FLORIDA PUBLIC SERVICE COMMISSION
OFFICE OF COMMISSION CLERK

DOCUMENT NUMBER ASSIGNMENT*

FILED DATE: 2/18/2020

CONFIDENTIAL

DOCKET NO.: 20200001-EI

DOCUMENT NO.: 00962-2020, 00963-2020, 00964-2020

DOCUMENT DESCRIPTION:

TRANSCRIPT (CONFIDENTIAL) - Volume 1, pages 1 to 156, of 2/4/20 final hearing held at DOAH before The Honorable Lawrence P. Stevenson [Case No. 19-006022]

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

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

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

APPEARANCES:

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

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

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

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

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

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

INDEX TO WITNESSES

INDEX TO EXHIBITS

NO.	DESCRIPTION	IDENTIFIED	ADMITTED
114	Revised Comprehensive Exhibit List	11	11
115	RCA draft	35	
116	3/18/2015 40-inch blade telemetry	35	

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

P R O C E E D I N G S

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

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

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

Representing Duke Energy.

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

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

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

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

good.

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

MR. SWARTZ: Good morning, Your Honor.

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

And Office of Public Counsel.

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

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

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

THE COURT: Okay. Very good.

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

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

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

MR. MOYLE: FIPUG, it's Florida Industrial

Power Users Group.

THE COURT: I am more comfortable saying that.

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

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

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

THE COURT: Okay. Very good.

And PCS Phosphate.

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

THE COURT: Very good.

And last but not least, the Public Service Commission.

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

our General Counsel.

THE COURT: Okay. Very good.

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

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

THE COURT: Okay. That's fine.

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

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

Mr. Rehwinkel.

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

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

MR. REHWINKEL: Okay.

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

the court reporter can.

COURT REPORTER: I'll let you know.

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

MR. DAVID: The switch was off.

THE COURT: Oh, is that it?

MR. DAVID: Yeah.

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

MR. REHWINKEL: Thank you.

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

MS. BROWNLESS: Yes, Your Honor.

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

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

MR. HERNANDEZ: That is correct, Your Honor.

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

THE COURT: Okay.

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

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

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

MS. BROWNLESS: Thank you, Your Honor.

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

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

MR. BERNIER: Yes, sir.

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

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

MR. REHWINKEL: Yes, sir.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

As this course of events was playing out, and

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

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

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

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

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

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

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

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

Now, not only does the later operating

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

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

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

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

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

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

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

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

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

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

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

Energy now wants its customers to pay.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Thank you.

THE COURT: Thank you, Mr. David.

Next will be Mr. Moyle.

MR. MOYLE: Thank you, Your Honor.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

THE COURT: All right. And PCS.

MR. BREW: Thank you, Judge Stevenson.

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

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

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

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

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

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

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

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

Thank you.

THE COURT: And the Commission.

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

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

MR. REHWINKEL: Your Honor --

THE COURT: Yes, sir.

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

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

THE COURT: Sure. That would be fine.

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

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

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

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

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

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

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

THE COURT: 115.

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

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

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

THE COURT: Okay. We will just identify them.

MR. BERNIER: Identify them for discussion.

THE COURT: Identify as 115 and 116.

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

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

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

MR. REHWINKEL: Yes.

MS. BROWNLESS: And what is 116?

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

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

there?

MR. REHWINKEL: I don't have one.

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

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

MS. BROWNLESS: I'm sorry.

MR. REHWINKEL: It has a cover on it.

MR. HERNANDEZ: That's it.

MS. BROWNLESS: Okay.

MR. REHWINKEL: Yeah.

MS. BROWNLESS: Thank you for being patient.

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

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

MR. REHWINKEL: Okay.

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

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

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

Raise your right hand.

Whereupon,

JEFF SWARTZ

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

THE WITNESS: I do.

THE COURT: Have a seat.

EXAMINATION

BY MR. BERNIER:

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

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

Q Thank you.

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

A Yes, I did.

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

A I do.

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

A Yes.

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

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

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

(Whereupon, prefiled direct testimony was inserted.)

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

DIRECT TESTIMONY OF

JEFFREY SWARTZ

ON BEHALF OF

DUKE ENERGY FLORIDA

DOCKET NO. 20190001-EI

MARCH 1, 2019

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

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

Q. What are your responsibilities in that position?

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

Q. Please describe your educational background and professional experience.

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

Q. What is the purpose of your testimony?

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

Q. Please provide a summary of your testimony.

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

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

Q. Are you sponsoring any exhibits?

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

Q: Is the RCA considered confidential by the Company?

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

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

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

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

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

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

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

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

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

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

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

Q. What restoration process did DEF follow to bring tl

service?

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

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

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

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

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

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

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

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

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

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

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

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

Q. Does that conclude your testimony?

A. Yes.

BY MR. BERNIER:

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

A I have.

Q And could you provide that, please?

A Certainly.

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

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

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

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

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

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

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

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

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

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

THE COURT: Sure.

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

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

generator producing electricity.

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

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

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

exhausted into a condenser.

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

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

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

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

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

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

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

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

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

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

Thank you for allowing me to show that.

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

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

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

Steam turbines are operated within the

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

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

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

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

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

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

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

benefit of making extra productive work, a product.

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

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

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

I look forward to answering your questions. Thank you.

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

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

MR. REHWINKEL: Yes.

EXAMINATION

BY MR. REHWINKEL:

Q Good morning, Mr. Swartz.

A Good morning.

Q Can you tell me your full name, please?

A Jeffery Raymond Swartz.

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

A Yes, sir.

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

A Yes.

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

A Correct.

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

A Yes, that's correct.

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

times; is that right?

A Yes.

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

A Yes, that's correct.

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

A Yes. Absolutely.

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

A It is.

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

A Yes.

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

A Could you ask that again, please?

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

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

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

A Correct.

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

MR. HERNANDEZ: Objection, compound.

THE WITNESS: The root cause --

THE COURT: Hang on.

THE WITNESS: Sorry.

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

MR. REHWINKEL: Okay.

BY MR. REHWINKEL:

Q Would you agree that the RCA was produced, at

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

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

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

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

A Yes.

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

A Yes, that's correct.

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

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

A I understand.

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

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

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

THE WITNESS: Could you ask that again, please?

BY MR. REHWINKEL:

Q Let me ask it a different way.

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

A Yes.

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

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

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

A Yes, as a Progress Energy employee.

Q Okay. And tell me what your role was.

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

Q Okay.

A -- the fossil generation and not nuclear.

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

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

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

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

A Yes.

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

A That's correct.

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

A That's correct.

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

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

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

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

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

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

A Yes, sir.

Q -- was yours?

A That's correct.

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

A All throughout.

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

A Yes.

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

A That's correct.

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

solution team?

A Yes.

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

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

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

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

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

A Not that I recall.

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

A Yes, that's fair.

Q And you would agree with me that the draft

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

A I am not sure I understand your question.

Q Okay. Let me break it down.

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

A Yes, sir.

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

A Yes.

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

THE COURT: It might be helpful.

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

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

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

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

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

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

MS. BROWNLESS: Charles, you can have --

COURT REPORTER: You can use mine.

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

BY MR. REHWINKEL:

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

A This one here is?

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

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

MR. REHWINKEL: Yes.

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

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

can mark that for him?

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

MR. BERNIER: It would be right here.

MR. REHWINKEL: Yeah, this is 116.

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

THE COURT: Let me see -- okay.

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

BY MR. REHWINKEL:

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

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

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

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

A I would.

Q Okay. Would you also agree with me that the

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

A I think that is our practice, yes.

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

A I would.

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

A Yes, I would.

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

A Yes.

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

A That's correct.

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

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

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

He was not the one making all the decisions. He was contributing to it, but somebody had to keep the record; is that right?

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

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

A Yes.

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

A Yes.

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

A It was the only Duke Energy product.

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

A Yes, that's accurate.

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

A I do.

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

There is a table of contents. And the first

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

A I do.

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

A Yes.

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

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

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

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

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

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

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

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

A I think so. Yes.

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

A I understand.

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

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

A Yes, it is.

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

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

A Yes, it is.

Q Would you mind reading that aloud for the record?

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

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

A Correct.

Q Okay.

A Mitsubishi Hitachi Power Systems.

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

THE WITNESS: It does. Original equipment manufacturer.

THE COURT: Okay.

BY MR. REHWINKEL:

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

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

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

A Yes, sir. That's correct.

Q Okay.

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

Q Right.

A -- Table A.

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

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

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

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

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

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

A It is.

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

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

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

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

BY MR. REHWINKEL:

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

A It does.

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

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

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

A It is not true.

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

MR. HERNANDEZ: Objection, Judge. I am

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

THE COURT: Maybe we should be more specific.

MR. REHWINKEL: Okay.

BY MR. REHWINKEL:

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

A Could you point that out to me?

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

A In Tab 9 in Exhibit 115?

Q I apologize. Yeah. Tab 9, yes.

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

Q 75.

A Okay, I am there.

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

A Yes.

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

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

A Yes, I see that.

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

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

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

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

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

A It is.

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

A They did use that term.

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

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

Q Okay.

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

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

A Correct.

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

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

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

A Correct.

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

A That's correct.

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

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

with an adequate margin for the application at the Bartow.

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

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

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

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

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

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

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

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

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

So many times, people talk about sizes of

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

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

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

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

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

A Yes.

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

A Correct.

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

A Yes, that's what it says.

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

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

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

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

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

A Right. I see what you are saying.

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

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

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

A Correct.

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

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

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

A Yes.

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

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

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

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

A Starting with, Duke also studied?

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

A Duke Engineering?

Q Yes.

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

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

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

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

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

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

A I am sorry, which page are you on?

Q I apologize. I am back on page 75.

A 75. Okay, thank you.

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

A I would have to look at all the drafts.

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

turbine excessive steam flow?

A I do.

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

A I do.

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

A Likely it is Ben Meissner, yes.

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

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

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

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

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

A That's correct.

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

the words are the same here, right?

A They are.

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

A I am sorry, which page?

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

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

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

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

THE WITNESS: Yes, it says the same thing.

MR. REHWINKEL: Okay. Thank you.

THE WITNESS: Thank you, Your Honor.

BY MR. REHWINKEL:

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

A Yes.

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

A Yes.

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

right?

A That's correct.

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

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

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

A It does.

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

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

Q Right. They are not identical.

A Okay.

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

A Yes.

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

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

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

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

A Okay.

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

A I do.

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

A It is me.

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

A Yes, sir. That's correct.

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

A That's right.

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

A I see that.

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

A No, it absolutely is part of the process.

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

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

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

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

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

A Yes, it does.

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

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

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

A Yes.

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

A Yes, I agree.

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

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

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

THE WITNESS: Yes, Your Honor.

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

BY MR. REHWINKEL:

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

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

asking?

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

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

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

A Pounds per hour per square foot.

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

A That's what it says, yes.

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

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

having some statement on that subject.

Q Okay.

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

MR. REHWINKEL: It says "miscellaneous".

MR. BERNIER: Oh, thanks.

MR. REHWINKEL: I am sorry.

MR. BERNIER: That's okay.

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

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

MR. REHWINKEL: Yes.

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

(Brief recess.)

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

MR. REHWINKEL: Thank you.

MR. BREW: Excuse me, Your Honor, before we start, just to save time, I circulated copies of the two exhibits that we may eventually get to. All the parties should have it.

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

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

COMMISSIONER GRAHAM: Thank you.

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

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

MS. BROWNLESS: Yeah.

BY MR. REHWINKEL:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

A I am sorry, could you ask that again?

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

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

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

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

A Correct.

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

A Correct.

Q Were they identical to the blades in Period 1?

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

THE COURT: Sure.

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

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

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

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

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

BY MR. REHWINKEL:

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

A Yes, it was.

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

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

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

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

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

A Not any personal knowledge, no.

Q Okay. And did you have any evidence that they

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

A Not to my knowledge.

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

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

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

MR. HERNANDEZ: May I approach, Your Honor?

THE COURT: Yes.

BY MR. REHWINKEL:

Q Do you understand that?

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

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

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

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

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

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

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

I think that's good for now.

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

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

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

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

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

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

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

A Yes.

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

A It is.

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

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

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

A Right.

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

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

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

I am not sure if I answered your question.

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

A I don't disagree with that calculation.

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

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

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

A That's correct.

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

A Yes.

Q -- 2,466?

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

A I do.

What's really important to understand about

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

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

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

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

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

about, and so they said that's what they believed. There was too much steam flow in the last stage.

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

A I am sorry, could you --

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

A Correct.

Q Okay.

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

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

A Correct.

Q Okay.

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

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

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

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

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

A Oh, yes.

Q Yes.

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

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

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

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

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

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

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

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

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

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

MR. REHWINKEL: Your Honor, I am trying to

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

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

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

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

A I do not have 105.

Q It should be in that package there.

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

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

I am sorry.

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

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

A Yes.

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

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

A I am, yes.

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

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

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

A Yes.

Q -- is that right?

A Yes.

Q So we see here on 6868 all the executives,

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

A Yes, I do.

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

A Part of this is, yes.

Q Part of it, yes.

A Yes.

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

A Yes, that's fair.

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

A Yes.

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

A That's accurate.

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

right? If you look on the prior page.

A So we are looking at 6875?

Q 74 and 75, I should say.

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

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

A Yes.

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

A Yes, it is.

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

A Sure.

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

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

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

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

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

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

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

A Yes, that's correct.

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

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

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

A Right.

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

A Yes.

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

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

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

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

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

A On 6885?

Q Yes?

THE COURT: On the recommendation --

BY MR. REHWINKEL:

Q On the recommendation there.

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

the purpose for this document --

Q Okay. We --

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

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

A Yes.

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

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

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

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

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

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

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

BY MR. REHWINKEL:

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

A Yes.

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

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

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

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

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

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

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

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

A Yes.

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

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

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

There is different operating pieces of equipment that might be operating or not operating. There is different atmostpheric conditions. The temperature of the weather makes a difference. The temperature of the air makes a difference. The temperature of the cooling water makes a difference. The temperature of the cooling substance which might be hydrogen in the case of a generator. All these things are analyzed many different ways.

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

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

gross output of the power block.

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

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

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

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

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

THE COURT: Steam turbine, I got you.

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

BY MR. REHWINKEL:

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

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

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

A Yes, I have 108.

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

A Yes.

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

MR. HERNANDEZ: So you want 437?

MR. REHWINKEL: Yeah, 437.

MR. BERNIER: It is small.

MR. REHWINKEL: Yeah.

BY MR. REHWINKEL:

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

A I think I am there.

Q You found it?

A Yeah.

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

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

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

Q Oh, yes.

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

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

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

Q Yeah. Go to 2443?

A 2443.

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

A Yes.

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

A They do, yes.

Q -- long columns, right?

A Right.

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

whole new set of heat balances?

A Right, 16 through.

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

A I would say they are predictions --

Q Okay.

A -- based on varying different operating parameters.

Q Okay.

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

Q Right, okay.

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

A Yes.

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

A Yes, I see that.

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

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

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

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

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

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

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

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

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

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

Q Well -- okay.

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

A I am sure there had to have been collaboration.

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

A Yes, I do.

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

A Correct.

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

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

Q But like you told the executives when you said

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

A Could you ask that again, I am sorry?

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

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

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

A Yes.

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

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

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

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

A I believe that's correct, yes.

Q And the other was 420, right?

A That's correct.

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

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

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

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

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

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

MR. HERNANDEZ: May I approach?

THE COURT: Yes.

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

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

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

MS. BROWNLESS: Thank you.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

BY MR. REHWINKEL:

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

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

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

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

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

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

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

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

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

Q Do you have Exhibit 116 with you still?

A Let me get organized here.

Q I would ask you to turn to page 21 when you get there.

A I do have 116. Page 21?

Q Yes, sir.

A All right, I am there.

Q Now, this is a Mitsubishi document. And do

you disagree that the Bartow steam turbine was designed to operate at 420 megawatts, as the OEM says?

A I agree that there is a case with certain variables, and you can see there is pages of variables that go in. And if the variables are at those particular numbers, then 420 is the predicted output. And that was used as a contractual minimum that Mitsubishi had to achieve.

Q Well, in the second bullet, it says a heat balance diagram providing max operation, parenthesis, 420 megawatt, thermal conditions was provided as part of the thermal kit. Do you disagree with that?

A That's what it says. And my interpretation of that is the maximum the generator can put out at those conditions at a power factor of .949 is 420 megawatts.

Q Okay. And then the next bullet there was -- it says: During the performance test in 2009, using the 420-megawatt thermal conditions, the unit was able to reach approximately 402 megawatts; is that right?

A That's correct.

Q And the performance test here was when you were installing the unit. Sometime before you commissioned it, you did a test to see whether it met the contractual terms as far as that guarantee, right?

A That's correct.

Q And is this factual?

A Yes.

Q All right. So let's go to Exhibit 109, which is the contract. And I want to go to actually attachment Appendix A.

A Appendix A?

Q Yes, sir. It starts at Bates 12419.?

MS. BROWNLESS: Excuse me, Charles. Just so I understand, this is the page that says Contract No. 270810, Amendment 005?

MR. REHWINKEL: Yes.

MR. BERNIER: Mr. Swartz, I think it's after the first divider sheet.

THE WITNESS: I found it. I am sorry. I just found it.

BY MR. REHWINKEL:

Q All right. So you agree with me, this is part of the contract for the steam turbine, right?

A I do.

Q Okay. And if I get you to go to Bates 12437. This is 3.3 Basis for Guaranteed Performance, as a header, when you get there.

A Okay, I am there.

Q Okay. Is this how the electrical output of the turbine was calculated? Is this the formula?

A It is.

Q Okay. And if we go over to 12439, just for the -- to follow up on your testimony about the power factor. We see those -- this is what you were talking about -- power factor is .9 and .949?

A It is. On that -- the table in 4.2, you can see those in the third row down in each column.

Q Okay. And they also have condenser back pressure assumptions that correlate to those outputs, is that right?

A Yes.

Q So -- and we see that -- is it true that the Case 28 was a 4-x-1 configuration, and Case 48 was a 3-x-1 configuration?

A Case 28, to my memory, was a 4-x-1 without duct burners. And Case 48, to my memory, was a 3-on-1 with full duct burning.

Q Okay. Does this document here, or the heat balances, or any other documentation that you can point to demonstrate that Mitsubishi or Bibb told you that you could get more than 420 megawatts of output from the steam turbine?

A Well, I believe you can look at some of this documentation and reach that conclusion, yes.

Q Because of the power factor?

A Yes.

Q Okay. But did anybody tell you that it would be perfectly normal to operate the unit above 420 megawatts per -- as much as you wanted?

A That's not a typical conversation. So the Bartow combined cycle, just like any other project, you talk about what the capacity is you are going to get out of the site. And in this case, I think some of the documents referred to a number maybe 1,278 or 1,279 megawatts, something like that. But there are many, many variables that come into play as far as the output of your machine. In the wintertime, when it's colder, when the cooling water temperature is lower, we can run with better condenser vacuums much more efficient.

So to give you an example, our Duke Energy Florida fleet, in the summertime we can produce about 10,000 megawatts of power. In the wintertime, we can produce about 11,000 megawatts of power. And the difference is the colder weather, the colder cooling water that helps the machines be more efficient in the wintertime.

So you have to make sure you are understanding. Every time you are talking about a rating of a piece of equipment, you have to understand

all the other conditions that are part of that predicted rating. And it would be a really bad thing to say you have to adhere to this one case out of more than 300 and never exceed that because you would be leaving potential capacity on the table that could be used for the benefit of our customer.

So let's expand Bartow, the Bartow is a steam turbine. You know, Bartow is a 1270-megawatt site. The steam turbine is, you know, 400, 450 megawatts, somewhere in that range. But it's different in the summer than it is in the winter.

But if we were to apply, say, summer ratings, and then in the wintertime, when we need 11,000 megawatts to serve our customers, we would have to buy expensive fuel, or we would have to put on less efficient generating units to great expense for our customers.

So you have to understand all the variables associated with a rating. Our job as operators is to make sure we stay within the operating parameters that are given by our equipment manufacturers and get the most out of our machines that we can without exceeding those parameters. And that's what every operator does. That's what every utility should be doing, and that's certainly what we did with Bartow.

And there is one more thing I would like to say. So to answer your question directly, if you go to page 12596 in this same document. It's way back there. It looks like this.

MS. BROWNLESS: What's the number again, sir?

THE WITNESS: In the lower right-hand corner, it's 012596.

So, Your Honor, are you there?

THE COURT: I am there.

THE WITNESS: This is the capability curve of the generator for this project. And this is the page that shows that you can get more than 420 megawatts if the power factor is greater than .9.

And I know this is hard to read, but this line right here going up at a positive angle is a .9 power factor line. And you can see it intersects the generator capability curve. If you come down, you see that's right at 420 megawatts.

We run closer to unity, closer to one. And if you go all the way across, that's almost 470 megawatts. And if you look up at the very top of this piece of paper, you can see there is a rating up at the very top. It says 468000 kVA, that's kilovolt-amperes. That's the reactive power

that this generator is capable of putting out. Power factor is the kilowatts divided by the kilovolt-amperes.

So you can see the kilowatts is only 420.2 -- 421.2. It's 421,200 kilowatts. So it's 421.2 megawatts. But with a power factor closer to one, you can get closer to 468 megawatts out of this steam turbine. That's what that information is telling you. So in the same document, they are saying you can get greater than 420 megawatts.

BY MR. REHWINKEL:

Q So 468, is that approximately the rating of the generator?

A Correct.

Q Okay. So --

A The -- well, kVA, to be more precise. And it depends on the power factor, and whether or not you can get that much megawatts, the real power out.

Q So is it Duke's position that as long as you stay within the IP, HP and condenser limits, that if you could get to 468 on a regular basis, that you would be -- it would be perfectly okay to operate -- have operated that unit in 2001 -- Period 1? I am sorry.

A Right. You have to look at other parameters as well. Again, it's hazardous to look at just any one

parameter, but this gives you an idea of what the capability of the generator is.

So we have a piece of equipment attached to the steam turbine that's capable at the power factors we run of doing in excess of 460 megawatts. So as long as we can stay within the operating parameters of the steam turbine, and those are pressures and temperatures, why don't we try to get as much output from the generator as we can.

Q Do you have Mr. Pollock's exhibit RAP-5 with you?

A I do. Okay, I am there.

Q You got that, okay.

And this is a document you prepared at our request, the Public Counsel's request, right?

A Yes.

Q Okay. So there is no question about the validity of this data, and accuracy of it, right?

A I will say I know that there is -- this is -- it uses averaging. And it depends on how often you sample a data point, and that can cause discrepancies in the data. It's a good representation, I will say that.

Q Okay. And this document here is what Mr. David referred to in his opening. It has the operating hours above 420 as distributed on this chart, is that

right --

A Yes, it does.

Q -- with that approximation caveat?

A It does.

Q So I just wanted to ask you about this, because as you were talking about being able to increase the output based on certain efficiencies, including ambient temperature, weather, right? And what I mean now, I am talking about the air temperature and the water temperature, right?

A Sure.

Q Let's look at period of 2010. Would you agree with me that -- and would you also agree with me that the months of June through September are your hottest months?

A I would.

Q Okay. And we look at here, we see a fairly large distribution of the operating time above 420 in the hottest months, right?

A Yes.

Q Okay. So it wouldn't necessarily be a reasonable conclusion to suggest that you operated this high above 420 -- or this much above 420 because the weather was colder, right?

A Well, you have to understand what else is

going on at the plant at the time. So our ability to pump that cold or warmer water through the system is really important. You are not going to get the efficiency unless you are able to pump it.

And what I know is when we first commissioned this plant, and during the first several months of operation -- and I don't know how long it went into 2010, but we had some great difficulty with what's called the circulating water system, which circulates the cooling water through the equipment, including the condenser underneath the steam turbine.

My conclusion from this data would be that once we straightened that out and were able to fully pump water through the condenser, we started really taking advantage of what we could from an installed equipment standpoint. Also understanding that in any new operation, there is a period of learning for the operating staff as well. But I know we had these equipment issues with the circulating water system for the first several months of operation.

Q But in 2010, there is not -- in fact, it looks like you have more hours above 420 --

A I think --

Q -- in the hot months than in the cooler months, right?

A Right, because I think in the cooler months, we were still having trouble with the circulating water system. I don't know that, but --

Q Okay. And before 2012, you did not do an engineering analysis that showed that it was possible to operate the unit above 420, did you?

A Well, I think we had all kinds of information that showed that it was possible to operate above 420. In fact, if we could, let's refer back to the contract for a minute.

I will have to find the exact page, but again, the 420 megawatts that you keep referencing was a contractual minimum that Mitsubishi had to meet in order to get full payment on the project. So just that fact alone tells everybody that above 420 is okay. 420 is the minimum that had to be achieved. And that's in this contract. I will just have to -- if you give me a moment, I will find the page.

Okay, so if you turn in the -- let me see what the exhibit number is. It's the contract. It's the very large document, Exhibit No. 109. And if you turn to the Bates numbers 012434 in the bottom right hand. Well, it's even better if you page to 12432, which is two pages before that, 12432.

And you can see in paragraph 3.2.1 that the

420.07 is a liquidated damage performance guarantee, which means that's the minimum that the project had to achieve in order to get full payment on the project.

Q But it says in 3.2.12: MPS Net Steam turbine Maximum Electrical Output 420.07, right?

A Yes, that's referring, in my opinion, to that generator capability curve that I just showed you. It's at a lower power factor than we operate. So again, you have to make sure any time you talk about a rating, you have to make sure you understand all the variables that go into that rating. In this assistance, it used a power factor that we can far out achieve.

Q Okay. So in 2012, after you had the first discovery of blade damage, isn't it true that you went to Mitsubishi and asked them for their help in telling you how you could operate above 420?

A I would phrase it a little differently than that.

So we opened up the steam turbine for a routine inspection in the spring of 2012. We found five of the mid-span snubbers that had damage. We were concerned with that. So we consulted with Mitsubishi. They recommended we don't continue running with those snubbers broken. That could lead to blade failure, which would be catastrophic, as I have described

earlier.

At that time, Mitsubishi, as we've seen and you pointed out, they were concerned we were running higher than their fleet experience from a pounds per hour per square foot standpoint in the last stage blade, so they gave us, for the first time, a lower operating limit.

And in this case, if we could turn to my -- to JS-2 in the root cause, I can show you what the operating limit is. It's page 5 of 18, Table A in JS-2, or JS-1.

Are you there, Your Honor?

THE COURT: I am just about there. Yeah, I am there now.

THE WITNESS: Okay. So in that table, you can see it has columns for each of the five periods. And the one, two, three, four, the fifth row down says MHPS IP exhaust pressure operating limits.

So it's at the start of Period 2, because of that damage we found, following Mitsubishi's recommendation, we replaced all of the blades on just one end of the machine because all five snubbers were damaged on the same end of the machine, I believe on the turbine end. It says in this chart. I am not looking at it.

And if you look at the picture over here, you can see that the machine has two ends. The generator is coupled to the right-hand side, and the HP IP turbine is coupled to the left-hand side. So on the turbine end of the machine, we replaced all 64 L0 blades.

Before we started operating again in April of 2012, Mitsubishi, in order to make sure that we didn't exceed their operating experience with 40-inch L0 blades, they put this 118-pound limit on the intermediate pressure turbine exhaust. And in this case, that served as a proxy.

Why that intermediate pressure exhaust rather than the low pressure turbine inlet. There was no pressure instrument on the low pressure inlet, but there was one on the intermediate pressure exhaust, so that was used as a proxy.

And if I could stand up just a minute just to make sure everyone understands. Mitsubishi was concerned, as I described, with the steam flow, but there was no pressure instrument on the pressure going into the low pressure turbine, but there was one coming out of the intermediate pressure. So there is just a slight amount of pressure drop across this pipe.

So we used this pressure as a proxy for the low pressure turbine inlet. It was more conservative than what had been in the past, so the combination --

And I am sorry, but I forgot what your question was, but, yeah, we put a more conservative operating limit in place based on pressure, which is consistent with operating parameters that we followed from the start of Period 1 throughout each of the periods.

BY MR. REHWINKEL:

Q So I asked you if, after the failure, you went to Mitsubishi and asked for them to help you --

A Right.

Q -- increase the output in the unit.

A So it's just not so simple as that. It's a very collaborative back-and-forth process, but because we then had to -- we followed this lower, more conservative guidance on the IP exhaust pressure, we were not satisfied that we were getting as much out of the equipment as we could, so that's when we did ask Mitsubishi.

So we don't want to have this limit. We weren't supposed to have this limit. We want to get as much out of the generator as we can. Is there something

that can be done?

They studied it and came back with us -- to us and said, yes, we can redesign the L0 blades and put a different design of blade in both L0 rows, and you will be able to achieve, we estimate, 450 megawatts.

Q Well, are you familiar with the quote that they gave you for an engineering study for additional optimization and reliability for $232,025?

A Could I see that?

Q Yeah. It's on -- it's in Exhibit 102 at Bates 145. It's the late filed exhibit for 145.

A I have 102. Could you say the Bates number again, please?

Q Yeah. It's kind of two-thirds of the way or more back, it's at 145, and it's a real tiny print up in the upper right above the slide.

A I am almost there. Okay, I see that.

Q Do you know what this was for?

A I don't recall what this was for.

Q Okay. If you roll back a few pages to 135.

A Okay, I am there.

Q And this is a part of, I guess, a slide presentation at a joint meeting between Mitsubishi and Duke?

A I am looking back at the beginning to see if I

can get an idea.

Q On 122, it talks about August 21st, 2012, discussion.

A Okay. It does appear to be a meeting where we discussed the turbine.

Q Okay. Just back on 135, a discussion -- further discussion to support their own investigation and possible means of increasing unit output.

And then it looks like they have a response. It says: We will continue technical support for you. As of now, it is difficult for us to propose a concrete method to increase the unit output. An engineering study is suggested.

And so my question is, is that what 145 is, is them saying here's what it will cost you for us to do an engineering study?

A It does appear to be that, yes.

Q Okay. And did you engage them to do that study?

A I don't recall if we engaged them to do this study, or if that was included in the ultimate -- we did contract with them to supply new blades that could -- that were theoretically going to be able to raise the output to about 450 megawatts.

Q Okay. So that would have been the most likely

output product of this study if you did, in fact, say, yes, go ahead and do that?

A That -- I would say that would be a likely output, yes.

Q Okay. Now, did that study say that Mitsubishi agreed that you could run the unit above 420 without different blades?

A Well, I am not familiar with the study, but -- so if I could have a few minutes to read it, but I think it's really important to remember that at this point in time, Mitsubishi thought that the root cause was too much steam flow in the low pressure turbine, and that they -- there was a way to get from steam flow and correlate it, as you have already said, to megawatts.

So that's been disproven in later cases, later periods of time. So I am not sure what your question is.

THE COURT: I am going to jump in while we are on a pause here.

One thing we didn't have in our order of procedure was a lunch break. I am just wondering what the will of the, you know, the room is as far as taking a break and how long you think we need.

MR. BREW: Yes, I think we should have one.

MS. BROWNLESS: Yes.

THE COURT: We agree on that. How long? Should we try to get back inside of an hour, or is it going to take an hour?

MR. REHWINKEL: I think an hour is reasonable.

THE COURT: Okay. We will -- we'll say, then, we will reconvene at 120:20, and if everybody, by some miracle, is back sooner, we will start sooner.

MR. REHWINKEL: Okay. Sounds good.

THE COURT: We will stand in recess then.

(Lunch recess.)

(Transcript continues in sequence in Volume 2.)

CERTIFICATE OF REPORTER

STATE OF FLORIDA)
COUNTY OF LEON)

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

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

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

DATED this 18th day of February, 2020.

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

CONFIDENTIAL

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

APPEARANCES:

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

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

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

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

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

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

INDEX TO WITNESSES

INDEX TO EXHIBITS

NO.	DESCRIPTION	IDENTIFIED	ADMITTED
114	Revised Comprehensive Exhibit List	11	11
115	RCA draft	35	
116	3/18/2015 40-inch blade telemetry	35	

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

P R O C E E D I N G S

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

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

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

Representing Duke Energy.

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

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

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

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

good.

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

MR. SWARTZ: Good morning, Your Honor.

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

And Office of Public Counsel.

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

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

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

THE COURT: Okay. Very good.

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

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

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

MR. MOYLE: FIPUG, it's Florida Industrial

Power Users Group.

THE COURT: I am more comfortable saying that.

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

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

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

THE COURT: Okay. Very good.

And PCS Phosphate.

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

THE COURT: Very good.

And last but not least, the Public Service Commission.

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

our General Counsel.

THE COURT: Okay. Very good.

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

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

THE COURT: Okay. That's fine.

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

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

Mr. Rehwinkel.

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

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

MR. REHWINKEL: Okay.

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

the court reporter can.

COURT REPORTER: I'll let you know.

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

MR. DAVID: The switch was off.

THE COURT: Oh, is that it?

MR. DAVID: Yeah.

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

MR. REHWINKEL: Thank you.

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

MS. BROWNLESS: Yes, Your Honor.

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

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

MR. HERNANDEZ: That is correct, Your Honor.

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

THE COURT: Okay.

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

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

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

MS. BROWNLESS: Thank you, Your Honor.

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

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

MR. BERNIER: Yes, sir.

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

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

MR. REHWINKEL: Yes, sir.

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

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

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

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

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

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

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

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

Prior to the purchase, Mitsubishi was responsible for ensuring the turbine was compatible and acceptable for the use at Bartow. They were also responsible for providing Duke Energy with the operating parameters for the unit. DEF was responsible for operating the unit within those parameters, which it did.

Notwithstanding DEF's compliance with the operating guidelines, during a planned outage in the spring of 2012, after approximately three years of operation, damage was discovered on the last stage of blades in the low-pressure turbine. The

last stage blades are also referred to as the L0 blades. You will hear both, and we have an actual representation of the blade over there on the side of the courtroom for you so you can see it.

THE COURT: Oh, okay. I walked right by it.

MR. BERNIER: So that's what we will be talking about today.

We also have a diagram that staff has provided of the operation and the actual steam turbine with CTs and everything that Mr. Swartz and maybe Mr. Polich will be referring to.

Now, DEF discovered the damage during an inspection as part of an unrelated outage and consulted with Mitsubishi, which recommended replacing the L0 blades on the turbine end of the steam turbine prior to restarting operations. The damaged blades were replaced and the operating parameters were also adjusted by Mitsubishi, resulting in the establishment for the first time of a new exhaust pressure limit on the intermediate pressure portion of the turbine.

Now, during of this second period of operation -- and you are going to hear us referring to different periods of operation, and those periods are shown on Mr. Swartz's Exhibit JS-2,

it's No. 80 on the comprehensive exhibit list, and it's Duke Energy's root cause analysis. That breaks it down into the various periods you are going to hear us discuss throughout this hearing.

During the second period of operation, DEF complied with the modified operating parameters, but DEF wanted to return to the output from the machine that it was previously able to provide when operated to its original higher specifications. To be clear, beneficially extracting as much energy from the steam being produced by the combustion turbines benefits Duke Energy's customers.

Therefore, during Period 2, DEF contracted for new heavy-duty blades that would allow the machine to produce additional megawatts. When the unit was removed from service to install these new upgraded blades, damage was discovered on the Period 2 blades. So at the outset of Period 3, Mitsubishi installed temporary blade vibration monitoring to allow for telemetry testing to better understand what was happening with the blades.

As a result of that testing, for the first time, Mitsubishi created an avoidance zone, which is a combination of steam pressure and condenser pressures that should be avoided or minimized

during stable operations, and that was communicated to Duke Energy around four months into Period 3.

Again, notwithstanding DEF's compliance with these new operating parameters, including avoiding operation in the newly-established avoidance zone, the new upgraded blades again suffered damage. For the first time, however, the damaged areas shifted from the mid-span snubbers, which I believe is right in the middle of the blade, and shifted out to what's called the Z-locks, which are at the end of the blade. And this led DEF to the conclusion that the modifications simply shifted rather than corrected the blade issues.

This Period 3 experience led to further blade modifications and reduced operating parameters in addition to the avoidance zone for the Period 4 operations.

Once again, although DEF complied with the reduction and operating pressures, knowing that those modifications to the operating specifications would result in reduced output for its customers, the Period 4 blades were also found to have damage after approximately five months of operation.

At this point, DEF determined the best course of action was to go back to the first iteration of

blades, which, coupled with further reduction in steam pressure, was thought to provide the best chance of event-free operation while Duke Energy and Mitsubishi could more fully understand the cause of the damage. However, DEF's operators detected an indication of blade damage in these Period 5 blades after only approximately 1,500 hours of operation.

Again, the blades were damaged even though the unit was operated pursuant to the most conservative guidelines provided to date. Therefore, DEF determined the prudent intermediate path forward was to replace the last-stage blades altogether with pressure plates. These plates allow steam to pass through the turbine but do not rotate and, therefore, do not contribute to generating power resulting in a reduction in potential generating capacity. However, the pressure plates did allow for event-free operation for the benefit of Duke Energy's customers.

It's also important to remember that DEF was able to discover each instant of blade damage -- instance, excuse me -- before catastrophic failure could occur.

As this course of events was playing out, and

in addition to cooperating with Mitsubishi on their various root cause analyses, which I think you will hear about today, DEF was engaged in performing a root cause analysis analyzing the information gleaned from each of the different incidents.

DEF's root cause analysis specifically considered six potential failure causes, three operational causes and three design causes.

Ultimately, DEF determined that none of the reviewed causes in isolation or in combination could explain the various blade episodes. Thus, DEF was left with one conclusion: The blades' lack of adequate design margin did not allow the blades to operate without incident at even the reduced operating pressures recommended by the equipment manufacturer.

Said differently, under normal operating conditions within Mitsubishi's operating guidelines, the blades were not designed to handle the pressures found within the low pressure turbine. DEF had no way of knowing this information. It prudently relied on Mitsubishi and operated the machine according to their instructions, as it would any other machine across its fleet.

Now, Public Counsel's witness, Mr. Polich, based on his review of documents, has determined that the cause of the failures is very simple. He believes that DEF ran the steam turbine too hard in the first period of operation. More specifically, Mr. Polich concluded that the operation of the steam turbine in a manner that produced over 420 megawatts caused the blade damage, and had the unit not been operated in this manner, the original blades would still be in the machine and operating today.

This conclusion is contradicted by the later episodes that occurred without reaching the operation levels Mr. Polich asserts caused the damage.

During his deposition, Mr. Polich candidly agreed that DEF operated the unit prudently in each period other than the first.

Of course, if DEF operated -- prudently operated the blades in those latter periods, as Mr. Polich agrees, and the blades still suffered damage, there must be a cause, and that cause is the lack of adequate design margin as DEF has concluded.

Now, not only does the later operating

experience and blade damage at lower operating pressures show that the original blade damage was not caused by operating in excess of 420 megawatts, Mr. Polich also admitted that he does not and cannot know at what point during Period 1 the original blades failed.

Because he cannot know when the original blades were damaged, it follows that he does not know how the steam turbine was being operated at the time the damage occurred, or whether the damage occurred when the unit was being operated above or below 420 megawatts of output.

Now, obviously this begs the question, how can he be so certain that it was simply operation above 420 megawatts that caused this damage?

Now, this is important, because under Mr. Polich's definition, operating below 420 megawatts was prudent. And if the damage occurred during prudent operation, the damage is certainly not DEF's fault.

And Mr. Swartz will testify that the Bartow plant was operated pursuant to industry standards and in line with the best interest of customers. The goal of plant operators is to maximize the output of generating units. This allows the

utilities to avoid building additional generation or operating less cost-effective units to meet demand and, therefore, it saves customers money. Moreover, his testimony demonstrates that the steam turbine was at all times operated by the guidelines provided by Mitsubishi.

In short, DEF operated the steam turbine prudently from commissioning up until the February 2017 outage, and prudently installed pressure plates in place of the malfunctioning blades while a long-term solution could be devised, tested and implemented. Therefore, DEF should be permitted to recover its prudently incurred costs.

And I apologize for taking so long, that's more than I have ever said. Thank you.

THE COURT: I guess Office of Public Counsel goes next.

MR. DAVID: Yes, sir. Good morning, Judge Stevenson.

My name is Tad David with the Office of Public Counsel, and we represent the customers of Duke Energy Florida. We are here to establish facts, facts that we contend showed Duke Energy made foreseeable errors in the operation of its Bartow plant, errors that cost money, money that Duke

Energy now wants its customers to pay.

As you will see from the evidence, the sequence that links the customers to these errors is tenuous, but the link between Duke Energy's imprudent decisions and these errors is direct and proximate. Further, we will show that Duke initially concluded that the damage was caused by its operation of the plant.

As an investor-owned utility in Florida, Duke has a duty to make prudent and reasonable decisions in operating its generation facilities, and regarding any items that add cost for customers.

In this case, Duke had the resources and information that should have informed them of the proper operation of the Bartow plant. They knew or should have known that the way the Bartow plant was being operated was beyond the prudent operation of that plant. Through the exercise of due diligence and prudence, Duke should have understood that the output was entirely too good to be true. Their imprudent operation directly damaged this plant and cost money.

In this case, we are asking that the fuel clause recovery requested by Duke be reduced by an amount equal to the additional fuel cost caused by

Duke's imprudent operation of the plant, additional costs they are now trying to recover from customers. These costs should not be paid by Duke's customers.

No documentation exists that showed shows the manufacturer ever indicated that the steam turbine could generally be operated to produce an output above 420 megawatts during the initial period. The steam turbine was not designed to operate above 420 megawatts for any extended period of time. And the contract with Mitsubishi, who was manufacturer of the steam turbine, did not contemplate it operating above 420 megawatts of output.

For the period of July 2009 through February 2012, Duke operated the steam turbine above 420 megawatts for a total of 2,972 hours, including 2.4 hours above 450 megawatts, 1,555 hours above 440 megawatts and 2,302 hours above 430 megawatts.

As Mr. Bernier mentioned, in March of 2012, upon a routine inspection of the low pressure section of the steam turbine, Duke discovered that parts of the turbine were damaged. Since that time, for the past eight years, Duke has been trying to fix this steam turbine.

The evidence will show that the problems, and more importantly the costs at issue in this case cascade from Duke's operation of the Bartow plant in that initial period of operation from 2009 to 2012. This was Duke's fault.

The first evidence that Duke requested Mitsubishi consent to run the plant above 420 megawatts was in July of 2012, after the damage had been discovered in the first period.

The reply to this request was basically, hold on, you know, let's be careful. After the damage was discovered in March of 2012, the steam turbine never again consistently achieved 420 megawatts, except during very limited periods in a testing environment.

Later in 2012, Mitsubishi indicated that they could do an analysis of the circumstances that might allow the plant to produce -- to consistently produce 420 megawatts, but this analysis would cost $232,000 just to perform the analysis. There is no evidence that Duke commissioned Mitsubishi to perform this analysis.

In March 2018, Duke completed a root cause analysis of the problems experienced with the steam turbine at the Bartow plant. This root cause

analysis was originally initiated to establish the cause of the damage discovered in -- during the first period beginning, you know, in March of 2012.

Drafts of this root cause analysis indicate that Duke engineers initially acknowledged that Duke contributed to the damage by introducing excessive steam pressure into the low pressure section of the steam turbine.

Over time, Duke's root cause analysis drafters softened the role that the excessive steam pressure played in the damage and focused instead on the blade design issues that followed the initial damage and failures.

We do not know the reason behind all the subsequent edits or revisions, however, you know, presumably not because the admitted information strengthens the argument that it was not -- the problems were not Duke's fault.

The evidence will show that no similar Mitsubishi steam turbines with the same blades has had blade damage or failures like that experienced at the Bartow plant.

Through Mr. Swartz's direct and rebuttal testimony, Duke will try to invert the cause and effect in this case. They will point to situations

after they damaged the turbines to support the idea that similar but not identical situations did not damage the turbine during the initial period.

The evidence they will try to use, in fact, shows that Duke decided it was easier to ask for forgiveness than permission to increase the output from the steam turbine and that Duke imprudently operated the turbine in such a fashion that it was damaged, potentially irreparably damaged.

This case, as you have already heard, revolves around some technical subjects. We will discuss succinctly as possible how this particular type of power plant works; how the operation of the plant affects the components of the plant; and how the operation and the resulting breakdowns have increased the cost of operating the plant.

Lastly, we will explain why it is appropriate for only prudently and necessarily incurred fuel expenses to be recovered from ratepayers in the fuel clause.

We cannot forget, Duke bears the burden of proof in this case to establish its entitlement to the recovery of replacement power costs as prudently and necessarily incurred. We are certainly not here to suggest that Duke Energy or

any of its employees are bad. The bottom line is that someone at Duke made errors, foreseeable errors that cost money, money that Duke Energy now wants its customer to pay.

We believe that you will see that Duke, not its customers, should be the one that bear these additional avoidable costs.

Thank you.

THE COURT: Thank you, Mr. David.

Next will be Mr. Moyle.

MR. MOYLE: Thank you, Your Honor.

Again, Jon Moyle for the Florida Industrial Power Users Group.

Your Honor, my client is comprised of a number of entities that use a lot of power 24/7, and the cost of power is important to them. A lot of them compete in markets not only in the United States, but internationally. I characterize them as folks in the pulp and paper business, the phosphate business, the chemical business, metal recycling. There is a wide variety of folks. I just wanted to share that with you to give you a little sense of why I am here and who I represent.

I think that, as noted, the burden of proof, obviously, is very important. I don't think there

is a disagreement that Duke bears that burden. And they have a tough burden to overcome. As you heard, I don't think it's really in dispute that Duke operated this plant initially when they got it out of a warehouse in Japan.

They brought it over, it sat in a warehouse for, I think, a number of years in Japan. And when they brought it here, they ran it beyond its 420-megawatt capabilities. And I don't think you will hear disputes about that, that in terms its operation, it was beyond that.

So with that fact going in, I think they have a tough hill to climb to show, well, notwithstanding that, we still should recover the monies in dispute.

And I think it's also helpful for -- to put in context the monies in dispute here. These issues, as you know, are a couple of issues that in the fuel docket. And the fuel docket is an annual docket that the PSC opens. All of us are in it and participate in it.

And in the fuel docket, of which these two issues have been spun off for your consideration, Duke -- the Commission has already ordered that Duke recover, its a big number, 1.3 billion

approximately -- for the record, 1,303,329,632 -- and that's in an order from the PSC. So what we are arguing about today is give or take approximately one percent of monies that have already been ordered to be recovered by the Commission.

And in terms of thinking about how to make the opening point with you, you are going to hear a lot of technical information today. But I think it's important to note that, you know, the ratepayers, I would draw an analogy of the ratepayers maybe to a homeowner who is going to get a new home built. And the homeowner contracts with knowledgeable people, an architect and a general contractor to build a home. And if a construction defect occurs, the homeowner is inclined to say, that's on you all, because I don't have expertise in this. I relied on you. And I think that ratepayers are in a similar position.

It's a regulatory compact. These are monopolies, but the ratepayers surely don't have the expertise in these areas. And what you have here is you have Duke kind of pointing the finger at Mitsubishi and saying, well, we think it's a design defect. And why do they say that? I mean,

largely because largely because they can't identify the problem that occurred.

And Mitsubishi is saying, no, we think you overran the plant at the beginning, that you put too much steam through it, and you all caused the problem.

So there is a lot of uncertainty there. These are complicated machines. Overrunning it at the beginning, does that have a downstream effect that these turbine kept breaking?

What we do know is that the turbines continued to break and not be operational. And the result was is that they had to go out and get extra power, and that's what we are arguing about today.

But I think it's important that the customers, you know, not bear this risk. I don't think Duke can make -- prove the burden. And I am going to spend a little time asking about, well, how is it between Mitsubishi and Duke? I mean, shouldn't you all figure out who is responsible for this?

And I think you will hear a little bit from Duke's witness about, well, we really couldn't get them to assume risk because it's too great of a risk for going out and buying power and -- you know, but respectfully, we don't think that risk

should fall on the ratepayers, particularly in this case, because we don't believe Duke can carry their burden of proof.

So thank you for the opportunity to share those thoughts with you.

THE COURT: All right. And PCS.

MR. BREW: Thank you, Judge Stevenson.

PCS Phosphate operates their phosphate mining operating in Hamilton County. It is by far one of the largest electric loads on the Duke Energy system, and so affordable power is crucial to their operations and fees, quote. That's why we are here.

You will find that everyone at these tables will agree that in its roughly 11-year history, the Bartow plant hasn't run as expected, that there are a series of events all involving the last level of blades, the L0 blades and the failures, and you will get a real education on that.

What we also agree on is that the manufacturer of the steam turbine, Mitsubishi, has no prior experience anywhere in the world with what has happened at Bartow; that Duke has no prior experience operating a combined cycle facility in the configuration of this plant.

And it's important to remember that when the steam turbine is running, it always runs at 3,600 RPM when it's connected to the grid. And so you are going to hear a lot about the five initial period that were studied in the root cause analysis. I just want to focus on the last one, which occurred in February 2017, where a fragment of one of the blades flew off at 3,600 RPM, which means that it was carrying a velocity roughly comparable to a speeding bullet through the turbine until it hit something and caused some damage.

And that's what we are talking about in terms of replacement fuel is the downtime while they initially decided how to repair from that damage, where the decision was to take all the blades out, all the zero level blades out and put in the pressure plate that Mr. Bernier talked about, which downgraded the unit, so it was -- it lost about 10 percent of its production capacity that consumers have had to deal with for almost three years now.

It's been our concern on rebuilding the record that we still don't know if the plant is fixed. We still don't know if the real root cause has been addressed; that Duke and Mitsubishi worked together

when they finally decided to focus on vibration levels to do some actual telemetry testing for vibration, and they are now insisting that their vibration monitoring be part of the new fix.

So to our mind, Duke hasn't really established that it has still figured out how to repair the plant, but clearly the burden lies with them.

Thank you.

THE COURT: And the Commission.

MS. BROWNLESS: We will waive opening statements. Thank you.

THE COURT: I don't know whether you are here as a referee or what. Thank you.

MR. REHWINKEL: Your Honor --

THE COURT: Yes, sir.

MR. REHWINKEL: -- if I could interject. I have a housekeeping matter.

We have a copy of the documents we were required to bring today. Would you like me to give you those now?

THE COURT: Sure. That would be fine.

MR. REHWINKEL: Okay. And I also wanted to mention that we've identified exhibits. There are two additional exhibits that we have distributed to all the parties that I would just ask at this

time -- oftentimes at the Commission, when we have cross-examination exhibits, we don't normally pre-identify them, but I have done that.

One of them is an exhibit that is excerpts from what would be Exhibits 102 and 103, and I have talked to counsel for the company about that. Everyone has it in the red folders that we've distributed, and I would just ask if I could get agreement that that would be admitted into the record under the same conditions that the other documents have and given a number?

MR. BERNIER: Which one was the excerpts from 102 and 103? Of this?

MR. REHWINKEL: It's in the first one. It's got the tabs on it.

THE COURT: So you are saying, Mr. Rehwinkel, you want these sort of pulled out and identified as a separate exhibit?

MR. REHWINKEL: Yes, Your Honor. They don't have a number at this time, but assuming that we have no objection to it, I think it would be given No. 115.

THE COURT: 115.

MR. REHWINKEL: It would be called draft -- RCA draft exhibit. And then there is one other one

which would be 116, and it would be March 18, 2015, 40-inch blade telemetry. And that's the other envelope that says telemetry on it.

MR. BERNIER: So we have no objection to this being marked at this time. Based on the questions that are being asked, there may be objections at that point. I don't know yet, so I will withhold right to object at that time.

THE COURT: Okay. We will just identify them.

MR. BERNIER: Identify them for discussion.

THE COURT: Identify as 115 and 116.

(Whereupon, Exhibit Nos. 115 & 116 were marked for identification.)

MR. REHWINKEL: That way we won't have to do that then. I will give you your set.

MS. BROWNLESS: Excuse me, Charles, I just want to make sure I am doing this correctly. This RCA draft exhibit is 115?

MR. REHWINKEL: Yes.

MS. BROWNLESS: And what is 116?

MR. REHWINKEL: It's in the other pouch, and it's the last one. It's the last document. No, it's a skinny one.

MR. BERNIER: I have another question. Is there a copy for the witness when they are up

there?

MR. REHWINKEL: I don't have one.

MS. BROWNLESS: What does it say on the outside, Charles?

MR. HERNANDEZ: It does not have an exhibit number on the top right-hand, so it's blank.

MS. BROWNLESS: I'm sorry.

MR. REHWINKEL: It has a cover on it.

MR. HERNANDEZ: That's it.

MS. BROWNLESS: Okay.

MR. REHWINKEL: Yeah.

MS. BROWNLESS: Thank you for being patient.

MR. REHWINKEL: I apologize for going off the schedule there, but I thought it would be better if we just got this taken care of.

THE COURT: That's fine. That's perfectly okay.

MR. REHWINKEL: Okay.

THE COURT: If there is no other preliminaries, I guess we are ready for Mr. Swartz.

MR. BERNIER: Thank you. Duke Energy calls Mr. Jeff Swartz.

THE COURT: Mr. Swartz. You have already offered testimony, but I will swear you in.

Raise your right hand.

Whereupon,

JEFF SWARTZ

was called as a witness, having been first duly sworn to speak the truth, the whole truth, and nothing but the truth, was examined and testified as follows:

THE WITNESS: I do.

THE COURT: Have a seat.

EXAMINATION

BY MR. BERNIER:

Q Mr. Swartz, could you please provide your name and job title for the record, please?

A Jeff Swartz. I am the Vice-President of Generation for Duke Energy Florida.

Q Thank you.

And on or about March 1st, 2019, did you cause to be filed direct testimony in the 2019 fuel docket before the Florida Public Service Commission?

A Yes, I did.

Q And do you have a copy of that testimony with you today?

A I do.

Q If I were to ask you the same questions here today, would your answers be the same?

A Yes.

MR. BERNIER: Judge, at this time, we would

ask that Mr. Swartz's prefiled direct testimony, dated March 1, 2019, be entered into the record as though read.

THE COURT: Hearing no objections, we will show that done.

(Whereupon, prefiled direct testimony was inserted.)

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

DIRECT TESTIMONY OF

JEFFREY SWARTZ

ON BEHALF OF

DUKE ENERGY FLORIDA

DOCKET NO. 20190001-EI

MARCH 1, 2019

Q. By whom are you employed and in what capacity?

A. I am employed by Duke Energy Florida ("DEF" or the "Company") as Vice President – Generation.

Q. What are your responsibilities in that position?

A. As Vice President of DEF's Generation organization, my responsibilities include overall leadership and strategic direction of DEF's power generation fleet. My major duties and responsibilities include strategic and tactical planning to operate and maintain DEF's non-nuclear generation fleet; generation fleet project and additions recommendations; major maintenance programs; outage and project management; retirement of generation facilities; asset allocation; workforce planning and staffing; organizational alignment and design; continuous business improvements; retention and inclusion; succession planning; and oversight of hundreds of employees and hundreds of millions of dollars in assets and capital and operating budgets.

Q. Please describe your educational background and professional experience.

A. I earned a Bachelor of Science degree in Mechanical Engineering from the United States Naval Academy in 1985. I have 17 years of power plant and production experience in various managerial and executive positions within Duke Energy managing Fossil Steam Operations, Combustion Turbine Operations and Nuclear Plant Operations. While at Duke Energy I have managed new unit projects from construction to operation, and I have extensive contract negotiation and management experience. My prior experience also includes nuclear engineering and operations experience in the United States Navy and project management, engineering, supervisory and management experience with a pulp, paper and chemical manufacturing company.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to provide the Commission with information related to the Bartow Steam Turbine (ST) forced outage that occurred from February 9, 2017 through April 8, 2017, including background information on the event that led to the outage, an explanation of DEF's responsive actions, a presentation of DEF's root cause analysis and findings, and an explanation of DEF's reasonable and prudent restoration actions.

Q. Please provide a summary of your testimony.

A. On February 9, 2017, the Bartow steam turbine was removed from service due to an indication of a sodium leak into the steam water cycle. During this shutdown, DEF discovered a failed LP turbine rupture disk. The disk had been breached by a foreign

object that caused a hole in the rupture diaphragm. DEF performed an inspection of the Bartow Steam Turbine ("ST") and discovered damage to the ST's L-0 blades (and determined part of an L-0 blade ruptured the LP turbine rupture disk), resulting in a forced outage to the ST that lasted until April 8, 2017 (while the ST was off-line, the Bartow combustion turbines ("CTs") remained available to run in simple cycle mode). DEF performed a Root Cause Analysis ("RCA") that determined the failure of the Bartow ST's L-0 Blades was caused by events beyond DEF's control, and DEF could not have reasonably prevented the failure from occurring. The results of DEF's RCA were discussed in more detail in my March 1, 2018 testimony filed in Docket No. 20180001-EI, which I adopt and incorporate as if fully set forth herein. DEF's actions prior to and in the wake of the blade failure were reasonable and prudent.

Q. Are you sponsoring any exhibits?

A. Yes. I am sponsoring the DEF RCA Report, attached as Exhibit No. __ (JS-1) to my March 1, 2018 testimony filed in Docket No. 20180001-EI.

Q: Is the RCA considered confidential by the Company?

A: Yes. Portions of the RCA's findings are considered proprietary and confidential by the blades' manufacturer. In order to protect the OEM's rights, this information has been treated by the Company as proprietary confidential business information and has not been made publicly available. As part of the stipulation reached on Issue 1B in Docket No. 20180001-EI, DEF committed to work with the OEM to revise the confidentiality request; DEF intends to fully comply with that stipulation.

Q. Please summarize the events leading up to the 2017 Bartow event.

A. Bartow is a 4x1 Combined Cycle ("CC") Station with a ST manufactured by Mitsubishi Hitachi Power Systems ("MHPS"). The ST was purchased from a company that intended to use it for a 3x1 CC with a gross output of 420MW. The ST was never delivered to that third party but instead remained with MHPS in a warehouse in Japan until DEF purchased the unit in 2006.

Before the ST was purchased, DEF contracted with MHPS to evaluate the ST design conditions and to update heat balances for a 4x1 CC configuration. CC units blend steam from the CTs as they start-up and/or shut-down with steam to the ST. These blending events result in brief periods of higher steam temperatures and flows into the condenser below the ST L-0 blades, a common occurrence for CC units.

Since commissioning of the Bartow ST in 2009, there have been five (5) events involving L-0 blade failures and/or replacements. The latest blade failure occurred when a "loss of mass" event resulted in a blade fragment traveling through the Low-Pressure Turbine rupture disk diaphragm.

Q. What actions did DEF take in response to the February 2017 failure?

A. The Company took three primary actions in the wake of the event: a root cause team was established to investigate the incident and prepare a root cause analysis; a restoration team was formed to bring the unit back on-line; and a team was formed to evaluate a long-term solution for Bartow.

Q. Please describe the process DEF followed to ascertain the root cause of the event.

A. DEF created a RCA Team consisting of internal experts to investigate and determine the root cause of the event. The RCA Team consisted of seven individuals with expertise in engineering, operations and process, and human performance.

Following industry standard procedures, the RCA Team employed specific tools used to determine potential root cause(s) including: interviews, event and causal factor review ("E&CF"), flawed barrier analysis, change analysis, component analysis, visual inspections of the equipment, photographs taken following the event, engineering calculations and measurements, and detailed review of outage reports and maintenance logs.

DEF's findings are fully set forth in the RCA identified as Exhibit No. __(JS-1) to my March 1, 2018 testimony in docket No. 20180001-EI and as summarized in my testimony of that date. To avoid unnecessary repetition, those findings will not be rehashed here.

Q. What restoration process did DEF follow to bring tl service?

A. It's important to recall that the four Bartow CTs were able to continue operation in simple cycle mode (i.e., without operation of the ST) notwithstanding the blade failure. DEF worked with the OEM to identify and implement an interim solution that would allow the ST to resume operation, ultimately resulting in the installation of a pressure

plate in place of the L-0 blades on March 22, 2017. The plate allows the ST to operate increasing the energy output of Bartow above what was possible in simple cycle mode. As mentioned above, the ST returned to service on April 8, 2017.

Q. Could DEF have reasonably prevented the event and the ensuing outage at Bartow?

A. No, the outage was caused by circumstances beyond DEF's reasonable control, as demonstrated by the RCA. DEF was not at fault.

Q. Did DEF act reasonably and prudently to restore Bartow to service in a timely fashion?

A. Yes, DEF took reasonable and prudent steps to develop a restoration team and guiding processes to restore the Bartow ST to service. The restoration team followed those processes and the unit was successfully brought back on line in a timely manner.

Q. Did DEF's agreement with the OEM include a provision obligating for the OEM to contribute funds towards replacement power costs in the event of an outage caused by the OEM's product?

A. No; to the contrary, the agreement specifically disclaimed any liability for consequential damages.

Q. In your experience, do DEF's agreements with OEMs usually include a similar disclaimer of liability?

A. Yes. In my experience OEMs are not willing to accept the risk of agreeing to pay consequential damages (such as replacement power costs) given the uncertain and potentially open-ended liability. To my knowledge, this is the case throughout the industry.

Q. Have you or anyone under your supervision engaged in negotiations with a vendor that was willing to accept consequential damages as part of a component part purchase order?

A. No, in DEF's experience, vendors do not offer to accept consequential damages as part of the terms and conditions of their agreements. Further, when DEF has indicated that such a provision would be a required part of the agreement, vendors have indicated they would withdraw rather than agree to those terms. DEF simply has not found such a provision to be commercially available.

Q. Does that conclude your testimony?

A. Yes.

BY MR. BERNIER:

Q Mr. Swartz, have you prepared a summary of your direct testimony?

A I have.

Q And could you provide that, please?

A Certainly.

Good morning, Judge Stevenson. Again, my name is Jeff Swartz. I am the Vice-President of Generation for Duke Energy Florida. I will say DEF in the future. That meanings I have overall responsibility for DEF's generation fleet.

My direct testimony provides background regarding the issues that have arisen over the past few years with the Bartow combined cycle plant steam turbine, an explanation of DEF's response to those issues, including a summary of DEF's actions to restore the unit to service as quickly as possible. And finally a presentation of DEF's root cause analysis.

In short, after analyzing data from each of the blade failures that I will discuss in a moment, DEF determined that the only causal factor that explains each failure, and accounts for the different conditions attended to each failure, is that the blades lack sufficient design margin to effectively operate in the Bartow steam turbine.

Bartow steam turbine was manufactured by Mitsubishi Hitachi Power Systems. The combined cycle was placed into service in the year 2009.

And briefly some background. A combined cycle power plant uses both gas and steam turbines together to produce electricity. Combustion of natural gas in the gas turbine turns a generator producing electricity, and the waste heat from the gas turbine is routed to a heat recovery steam generator, or HRSG, producing steam routed to a nearby steam turbine which generates extra power. It is coupled to a generator.

Combined cycle plants can be set up in multiple configurations and provide for great operational flexibility. The Bartow combined cycle is called a 4-on-1 plant, meaning there are four natural gas fired combustion turbines, four heat recovery steam generators which provide steam to the one steam turbine. It can operate in a 1-on-1 configuration, a 2-on-1, a 3-on-1, a 4-on-1; or, when necessary, the gas turbines can operate in what we call simple cycle mode to generate electricity when the steam turbine is off-line.

The steam turbine itself is made up of a high pressure/intermediate pressure section which is a combined section, and a low pressure section as well. Each has a series of blades that, as the steam passes

through the blades in the turbine sections, it spins the blades which, in turn, spin the rotor. The rotor is connected to a generator, and the generator is what produces electricity.

At issue in this proceeding is the low pressure section, specifically the last stage of blades in the low pressure section. They are called the L0 blades. The low pressure turbine at Bartow is a dual-flow unit, meaning the steam is admitted in the middle of the turbine and then flows axially in opposite directions through rows of blade. So thus, there are two rows of L0 blades, one at each end of the machine.

And if I could, Your Honor, I think it if I could stand up at this point --

THE COURT: Sure.

THE WITNESS: -- and use some of these exhibits over here, it might be helpful. I think I am going to move of this out of the way so everybody can see.

First, this is a overall plant. This is the combined cycle plant. This is the gas turbine right here. The gas turbine can run on its own. Gas is admitted in the middle. The combustion process of gas and air, compressed air spins a rotor, spins blades, spins a rotor, turns this

generator producing electricity.

In simple cycle mode, the exhaust gases from that combustion just flow up this stack to the atmosphere. The beauty of combined cycle operation is that we can take that energy that's in that heat and swing a damper and make the gases flow this way instead.

All this represents what's called the heat recovery steam generator. It's a boiler. There is water in tubes that heat, and these exhaust gases heat the water in the tubes, and then the water is turned into steam. That steam then is then reused in the turbine generator unit. It's admitted into the high pressure turbine, and then actually sent back to the heat recovery steam generator, reheated to get more energy into the steam. If you raise the temperature of the steam, it raises the energy level. It's then readmitted to the intermediate pressure turbine. But this is really one shaft with blades connected to it.

And then the exhaust from this intermediate pressure turbine goes to the low pressure turbine, and some steam from the heat recovery steam generator comes into the low pressure turbine into the middle, flows in both directions, and then is

exhausted into a condenser.

This, again, is rotating the shaft. This is one common shaft that's bolted together here and bolted together here, and then the generator produces electricity.

And like I said, at issue in this proceeding is the last stage of blades in this low pressure turbine. So it would be right here and right here, the longest stage of blades. The blades get successively longer as the steam flows through the machine because the steam is losing energy as it travels through the machine. It's transferring energy to the blades making them rotate. The blades have to be bigger and longer in order for the lower energy steam to have any effect. So the longest blades are the L0 blades.

This is an actual L0 blade from the Bartow combined cycle low pressure turbine. There is -- you can see it's curved. This is the blade itself. It's very heavy. It's about 60 pounds. A big piece of metal.

The issue that we've had is that the mid-span, there is something called snubbers. And at the tip, there is something called Z-locks or a shroud. These blades aren't connected to one another

during -- when the turbine is stationary. When the turbine starts spinning, and someone already said, it spins at great speed, 3600 revolutions per minute, so 60 cycles per second.

Think about that. It's spinning that rapidly, and this is just one of 64 blades on the low pressure turbine. So it's quite a large diameter machine at this stage of the turbine.

These blades, you wouldn't be able to see it, but they untwist a little bit, just a tiny bit, and it makes these mid-span snubbers and these Z-lock tips come together, which strengthens the whole machine.

You get a segment in the middle of the blade and a segment at the tip of the blade that helps strengthen the entire machine. If not for that, these blades would vibrate more and potentially crack from high cycle fatigue, and that would be very disastrous and catastrophic if a piece of the blade were to come loose.

What we've had happen four different times was a piece of either the snubber or a piece of this Z-lock tip, or pieces have come off, come apart. So when we talk about blade damage, it was limited to the Z-lock tips or the snubbers.

And I wanted to make that clear, because through proactive action, we were able to find that damage before the blade itself was damaged, which could have been much more catastrophic.

Thank you for allowing me to show that.

So since being placed into service, the steam turbine has experienced five separate L0 blade incidents. Importantly, each instance was discovered either, as I said, by proactive inspection or by installed monitoring equipment, and DEF was able to take appropriate action prior to any catastrophic damage to the turbine itself.

As we discuss the incidents and throughout these proceedings, you will hear reference to different periods of operation. Period 1 is the time from when the units were first commissioned in year 2009 until discovery of the first blade issue. Period 2 began when the damaged blades were replaced and the unit returned to service, and so on.

Each period was accompanied by blade modifications, with one notable exception I will discuss momentarily, as well as modified operating parameters provided by Mitsubishi.

Steam turbines are operated within the

guidelines provided by the manufacturer. Those guidelines are based on the manufacturer's calculations of permissible steam flows, pressures and temperatures. With one exception in Period 3, when new hardened blades were installed, each operating parameter modification lowered permissible pressures which resulted in a corresponding reduction in electrical output from the generator.

Notwithstanding DEF's adherence to these operating instructions, each period concluded with discovery of blade damage. Of particular importance to DEF's root cause analysis was the experience of Period 5. The lessons learned from that period have significant importance because the blades used during that time were of the same design as the original iteration, and L0 blade damage was discovered despite the unit being operated well below the originally provided operating parameters.

Therefore, DEF's operation of the unit was not the cause of the iterative blade damage. As mentioned earlier, after analyzing the available data from each of the operational periods, and taking note of the fact that blade damage continued

to be discovered even after the operating pressures were curtailed, DEF determined that the ultimate causation had to be the blades' lack of sufficient design margin.

With the discovery of the blade damage at the end of Period 5, DEF determined that the most prudent means of returning the steam turbine to service while a long-term solution to the blade issues could be determined, designed and implemented was to replace the last stage blades with what are called pressure plates, as Mr. Bernier said.

It's important to remember that while the unit was off-line and the pressure plates were being installed, the four combustion turbines continued to operate in simple cycle mode and provide service to our customers.

For reference, a pressure plate is just what it sounds like, it's a non-rotating plate, as Mr. Bernier mentioned. Instead of a blade reducing the pressure and the energy of the steam before it goes into the condenser, there is holes drilled in the pressure plate which reduce the pressure so that the steam then doesn't damage the condenser. So it takes that work out of the steam without the

benefit of making extra productive work, a product.

So the pressure plate does not use the steam passing through it to produce electricity and, therefore, there is a decrease in efficiency because the unit is not getting all the available energy of the steam passing through it.

However, the pressure plate allowed for the unit to return to service quickly and to operate event-free for the past two-and-a-half years.

Because DEF did not and could not know that the blades in question did not have the necessary design margin, and because DEF at all times operated the unit within the OEM's operating parameters, DEF's actions leading up to and in response to the February 2017 outage were prudent, and DEF should be permitted recovery of its prudently incurred replacement power costs.

I look forward to answering your questions. Thank you.

MR. BERNIER: Thank you, Judge. We will tender Mr. Swartz for cross-examination.

THE COURT: Is there an agreement as to order of cross? Public Counsel is first?

MR. REHWINKEL: Yes.

EXAMINATION

BY MR. REHWINKEL:

Q Good morning, Mr. Swartz.

A Good morning.

Q Can you tell me your full name, please?

A Jeffery Raymond Swartz.

Q Okay. And you are the Duke witness alone, who alone is here to provide whatever evidence you feel is most relevant to meet your burden to demonstrate that Duke acted prudently in operating the Bartow steam turbine; is that right?

A Yes, sir.

Q Would you also agree with me that JS-2 is the principal piece of evidence that Duke submits as your explanation of the cause of the failure of the various sets of blades at the unit?

A Yes.

Q And just for the record, JS-2 was the same as JS-1, it just has a different level of confidentiality, right?

A Correct.

Q The RCA -- can you agree with me that if I ask you about an RCA, it means a root cause analysis?

A Yes, that's correct.

Q Okay. And this RCA is the sum of the evidence that you contend proves that Duke acted prudently at all

times; is that right?

A Yes.

Q And, Mr. Swartz, isn't it also true that sometime after March of 2012, Duke began, at least informally, the process of determining a root cause of the problems that you identified after the March 2012 discovery of the blade damage?

A Yes, that's correct.

Q And am I correct in assuming that a root cause analysis is important to any utility as a way of understanding their operations for and understanding and apply lessons learned and improving processes for safety and efficiency purposes?

A Yes. Absolutely.

Q And that RCA process is part of the Duke culture?

A It is.

Q Would you agree with me, to be effective, the RCA process must be objective and honest and designed and executed to get to the truth, even if it's not a flattering view of how the company conducted operations?

A Yes.

Q Would you also agree with me that a true RCA should not be an advocacy document, that it --

A Could you ask that again, please?

Q Would you agree with me that a true RCA should not be an advocacy document that is biased in its scope or analysis?

A Correct. It should dig into the issues and understand the lessons learned so we can improve. That's the purpose.

Q Okay. The RCA should also not be designed to reach predetermined or confirmatory conclusions, should it?

A Correct.

Q Would you agree with me that the final RCA document that was ultimately prepared was at least in part done so with an eye toward making Duke's case to the Florida Public Service Commission that you believed you were not imprudent in the actions related to the blade failures and the need to buy replacement power?

MR. HERNANDEZ: Objection, compound.

THE WITNESS: The root cause --

THE COURT: Hang on.

THE WITNESS: Sorry.

THE COURT: Yeah, could you break it down? It was two questions there.

MR. REHWINKEL: Okay.

BY MR. REHWINKEL:

Q Would you agree that the RCA was produced, at

least in part, with an eye toward making your case to the Public Service Commission?

A I would not think about it that way. The root cause was truly to dig into what happened, what can we learn from that? How are we going to improve?

There are many -- not many, but there are times when we have root causes, or any causal analysis when there is a likelihood that there might be legal proceedings attached to it, and so we will make sure that we follow certain guidelines from an attorney-client privilege standpoint, which we did in this one because we thought that there could be, but it wasn't what you are suggesting. It was truly to get at the issues and learn.

Q Okay. So is it also true that the RCA is your final product of an inte -- well, let me ask you this: When I ask you about an RCA -- if I ask you about the RCA, or the Duke RCA, can you agree with me that we are talking about JS-2?

A Yes.

Q Okay. So is it true that the RCA is your final product of an iterative and continuous root cause analysis process that dates back to 2012?

A Yes, that's correct.

Q And can we also agree that if I ask you about

the September 22nd, 2017, Mitsubishi RCA, that I will specifically refer to that as Mitsubishi's RCA; you understand that?

A I understand.

Q Okay. And when I ask you -- or when I say Duke, can you agree with me that even though Duke's merger with Progress Energy occurred in July of 2012, that any relevant actions or inactions that transpired, or should have done so, under the control of Progress Energy Florida's management are the same as if those things happened or didn't under Duke's management control?

MR. HERNANDEZ: Objection, Judge, calls for a legal conclusion.

THE COURT: I will overrule. I mean, if you know.

THE WITNESS: Could you ask that again, please?

BY MR. REHWINKEL:

Q Let me ask it a different way.

Will you agree with me that Duke today, in this case, stands in the shoes of Progress Energy for all relevant actions that occurred related to this Bartow steam unit?

A Yes.

Q Can you tell me when you first had the responsibility of overseeing the Bartow plant?

A It was at the beginning of 2012, when I first actually assumed the position I am still currently in. So just about eight years ago. Prior to that, I wasn't directly involved with the operation of the Bartow site.

Q Okay. So when you said the beginning of 2012, you mean you were a Progress Energy employee?

A Yes, as a Progress Energy employee.

Q Okay. And tell me what your role was.

A In January of 2012, I became the vice -- we made some organizational changes at the beginning of 2012 while we were still Progress Energy in anticipation of the merger. So prior to that, I was in our nuclear generation group during the year 2011, but in anticipation of the merger closing, we did some reorganization, and I became the Vice-President of Generation for the Florida region --

Q Okay.

A -- the fossil generation and not nuclear.

Q Tell me when your first time was having a role or responsibility in the Bartow blade failure RCA process?

A When we first found the issues in the spring of 2012, and we needed to know what the causes were.

It's a significant issue. And so under my direction, we started what became a very long root cause because we kept learning more as each iteration of failure occurred.

Q Okay. Can we agree that when I make a reference to a period like 1, 2, 3, et cetera, that you understand them to be many as they are defined in the first two rows in Table A on page five of the Duke RCA?

A Yes.

Q Okay. So you were with Duke and had executive oversight over the plant during Period 1, is that right; during the very last few days of Period 1?

A That's correct.

Q Okay. And I think you just said so, but I want to make sure I understand. You were the person responsible for initiating the RCA process that we are talking about here today?

A That's correct.

Q Okay. And would that also mean that you were the person most responsible for assigning the employees to conduct the RCA process?

A I had an overview of that, and I could weigh in on the team makeup, yes.

Q Okay. Now, I think you said in -- before to me that for the RCA team that was -- for the RCA process

that was conducted after Period 5, you did assign the members of the team that responsibility with you, is that right?

A I didn't specifically assign the people. I could have modified the group. I had input into the team members. I don't remember specifically assigning the individuals.

Q Well, let me ask it this way: Isn't it true that the responsibility for assigning the members to the team --

A Yes, sir.

Q -- was yours?

A That's correct.

Q Okay. Was that true just after the March 2017 events, or all throughout this long RCA process?

A All throughout.

Q Okay. Now, I think in your testimony you mentioned a long-term solution team, is that right?

A Yes.

Q And it's fair to say the long-term solution team and the RCA team worked somewhat in concert through the process, at least since Period 5; is that right?

A That's correct.

Q And would you have had the responsibility of assigning the members to both the RCA and the long-term

solution team?

A Yes.

Q Okay. Throughout the RCA process, going back to 2012, would it be fair to say that you did review and provide edits to some of the drafts in the process?

A I know I reviewed some. I don't recall if I provided edits.

Q Okay. If I saw a draft that had the initials JRS on either a comment or an edit, you are the only JRS that would have been allowed to make edits to those documents; is that right?

A I don't know if I am the only one, but it's likely me, yes.

Q You didn't give me names of anybody in the root cause team that had the initials JRS, right?

A Not that I recall.

Q Okay. Would it be fair to say that even though the engineers that were primarily associated with the RCA worked for what you called Duke's central engineering, in this project, they had at least a dotted line responsibility to you in the RCA process in that you were the highest Florida Power generation executive in charge of the Bartow project?

A Yes, that's fair.

Q And you would agree with me that the draft

documents that were provided to the Public Counsel as a result of late filed Exhibits 4, 5 and 6 of your deposition constituted a part of the work product supporting the document that is JS-2?

A I am not sure I understand your question.

Q Okay. Let me break it down.

You are aware that you -- that as -- at your deposition in August 30th, the Public Counsel asked for -- in various ways, we asked for the draft documents that preceded the Duke RCA, is that right?

A Yes, sir.

Q Okay. Would you agree with me that those draft documents, and the documents that we received in Exhibits 4, 5 and 6 constitute, at least in part, the work product that supported the RCA that you finally produced?

A Yes.

MR. HERNANDEZ: Your Honor, could the witness see the documents?

THE COURT: It might be helpful.

Do you have a clear recollection of what he is referring to?

THE WITNESS: I don't. There were a lot of documents involved with the root cause, so I don't know that I have -- I know specifically.

THE COURT: It might be helpful to put those in front of him.

MR. REHWINKEL: Okay. I was asked to bring eight copies, and I have distributed all my eight copies, so I --

THE COURT: Let's see what I have up here.

MR. REHWINKEL: The documents I am referring to are exhibit -- what we identified as Exhibit 115.

MS. BROWNLESS: Charles, you can have --

COURT REPORTER: You can use mine.

MR. REHWINKEL: Okay. This will be the official copy.

BY MR. REHWINKEL:

Q If I may. So this is the summary of the synthesis.

A This one here is?

Q Yes, and then this is Exhibit 4, 5 and 6.

MR. BERNIER: And those are marked, okay, in our version?

MR. REHWINKEL: Yes.

And just for the record, Exhibit 115 is a culling of the root cause drafts that were taken from Exhibits 4, 5 and 6.

MR. BERNIER: Okay. Does he have 116 so we

can mark that for him?

MR. REHWINKEL: Oh, yeah. It would be in here.

MR. BERNIER: It would be right here.

MR. REHWINKEL: Yeah, this is 116.

MR. BERNIER: That way you don't have to mark it later.

THE COURT: Let me see -- okay.

MR. BERNIER: Which ones should he be looking at?

BY MR. REHWINKEL:

Q Oh, I am sorry. I thought you were reviewing. Your counsel asked if you could look at the documents.

A Okay. So I have reviewed it. I am familiar with what you --

Q Okay. So the question -- I think you answered it, but given that the objection came in, if I could just make sure.

Those documents that you reviewed in Exhibits 102, 103, 104 and 115, with the understanding that 115 is culled from 102 and 103, would you agree that they constitute a part of the work product supporting the Duke RCA?

A I would.

Q Okay. Would you also agree with me that the

documents in those four exhibits, 102, 103, 104 and 115, were retained as a matter of company practice?

A I think that is our practice, yes.

Q Okay. Would you agree with me that an engineer named Jake, Jacob or Jake English was designated to be the primary author of the Duke RCA?

A I would.

Q Okay. Would you also agree with me that he was the primary custodian or keeper of the documents that supported the RCA?

A Yes, I would.

Q Okay. Now Mr. English, you would consider him also to have been the lead author of the RCA?

A Yes.

Q But that didn't mean that he made all the analytical decisions, is that correct?

A That's correct.

Q He would be sort of like the engineer with the pen, is that fair?

A Well, Mr. English is more than that. He is --

Q I don't mean he is the scribe. But he was the one that was -- well, I will withdraw the question.

He was not the one making all the decisions. He was contributing to it, but somebody had to keep the record; is that right?

A He was one of multiple contributors, but he is the one that was the main author.

Q Okay. Other engineers, including yourself, were contributors to the RCA, is that fair?

A Yes.

Q Is it also true that non-engineers, including attorneys, reviewed drafts at some point throughout the process?

A Yes.

Q And RCA -- the Duke RCA was the only RCA, final RCA report that was produced throughout this whole process, is that correct?

A It was the only Duke Energy product.

Q That's what I mean. It was -- on your side of the fence, it was the only product that Duke finalized in this -- I think you referred to it before as a big, long root cause analysis, is that right?

A Yes, that's accurate.

Q Okay. Do you have a copy of your JS-2 with you?

A I do.

Q And we can do this. I am going to ask you questions from Exhibit 115, and just -- I should clarify something about 115, if you don't mind, Your Honor.

There is a table of contents. And the first

document actually is JS-2, and then I have put Documents 2 through 18 in here, and I have extracted -- I have included a screen shot at the back of this exhibit of the Duke file names that we were provided electronically, and I have extracted -- they say Bartow RCA white paper, pretty much, but there are some distinguishing features such as the date of the file or the author of it on this; do you see that?

A I do.

Q But you would agree with me that -- I mean, JS-2 is not a draft, it is the final document?

A Yes.

Q And if I could ask you to look back at Document 18. And this handwriting up at the top of each document is mine. It's not Duke's.

Would you agree with me that February 6th, 2018 draft, it has a watermark of draft on it, but this document is, in all respects, identical to the final document; is that right?

A I would really have to do a page-by-page turn to determine that.

Q Okay. But would you accept my representation it is the same document? It's the same date.

A It is the same date. I see that. So it's likely the same document, yes.

Q Okay. So maybe the easiest thing to do would be just to ask questions about the RCA in this document, because I am going to attempt to ask you questions going back and forth between the final and some of the drafts.

So if I could take you to Document 1 -- and one other thing, if you don't mind, as we work through this. In the bottom right-hand page of this Exhibit 115, we have a Bates number OPCCR -- RCAEXH dash, and then have the numbers. And those numbers correspond on the table of contents to the documents.

The Bates numbers in the upper right-hand corner are Bates numbers that we gave the late filed Exhibits 4, 5 and 6 because they came to us un-Bates, do you understand that?

A I think so. Yes.

Q All right. We don't need worry about those numbers up there. I am only going to be asking you about Bates numbers on the lower right-hand.

A I understand.

Q Okay. All right. So back on my questions.

On page two of JS-2, is it fair to say that the second full paragraph, starting with the word "based" is the ultimate conclusion of this RCA?

A Yes, it is.

Q And if we look on page 15 of the RCA, that

paragraph is just repeated under the word conclusion, is that right?

A Yes, it is.

Q Would you mind reading that aloud for the record?

A Based on its observations and study, Duke has been and remains of the opinion that the root cause of the failures in the steam turbine L0 40-inch blades is the blade design, lack of blade design margin. That is to say, under expected operating conditions at Bartow's 4-on-1 combined cycle unit, the MHPS blades are substantially more fragile than similar 40-inch blades both in Duke's combined cycle fleet and elsewhere in the industry.

Q Throughout, when we see MHPS, that's Mitsubishi, right?

A Correct.

Q Okay.

A Mitsubishi Hitachi Power Systems.

THE COURT: And OEM in this context also means Mitsubishi, right?

THE WITNESS: It does. Original equipment manufacturer.

THE COURT: Okay.

BY MR. REHWINKEL:

Q So in this RCA document, with this conclusion, Duke lays all the blame on Mitsubishi and assigns none of the blame to itself for the way the legacy Progress organization operated the plant in the first period; is that right?

A I think it's very clear we believe that the lack of blade design and the lack of margin in the blades is the root cause of all the failures of the blades.

Q Okay. Now, we discussed the period naming convention a few minutes ago. Under that Period 1 would generally be from June of 2009 to March of 2012, is that right?

A Yes, sir. That's correct.

Q Okay.

A And there is an easy reference for that on page five --

Q Right.

A -- Table A.

Q Would it be most accurate to say that the beginning of commercial operation of the Bartow plant and the steam turbine was approximately June 1st, 2009?

A I don't know if it was June 1st, but I know it was the months of June.

Q Okay. And is it further true that the end of

Period 1 was actually February 28th at 2:00 a.m. in 2012?

A Subject to check, yes. That sounds like when we would start an outage. Typically, we start when customer demand is low, and it was a planned scheduled outage we started at nighttime.

Q So isn't it Duke's position today that the company did nothing wrong in the way it operated the steam turbine during the first period?

A It is.

Q Is it also true that you have effectively asserted that even if you somehow operated the plant improperly with excess steam flow and high back-end loading on new L0 blades that you only did so because you were just not aware that you were doing anything wrong?

A We operated according to the parameters provided by the original equipment manufacturer, so I'm are not sure -- it seemed like there was two different -- a statement and a question there.

MR. BERNIER: I am sorry, Charles, are you referencing anywhere in his testimony?

MR. REHWINKEL: I am asking about what his root cause analysis shows and doesn't show, so...

BY MR. REHWINKEL:

Q So does the conclusion that you just read from your RCA mean that Duke's position is that Duke did not operate the steam turbine improperly in Period 1 by introducing excessive steam flow in the low pressure turbine and imposing high back-end loading on the L0 blades, and thus, Duke's operation of the steam turbine was not and could not have been a root cause of the blade failures in Periods 1 through 5?

A It does.

Q Is another way of putting that that the RCA conclusion means that it is Duke's position that even if Duke did run the unit improperly in Period 1 by introducing excessive steam flow into the low pressure turbine and imposing high back-end loading on L0 blades that it did not know that it was doing so, and thus, any harm caused was not its fault?

A It's our position that we ran it in accordance with the operating parameters that were provided.

Q Well, isn't it true that Duke put excessive steam into the low pressure turbine during Period 1?

A It is not true.

Q Isn't it true that excessive steam and high back-end loading on L0 blades caused damage to those blades?

MR. HERNANDEZ: Objection, Judge. I am

objecting on the basis of vague. I don't know what excessive means.

THE COURT: Maybe we should be more specific.

MR. REHWINKEL: Okay.

BY MR. REHWINKEL:

Q Well, in the root cause analysis process, didn't Duke engineers decide -- agree that excessive steam flow was introduced into the low pressure turbine?

A Could you point that out to me?

Q Okay. Do you have exhibit -- okay, let's go to -- let's just look at -- let's just look -- if you could turn to page 75, which is Exhibit 9.

A In Tab 9 in Exhibit 115?

Q I apologize. Yeah. Tab 9, yes.

A And I am sorry, could you say the page again?

Q 75.

A Okay, I am there.

Q And would you agree with me that the file name for this document is October 5, 2017, and it says PBC comments? That will be Paul Crimi, C-R-I-M-I?

A Yes.

Q And if you look halfway down the page, it says -- would you agree with me that it says: After months of study, Duke Engineering believes the following to be the most significant contributing factors towards

root cause of the history of Bartow Unit 4S L0 events, and the first put bullet is low pressure LP turbine excessive steam flow?

A Yes, I see that.

Q Okay. So the Duke Engineering folks that were drafting these documents accepted at this point in time that there was excessive steam flow introduced in the low pressure turbine, isn't that correct?

A I do not believe that to be the case, no. This is a working document that these are -- this is a list of bullet points of things that could have caused the root cause, things that needed to be investigated or analyzed more.

So low pressure turbine excessive steam flow is one of multiple items. Thermal distress at the LP turbine exhaust. Pressure pulses during hood or curtain spray operations. Shroud fretting fatigue found through zone analysis. Loss of dampening, blade fitment, those are all potential causes.

In fact, it looks to me like the team was zeroing in on the more likely causes that needed more analysis, but this is not a final document, so I would not agree with your statement.

Q Well, Duke Engineering wrote this statement, that's correct, isn't it?

A It is.

Q And Duke Engineering used the term "excessive steam flow", right?

A They did use that term.

Q Okay. So they had an idea that there was too much steam being introduced into the low pressure turbine, right?

A I think they had an idea that that could have been -- that is a potential cause.

Q Okay.

A That -- to be really clear, Mitsubishi's conclusion at that point in time was that there was excessive steam flow to the low pressure turbine. That fact that Mitsubishi believed that couldn't be ignored, and so that was investigated and analyzed very significantly throughout the course of the long root cause. Ultimately, it's not the root cause.

Q Just turn over a couple of pages to page 77 within this same document. Well, let me withdraw that question and let me take you -- well, let me ask you this: Mitsubishi said that you were putting too much steam in the low pressure turbine in Period 1, right?

A Correct.

Q Okay. Is high back-end loading, is that the same as excessive steam flow?

A They are related, I would say. If you can picture the steam pipe going into the center of the low pressure turbine on the diagram, if there is too much steam flow going in the middle of the machine, and then it goes axially in both directions, that could lead to high loading throughout the machine, including the back end, which would be the L0 blades.

Q Okay. And when you talk about high back-end loading here, just to be clear, you are talking about the loading on the blades, not loading on the condenser; is that right --

A Correct.

Q -- the way it's being discussed here?

A That's correct.

Q Can you show me in the RCA where you affirmatively determine that the introduction of excessive steam flow into the low pressure turbine and resulted in the position of high back-end loading on L0 blades in Period 1 did not occur?

A I don't know that I can show you that in the root cause. I think the root cause document -- well, what I know is the root cause document examines likely causes, potential factors operationally and from a design standpoint, and essentially rules each one of them out, concluding that the blades were not designed

with an adequate margin for the application at the Bartow.

The root cause document, if we wrote in there everything that was not found, it would be an extremely long document, so I don't think I can point to what you just stated.

Q Well, you said that Mitsubishi said you put too much steam into the low pressure turbine, right, excessive steam?

A Yes, let me make sure, from a technical standpoint it's the pounds per hour per surface area on the blade that Mitsubishi was concerned about on the L0 blades. The units -- the engineering units are pounds per hour per square foot. And if you put -- you can calculate that number. It's not a measured number. But it's related to steam flow, but it has to do with the impact on the blade for steam flow on a certain surface area of the blade.

That was Mitsubishi's concern when we first had the issue. In fact, for quite some time, it was their concern, because the calculated pounds per hour per square foot of steam flow impinging on the L0 blades was higher than what their experience was. It wasn't higher than any limit. It wasn't exceeding any pressure limit. It wasn't exceeding any temperature limit. It

wasn't exceeding any flow limit. It was higher than their experience, and that made them concerned. And so they concluded that there was too much steam flow that caused that higher loading on the back-end blade.

Q Well, specifically Mitsubishi said that running the unit above 420 caused excessive steam to impact the L0 blades, and that caused damage, isn't that correct? That's exactly what they said.

A Not really. The -- there is something we really need to talk about here.

So the 420 megawatts is the product of the generator. And as we have discussed, the electrical generator is coupled to the steam turbine. When you talk about a steam turbine, you talk about parameters like pressures, flows, temperatures.

The steam turbine is what is then spinning the rotor. The rotor is connected to the generator. The generator produces megawatts, or more precisely kilovolt-amperes, which then, in order to talk about the entire unit, it's very common in the industry. We produce megawatts. We produce kilovolt-amperes. So it's common throughout industry to talk in terms of the product that you are making to get a relative feel of the size of the unit.

So many times, people talk about sizes of

combined cycle plants by the amount that the generator can produce. The amount that the generator can produce is dependent on many factors that are separate, actually. There is many factors that are part of the steam turbine output, but there is other factors that are in play as far as what a generator could produce.

So there is really -- in technical terms, Mitsubishi wasn't saying you exceeded 420, that was it. It was always all about the pounds per hour per square foot of steam flow impinging that last stage blade.

Q Do you have a copy of Exhibit 116 in front of you?

A I know I do somewhere. Yes, I do.

Q Okay. And this is -- are you familiar with this document?

A Yes.

Q Okay. And it's dated March 18, 2015, and it says, Duke Energy Bartow Report of Telemetry Test for 40-inch L0, right?

A Correct.

Q And if we turn to slide No. 4. This is what Mitsubishi says in the last bullet point: Mitsubishi estimated the cause of cracking was overloading of LP section based on 450-megawatt operation, which is over the design point of 420 megawatts, correct?

A Yes, that's what it says.

Q And that's what Mitsubishi said pretty much consistently throughout with respect to Period 1, right?

A They did. They were technical discussions, and I can point to other documents where they really talked about the steam flow, in particular the steam flow per surface area impacting the last stage blade. The use of the 420 here is just really a proxy for that steam flow.

Q Okay. But this phenomenon that I just read in that bullet point is what you mentioned that Mitsubishi said was going on, that that's why the Duke engineers put it in their RCA drafts before the final result was -- the final document was produced; is that correct?

A I am sorry, I am not sure what you are asking.

Q All right. Let me ask it this way: Because Mitsubishi said what I just read in that bullet on page four of Exhibit 116, that's the reason why that item is in the document that we looked at?

A Right. I see what you are saying.

So more correctly, I would say because Mitsubishi was talking about the steam flow that I have been stating was an issue, that's why we looked at it in the root cause.

Q Okay. So it wasn't just something off the

street that you had to deal with that would have made the document long. This was a significant central contention of Mitsubishi, correct?

A Correct.

Q This being the excessive steam flow and loading on the blades.

A At this point in time. Remember, this is without Period 3, 4 and 5 information available.

Q All right. But a document that was drafted in October 2017 would have been after Period 5, right?

A Yes.

Q Okay. So I guess what I am asking is you didn't affirmatively study the issue of high back-end loading on the L0 blades and reach a conclusion on that. Instead, you found that you couldn't study it, so you removed it from the final RCA, is that fair?

A I don't know if that -- I don't know all the details of every single thing that the root cause team studied or didn't study, so I don't know the answer to that question.

Q Well, let's look, if you will, on page one of the RCA.

Would you read for me the last full paragraph, because I want to ask your understanding of what that means?

A Starting with, Duke also studied?

Q I am sorry, starting with the second to the last paragraph.

A Duke Engineering?

Q Yes.

A Duke Engineering concluded that there was no correlation between any one of the above-listed factors in the five failure periods. Notably, Duke was only able to study each factor independently based on available data. In the absence of one, blade telemetry, two, duplication of the factors in various combinations, and three, operation in varying but normal conditions, it is not possible to study how each factor relates to and interacts with any other factor, if at all.

Q So doesn't that say that with respect to the early contentions that were even included in Duke Engineering's drafts about excessive steam flow and high back-end loading on the L0 blades, that you were unable to study it, and thus, you could not make a correlation and include it as an RCA conclusion; is that right?

A I don't believe that's what that is saying at all, actually. I think what this is saying is the root cause analysis is looking at things that happened in hindsight. If you had the ability to vary some variables and keep some others constant and do

repetitive testing, you would be able to test out whether conclusions were valid or invalid.

Obviously, we couldn't do that. We are looking at data. We are looking at combinations of variables at specific points in time without the ability to change those. And that's what this paragraph is saying.

Q Well, let's go back to Document 9. It was written down in this document, and would you agree with me -- and we can go through many of these documents and see that this language, after months of study Duke Engineering believes --

A I am sorry, which page are you on?

Q I apologize. I am back on page 75.

A 75. Okay, thank you.

Q This -- after months of student, Duke Engineering believes the following to be the most significant contributing factors towards root cause of the history of Bartow Unit 4S L0 event. That language is replete throughout these drafts, would you agree with that?

A I would have to look at all the drafts.

Q Okay. So let's turn to page 123, which is Document 13, and we see halfway down the page there, same -- with the same bullet point, low pressure LP

turbine excessive steam flow?

A I do.

Q And then we could go to -- and that was dated October 12th, 2017, and you accept my representation that that's what the file name said?

A I do.

Q Okay. And then we see on 137, which is -- this is a document that appears to be dated the same day, but it has a different set of initials, BWM, is that Ben Meissner?

A Likely it is Ben Meissner, yes.

Q He is your Charlotte-based steam turbine expert, right?

A He is one of our subject-matter experts, right.

Q Now, this document purports to be his edits to the RCA draft, right, if the file name is correct?

A That's what it appears to be, yes.

Q And this has the same -- I mean, there are some edits here, but there is no edits to this -- this thing we are talking about, this comparable sentence, right?

A That's correct.

Q And then we go to Document 15, it's just dated 10/13/17. It doesn't identify who, but there is no --

the words are the same here, right?

A They are.

Q Okay. And then if we go to Document 16, this is dated 10/17/2017, we see the same verbiage, right?

A I am sorry, which page?

Q I apologize, page 165. This is Document 16.

A I seem to be missing that page from my copy. That tab 16 starts, unfortunately, with page 167.

MR. BERNIER: I will show him mine, Charles.

THE COURT: I'll check mine. To cut to the chase, this is 165.

THE WITNESS: Yes, it says the same thing.

MR. REHWINKEL: Okay. Thank you.

THE WITNESS: Thank you, Your Honor.

BY MR. REHWINKEL:

Q All right. And then we have a differently styled, but on Tab 17 at 179, we see the same language; is that right?

A Yes.

Q Now, if you turn over to Tab 18, this is the RCA draft that we agree that, in all likelihood, is identical to the final, right?

A Yes.

Q That sentence, that phrase falls out. It's not in the corresponding portion of the RCA; is that

right?

A That's correct.

Q Okay. So between October 2017, assuming this file date is correct, and February 6, 2018, we have no draft documents, but that falls out -- that meaning the statement that Duke Engineering believes the following to be the most significant contributing factors toward blade failure, et cetera, that concept is not in the filing document; is that right?

A It is. I think you are making an assumption that each of these documents you are referring to are drafts of the final root cause, and I don't believe that to be the case. Now, I don't know -- again, I don't know all the details of what the root cause team was doing during the long period of time they were working, but if you examine what you are showing here in all of these Tabs 9 through 17 and compare it to 18, there are many differences between all those working documents and the final root cause analysis, and you just happen to be pointing to one of many, many differences between working copies and the final root cause document.

Q Okay. Well, let's look at page 188, which is in Document 17, and this -- it says Appendix A, Bartow L0 Event Summary, right?

A It does.

Q Now, in the root cause, it's called Table A, on page five, right?

A It looks to be very similar to, if not identical, to Table A, yes.

Q Right. They are not identical.

A Okay.

Q This table -- Appendix A and Table A appear to be -- have common genealogy in this process, right?

A Yes.

Q All right. So I don't understand now your assertion that documents 2 through 17 are not drafts of the final RCA?

A I -- what I am saying is I don't know if they are or not, but to me, it does not appear that they are. There are so many differences between 2 through 17. And then when you compare it to how the root cause on Tab 18 reads, there are many, many differences.

I would classify all these documents as working papers that summarize what the root cause team is doing; what they are finding; what they are analyzing, but it's not a draft of the root cause, in my opinion.

Q Well, let's go back to Document 3, and it's dated -- it's on page 23.

A Okay.

Q It's dated June 26th, 2017, do you see that?

A I do.

Q Now, if you turn to page 25, we see a comment by JRS1, is that you?

A It is me.

Q Okay. So it would be fair to assume that you reviewed this document?

A Yes, sir. That's correct.

Q I mean, you wouldn't just review this one little paragraph here. You would have read the whole thing, right?

A That's right.

Q Okay. So this indicates -- and if we go to page 27, we see an early version of Appendix A, right?

A I see that.

Q Okay. Now, is it your testimony here today in court that this is not part of the process that developed the RCA?

A No, it absolutely is part of the process.

Q Okay. So let's go over to Document 6 now. I have included Document 6 in here because there on page 49 to 58, there were some stray documents that were in the file that was submitted, and I want to ask you if you are familiar with or recognize the document on page 49?

A I am familiar with the information. I don't know -- I can't say whether I saw this document before or not.

Q Is it fair to say that this document is sort of a template for how to put together the root cause analysis that you are going to be producing through this technical paper process?

A I really -- again, I don't know the details of how the root cause team decided they would gather information and make a final report. I can read it and tell you what I think if you can give me a minute, but I really don't know.

Q Well, if we look at -- let's just look, if we can, the top line says Bartow 4S root cause analysis and evaluation of contributing factors, right?

A Yes, it does.

Q That's kind of what you would do if you were going to get a root cause analysis process under way, right?

A It is. It's also something -- notes of the team, things that they need to analyze and investigate, absolutely.

Q Okay. And it says a little bit down there, brief history, copy/paste and add to what Ben wrote in his summary to Jeff Swartz/Tony Salvarezza, 3/29, right?

A Yes.

Q So this is -- this -- Ben, again, is probably Ben Meissner?

A Yes, I agree.

Q All right. And he wrote you a memo, I guess on March 29, we don't have it, but obviously there was something that probably explained what had happened from the steam turbine expert's point of view?

MR. HERNANDEZ: Objection, Your Honor, calls for speculation.

THE COURT: To the extent you know, Mr. Swartz, I mean, you can explain.

THE WITNESS: Yes, Your Honor.

I don't remember specifically what Ben Meissner wrote, but it appears he wrote some -- an email, a note, something pertaining to the steam turbine, yes. It's not surprising. He is one of our technical experts.

BY MR. REHWINKEL:

Q Right. So I don't know, and I can't represent to you that the next page, which is 51, which is a one-page document, that's dated 8/24/2017, is related or not to this document. Would you know? This document being page 49.

A If 51 is related to 49, is that what you are

asking?

Q Yeah, I don't know if it is. I'm telling you I put together stray documents that were in the same area of the file.

A It appears to me that page 51 is actually some notes from a meeting, a working meeting. And I do agree with you that on 49, it looks like they are starting to put together things that would go into how you might want to format a root cause so that it would be clear and understandable.

Q Okay. So going back to page 49, it says: LP turbine back-end loading greater than 15,000 -- I forget how to say that.

A Pounds per hour per square foot.

Q Okay. And does this talk about how this has had an effect or not on the unit across the different periods of operation, right?

A That's what it says, yes.

Q So it would be reasonable to assume these documents that were maintained by the company, that there was an instruction to evaluate this as a part of the root cause process, right?

A Well, it looks to me like they were starting to build what would be in a final report out. And at that section, it appears that they were planning on

having some statement on that subject.

Q Okay.

MR. BERNIER: Charles, I am sorry, could I ask you what the first word before draft is up at the top?

MR. REHWINKEL: It says "miscellaneous".

MR. BERNIER: Oh, thanks.

MR. REHWINKEL: I am sorry.

MR. BERNIER: That's okay.

MR. REHWINKEL: I think I had brackets around it.

THE COURT: Would this be a good time to take five?

MR. REHWINKEL: Yes.

THE COURT: We have been at it for a while and give Mr. Swartz and everybody else a stretch.

(Brief recess.)

THE COURT: I think we can resume, Mr. Rehwinkel.

MR. REHWINKEL: Thank you.

MR. BREW: Excuse me, Your Honor, before we start, just to save time, I circulated copies of the two exhibits that we may eventually get to. All the parties should have it.

THE COURT: Okay. Very good. I have it.

MR. BREW: And there is copies on the desk for the witness when he gets to it.

COMMISSIONER GRAHAM: Thank you.

MS. BROWNLESS: Excuse me, Mr. Brew. I don't see any exhibits. Oh, got it. Thank you, sir.

THE COURT: All these red folders, they all look alike.

MS. BROWNLESS: Yeah.

BY MR. REHWINKEL:

Q So, Mr. Swartz, are you saying that Duke did study the impact of high back-end loading on the L0 blades, or did you say because of what happened with the blade failures in Periods 3, 4 and 5, you didn't study it, you just took it out of the RCA?

A Well, I don't think I am saying either of those things. The loading is a calculated value. It's really based on Mitsubishi's experience with their fleet, and it's a parameter that Mitsubishi just uses to help look at what is the forces -- what are the forces on a turbine blade.

You know, as far as studying that, again, with hindsight, you can only look at what happened. You can't run experiments to try to determine if you run a certain amount of steam flow, you will get a certain response. In fact, you may not want to run that. So,

you know, I don't think it's either of the choices you gave me.

Q Well, did you study whether the introduction of excessive steam flow into the low pressure turbine and the resulting imposition of high back-end loading on the L0 blades was not a significant contributing factor to the root cause of the L0 blade failures?

A I believe that was considered as -- I mean, it's obvious in all these documents that the root cause team considered that as a potential cause. The steam flow -- what's the exact wording? Let me read it exactly here. Excessive steam flow.

The turbine parameters, the operating parameters are pressures and temperatures. And pressures really are what dictate the flow.

What we are saying is that we did operate in accordance with the design pressures of the unit. Mitsubishi is saying that they are not disputing that, actually. What Mitsubishi is saying is that operating at those pressures ends up having a higher pounds per hour per foot square of loading on the back end on the L0 blade than what they are used to, and that that's unknown to them. It's uncertain.

In fact, there is certain documents. In fact, if you look at RAP-6, and even in Mr. Pollock's exhibit

attached to his testimony, it talks about how Mitsubishi is just uncertain of what will happen in that zone.

So it's not known. I think that actually lends credence to the fact that the lack of blade design margin is the root cause. It's uncertain. The margin is not built in, and when you look at what happened over each successive period of time, even with lower operating pressures -- and again, the pressures are what dictates the flow through the turbine. Higher pressure, you are going to get more flow through the turbine.

As we went from Period 1 through Period 5, it wasn't successively lower, because Period 3 we actually raised the pressure at first in order to do some testing. But then during that testing, we realized we had something called an avoidance zone and we had -- which we had to avoid during operation, but we put specific pressure limits in place to make sure that we didn't have vibration on the last stage blades.

And that's really the issue. Whether it's steam flow, whether it's hardening on blade -- on the snubber or the tip, the shroud; whether it's blade fitment. It may be too loose. That means that there is not enough -- there is too much tolerance, perhaps, between the snubbers and the Z-locks. All those things lead to vibration or flutter in the blades, which then

could cause a failure. And that's what we are trying to avoid. In fact, we did avoid that.

Again, I can't emphasize this enough. We found proactively four times that there were issues with the snubbers and with the Z-locks, and we were able to take the unit out of service, continue operating for our customers with the combustion turbine generators, but we took the unit out of service before that damage migrated into the blade itself, which that would have been a catastrophic failure that could have taken months or years, and many, many millions of dollars to fix. But we were able to avoid that because we found these issues proactively.

So, again, the steam flow is just one of a number of things that can cause vibration in a blade. And ultimately, the root cause is that there is not enough design margin in the blades to prevent that vibration from happening. Even Mitsubishi agrees with that in their later root cause, that the root cause in every period is too much vibration.

Now -- so that's -- that's what I think this is saying.

Q Mitsubishi doesn't agree that they designed a blade that caused a vibration in every period, do they?

A I am sorry, could you ask that again?

Q Mitsubishi doesn't agree that they had an inadequately designed blade that caused the vibration, do they?

A They are in agreement that high -- that flutter, vibration, was the cause of blade failures in each of the five periods.

Now, I think it's a debate whether or not the blade should have put up with the atmosphere at Bartow, the operating conditions at Bartow, pressures and temperatures, and able to vibrate without having damage or, you know, obviously they vibrated and had damage. I don't think Mitsubishi would ever admit to a design weakness.

Q Okay. I just wanted to make it clear, they didn't admit that they have an inadequate design, right?

A Correct.

Q Just along that line, the blades in Period 5, they are called Type 1 blades, right?

A Correct.

Q Were they identical to the blades in Period 1?

A There was one slight difference. They were -- so let's talk about type for a minute. The type of the blade is the, by far the most important thing. And could I -- could I stand up, Your Honor, again?

THE COURT: Sure.

THE WITNESS: So again, we have some other folks in here, too, but the type of the blade is the curvature of the blade, and it's really talking about this blade itself, which is the structure you are trying to protect. You don't want that to come apart. You don't want it to crack. All of our issues were either with this snubber at the mid-span, or with this shroud at the tip.

But Type 1 blades have a certain geometry of the blade and a certain manufacturer. Type 3 blades are different. I don't know the specific -- I am not a turbine engineer, but the curvature is different. The thickness might be different. It's a different style of blade.

When we went back to Type 1 blades at the end in Period 5, it's the exact same blade. It's the same snubber, and it's the same Z-lock with one small change. There was a change in the geometry, just a softening of the edges, so to speak, to prevent some potential stress riser spots on the Z-lock and on the snubber. And that was the only difference.

Both Mitsubishi and Duke Energy concluded that based on all of the different data that they saw from other periods, that those small geometry

changes would be helpful to prevent future failures of either the shroud, the Z-locks or the snubbers.

BY MR. REHWINKEL:

Q The snubber was in exactly the same spot on the Period 5 blade as in Period 1?

A Yes, it was.

Q Do you know whether the manufacturing was exactly the same from the Period 1 blades that were made sometime before 2008 and the Period 5 blades that were made in 2012?

A Well, when you say the manufacturing, what do you -- how do you define that?

Q Well, how they are made, who they were made by, and the materials in them, were they exactly the same?

A I know the materials are exactly the same. I know that they are Mitsubishi blades, so we are really relying on Mitsubishi. They are a certain definition. They are Type 1 blades, so for what I know, yes, they are the same blades.

Q But you don't have any personal knowledge that they were -- that the manufacturing process was exactly the same, do you?

A Not any personal knowledge, no.

Q Okay. And did you have any evidence that they

were exactly the same? Did you go back and compare the manufacturing process in Period 1 blades and Period 5 blades?

A Not to my knowledge.

Q Okay. When -- at any point during this L0 blade event process, did Duke ever change any of the components in the low pressure turbine other than the L0 blades?

A Not to my knowledge, no. It wouldn't be surprising -- I mean, when you say any. There's many components inside a steam turbine, and every time you open it up, there is probably some sort of sealing surface that has to be changed. So I don't want to be wrong on a technicality, but -- actually, Mr. Bernier has a picture that might be really valuable if I could show it.

Q Sure. Just to be clear, I am not asking you about whether there was any ordinary maintenance that you did that affected any other component. My question was, and I think you understood it this way, did you make any other changes inside the L -- inside the low pressure turbine as a result of what you found in any of those damage events?

MR. HERNANDEZ: May I approach, Your Honor?

THE COURT: Yes.

BY MR. REHWINKEL:

Q Do you understand that?

A I do. And to answer, we did not make any others changes, and I think I can explain.

So this is the actual low pressure turbine at Bartow. Again, the steam goes in the middle and travels axially in both directions. You can see the blades get bigger as the steam travels through the turbine because the steam is losing energy and it needs more surface area to spin the turbine.

What you can't see in this picture is that there is fixed blades, called diaphragms, that fit in between each of these rows. So when you encase the turbine, those diaphragms are fitting in between. So as the steam travels through these nozzles, or blades, to spin the turbine, the diaphragms then redirect the steam so that they impinge on just the right angle to get the most work out of these blades as they travel through.

So they work in the second stage. Then they are redirected through diaphragms here, and then again redirected through the third stage. They are redirected into fixed blades here and redirected into the L0 stage.

And I think it's pretty important to understand that each iteration we had, we were able to inspect this whole turbine, and there were no other

issues with the turbine. There were no other issues with the diaphragms. It was only with the L0 blades. And it wasn't with the blade itself, it was with the snubbers and the tips. And we took the blades out of service before there was damage to the blade, which would be much more significant and could cause damage to the whole turbine if an L0 blade failed.

It's such a massive weight going at such a high speed, that if a blade itself failed, it would be catastrophic, and that's what we were trying to prevent, and we did prevent through this process.

I think that's good for now.

Q So beyond inspection, you didn't do any study that determined that the upstream blades, or the nozzles or any other components in the low pressure turbine were unaffected by the pressures that were imposed in Period 1?

A Oh, I would say we have a great deal of information from these iterative inspections we did. You know, it's unfortunate that we had do so many inspections. The regular maintenance interval on a turbine would be maybe 100,000 operating hours, or 80,000 operating hours. It would be measured in years before you actually open up the casing of a turbine and look at it.

Because we proactively worked to prevent a blade failure, we had opportunity to look at the whole low pressure turbine multiple times over five years. Every time you open up a turbine, turbine engineers were all looking at it, taking measurements, doing nondestructive examination, making sure we don't have any other issues.

It was a concern. If we had issues in the last stage of blade, maybe there is issues in other stages, and so we did extensive examination, but we did not find any issues with any other stages or rows of blades.

Q And you didn't put that in the RCA, because you didn't feel that needed to be in there, that you determined that the rest of the turbine was fine?

A I am not sure why we didn't decide to put that piece of information in, but it's very clear we had so many opportunity for that inspection, and I know we did not have any other issues.

Q So looking at page six of the RCA, do you see a discussion under the heading "Operational Factors Potentially Impacting MHPS Blades", and then it has a subheading, "Low Pressure (LP) turbine Excessive Steam Flow - Running In The Avoidance Zone", right?

A Yes.

Q And these three paragraphs here are basically how you disposed of the issue of excessive steam flow, is that fair?

A It is.

Q Okay. And there is a reference here to the -- it says in the middle of that first paragraph: Based on hindsight, MHPS Engineering claimed at the time of the first failure (Period 1) Bartow Unit 4S exceeded the back-end loading limitation of 15,000 foot pounds per hour squared, is that the way to say it?

A The way I say it. There is actually a couple different ways, but pounds per hour per square foot.

Q Okay -- by many hours, and that the MHPS 40-inch L0 fleet average for back-end loading was closer to 12,000, whatever that is?

A Right.

Q Okay. And you don't disagree with those factual recitations about those numbers, either the L0 fleet average or the exceeding 15,000 foot pounds per hour squared?

A Yeah. What that represents is Mitsubishi's concern. So Mitsubishi's concern was that we were up in the 15,000 range with these blades, but the Mitsubishi fleet experience with 40-inch L0 blades was closer to 12,000 pounds per hour per foot squared. And that's

what led Mitsubishi to conclude that, oh, it must be that back-end loading. So that's the concern that's stated.

I am not sure if I answered your question.

Q Well, do you disagree that you were operating above 15,000 foot pounds per hour squared in Period 1?

A I don't disagree with that calculation.

Q In fact, when you were at 450, you were more at, like, 17,000, right?

A I think that he is a good approximation, yes.

Q And you don't disagree that the -- you don't have any basis to disagree with the Mitsubishi fleet experience, right?

A That's correct.

Q Okay. So there is a statement in the middle of the next paragraph about how many hours in Period 1 you were in exceedance of the avoidance zone you talked about, right --

A Yes.

Q -- 2,466?

You agree with Mr. Pollock's testimony that for Period 1, you operated the turbine at, was it 2,972 or 73 hours above 420 megawatts?

A I do.

What's really important to understand about

these hours and avoidance zone in Period 1 is they are back-calculated. This thing called the avoidance zone didn't exist until after the telemetry testing was done at the start of Period 3. And with the value gained from that telemetry testing, which then derived this avoidance zone, we said, well, why don't we look back at the other operating periods and see where are we operating in that avoidance zone during the other periods.

So it wasn't as if we were violating some kind of limit during Period 1. We back-calculated that we were in the avoidance zone for that many hours during Period 1.

Q Well, Mitsubishi never said that operating in the avoidance zone in Period 1 was a problem. They said operating above 420 in Period 1 was a problem, didn't they?

A No. See, again, technically, this is -- 420 is really a proxy for the 15,000 pounds per hour per foot squared, or maybe even 17,000 pounds per hour per foot squared, which is the calculated steam flow for the surface area on the L0 blade.

That was Mitsubishi's concern. It was not an operating limit. It was beyond their experience. It was an area of uncertainty and that they did not know

about, and so they said that's what they believed. There was too much steam flow in the last stage.

Q Mitsubishi didn't say that you operated in the avoidance zone in Period 1, and that was the problem. That wasn't -- that was your -- that was a construct that you put on your evaluation in Period 1, right?

A I am sorry, could you --

Q Okay. Mitsubishi established the avoidance zone from, was it Period 3 forward?

A Correct.

Q Okay.

A They established the avoidance zone for Period 3 with the blade vibration monitoring system that was installed with those new blades in Period 3.

Q So the avoidance zone was established for a prospective purpose, right, by Mitsubishi?

A Correct.

Q Okay.

A It was -- well, let me make sure we understand.

So it was installed to make sure that we didn't have any more issues, so we created -- Mitsubishi did testing, and we were able to gather data that showed if you run in a combination of inlet pressures and exhaust pressures in certain areas, the blades vibrate

too much, and so you need to avoid operating in those operating conditions.

And then we received guidance from Mitsubishi. They said, don't operate in those avoidance zones. If you have to ramp up or down through those zones of operation, don't spend time in those zones. Get right out of them. That was the guidance issued to make sure we didn't have an issue from Period 3 on. We still had issues even though we avoided the avoidance zone in Periods 3, 4 and 5.

Q Well, my question to you is that imposition of the avoidance zone was about going-forward operations, correct?

A Oh, yes.

Q Yes.

A But I think the avoidance zone and the steam flow can't be separated. The avoidance zone is related to the steam flow, this pounds per hour per foot squared, and that's what is being talked about here in the root cause.

Q By the same token, operating above 420 and steam flow can't be separated either, can they?

A They can be correlated. There are many different factors that determine what the generator can produce as opposed to the pressures and the flows and in

the steam turbine. So there is a correlation there, no doubt, but you can't just use a megawatt output of the generator to talk about conditions in a steam turbine.

Q There is a high correlation between the amount of steam flow that gets you to 420 and above, right?

A There is. I think to try to really simplify, Mitsubishi is saying that the steam flow, the 420 and above would produce steam flow that would be beyond their operating experience in a zone that they were not certain of.

Q Okay. In the RCA, would it be fair to say that your analysis did not look at whether steam flows for the approximately 3,000 hours you operated the steam turbine above 420 megawatts caused material lasting damage to the non-blade portion of the steam turbine, did you?

A Are you looking at a specific part of the --

Q No. I am asking you if there is anything in your RCA where you studied the number of hours that you operated above 420 to determine whether it damaged the low pressure turbine.

MR. HERNANDEZ: Judge, I am going to object on vague because I am not sure I understand what the question is.

MR. REHWINKEL: Your Honor, I am trying to

understand what the RCA did and didn't do. And my question is: Did the RCA study the amount of hours above 420 to determine whether that had impacted the low pressure turbine? That's my question.

A I think even better than just looking at hours -- and I don't know if that was a detail that the root cause team looked at or not. I suspect it was a detail that they looked at, but again, the root cause team had knowledge of -- in fact, firsthand knowledge for many of the team members of inspections that were done at every iteration at the end of Period 1, at the end of Period 2, at the end of Period 3, at the end of Period 4 and at the end of Period 5 to look at each stage of blades in the low pressure turbine; to look at each of the diaphragms in the low pressure turbine.

We had nondestructive examination conducted during those times to conclusively say that there was no damage in the low pressure turbine other than the snubbers and the shroud tips on the L0 blades.

Q Do you have a copy of Exhibit 105 in front of you? It's revised DEF response to OPC POD 31?

A I do not have 105.

Q It should be in that package there.

A I have 102, 103, 104, 115 and 116.

Q Oh, look to your left there, the red folders.

I am sorry.

A Oh, I am sorry. I covered it with my pictures. Okay, I have 105.

Q Now, would you agree with me that 105 is a response to an OPC POD No. 31?

A Yes.

Q Okay. And it's Bates numbered in the lower right-hand corner, so I am just going to refer to the last four numbers there.

Could I ask you to -- well, first of all, look at Bates 6868. And given your tenure at Progress, you are familiar with this kind of document, are you not?

A I am, yes.

Q Okay. This is what you do -- you meaning the executives and operational folks -- do to go to the Board to get approval to initiate a project?

A Well, it may or may not be the Board, but it is part of the project approval process. And based on the dollar value, the total project cost, there are different levels of approval.

Q I said board, I meant senior executive team --

A Yes.

Q -- is that right?

A Yes.

Q So we see here on 6868 all the executives,

like Jeff Lyash and Bill Johnson, et cetera, you see their names and initials for approval, right?

A Yes, I do.

Q Okay. And if we go to 68 -- this is called a business analysis package, right?

A Part of this is, yes.

Q Part of it, yes.

A Yes.

Q And the business analysis package says, here's what we need to do for the benefit of the company and its customers, and here's what it's going to do for them, and here's what it's going to cost to do it in very rough terms, is that fair?

A Yes, that's fair.

Q Okay. And the senior executives look at that information and they give you a thumbs up or a thumbs down, right?

A Yes.

Q Thumbs up is all these signatures and initials here, right?

A That's accurate.

Q Okay. So when we look on 6875, which is just a few pages in, we see that there was, I guess, an analysis done for business as usual, and that was basically the recommended case to build Bartow; is that

right? If you look on the prior page.

A So we are looking at 6875?

Q 74 and 75, I should say.

A Oh, 74 and 75. And so, yes, looking at the alternatives considered, I know -- I am familiar with these documents, and there were multiple alternatives considered.

Q Okay. And on 6875, in the, it looks like the second full paragraph starting with the secondary market; do you see that?

A Yes.

Q Okay. This is part of what was the chosen solution, is that right?

A Yes, it is.

Q Okay. Can you read that paragraph for me aloud?

A Sure.

A secondary market 400-megawatt steam turbine was found. The use of this turbine was investigated and proved to be a very good fit for the 4 CT and 4 HRSG combinations. In fact, it provided more operating flexibility (see operational analysis detail below). In addition, the uncertainty in project schedule and cost was reduced.

Q Okay. So this is -- this document is what the

senior executives would have reviewed to give the approvals that we see back on 6868?

A It's a piece of that document, yes.

Q Okay. All right. So there was an expectation that at the time this was approved by executives, that you were getting a steam turbine that was 400 megawatts in output, right?

A I would be very careful to characterize the actual capacity of any of the pieces of equipment based on this document. This is not a technical engineering document. It is a, like you said, a business analysis package. It gives the relative size of part of the equipment that's going to go into an approximate 1,200 megawatt 4-on-1 combined cycle.

Q Okay. Turn back to page 6911. This is page 3 of 27 of an IPP, which is integrated project plan.

A Yes, that's correct.

Q Okay. And we see over here -- in 2008, what would have been happening with the Bartow project where an IPP would be reviewed and approved?

A As far as what would be happening, could you give me more specific --

Q Well, you saw the BAP was approved in 2006, so that meant you could go ahead and execute on whatever contracts you had to do and spend the money, right?

A Right.

Q And that was kind of your authorization to conclude the contracting, I guess, for the Tenaska plant steam turbine?

A Yes.

Q Okay. So in 2008, if this IPP is dated -- these approvals look like on page 6907 they are in March of 2008. What's going on here?

A Well, I am paging back towards the beginning of the document. I am not familiar with -- and this is a long time ago before I was directly involved, of course.

Q Okay. 6861 -- 6881 is the beginning of that IPP and business analysis package, is that right?

A Yes. Could you -- I am sorry, could you state your question again?

Q So if we look on page 6885, we see -- I think they are looking for an additional $18 million of funding?

A On 6885?

Q Yes?

THE COURT: On the recommendation --

BY MR. REHWINKEL:

Q On the recommendation there.

A I see that, yes. I see it. So that is likely

the purpose for this document --

Q Okay. We --

A -- you know, I don't know specifically, but what I do know is that the project was commissioned in June of '09, as we have previously discussed. It was well underway from a construction standpoint when this -- the date of this document. So it looks like they were looking for some additional funding.

Q Okay. And on 6911, which is where I wanted to ask you a question, we see Paul Crimi's name and his signature and a date, right?

A Yes.

Q Does that mean he was -- would have been involved in sort of the planning and implementation of the Bartow repowering project?

MR. HERNANDEZ: Objection, Your Honor. I think the witness is testifying he is not certain about this document altogether. He is not certain what's occurring here, and so there is a lack of a predicate for this question.

MR. REHWINKEL: My question is to ask him about Mr. Crimi, and I have a question later on that will tie this later on, Your Honor.

THE COURT: Again, I will overrule to the extent he can only answer what he knows. If he

doesn't know, I think he is capable of saying that.

THE WITNESS: Well, so if you look at the signature blocks required here, it's -- this is a big decision for the company. It's a lot of money being talked about, a lot of funding, and there is a lot of executives listed here from multiple departments. It's not just the department involved with the construction. It's not just the department that would be involved with the operation of the unit.

Mr. Crimi, at the time, was an executive with a support services branch of the company, and so he was one of the required signatures of many executives. Since it was a large financial decision, there had to be buy-in from an alignment across the executive suite.

BY MR. REHWINKEL:

Q He was Executive Director of Power Generation Services, is what it appears to say here?

A Yes.

Q Okay. So based on your knowledge of the company at the time, would that have meant he would have had some operational responsibilities with respect to the steam turbine and the Bartow repowering?

A Actually, no, it would not have. He was -- as

power generation services, that's technical expertise. It's engineering. It's not the operation of the unit. The operation would be some of the other signatures on this page.

Q Well, obviously, it wasn't commissioned at this time. I am talking about as far as implementing the project, when I said operational.

A Well, and again, as far as implementing the project, this looks like every executive in every department in the company was part of the decision to implement the project since it was such a big investment.

Q So in 2006, you executed a contract to buy the steam turbine from Mitsubishi, right?

A Subject to check, yeah. I don't remember if it was 2006.

Q But in 2006, Duke contracted with Mitsubishi, as your documentation says, to perform heat balances, correct?

A Yes.

Q And could you tell the judge what a heat balance is and what its intended output is?

A Sure. Any big new project like a new power plant, you have to try to -- well, the engineering analysis includes looking at many, many variables, in

fact, a few dozen variables that can come into play to predict what the output of a unit will be.

There is different operating pieces of equipment that might be operating or not operating. There is different atmostpheric conditions. The temperature of the weather makes a difference. The temperature of the air makes a difference. The temperature of the cooling water makes a difference. The temperature of the cooling substance which might be hydrogen in the case of a generator. All these things are analyzed many different ways.

So, for example, on the Bartow combined cycle project, there were over 300 heat balance cases that were developed. And it seems excessive, there is over 300, but think about Bartow for a minute. It's a 4-on-1 combined cycle, so you might run a heat case that is with all four combustion turbines running and the steam turbine, so 4-on-1 operation, but without what are called duct burners running. And you might do that at 32 degrees. You might do it at 72 degrees. You might do it at 95 degrees ambient conditions.

And then each one of those ambient air conditions, you might do it at a different cooling water temperature, because all those variables make an impact on what the engineering prediction is going to be on the

gross output of the power block.

So for Bartow, you would do it on 4-on-1, 3-on-1, 2-on-1, 1-on-1 configuration. You would do it with duct burners, without duct burners in service, which is a very significant part of the operation that I haven't talked about yet.

In the heat recovery steam generator, I mentioned how the exhaust steam -- or the exhaust gases, rather, from the combustion turbines, rather than go out in the atmosphere, which they would in simple cycle operation, they are captured and they heat water, but there is also capability built into these heat recovery steam generators that they are called duct burners. The natural gas-fired burners will light fire literally in the duct to put more heat in addition to the exhaust gases coming from the combustion turbine so that you can generate -- turn more water into steam. Generate more steam from the HRSGs. So whether duct burners are on or off is a very significant variable.

In addition, at the Bartow site, there is something called power augmentation in the combustion turbines. And this gets pretty technical, but you can actually extract part of the steam as it's going through the steam turbine before it reaches the condenser and then pipe it into the combustion turbines to augment the

air and combustion gases that are turning the combustion turbines motor.

So you are putting some high pressure steam into the combustion turbines to make it generate more megawatts. You are stealing a little bit of steam from the steam turbine to do that, so whenever you use power augmentation in the combustion turbines, you turn on your duct burners to get more steam from the HRSGs to put back in the steam turbine.

THE COURT: Steam turbine, I got you.

THE WITNESS: So depending on what pieces of equipment are operating at Bartow, there is a great variation in how many megawatts the site is going to have as output. And so, like I said, over 300 different heat balance cases were generated as part of the project as engineering predictions on what the result would be.

BY MR. REHWINKEL:

Q So what is the primary output of a heat balance? Isn't there, like, a bottom line that comes out?

A There is a lot of output. I don't know that I can say there is a primary output.

Q Okay. Well, let's -- do you have a copy of Exhibit 108 in your red folder there?

A Yes, I have 108.

Q Now, this happens to be Mitsubishi's response to your RFP for the long-term solution, right, this document?

A Yes.

Q Okay. But if we -- if I could get you to turn, and I apologize I didn't Bates these, these Bates numbers at 2437, they are real tiny. If you go to 2435, you can see there is an electrical -- or there is a diagram, and then after that, I want to ask you something about the heat balances that are behind that.

MR. HERNANDEZ: So you want 437?

MR. REHWINKEL: Yeah, 437.

MR. BERNIER: It is small.

MR. REHWINKEL: Yeah.

BY MR. REHWINKEL:

Q Once you get into that area, you will see that there is an easier-to-read page 2 of 129, there is 100 --

A I think I am there.

Q You found it?

A Yeah.

Q Okay. And I apologize, I don't know why page 1 of 129 is not here. Our -- the document is Bates numbered consecutively, but I want to ask you if 2437 is

the output of the heat balances, one of the pages of the output of the heat balances that you just told the judge about?

A It is, and it's also on 2438, the columns follow down. There is so many variables involved.

Q Oh, yes.

A It's the same -- like, for instance, if you look across the top of 2437, this looks like it's Case 1 through Case 15 of the heat balance, and there is still more of Case 1 through Case 15 on 2438.

Q Well, go to 43, I think you will see at the bottom of that.

A And there is more on the page after that as well.

Q Yeah. Go to 2443?

A 2443.

Q Yeah. Is that where this -- these -- the cases are numbered across the top 1 through 15?

A Yes.

Q Okay. So these pages from 37 to 43, these are -- these all relate to the same --

A They do, yes.

Q -- long columns, right?

A Right.

Q Okay. And then we see on 44 there, there is a

whole new set of heat balances?

A Right, 16 through.

Q Okay. But let's go back to 37. And would it be fair to say that these are operating permutations, is that a fair way to say these are kind of postulated ways you could operate the unit, 1-on-1, 3-on-1, 2-on-1?

A I would say they are predictions --

Q Okay.

A -- based on varying different operating parameters.

Q Okay.

A And having different pieces of equipment in service or out of service.

Q Right, okay.

So when we look on -- in the bottom -- at the top a little bit, say, the top third of the page, we see on the left-hand side, run date, in the heading titles, right?

A Yes.

Q And if we follow that all the way across, it says 7 September, 2006?

A Yes, I see that.

Q Okay. So are these the ones that were done by Mitsubishi or by Bibb?

A I don't know, looking at them. I know -- let

me look up at the title. These appear to be the ones done by Bibb.

Q Okay. Now, Bibb is an engineer, or an engineering firm that you hired to run heat balances in conjunction with Mitsubishi, so you knew what you were going to be getting out of this unit before you finalized the purchase, right?

A Well, Bibb was a little bit more than that. That's a piece of their scope. But Bibb was the engineer on the project, so we -- we, Progress Energy at the time, had a contract with a consortium that was Bibb and TIC constructors that together acted as the engineer procuring construct contractors for the entire project.

Both of them later merged and were bought by Kiewit. If you know what Kiewit is, Kiewit was in the business of doing EPC projects for companies.

So Bibb acted as the owner's engineer, but that's -- so what you just stated is a piece of the service they supplied.

Q Okay. But it is true that Bibb was your guy -- I don't know if it's a person or people -- that's your guy that represents you and makes sure that the heat balances are run correctly and that Mitsubishi agrees with the heat balances, is that fair?

A I -- it's -- part of it I know is fair. I

don't about the Mitsubishi agrees piece. I don't know the ins and outs of how that's done in a large construction project.

Q Well -- okay.

So Mitsubishi -- didn't Bibb work with Mitsubishi to run these heat balances?

A I am sure there had to have been collaboration.

Q Okay. So let's look at -- above that run date, we see somewhere up in the mix, more than halfway up, it says STG output, do you see that?

A Yes, I do.

Q All right. And then in bold all the way across the page, we see variations of megawatt outputs under these heat balances, right?

A Correct.

Q All right. So these are -- it's bolded. This is a primary result that you are looking for out of the heat balances. It tells you what the bottom line is you are going to get out of this, you expect to get out of this unit under these predictions or permutations, right?

A It is one of many things that we are getting out of this, yes.

Q But like you told the executives when you said

400, that's kind of the bottom line when you get a steam turbine, is what are you going to be able to generate in terms of electricity to serve customers, right?

A Could you ask that again, I am sorry?

Q Yeah. When you are buying a steam turbine, the bottom line is what kind of megawatts can you get out of it, right?

A That's one of the -- well, the efficiency is one the Keys. In fact, I would say efficiency is even more key in a big project like this, because ultimately the long-term cost to the customer comes down to how efficient are you converting fuel energy into a product.

Q Right. So would you agree with me that heat balances were run and certain cases were selected and used for the contract that you determined -- that you executed with Mitsubishi?

A Yes.

Q There were two heat balances that were part of the contract guarantee that Mitsubishi said they were warranting the unit to put out?

A That's correct. I have seen other documents where two of these heat balance cases were chosen and were included in the contract language relative to liquidated damages.

Q Okay. And one of the outputs -- one of the

heat balances was 389, and that was a certain configuration, correct?

A I believe that's correct, yes.

Q And the other was 420, right?

A That's correct.

Now, a really important point here, you are picking one. Let's look again at how many pages of data is in each one of these heat cases. It's multiple pages, right? I won't count them, but at least five or six pages.

One of these -- for example, one of these variables is power factor. And I can't read it, I am having a hard time reading it. I wish I could point to the row. If I could get a magnifying glass, I could read it to you. But I have read through these before. I have looked at all 300 plus of these P cases.

The power factor assumptions are really key, because when you think about a generator, an electrical generator, the power factor of the electrical system has great bearing on what the generator is able to do.

So in each of these cases, there is an assumed value-of-power factor. And so for the assumed value-of-power factor in case number 48, which you are referencing, which ended up 420 megawatts of the steam turbine, it was at a power factor of .949. We don't run

at a power factor of .949. We run at a power factor close to one, which we call unity.

And this might be a good time, Mr. Bernier has a drawing, I could explain power factor, and I think this is quite important.

MR. HERNANDEZ: May I approach?

THE COURT: Yes.

THE WITNESS: And again, this is just an example of --

MS. BROWNLESS: Mr. Swartz, I am sorry, when you hold the paper up, I can't see.

THE WITNESS: I am sorry, I will stand up.

MS. BROWNLESS: Thank you.

THE WITNESS: There is so many variables, as you see in all these pages, that go along with these heat balance cases. All of them have an impact on the capacity of what the unit is going to run. So I am picking one that's called power factor because I think it's pretty important.

Power factor is a measure of the efficiency of how load current -- we produce load current from our generator, megavolt-amperes, all right. How efficiently can we make that -- I am not there yet. This is a donkey pulling on a barge. I will get there in a second. A efficiently we convert that

load current into voltage, into real power, rather, is really important to us. It's really important to all of our customers. We want to do that as efficiently as we can.

So we have -- there is a measurement called power factor that measures that efficiency. We want to be as close to one as you possibly can be. A 1.0 power factor means you are being as efficient as you can converting load current into real work.

In the real world, there are loads. There is motors; motors at FIPUG; motors at PCS Phosphate that are creating a drag on the system. They are creating the system to do extra work.

But also in the real world, we have equipment that -- and that makes the power factor drop less than one -- to go down into maybe -- when I say less than one, I am talking decimal places. It might go down to .9 or to .95. But we have things on our electrical system that keep it up close to one called capacitor banks that are in service all the time, because we want to make that conversion as efficient as possible for the benefit of our customers.

So to make it real simple, power factor is just like in this picture. A power factor of one,

for this horse to pull this barge through the canal as efficiently as possible, the horse would have to walk on water, right, and be directly in front of the barge. If you are directly in front of the barge pulling it, the horse is going to have to do less work and it won't heat up as much to pull the barge.

The greater the angle becomes this direction, more of the work of the horse is pulling this way and less of it is pulling straight down the barge. And so the greater this angle is, as the horse is pulling the barge down the canal, the more overheated the horse might come because it's harder. It's harder work. The power factor is lower in that case.

So the generator is -- the analogy is to the electrical generator. The generators are rated by power factor as part of the rating, and there is curves -- and there is curves in a lot of this information that we saw that you can see based on power factor how much a generator is capable of putting out.

And these heat balances, the power factor was assumed to be various numbers; ..9 was used in many of the examples of heat cases; .949 was used in the

one you are referring to. Our system runs between .97 and .995 all the time. Our generator at Bartow can do more than 420 megawatts because it's closer to walking straight ahead of the barge. The 420 is at a power factor .949, which is not where we run.

So the 420 megawatts doesn't apply to the steam turbine. It's part of the generator, and our generator is capable of doing more than that because our power factor runs closer to unity.

I hope it made sense. It's an odd -- it's a difficult-to-understand electrical concept.

BY MR. REHWINKEL:

Q So none of the P balances that are shown in this exhibit, we call it 108, showed a expected output above 420, maybe 420.2, but nothing up to 421 or above, right?

A I didn't see -- they don't, but I also didn't see any power factors above .949.

Q Okay. You would agree that the contract contained expected megawatt output of 420 megawatts, correct?

A At an assumed set of conditions, including power factor, that is correct.

Q So at the time you talked to senior executives and contracted with Mitsubishi, both Mitsubishi and Duke

expected the steam turbine to put out 420 megawatts at normal operations, right?

A The expectation would be that the predicted heat case would be achieved.

So, again, let's be really clear. What Mitsubishi and the project team used, they used heat case number 48, which used a power factor of .949. It predicted a megawatt output of 420. They used that as the minimum thing that Mitsubishi had to achieve in order to get full payment on the project. Anything below 420, there would have been liquidated damages that Mitsubishi had to pay to Progress Energy.

So the 420 was actually a contractual minimum that had to be achieved. And again, it was at a lower power factor than we actually run at. So everybody would have known that the steam turbine generator can produce more than 420 megawatts.

Q Do you have Exhibit 116 with you still?

A Let me get organized here.

Q I would ask you to turn to page 21 when you get there.

A I do have 116. Page 21?

Q Yes, sir.

A All right, I am there.

Q Now, this is a Mitsubishi document. And do

you disagree that the Bartow steam turbine was designed to operate at 420 megawatts, as the OEM says?

A I agree that there is a case with certain variables, and you can see there is pages of variables that go in. And if the variables are at those particular numbers, then 420 is the predicted output. And that was used as a contractual minimum that Mitsubishi had to achieve.

Q Well, in the second bullet, it says a heat balance diagram providing max operation, parenthesis, 420 megawatt, thermal conditions was provided as part of the thermal kit. Do you disagree with that?

A That's what it says. And my interpretation of that is the maximum the generator can put out at those conditions at a power factor of .949 is 420 megawatts.

Q Okay. And then the next bullet there was -- it says: During the performance test in 2009, using the 420-megawatt thermal conditions, the unit was able to reach approximately 402 megawatts; is that right?

A That's correct.

Q And the performance test here was when you were installing the unit. Sometime before you commissioned it, you did a test to see whether it met the contractual terms as far as that guarantee, right?

A That's correct.

Q And is this factual?

A Yes.

Q All right. So let's go to Exhibit 109, which is the contract. And I want to go to actually attachment Appendix A.

A Appendix A?

Q Yes, sir. It starts at Bates 12419.?

MS. BROWNLESS: Excuse me, Charles. Just so I understand, this is the page that says Contract No. 270810, Amendment 005?

MR. REHWINKEL: Yes.

MR. BERNIER: Mr. Swartz, I think it's after the first divider sheet.

THE WITNESS: I found it. I am sorry. I just found it.

BY MR. REHWINKEL:

Q All right. So you agree with me, this is part of the contract for the steam turbine, right?

A I do.

Q Okay. And if I get you to go to Bates 12437. This is 3.3 Basis for Guaranteed Performance, as a header, when you get there.

A Okay, I am there.

Q Okay. Is this how the electrical output of the turbine was calculated? Is this the formula?

A It is.

Q Okay. And if we go over to 12439, just for the -- to follow up on your testimony about the power factor. We see those -- this is what you were talking about -- power factor is .9 and .949?

A It is. On that -- the table in 4.2, you can see those in the third row down in each column.

Q Okay. And they also have condenser back pressure assumptions that correlate to those outputs, is that right?

A Yes.

Q So -- and we see that -- is it true that the Case 28 was a 4-x-1 configuration, and Case 48 was a 3-x-1 configuration?

A Case 28, to my memory, was a 4-x-1 without duct burners. And Case 48, to my memory, was a 3-on-1 with full duct burning.

Q Okay. Does this document here, or the heat balances, or any other documentation that you can point to demonstrate that Mitsubishi or Bibb told you that you could get more than 420 megawatts of output from the steam turbine?

A Well, I believe you can look at some of this documentation and reach that conclusion, yes.

Q Because of the power factor?

A Yes.

Q Okay. But did anybody tell you that it would be perfectly normal to operate the unit above 420 megawatts per -- as much as you wanted?

A That's not a typical conversation. So the Bartow combined cycle, just like any other project, you talk about what the capacity is you are going to get out of the site. And in this case, I think some of the documents referred to a number maybe 1,278 or 1,279 megawatts, something like that. But there are many, many variables that come into play as far as the output of your machine. In the wintertime, when it's colder, when the cooling water temperature is lower, we can run with better condenser vacuums much more efficient.

So to give you an example, our Duke Energy Florida fleet, in the summertime we can produce about 10,000 megawatts of power. In the wintertime, we can produce about 11,000 megawatts of power. And the difference is the colder weather, the colder cooling water that helps the machines be more efficient in the wintertime.

So you have to make sure you are understanding. Every time you are talking about a rating of a piece of equipment, you have to understand

all the other conditions that are part of that predicted rating. And it would be a really bad thing to say you have to adhere to this one case out of more than 300 and never exceed that because you would be leaving potential capacity on the table that could be used for the benefit of our customer.

So let's expand Bartow, the Bartow is a steam turbine. You know, Bartow is a 1270-megawatt site. The steam turbine is, you know, 400, 450 megawatts, somewhere in that range. But it's different in the summer than it is in the winter.

But if we were to apply, say, summer ratings, and then in the wintertime, when we need 11,000 megawatts to serve our customers, we would have to buy expensive fuel, or we would have to put on less efficient generating units to great expense for our customers.

So you have to understand all the variables associated with a rating. Our job as operators is to make sure we stay within the operating parameters that are given by our equipment manufacturers and get the most out of our machines that we can without exceeding those parameters. And that's what every operator does. That's what every utility should be doing, and that's certainly what we did with Bartow.

And there is one more thing I would like to say. So to answer your question directly, if you go to page 12596 in this same document. It's way back there. It looks like this.

MS. BROWNLESS: What's the number again, sir?

THE WITNESS: In the lower right-hand corner, it's 012596.

So, Your Honor, are you there?

THE COURT: I am there.

THE WITNESS: This is the capability curve of the generator for this project. And this is the page that shows that you can get more than 420 megawatts if the power factor is greater than .9.

And I know this is hard to read, but this line right here going up at a positive angle is a .9 power factor line. And you can see it intersects the generator capability curve. If you come down, you see that's right at 420 megawatts.

We run closer to unity, closer to one. And if you go all the way across, that's almost 470 megawatts. And if you look up at the very top of this piece of paper, you can see there is a rating up at the very top. It says 468000 kVA, that's kilovolt-amperes. That's the reactive power

that this generator is capable of putting out. Power factor is the kilowatts divided by the kilovolt-amperes.

So you can see the kilowatts is only 420.2 -- 421.2. It's 421,200 kilowatts. So it's 421.2 megawatts. But with a power factor closer to one, you can get closer to 468 megawatts out of this steam turbine. That's what that information is telling you. So in the same document, they are saying you can get greater than 420 megawatts.

BY MR. REHWINKEL:

Q So 468, is that approximately the rating of the generator?

A Correct.

Q Okay. So --

A The -- well, kVA, to be more precise. And it depends on the power factor, and whether or not you can get that much megawatts, the real power out.

Q So is it Duke's position that as long as you stay within the IP, HP and condenser limits, that if you could get to 468 on a regular basis, that you would be -- it would be perfectly okay to operate -- have operated that unit in 2001 -- Period 1? I am sorry.

A Right. You have to look at other parameters as well. Again, it's hazardous to look at just any one

parameter, but this gives you an idea of what the capability of the generator is.

So we have a piece of equipment attached to the steam turbine that's capable at the power factors we run of doing in excess of 460 megawatts. So as long as we can stay within the operating parameters of the steam turbine, and those are pressures and temperatures, why don't we try to get as much output from the generator as we can.

Q Do you have Mr. Pollock's exhibit RAP-5 with you?

A I do. Okay, I am there.

Q You got that, okay.

And this is a document you prepared at our request, the Public Counsel's request, right?

A Yes.

Q Okay. So there is no question about the validity of this data, and accuracy of it, right?

A I will say I know that there is -- this is -- it uses averaging. And it depends on how often you sample a data point, and that can cause discrepancies in the data. It's a good representation, I will say that.

Q Okay. And this document here is what Mr. David referred to in his opening. It has the operating hours above 420 as distributed on this chart, is that

right --

A Yes, it does.

Q -- with that approximation caveat?

A It does.

Q So I just wanted to ask you about this, because as you were talking about being able to increase the output based on certain efficiencies, including ambient temperature, weather, right? And what I mean now, I am talking about the air temperature and the water temperature, right?

A Sure.

Q Let's look at period of 2010. Would you agree with me that -- and would you also agree with me that the months of June through September are your hottest months?

A I would.

Q Okay. And we look at here, we see a fairly large distribution of the operating time above 420 in the hottest months, right?

A Yes.

Q Okay. So it wouldn't necessarily be a reasonable conclusion to suggest that you operated this high above 420 -- or this much above 420 because the weather was colder, right?

A Well, you have to understand what else is

going on at the plant at the time. So our ability to pump that cold or warmer water through the system is really important. You are not going to get the efficiency unless you are able to pump it.

And what I know is when we first commissioned this plant, and during the first several months of operation -- and I don't know how long it went into 2010, but we had some great difficulty with what's called the circulating water system, which circulates the cooling water through the equipment, including the condenser underneath the steam turbine.

My conclusion from this data would be that once we straightened that out and were able to fully pump water through the condenser, we started really taking advantage of what we could from an installed equipment standpoint. Also understanding that in any new operation, there is a period of learning for the operating staff as well. But I know we had these equipment issues with the circulating water system for the first several months of operation.

Q But in 2010, there is not -- in fact, it looks like you have more hours above 420 --

A I think --

Q -- in the hot months than in the cooler months, right?

A Right, because I think in the cooler months, we were still having trouble with the circulating water system. I don't know that, but --

Q Okay. And before 2012, you did not do an engineering analysis that showed that it was possible to operate the unit above 420, did you?

A Well, I think we had all kinds of information that showed that it was possible to operate above 420. In fact, if we could, let's refer back to the contract for a minute.

I will have to find the exact page, but again, the 420 megawatts that you keep referencing was a contractual minimum that Mitsubishi had to meet in order to get full payment on the project. So just that fact alone tells everybody that above 420 is okay. 420 is the minimum that had to be achieved. And that's in this contract. I will just have to -- if you give me a moment, I will find the page.

Okay, so if you turn in the -- let me see what the exhibit number is. It's the contract. It's the very large document, Exhibit No. 109. And if you turn to the Bates numbers 012434 in the bottom right hand. Well, it's even better if you page to 12432, which is two pages before that, 12432.

And you can see in paragraph 3.2.1 that the

420.07 is a liquidated damage performance guarantee, which means that's the minimum that the project had to achieve in order to get full payment on the project.

Q But it says in 3.2.12: MPS Net Steam turbine Maximum Electrical Output 420.07, right?

A Yes, that's referring, in my opinion, to that generator capability curve that I just showed you. It's at a lower power factor than we operate. So again, you have to make sure any time you talk about a rating, you have to make sure you understand all the variables that go into that rating. In this assistance, it used a power factor that we can far out achieve.

Q Okay. So in 2012, after you had the first discovery of blade damage, isn't it true that you went to Mitsubishi and asked them for their help in telling you how you could operate above 420?

A I would phrase it a little differently than that.

So we opened up the steam turbine for a routine inspection in the spring of 2012. We found five of the mid-span snubbers that had damage. We were concerned with that. So we consulted with Mitsubishi. They recommended we don't continue running with those snubbers broken. That could lead to blade failure, which would be catastrophic, as I have described

earlier.

At that time, Mitsubishi, as we've seen and you pointed out, they were concerned we were running higher than their fleet experience from a pounds per hour per square foot standpoint in the last stage blade, so they gave us, for the first time, a lower operating limit.

And in this case, if we could turn to my -- to JS-2 in the root cause, I can show you what the operating limit is. It's page 5 of 18, Table A in JS-2, or JS-1.

Are you there, Your Honor?

THE COURT: I am just about there. Yeah, I am there now.

THE WITNESS: Okay. So in that table, you can see it has columns for each of the five periods. And the one, two, three, four, the fifth row down says MHPS IP exhaust pressure operating limits.

So it's at the start of Period 2, because of that damage we found, following Mitsubishi's recommendation, we replaced all of the blades on just one end of the machine because all five snubbers were damaged on the same end of the machine, I believe on the turbine end. It says in this chart. I am not looking at it.

And if you look at the picture over here, you can see that the machine has two ends. The generator is coupled to the right-hand side, and the HP IP turbine is coupled to the left-hand side. So on the turbine end of the machine, we replaced all 64 L0 blades.

Before we started operating again in April of 2012, Mitsubishi, in order to make sure that we didn't exceed their operating experience with 40-inch L0 blades, they put this 118-pound limit on the intermediate pressure turbine exhaust. And in this case, that served as a proxy.

Why that intermediate pressure exhaust rather than the low pressure turbine inlet. There was no pressure instrument on the low pressure inlet, but there was one on the intermediate pressure exhaust, so that was used as a proxy.

And if I could stand up just a minute just to make sure everyone understands. Mitsubishi was concerned, as I described, with the steam flow, but there was no pressure instrument on the pressure going into the low pressure turbine, but there was one coming out of the intermediate pressure. So there is just a slight amount of pressure drop across this pipe.

So we used this pressure as a proxy for the low pressure turbine inlet. It was more conservative than what had been in the past, so the combination --

And I am sorry, but I forgot what your question was, but, yeah, we put a more conservative operating limit in place based on pressure, which is consistent with operating parameters that we followed from the start of Period 1 throughout each of the periods.

BY MR. REHWINKEL:

Q So I asked you if, after the failure, you went to Mitsubishi and asked for them to help you --

A Right.

Q -- increase the output in the unit.

A So it's just not so simple as that. It's a very collaborative back-and-forth process, but because we then had to -- we followed this lower, more conservative guidance on the IP exhaust pressure, we were not satisfied that we were getting as much out of the equipment as we could, so that's when we did ask Mitsubishi.

So we don't want to have this limit. We weren't supposed to have this limit. We want to get as much out of the generator as we can. Is there something

that can be done?

They studied it and came back with us -- to us and said, yes, we can redesign the L0 blades and put a different design of blade in both L0 rows, and you will be able to achieve, we estimate, 450 megawatts.

Q Well, are you familiar with the quote that they gave you for an engineering study for additional optimization and reliability for $232,025?

A Could I see that?

Q Yeah. It's on -- it's in Exhibit 102 at Bates 145. It's the late filed exhibit for 145.

A I have 102. Could you say the Bates number again, please?

Q Yeah. It's kind of two-thirds of the way or more back, it's at 145, and it's a real tiny print up in the upper right above the slide.

A I am almost there. Okay, I see that.

Q Do you know what this was for?

A I don't recall what this was for.

Q Okay. If you roll back a few pages to 135.

A Okay, I am there.

Q And this is a part of, I guess, a slide presentation at a joint meeting between Mitsubishi and Duke?

A I am looking back at the beginning to see if I

can get an idea.

Q On 122, it talks about August 21st, 2012, discussion.

A Okay. It does appear to be a meeting where we discussed the turbine.

Q Okay. Just back on 135, a discussion -- further discussion to support their own investigation and possible means of increasing unit output.

And then it looks like they have a response. It says: We will continue technical support for you. As of now, it is difficult for us to propose a concrete method to increase the unit output. An engineering study is suggested.

And so my question is, is that what 145 is, is them saying here's what it will cost you for us to do an engineering study?

A It does appear to be that, yes.

Q Okay. And did you engage them to do that study?

A I don't recall if we engaged them to do this study, or if that was included in the ultimate -- we did contract with them to supply new blades that could -- that were theoretically going to be able to raise the output to about 450 megawatts.

Q Okay. So that would have been the most likely

output product of this study if you did, in fact, say, yes, go ahead and do that?

A That -- I would say that would be a likely output, yes.

Q Okay. Now, did that study say that Mitsubishi agreed that you could run the unit above 420 without different blades?

A Well, I am not familiar with the study, but -- so if I could have a few minutes to read it, but I think it's really important to remember that at this point in time, Mitsubishi thought that the root cause was too much steam flow in the low pressure turbine, and that they -- there was a way to get from steam flow and correlate it, as you have already said, to megawatts.

So that's been disproven in later cases, later periods of time. So I am not sure what your question is.

THE COURT: I am going to jump in while we are on a pause here.

One thing we didn't have in our order of procedure was a lunch break. I am just wondering what the will of the, you know, the room is as far as taking a break and how long you think we need.

MR. BREW: Yes, I think we should have one.

MS. BROWNLESS: Yes.

THE COURT: We agree on that. How long? Should we try to get back inside of an hour, or is it going to take an hour?

MR. REHWINKEL: I think an hour is reasonable.

THE COURT: Okay. We will -- we'll say, then, we will reconvene at 120:20, and if everybody, by some miracle, is back sooner, we will start sooner.

MR. REHWINKEL: Okay. Sounds good.

THE COURT: We will stand in recess then.

(Lunch recess.)

(Transcript continues in sequence in Volume 2.)

CERTIFICATE OF REPORTER

STATE OF FLORIDA)
COUNTY OF LEON)

I, DEBRA KRICK, Court Reporter, do hereby certify that the foregoing proceeding was heard at the time and place herein stated.

IT IS FURTHER CERTIFIED that I stenographically reported the said proceedings; that the same has been transcribed under my direct supervision; and that this transcript constitutes a true transcription of my notes of said proceedings.

I FURTHER CERTIFY that I am not a relative, employee, attorney or counsel of any of the parties, nor am I a relative or employee of any of the parties' attorney or counsel connected with the action, nor am I financially interested in the action.

DATED this 18th day of February, 2020.

DEBRA R. KRICK
NOTARY PUBLIC
COMMISSION #GG015952
EXPIRES JULY 27, 2020