much steam flow in the last stage.

3 Q Mitsubishi didn't say that you operated in the
4 avoidance zone in Period 1, and that was the problem.
5 That wasn't -- that was your -- that was a construct
6 that you put on your evaluation in Period 1, right?

7 A I am sorry, could you --

8 Q Okay. Mitsubishi established the avoidance
9 zone from, was it Period 3 forward?

10 A Correct.

11 Q Okay.

12 A They established the avoidance zone for Period
13 3 with the blade vibration monitoring system that was
14 installed with those new blades in Period 3.

15 Q So the avoidance zone was established for a
16 prospective purpose, right, by Mitsubishi?

17 A Correct.

18 Q Okay.

19 A It was -- well, let me make sure we
20 understand.

21 So it was installed to make sure that we
22 didn't have any more issues, so we created -- Mitsubishi
23 did testing, and we were able to gather data that showed
24 if you run in a combination of inlet pressures and
25 exhaust pressures in certain areas, the blades vibrate

1 too much, and so you need to avoid operating in those
2 operating conditions.

3 And then we received guidance from Mitsubishi.
4 They said, don't operate in those avoidance zones. If
5 you have to ramp up or down through those zones of
6 operation, don't spend time in those zones. Get right
7 out of them. That was the guidance issued to make sure
8 we didn't have an issue from Period 3 on. We still had
9 issues even though we avoided the avoidance zone in
10 Periods 3, 4 and 5.

11 **Q Well, my question to you is that imposition of**
12 **the avoidance zone was about going-forward operations,**
13 **correct?**

14 A Oh, yes.

15 **Q Yes.**

16 A But I think the avoidance zone and the steam
17 flow can't be separated. The avoidance zone is related
18 to the steam flow, this pounds per hour per foot
19 squared, and that's what is being talked about here in
20 the root cause.

21 **Q By the same token, operating above 420 and**
22 **steam flow can't be separated either, can they?**

23 A They can be correlated. There are many
24 different factors that determine what the generator can
25 produce as opposed to the pressures and the flows and in

1 the steam turbine. So there is a correlation there, no
2 doubt, but you can't just use a megawatt output of the
3 generator to talk about conditions in a steam turbine.

4 **Q There is a high correlation between the amount**
5 **of steam flow that gets you to 420 and above, right?**

6 A There is. I think to try to really simplify,
7 Mitsubishi is saying that the steam flow, the 420 and
8 above would produce steam flow that would be beyond
9 their operating experience in a zone that they were not
10 certain of.

11 **Q Okay. In the RCA, would it be fair to say**
12 **that your analysis did not look at whether steam flows**
13 **for the approximately 3,000 hours you operated the steam**
14 **turbine above 420 megawatts caused material lasting**
15 **damage to the non-blade portion of the steam turbine,**
16 **did you?**

17 A Are you looking at a specific part of the --

18 **Q No. I am asking you if there is anything in**
19 **your RCA where you studied the number of hours that you**
20 **operated above 420 to determine whether it damaged the**
21 **low pressure turbine.**

22 MR. HERNANDEZ: Judge, I am going to object on
23 vague because I am not sure I understand what the
24 question is.

25 MR. REHWINKEL: Your Honor, I am trying to

1 understand what the RCA did and didn't do. And my
2 question is: Did the RCA study the amount of hours
3 above 420 to determine whether that had impacted
4 the low pressure turbine? That's my question.

5 A I think even better than just looking at
6 hours -- and I don't know if that was a detail that the
7 root cause team looked at or not. I suspect it was a
8 detail that they looked at, but again, the root cause
9 team had knowledge of -- in fact, firsthand knowledge
10 for many of the team members of inspections that were
11 done at every iteration at the end of Period 1, at the
12 end of Period 2, at the end of Period 3, at the end of
13 Period 4 and at the end of Period 5 to look at each
14 stage of blades in the low pressure turbine; to look at
15 each of the diaphragms in the low pressure turbine.

16 We had nondestructive examination conducted
17 during those times to conclusively say that there was no
18 damage in the low pressure turbine other than the
19 snubbers and the shroud tips on the L0 blades.

20 **Q Do you have a copy of Exhibit 105 in front of**
21 **you? It's revised DEF response to OPC POD 31?**

22 A I do not have 105.

23 **Q It should be in that package there.**

24 A I have 102, 103, 104, 115 and 116.

25 **Q Oh, look to your left there, the red folders.**

1 **I am sorry.**

2 A Oh, I am sorry. I covered it with my
3 pictures. Okay, I have 105.

4 Q Now, would you agree with me that 105 is a
5 **response to an OPC POD No. 31?**

6 A Yes.

7 Q Okay. And it's Bates numbered in the lower
8 **right-hand corner, so I am just going to refer to the**
9 **last four numbers there.**

10 Could I ask you to -- well, first of all, look
11 **at Bates 6868. And given your tenure at Progress, you**
12 **are familiar with this kind of document, are you not?**

13 A I am, yes.

14 Q Okay. This is what you do -- you meaning the
15 **executives and operational folks -- do to go to the**
16 **Board to get approval to initiate a project?**

17 A Well, it may or may not be the Board, but it
18 is part of the project approval process. And based on
19 the dollar value, the total project cost, there are
20 different levels of approval.

21 Q I said board, I meant senior executive team --

22 A Yes.

23 Q -- is that right?

24 A Yes.

25 Q So we see here on 6868 all the executives,

1 like Jeff Lyash and Bill Johnson, et cetera, you see
2 their names and initials for approval, right?

3 A Yes, I do.

4 Q Okay. And if we go to 68 -- this is called a
5 business analysis package, right?

6 A Part of this is, yes.

7 Q Part of it, yes.

8 A Yes.

9 Q And the business analysis package says,
10 here's what we need to do for the benefit of the company
11 and its customers, and here's what it's going to do for
12 them, and here's what it's going to cost to do it in
13 very rough terms, is that fair?

14 A Yes, that's fair.

15 Q Okay. And the senior executives look at that
16 information and they give you a thumbs up or a thumbs
17 down, right?

18 A Yes.

19 Q Thumbs up is all these signatures and initials
20 here, right?

21 A That's accurate.

22 Q Okay. So when we look on 6875, which is just
23 a few pages in, we see that there was, I guess, an
24 analysis done for business as usual, and that was
25 basically the recommended case to build Bartow; is that

1 **right? If you look on the prior page.**

2 A So we are looking at 6875?

3 **Q 74 and 75, I should say.**

4 A Oh, 74 and 75. And so, yes, looking at the
5 alternatives considered, I know -- I am familiar with
6 these documents, and there were multiple alternatives
7 considered.

8 **Q Okay. And on 6875, in the, it looks like the**
9 **second full paragraph starting with the secondary**
10 **market; do you see that?**

11 A Yes.

12 **Q Okay. This is part of what was the chosen**
13 **solution, is that right?**

14 A Yes, it is.

15 **Q Okay. Can you read that paragraph for me**
16 **aloud?**

17 A Sure.

18 A secondary market 400-megawatt steam turbine
19 was found. The use of this turbine was investigated and
20 proved to be a very good fit for the 4 CT and 4 HRSG
21 combinations. In fact, it provided more operating
22 flexibility (see operational analysis detail below). In
23 addition, the uncertainty in project schedule and cost
24 was reduced.

25 **Q Okay. So this is -- this document is what the**

1 **senior executives would have reviewed to give the**
2 **approvals that we see back on 6868?**

3 A It's a piece of that document, yes.

4 Q Okay. All right. So there was an expectation
5 **that at the time this was approved by executives, that**
6 **you were getting a steam turbine that was 400 megawatts**
7 **in output, right?**

8 A I would be very careful to characterize the
9 actual capacity of any of the pieces of equipment based
10 on this document. This is not a technical engineering
11 document. It is a, like you said, a business analysis
12 package. It gives the relative size of part of the
13 equipment that's going to go into an approximate 1,200
14 megawatt 4-on-1 combined cycle.

15 Q Okay. Turn back to page 6911. This is page 3
16 **of 27 of an IPP, which is integrated project plan.**

17 A Yes, that's correct.

18 Q Okay. And we see over here -- in 2008, what
19 **would have been happening with the Bartow project where**
20 **an IPP would be reviewed and approved?**

21 A As far as what would be happening, could you
22 give me more specific --

23 Q Well, you saw the BAP was approved in 2006, so
24 **that meant you could go ahead and execute on whatever**
25 **contracts you had to do and spend the money, right?**

1 A Right.

2 Q And that was kind of your authorization to
3 conclude the contracting, I guess, for the Tenaska plant
4 steam turbine?

5 A Yes.

6 Q Okay. So in 2008, if this IPP is dated --
7 these approvals look like on page 6907 they are in March
8 of 2008. What's going on here?

9 A Well, I am paging back towards the beginning
10 of the document. I am not familiar with -- and this is
11 a long time ago before I was directly involved, of
12 course.

13 Q Okay. 6861 -- 6881 is the beginning of that
14 IPP and business analysis package, is that right?

15 A Yes. Could you -- I am sorry, could you state
16 your question again?

17 Q So if we look on page 6885, we see -- I think
18 they are looking for an additional \$18 million of
19 funding?

20 A On 6885?

21 Q Yes?

22 THE COURT: On the recommendation --
23 BY MR. REHWINKEL:

24 Q On the recommendation there.

25 A I see that, yes. I see it. So that is likely

1 the purpose for this document --

2 **Q Okay. We --**

3 A -- you know, I don't know specifically, but
4 what I do know is that the project was commissioned in
5 June of '09, as we have previously discussed. It was
6 well underway from a construction standpoint when
7 this -- the date of this document. So it looks like
8 they were looking for some additional funding.

9 **Q Okay. And on 6911, which is where I wanted to**
10 **ask you a question, we see Paul Crimi's name and his**
11 **signature and a date, right?**

12 A Yes.

13 **Q Does that mean he was -- would have been**
14 **involved in sort of the planning and implementation of**
15 **the Bartow repowering project?**

16 MR. HERNANDEZ: Objection, Your Honor. I
17 think the witness is testifying he is not certain
18 about this document altogether. He is not certain
19 what's occurring here, and so there is a lack of a
20 predicate for this question.

21 MR. REHWINKEL: My question is to ask him
22 about Mr. Crimi, and I have a question later on
23 that will tie this later on, Your Honor.

24 THE COURT: Again, I will overrule to the
25 extent he can only answer what he knows. If he

1 doesn't know, I think he is capable of saying that.

2 THE WITNESS: Well, so if you look at the
3 signature blocks required here, it's -- this is a
4 big decision for the company. It's a lot of money
5 being talked about, a lot of funding, and there is
6 a lot of executives listed here from multiple
7 departments. It's not just the department involved
8 with the construction. It's not just the
9 department that would be involved with the
10 operation of the unit.

11 Mr. Crimi, at the time, was an executive with
12 a support services branch of the company, and so he
13 was one of the required signatures of many
14 executives. Since it was a large financial
15 decision, there had to be buy-in from an alignment
16 across the executive suite.

17 BY MR. REHWINKEL:

18 **Q He was Executive Director of Power Generation**
19 **Services, is what it appears to say here?**

20 A Yes.

21 **Q Okay. So based on your knowledge of the**
22 **company at the time, would that have meant he would have**
23 **had some operational responsibilities with respect to**
24 **the steam turbine and the Bartow repowering?**

25 A Actually, no, it would not have. He was -- as

1 power generation services, that's technical expertise.
2 It's engineering. It's not the operation of the unit.
3 The operation would be some of the other signatures on
4 this page.

5 **Q Well, obviously, it wasn't commissioned at**
6 **this time. I am talking about as far as implementing**
7 **the project, when I said operational.**

8 A Well, and again, as far as implementing the
9 project, this looks like every executive in every
10 department in the company was part of the decision to
11 implement the project since it was such a big
12 investment.

13 **Q So in 2006, you executed a contract to buy the**
14 **steam turbine from Mitsubishi, right?**

15 A Subject to check, yeah. I don't remember if
16 it was 2006.

17 **Q But in 2006, Duke contracted with Mitsubishi,**
18 **as your documentation says, to perform heat balances,**
19 **correct?**

20 A Yes.

21 **Q And could you tell the judge what a heat**
22 **balance is and what its intended output is?**

23 A Sure. Any big new project like a new power
24 plant, you have to try to -- well, the engineering
25 analysis includes looking at many, many variables, in

1 fact, a few dozen variables that can come into play to
2 predict what the output of a unit will be.

3 There is different operating pieces of
4 equipment that might be operating or not operating.
5 There is different atmospheric conditions. The
6 temperature of the weather makes a difference. The
7 temperature of the air makes a difference. The
8 temperature of the cooling water makes a difference.
9 The temperature of the cooling substance which might be
10 hydrogen in the case of a generator. All these things
11 are analyzed many different ways.

12 So, for example, on the Bartow combined cycle
13 project, there were over 300 heat balance cases that
14 were developed. And it seems excessive, there is over
15 300, but think about Bartow for a minute. It's a 4-on-1
16 combined cycle, so you might run a heat case that is
17 with all four combustion turbines running and the steam
18 turbine, so 4-on-1 operation, but without what are
19 called duct burners running. And you might do that at
20 32 degrees. You might do it at 72 degrees. You might
21 do it at 95 degrees ambient conditions.

22 And then each one of those ambient air
23 conditions, you might do it at a different cooling water
24 temperature, because all those variables make an impact
25 on what the engineering prediction is going to be on the

1 gross output of the power block.

2 So for Bartow, you would do it on 4-on-1,
3 3-on-1, 2-on-1, 1-on-1 configuration. You would do it
4 with duct burners, without duct burners in service,
5 which is a very significant part of the operation that I
6 haven't talked about yet.

7 In the heat recovery steam generator, I
8 mentioned how the exhaust steam -- or the exhaust gases,
9 rather, from the combustion turbines, rather than go out
10 in the atmosphere, which they would in simple cycle
11 operation, they are captured and they heat water, but
12 there is also capability built into these heat recovery
13 steam generators that they are called duct burners. The
14 natural gas-fired burners will light fire literally in
15 the duct to put more heat in addition to the exhaust
16 gases coming from the combustion turbine so that you can
17 generate -- turn more water into steam. Generate more
18 steam from the HRSGs. So whether duct burners are on or
19 off is a very significant variable.

20 In addition, at the Bartow site, there is
21 something called power augmentation in the combustion
22 turbines. And this gets pretty technical, but you can
23 actually extract part of the steam as it's going through
24 the steam turbine before it reaches the condenser and
25 then pipe it into the combustion turbines to augment the

1 air and combustion gases that are turning the combustion
2 turbines motor.

3 So you are putting some high pressure steam
4 into the combustion turbines to make it generate more
5 megawatts. You are stealing a little bit of steam from
6 the steam turbine to do that, so whenever you use power
7 augmentation in the combustion turbines, you turn on
8 your duct burners to get more steam from the HRSGs to
9 put back in the steam turbine.

10 THE COURT: Steam turbine, I got you.

11 THE WITNESS: So depending on what pieces of
12 equipment are operating at Bartow, there is a great
13 variation in how many megawatts the site is going
14 to have as output. And so, like I said, over 300
15 different heat balance cases were generated as part
16 of the project as engineering predictions on what
17 the result would be.

18 BY MR. REHWINKEL:

19 Q So what is the primary output of a heat
20 balance? Isn't there, like, a bottom line that comes
21 out?

22 A There is a lot of output. I don't know that I
23 can say there is a primary output.

24 Q Okay. Well, let's -- do you have a copy of
25 Exhibit 108 in your red folder there?

1 A Yes, I have 108.

2 Q Now, this happens to be Mitsubishi's response
3 to your RFP for the long-term solution, right, this
4 document?

5 A Yes.

6 Q Okay. But if we -- if I could get you to
7 turn, and I apologize I didn't Bates these, these Bates
8 numbers at 2437, they are real tiny. If you go to 2435,
9 you can see there is an electrical -- or there is a
10 diagram, and then after that, I want to ask you
11 something about the heat balances that are behind that.

12 MR. HERNANDEZ: So you want 437?

13 MR. REHWINKEL: Yeah, 437.

14 MR. BERNIER: It is small.

15 MR. REHWINKEL: Yeah.

16 BY MR. REHWINKEL:

17 Q Once you get into that area, you will see that
18 there is an easier-to-read page 2 of 129, there is
19 100 --

20 A I think I am there.

21 Q You found it?

22 A Yeah.

23 Q Okay. And I apologize, I don't know why page
24 1 of 129 is not here. Our -- the document is Bates
25 numbered consecutively, but I want to ask you if 2437 is

1 the output of the heat balances, one of the pages of the
2 output of the heat balances that you just told the judge
3 about?

4 A It is, and it's also on 2438, the columns
5 follow down. There is so many variables involved.

6 Q Oh, yes.

7 A It's the same -- like, for instance, if you
8 look across the top of 2437, this looks like it's Case 1
9 through Case 15 of the heat balance, and there is still
10 more of Case 1 through Case 15 on 2438.

11 Q Well, go to 43, I think you will see at the
12 bottom of that.

13 A And there is more on the page after that as
14 well.

15 Q Yeah. Go to 2443?

16 A 2443.

17 Q Yeah. Is that where this -- these -- the
18 cases are numbered across the top 1 through 15?

19 A Yes.

20 Q Okay. So these pages from 37 to 43, these
21 are -- these all relate to the same --

22 A They do, yes.

23 Q -- long columns, right?

24 A Right.

25 Q Okay. And then we see on 44 there, there is a

1 whole new set of heat balances?

2 A Right, 16 through.

3 Q Okay. But let's go back to 37. And would it
4 be fair to say that these are operating permutations, is
5 that a fair way to say these are kind of postulated ways
6 you could operate the unit, 1-on-1, 3-on-1, 2-on-1?

7 A I would say they are predictions --

8 Q Okay.

9 A -- based on varying different operating
10 parameters.

11 Q Okay.

12 A And having different pieces of equipment in
13 service or out of service.

14 Q Right, okay.

15 So when we look on -- in the bottom -- at the
16 top a little bit, say, the top third of the page, we see
17 on the left-hand side, run date, in the heading titles,
18 right?

19 A Yes.

20 Q And if we follow that all the way across, it
21 says 7 September, 2006?

22 A Yes, I see that.

23 Q Okay. So are these the ones that were done by
24 Mitsubishi or by Bibb?

25 A I don't know, looking at them. I know -- let

1 me look up at the title. These appear to be the ones
2 done by Bibb.

3 Q Okay. Now, Bibb is an engineer, or an
4 engineering firm that you hired to run heat balances in
5 conjunction with Mitsubishi, so you knew what you were
6 going to be getting out of this unit before you
7 finalized the purchase, right?

8 A Well, Bibb was a little bit more than that.
9 That's a piece of their scope. But Bibb was the
10 engineer on the project, so we -- we, Progress Energy at
11 the time, had a contract with a consortium that was Bibb
12 and TIC constructors that together acted as the engineer
13 procuring construct contractors for the entire project.

14 Both of them later merged and were bought by
15 Kiewit. If you know what Kiewit is, Kiewit was in the
16 business of doing EPC projects for companies.

17 So Bibb acted as the owner's engineer, but
18 that's -- so what you just stated is a piece of the
19 service they supplied.

20 Q Okay. But it is true that Bibb was your
21 guy -- I don't know if it's a person or people -- that's
22 your guy that represents you and makes sure that the
23 heat balances are run correctly and that Mitsubishi
24 agrees with the heat balances, is that fair?

25 A I -- it's -- part of it I know is fair. I

1 don't about the Mitsubishi agrees piece. I don't know
2 the ins and outs of how that's done in a large
3 construction project.

4 **Q Well -- okay.**

5 **So Mitsubishi -- didn't Bibb work with**
6 **Mitsubishi to run these heat balances?**

7 A I am sure there had to have been
8 collaboration.

9 **Q Okay. So let's look at -- above that run**
10 **date, we see somewhere up in the mix, more than halfway**
11 **up, it says STG output, do you see that?**

12 A Yes, I do.

13 **Q All right. And then in bold all the way**
14 **across the page, we see variations of megawatt outputs**
15 **under these heat balances, right?**

16 A Correct.

17 **Q All right. So these are -- it's bolded. This**
18 **is a primary result that you are looking for out of the**
19 **heat balances. It tells you what the bottom line is you**
20 **are going to get out of this, you expect to get out of**
21 **this unit under these predictions or permutations,**
22 **right?**

23 A It is one of many things that we are getting
24 out of this, yes.

25 **Q But like you told the executives when you said**

1 400, that's kind of the bottom line when you get a steam
2 turbine, is what are you going to be able to generate in
3 terms of electricity to serve customers, right?

4 A Could you ask that again, I am sorry?

5 Q Yeah. When you are buying a steam turbine,
6 the bottom line is what kind of megawatts can you get
7 out of it, right?

8 A That's one of the -- well, the efficiency is
9 one the Keys. In fact, I would say efficiency is even
10 more key in a big project like this, because ultimately
11 the long-term cost to the customer comes down to how
12 efficient are you converting fuel energy into a product.

13 Q Right. So would you agree with me that heat
14 balances were run and certain cases were selected and
15 used for the contract that you determined -- that you
16 executed with Mitsubishi?

17 A Yes.

18 Q There were two heat balances that were part of
19 the contract guarantee that Mitsubishi said they were
20 warranting the unit to put out?

21 A That's correct. I have seen other documents
22 where two of these heat balance cases were chosen and
23 were included in the contract language relative to
24 liquidated damages.

25 Q Okay. And one of the outputs -- one of the

1 **heat balances was 389, and that was a certain**
2 **configuration, correct?**

3 A I believe that's correct, yes.

4 **Q And the other was 420, right?**

5 A That's correct.

6 Now, a really important point here, you are
7 picking one. Let's look again at how many pages of data
8 is in each one of these heat cases. It's multiple
9 pages, right? I won't count them, but at least five or
10 six pages.

11 One of these -- for example, one of these
12 variables is power factor. And I can't read it, I am
13 having a hard time reading it. I wish I could point to
14 the row. If I could get a magnifying glass, I could
15 read it to you. But I have read through these before.
16 I have looked at all 300 plus of these P cases.

17 The power factor assumptions are really key,
18 because when you think about a generator, an electrical
19 generator, the power factor of the electrical system has
20 great bearing on what the generator is able to do.

21 So in each of these cases, there is an assumed
22 value-of-power factor. And so for the assumed
23 value-of-power factor in case number 48, which you are
24 referencing, which ended up 420 megawatts of the steam
25 turbine, it was at a power factor of .949. We don't run

1 at a power factor of .949. We run at a power factor
2 close to one, which we call unity.

3 And this might be a good time, Mr. Bernier has
4 a drawing, I could explain power factor, and I think
5 this is quite important.

6 MR. HERNANDEZ: May I approach?

7 THE COURT: Yes.

8 THE WITNESS: And again, this is just an
9 example of --

10 MS. BROWNLESS: Mr. Swartz, I am sorry, when
11 you hold the paper up, I can't see.

12 THE WITNESS: I am sorry, I will stand up.

13 MS. BROWNLESS: Thank you.

14 THE WITNESS: There is so many variables, as
15 you see in all these pages, that go along with
16 these heat balance cases. All of them have an
17 impact on the capacity of what the unit is going to
18 run. So I am picking one that's called power
19 factor because I think it's pretty important.

20 Power factor is a measure of the efficiency of
21 how load current -- we produce load current from
22 our generator, megavolt-amperes, all right. How
23 efficiently can we make that -- I am not there yet.
24 This is a donkey pulling on a barge. I will get
25 there in a second. A efficiently we convert that

1 load current into voltage, into real power, rather,
2 is really important to us. It's really important
3 to all of our customers. We want to do that as
4 efficiently as we can.

5 So we have -- there is a measurement called
6 power factor that measures that efficiency. We
7 want to be as close to one as you possibly can be.
8 A 1.0 power factor means you are being as efficient
9 as you can converting load current into real work.

10 In the real world, there are loads. There is
11 motors; motors at FIPUG; motors at PCS Phosphate
12 that are creating a drag on the system. They are
13 creating the system to do extra work.

14 But also in the real world, we have equipment
15 that -- and that makes the power factor drop less
16 than one -- to go down into maybe -- when I say
17 less than one, I am talking decimal places. It
18 might go down to .9 or to .95. But we have things
19 on our electrical system that keep it up close to
20 one called capacitor banks that are in service all
21 the time, because we want to make that conversion
22 as efficient as possible for the benefit of our
23 customers.

24 So to make it real simple, power factor is
25 just like in this picture. A power factor of one,

1 for this horse to pull this barge through the canal
2 as efficiently as possible, the horse would have to
3 walk on water, right, and be directly in front of
4 the barge. If you are directly in front of the
5 barge pulling it, the horse is going to have to do
6 less work and it won't heat up as much to pull the
7 barge.

8 The greater the angle becomes this direction,
9 more of the work of the horse is pulling this way
10 and less of it is pulling straight down the barge.
11 And so the greater this angle is, as the horse is
12 pulling the barge down the canal, the more
13 overheated the horse might come because it's
14 harder. It's harder work. The power factor is
15 lower in that case.

16 So the generator is -- the analogy is to the
17 electrical generator. The generators are rated by
18 power factor as part of the rating, and there is
19 curves -- and there is curves in a lot of this
20 information that we saw that you can see based on
21 power factor how much a generator is capable of
22 putting out.

23 And these heat balances, the power factor was
24 assumed to be various numbers; .9 was used in many
25 of the examples of heat cases; .949 was used in the

1 one you are referring to. Our system runs between
2 .97 and .995 all the time. Our generator at Bartow
3 can do more than 420 megawatts because it's closer
4 to walking straight ahead of the barge. The 420 is
5 at a power factor .949, which is not where we run.

6 So the 420 megawatts doesn't apply to the
7 steam turbine. It's part of the generator, and our
8 generator is capable of doing more than that
9 because our power factor runs closer to unity.

10 I hope it made sense. It's an odd -- it's a
11 difficult-to-understand electrical concept.

12 BY MR. REHWINKEL:

13 **Q So none of the P balances that are shown in**
14 **this exhibit, we call it 108, showed a expected output**
15 **above 420, maybe 420.2, but nothing up to 421 or above,**
16 **right?**

17 A I didn't see -- they don't, but I also didn't
18 see any power factors above .949.

19 **Q Okay. You would agree that the contract**
20 **contained expected megawatt output of 420 megawatts,**
21 **correct?**

22 A At an assumed set of conditions, including
23 power factor, that is correct.

24 **Q So at the time you talked to senior executives**
25 **and contracted with Mitsubishi, both Mitsubishi and Duke**

1 **expected the steam turbine to put out 420 megawatts at**
2 **normal operations, right?**

3 A The expectation would be that the predicted
4 heat case would be achieved.

5 So, again, let's be really clear. What
6 Mitsubishi and the project team used, they used heat
7 case number 48, which used a power factor of .949. It
8 predicted a megawatt output of 420. They used that as
9 the minimum thing that Mitsubishi had to achieve in
10 order to get full payment on the project. Anything
11 below 420, there would have been liquidated damages that
12 Mitsubishi had to pay to Progress Energy.

13 So the 420 was actually a contractual minimum
14 that had to be achieved. And again, it was at a lower
15 power factor than we actually run at. So everybody
16 would have known that the steam turbine generator can
17 produce more than 420 megawatts.

18 Q **Do you have Exhibit 116 with you still?**

19 A Let me get organized here.

20 Q **I would ask you to turn to page 21 when you**
21 **get there.**

22 A I do have 116. Page 21?

23 Q **Yes, sir.**

24 A All right, I am there.

25 Q **Now, this is a Mitsubishi document. And do**

1 **you disagree that the Bartow steam turbine was designed**
2 **to operate at 420 megawatts, as the OEM says?**

3 A I agree that there is a case with certain
4 variables, and you can see there is pages of variables
5 that go in. And if the variables are at those
6 particular numbers, then 420 is the predicted output.
7 And that was used as a contractual minimum that
8 Mitsubishi had to achieve.

9 Q Well, in the second bullet, it says a heat
10 balance diagram providing max operation, parenthesis,
11 420 megawatt, thermal conditions was provided as part of
12 the thermal kit. Do you disagree with that?

13 A That's what it says. And my interpretation of
14 that is the maximum the generator can put out at those
15 conditions at a power factor of .949 is 420 megawatts.

16 Q Okay. And then the next bullet there was --
17 it says: During the performance test in 2009, using the
18 420-megawatt thermal conditions, the unit was able to
19 reach approximately 402 megawatts; is that right?

20 A That's correct.

21 Q And the performance test here was when you
22 were installing the unit. Sometime before you
23 commissioned it, you did a test to see whether it met
24 the contractual terms as far as that guarantee, right?

25 A That's correct.

1 **Q And is this factual?**

2 A Yes.

3 **Q All right. So let's go to Exhibit 109, which**
4 **is the contract. And I want to go to actually**
5 **attachment Appendix A.**

6 A Appendix A?

7 **Q Yes, sir. It starts at Bates 12419.?**

8 MS. BROWNLESS: Excuse me, Charles. Just so I
9 understand, this is the page that says Contract No.
10 270810, Amendment 005?

11 MR. REHWINKEL: Yes.

12 MR. BERNIER: Mr. Swartz, I think it's after
13 the first divider sheet.

14 THE WITNESS: I found it. I am sorry. I just
15 found it.

16 BY MR. REHWINKEL:

17 **Q All right. So you agree with me, this is part**
18 **of the contract for the steam turbine, right?**

19 A I do.

20 **Q Okay. And if I get you to go to Bates 12437.**
21 **This is 3.3 Basis for Guaranteed Performance, as a**
22 **header, when you get there.**

23 A Okay, I am there.

24 **Q Okay. Is this how the electrical output of**
25 **the turbine was calculated? Is this the formula?**

1 A It is.

2 Q Okay. And if we go over to 12439, just for
3 the -- to follow up on your testimony about the power
4 factor. We see those -- this is what you were talking
5 about -- power factor is .9 and .949?

6 A It is. On that -- the table in 4.2, you can
7 see those in the third row down in each column.

8 Q Okay. And they also have condenser back
9 pressure assumptions that correlate to those outputs, is
10 that right?

11 A Yes.

12 Q So -- and we see that -- is it true that the
13 Case 28 was a 4-x-1 configuration, and Case 48 was a
14 3-x-1 configuration?

15 A Case 28, to my memory, was a 4-x-1 without
16 duct burners. And Case 48, to my memory, was a 3-on-1
17 with full duct burning.

18 Q Okay. Does this document here, or the heat
19 balances, or any other documentation that you can point
20 to demonstrate that Mitsubishi or Bibb told you that you
21 could get more than 420 megawatts of output from the
22 steam turbine?

23 A Well, I believe you can look at some of this
24 documentation and reach that conclusion, yes.

25 Q Because of the power factor?

1 A Yes.

2 Q Okay. But did anybody tell you that it would
3 be perfectly normal to operate the unit above
4 420 megawatts per -- as much as you wanted?

5 A That's not a typical conversation. So the
6 Bartow combined cycle, just like any other project, you
7 talk about what the capacity is you are going to get out
8 of the site. And in this case, I think some of the
9 documents referred to a number maybe 1,278 or
10 1,279 megawatts, something like that. But there are
11 many, many variables that come into play as far as the
12 output of your machine. In the wintertime, when it's
13 colder, when the cooling water temperature is lower, we
14 can run with better condenser vacuums much more
15 efficient.

16 So to give you an example, our Duke Energy
17 Florida fleet, in the summertime we can produce about
18 10,000 megawatts of power. In the wintertime, we can
19 produce about 11,000 megawatts of power. And the
20 difference is the colder weather, the colder cooling
21 water that helps the machines be more efficient in the
22 wintertime.

23 So you have to make sure you are
24 understanding. Every time you are talking about a
25 rating of a piece of equipment, you have to understand

1 all the other conditions that are part of that predicted
2 rating. And it would be a really bad thing to say you
3 have to adhere to this one case out of more than 300 and
4 never exceed that because you would be leaving potential
5 capacity on the table that could be used for the benefit
6 of our customer.

7 So let's expand Bartow, the Bartow is a steam
8 turbine. You know, Bartow is a 1270-megawatt site. The
9 steam turbine is, you know, 400, 450 megawatts,
10 somewhere in that range. But it's different in the
11 summer than it is in the winter.

12 But if we were to apply, say, summer ratings,
13 and then in the wintertime, when we need 11,000
14 megawatts to serve our customers, we would have to buy
15 expensive fuel, or we would have to put on less
16 efficient generating units to great expense for our
17 customers.

18 So you have to understand all the variables
19 associated with a rating. Our job as operators is to
20 make sure we stay within the operating parameters that
21 are given by our equipment manufacturers and get the
22 most out of our machines that we can without exceeding
23 those parameters. And that's what every operator does.
24 That's what every utility should be doing, and that's
25 certainly what we did with Bartow.

1 And there is one more thing I would like to
2 say. So to answer your question directly, if you go to
3 page 12596 in this same document. It's way back there.
4 It looks like this.

5 MS. BROWNLESS: What's the number again, sir?

6 THE WITNESS: In the lower right-hand corner,
7 it's 012596.

8 So, Your Honor, are you there?

9 THE COURT: I am there.

10 THE WITNESS: This is the capability curve of
11 the generator for this project. And this is the
12 page that shows that you can get more than
13 420 megawatts if the power factor is greater than
14 .9.

15 And I know this is hard to read, but this line
16 right here going up at a positive angle is a .9
17 power factor line. And you can see it intersects
18 the generator capability curve. If you come down,
19 you see that's right at 420 megawatts.

20 We run closer to unity, closer to one. And if
21 you go all the way across, that's almost
22 470 megawatts. And if you look up at the very top
23 of this piece of paper, you can see there is a
24 rating up at the very top. It says 468000 kVA,
25 that's kilovolt-amperes. That's the reactive power

1 that this generator is capable of putting out.
2 Power factor is the kilowatts divided by the
3 kilovolt-amperes.

4 So you can see the kilowatts is only 420.2 --
5 421.2. It's 421,200 kilowatts. So it's 421.2
6 megawatts. But with a power factor closer to one,
7 you can get closer to 468 megawatts out of this
8 steam turbine. That's what that information is
9 telling you. So in the same document, they are
10 saying you can get greater than 420 megawatts.

11 BY MR. REHWINKEL:

12 **Q So 468, is that approximately the rating of**
13 **the generator?**

14 A Correct.

15 **Q Okay. So --**

16 A The -- well, kVA, to be more precise. And it
17 depends on the power factor, and whether or not you can
18 get that much megawatts, the real power out.

19 **Q So is it Duke's position that as long as you**
20 **stay within the IP, HP and condenser limits, that if you**
21 **could get to 468 on a regular basis, that you would**
22 **be -- it would be perfectly okay to operate -- have**
23 **operated that unit in 2001 -- Period 1? I am sorry.**

24 A Right. You have to look at other parameters
25 as well. Again, it's hazardous to look at just any one

1 parameter, but this gives you an idea of what the
2 capability of the generator is.

3 So we have a piece of equipment attached to
4 the steam turbine that's capable at the power factors we
5 run of doing in excess of 460 megawatts. So as long as
6 we can stay within the operating parameters of the steam
7 turbine, and those are pressures and temperatures, why
8 don't we try to get as much output from the generator as
9 we can.

10 Q Do you have Mr. Pollock's exhibit RAP-5 with
11 you?

12 A I do. Okay, I am there.

13 Q You got that, okay.

14 And this is a document you prepared at our
15 request, the Public Counsel's request, right?

16 A Yes.

17 Q Okay. So there is no question about the
18 validity of this data, and accuracy of it, right?

19 A I will say I know that there is -- this is --
20 it uses averaging. And it depends on how often you
21 sample a data point, and that can cause discrepancies in
22 the data. It's a good representation, I will say that.

23 Q Okay. And this document here is what Mr.
24 David referred to in his opening. It has the operating
25 hours above 420 as distributed on this chart, is that

1 **right --**

2 A Yes, it does.

3 Q -- with that approximation caveat?

4 A It does.

5 Q So I just wanted to ask you about this,
6 because as you were talking about being able to increase
7 the output based on certain efficiencies, including
8 ambient temperature, weather, right? And what I mean
9 now, I am talking about the air temperature and the
10 water temperature, right?

11 A Sure.

12 Q Let's look at period of 2010. Would you agree
13 with me that -- and would you also agree with me that
14 the months of June through September are your hottest
15 months?

16 A I would.

17 Q Okay. And we look at here, we see a fairly
18 large distribution of the operating time above 420 in
19 the hottest months, right?

20 A Yes.

21 Q Okay. So it wouldn't necessarily be a
22 reasonable conclusion to suggest that you operated this
23 high above 420 -- or this much above 420 because the
24 weather was colder, right?

25 A Well, you have to understand what else is

1 going on at the plant at the time. So our ability to
2 pump that cold or warmer water through the system is
3 really important. You are not going to get the
4 efficiency unless you are able to pump it.

5 And what I know is when we first commissioned
6 this plant, and during the first several months of
7 operation -- and I don't know how long it went into
8 2010, but we had some great difficulty with what's
9 called the circulating water system, which circulates
10 the cooling water through the equipment, including the
11 condenser underneath the steam turbine.

12 My conclusion from this data would be that
13 once we straightened that out and were able to fully
14 pump water through the condenser, we started really
15 taking advantage of what we could from an installed
16 equipment standpoint. Also understanding that in any
17 new operation, there is a period of learning for the
18 operating staff as well. But I know we had these
19 equipment issues with the circulating water system for
20 the first several months of operation.

21 **Q But in 2010, there is not -- in fact, it looks**
22 **like you have more hours above 420 --**

23 **A I think --**

24 **Q -- in the hot months than in the cooler**
25 **months, right?**

1 A Right, because I think in the cooler months,
2 we were still having trouble with the circulating water
3 system. I don't know that, but --

4 **Q Okay. And before 2012, you did not do an**
5 **engineering analysis that showed that it was possible to**
6 **operate the unit above 420, did you?**

7 A Well, I think we had all kinds of information
8 that showed that it was possible to operate above 420.
9 In fact, if we could, let's refer back to the contract
10 for a minute.

11 I will have to find the exact page, but again,
12 the 420 megawatts that you keep referencing was a
13 contractual minimum that Mitsubishi had to meet in order
14 to get full payment on the project. So just that fact
15 alone tells everybody that above 420 is okay. 420 is
16 the minimum that had to be achieved. And that's in this
17 contract. I will just have to -- if you give me a
18 moment, I will find the page.

19 Okay, so if you turn in the -- let me see what
20 the exhibit number is. It's the contract. It's the
21 very large document, Exhibit No. 109. And if you turn
22 to the Bates numbers 012434 in the bottom right hand.
23 Well, it's even better if you page to 12432, which is
24 two pages before that, 12432.

25 And you can see in paragraph 3.2.1 that the

1 420.07 is a liquidated damage performance guarantee,
2 which means that's the minimum that the project had to
3 achieve in order to get full payment on the project.

4 **Q But it says in 3.2.12: MPS Net Steam turbine**
5 **Maximum Electrical Output 420.07, right?**

6 A Yes, that's referring, in my opinion, to that
7 generator capability curve that I just showed you. It's
8 at a lower power factor than we operate. So again, you
9 have to make sure any time you talk about a rating, you
10 have to make sure you understand all the variables that
11 go into that rating. In this assistance, it used a
12 power factor that we can far out achieve.

13 **Q Okay. So in 2012, after you had the first**
14 **discovery of blade damage, isn't it true that you went**
15 **to Mitsubishi and asked them for their help in telling**
16 **you how you could operate above 420?**

17 A I would phrase it a little differently than
18 that.

19 So we opened up the steam turbine for a
20 routine inspection in the spring of 2012. We found five
21 of the mid-span snubbers that had damage. We were
22 concerned with that. So we consulted with Mitsubishi.
23 They recommended we don't continue running with those
24 snubbers broken. That could lead to blade failure,
25 which would be catastrophic, as I have described

1 earlier.

2 At that time, Mitsubishi, as we've seen and
3 you pointed out, they were concerned we were running
4 higher than their fleet experience from a pounds per
5 hour per square foot standpoint in the last stage blade,
6 so they gave us, for the first time, a lower operating
7 limit.

8 And in this case, if we could turn to my -- to
9 JS-2 in the root cause, I can show you what the
10 operating limit is. It's page 5 of 18, Table A in JS-2,
11 or JS-1.

12 Are you there, Your Honor?

13 THE COURT: I am just about there. Yeah, I am
14 there now.

15 THE WITNESS: Okay. So in that table, you can
16 see it has columns for each of the five periods.
17 And the one, two, three, four, the fifth row down
18 says MHPS IP exhaust pressure operating limits.

19 So it's at the start of Period 2, because of
20 that damage we found, following Mitsubishi's
21 recommendation, we replaced all of the blades on
22 just one end of the machine because all five
23 snubbers were damaged on the same end of the
24 machine, I believe on the turbine end. It says in
25 this chart. I am not looking at it.

1 And if you look at the picture over here, you
2 can see that the machine has two ends. The
3 generator is coupled to the right-hand side, and
4 the HP IP turbine is coupled to the left-hand side.
5 So on the turbine end of the machine, we replaced
6 all 64 L0 blades.

7 Before we started operating again in April of
8 2012, Mitsubishi, in order to make sure that we
9 didn't exceed their operating experience with
10 40-inch L0 blades, they put this 118-pound limit on
11 the intermediate pressure turbine exhaust. And in
12 this case, that served as a proxy.

13 Why that intermediate pressure exhaust rather
14 than the low pressure turbine inlet. There was no
15 pressure instrument on the low pressure inlet, but
16 there was one on the intermediate pressure exhaust,
17 so that was used as a proxy.

18 And if I could stand up just a minute just to
19 make sure everyone understands. Mitsubishi was
20 concerned, as I described, with the steam flow, but
21 there was no pressure instrument on the pressure
22 going into the low pressure turbine, but there was
23 one coming out of the intermediate pressure. So
24 there is just a slight amount of pressure drop
25 across this pipe.

1 So we used this pressure as a proxy for the
2 low pressure turbine inlet. It was more
3 conservative than what had been in the past, so the
4 combination --

5 And I am sorry, but I forgot what your
6 question was, but, yeah, we put a more conservative
7 operating limit in place based on pressure, which
8 is consistent with operating parameters that we
9 followed from the start of Period 1 throughout each
10 of the periods.

11 BY MR. REHWINKEL:

12 **Q So I asked you if, after the failure, you went**
13 **to Mitsubishi and asked for them to help you --**

14 A Right.

15 **Q -- increase the output in the unit.**

16 A So it's just not so simple as that. It's a
17 very collaborative back-and-forth process, but because
18 we then had to -- we followed this lower, more
19 conservative guidance on the IP exhaust pressure, we
20 were not satisfied that we were getting as much out of
21 the equipment as we could, so that's when we did ask
22 Mitsubishi.

23 So we don't want to have this limit. We
24 weren't supposed to have this limit. We want to get as
25 much out of the generator as we can. Is there something

1 that can be done?

2 They studied it and came back with us -- to us
3 and said, yes, we can redesign the L0 blades and put a
4 different design of blade in both L0 rows, and you will
5 be able to achieve, we estimate, 450 megawatts.

6 **Q Well, are you familiar with the quote that**
7 **they gave you for an engineering study for additional**
8 **optimization and reliability for \$232,025?**

9 A Could I see that?

10 **Q Yeah. It's on -- it's in Exhibit 102 at Bates**
11 **145. It's the late filed exhibit for 145.**

12 A I have 102. Could you say the Bates number
13 again, please?

14 **Q Yeah. It's kind of two-thirds of the way or**
15 **more back, it's at 145, and it's a real tiny print up in**
16 **the upper right above the slide.**

17 A I am almost there. Okay, I see that.

18 **Q Do you know what this was for?**

19 A I don't recall what this was for.

20 **Q Okay. If you roll back a few pages to 135.**

21 A Okay, I am there.

22 **Q And this is a part of, I guess, a slide**
23 **presentation at a joint meeting between Mitsubishi and**
24 **Duke?**

25 A I am looking back at the beginning to see if I

1 can get an idea.

2 Q On 122, it talks about August 21st, 2012,
3 discussion.

4 A Okay. It does appear to be a meeting where we
5 discussed the turbine.

6 Q Okay. Just back on 135, a discussion --
7 further discussion to support their own investigation
8 and possible means of increasing unit output.

9 And then it looks like they have a response.
10 It says: We will continue technical support for you.
11 As of now, it is difficult for us to propose a concrete
12 method to increase the unit output. An engineering
13 study is suggested.

14 And so my question is, is that what 145 is, is
15 them saying here's what it will cost you for us to do an
16 engineering study?

17 A It does appear to be that, yes.

18 Q Okay. And did you engage them to do that
19 study?

20 A I don't recall if we engaged them to do this
21 study, or if that was included in the ultimate -- we did
22 contract with them to supply new blades that could --
23 that were theoretically going to be able to raise the
24 output to about 450 megawatts.

25 Q Okay. So that would have been the most likely

1 **output product of this study if you did, in fact, say,**
2 **yes, go ahead and do that?**

3 A That -- I would say that would be a likely
4 output, yes.

5 Q **Okay. Now, did that study say that Mitsubishi**
6 **agreed that you could run the unit above 420 without**
7 **different blades?**

8 A Well, I am not familiar with the study, but --
9 so if I could have a few minutes to read it, but I think
10 it's really important to remember that at this point in
11 time, Mitsubishi thought that the root cause was too
12 much steam flow in the low pressure turbine, and that
13 they -- there was a way to get from steam flow and
14 correlate it, as you have already said, to megawatts.

15 So that's been disproven in later cases, later
16 periods of time. So I am not sure what your question
17 is.

18 THE COURT: I am going to jump in while we are
19 on a pause here.

20 One thing we didn't have in our order of
21 procedure was a lunch break. I am just wondering
22 what the will of the, you know, the room is as far
23 as taking a break and how long you think we need.

24 MR. BREW: Yes, I think we should have one.

25 MS. BROWNLESS: Yes.

1 THE COURT: We agree on that. How long?
2 Should we try to get back inside of an hour, or is
3 it going to take an hour?

4 MR. REHWINKEL: I think an hour is reasonable.

5 THE COURT: Okay. We will -- we'll say, then,
6 we will reconvene at 120:20, and if everybody, by
7 some miracle, is back sooner, we will start sooner.

8 MR. REHWINKEL: Okay. Sounds good.

9 THE COURT: We will stand in recess then.

10 (Lunch recess.)

11 (Transcript continues in sequence in Volume
12 2.)

13

14

15

16

17

18

19

20

21

22

23

24

25

1 CERTIFICATE OF REPORTER

2 STATE OF FLORIDA)
COUNTY OF LEON)

3

4

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

8 IT IS FURTHER CERTIFIED that I

9 stenographically reported the said proceedings; that the
10 same has been transcribed under my direct supervision;
11 and that this transcript constitutes a true
12 transcription of my notes of said proceedings.13 I FURTHER CERTIFY that I am not a relative,
14 employee, attorney or counsel of any of the parties, nor
15 am I a relative or employee of any of the parties'
16 attorney or counsel connected with the action, nor am I
17 financially interested in the action.

18 DATED this 18th day of February, 2020.

19

20

21



22

23

24

25

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