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16	DATE: Entruction E 2020	5011	16			
17	DATE: February 5, 2020		17			
18	TIME: Commenced: 8:55 A.M.		18			
19	LOCATION: Division of Administrative He 1230 Apalachee Parkway	earings	19			
20	The DeSoto Building, Tallahassee, Florida		20			
21	REPORTED BY: DEBRA R. KRICK		21			
22	Court Reporter		22			
23	APPEARANCES: (As heretofore noted.) PREMIER REPORTING		23			
24	114 W. 5TH AVENUE TALLAHASSEE, FLORIDA		24			
25	(850) 894-0828		25			
114 W. Premie	5th Avenue, Tallahassee, FL 32303 r Reporting (850) 894-0828 R	premier-reporting.com eported by: Debbie Krick	114 W. Premier	5th Avenue, Tallahassee, FL 32303 Reporting (850) 894-0828	prem Reported	ier-reporting.co by: Debbie Kri

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1		INDEX TO EXHIBITS		
2	NO.	DESCRIPTION	IDENTIFIED	ADMITTED
3	101-109	As identified in the		295
4	115	As previously identified on		295
5	116	As previously identified on the record		295
6	113	As identified in the		296
7	110	As identified in the		296
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9	117 68-75	Revised Exhibit RAP-9 As identified on the	342	342 370
10	112	comprehensive exhibit list As identified in the		414
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1.4		comprehensive exhibit fist		
14				
16				
17				
19				
10				
20	*IIub ub io	- negative reasona		
20	*Uh-huh is	a positive response		
22				
22				
23				
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114 W. Premier	5th Avenue, Tallahassee, FL 32303 premier-reporting.com Reporting (850) 894-0828 Reported by: Debbie Krid
25	THE COURT: Yeah, what the testimony,
24	MR. REHWINKEL: I have his direct.
23	them here.
22	yeah, what I have got here well, I thought I had
21	THE COURT: That's fine. I can tell you,
20	move his, and then we need to address ours.
19	MR. REHWINKEL: Yeah, so I think Duke needs to
18	THE COURT: Exhibits?
17	in.
16	witness leaves the stand, his exhibits are moved
15	usually do with the Commission, which was after a
14	to take care of a housekeeping measure that we
13	break from engineering 101 yesterday. We neglected
12	concluded, I think everyone was ready to take a
11	started with Mr. Polich. Yesterday, when we
10	MR. REHWINKEL: Your Honor, before we get
9	THE COURT: All right. Have a seat.
8	THE WITNESS: I do, sir.
7	truth, was examined and testified as follows:
6	speak the truth, the whole truth, and nothing but the
5	was called as a witness, having been first duly sworn to
4	RICHARD A. POLICH
3	Whereupon,
2	THE COURT: I will swear you in.
1	P R O C E E D I N G S

	295		296
1	then I am just going through in the order that	NFIL	JENIIAL 1 THE COURT: Okay, and not 112?
2	these exhibits came up. I have not 115 and 116.		2 MR BREW. We haven't discussed 112 vet
3	that was I think was Public Counsel's exhibits, is		3 THE COURT: Okay that's right That was
1	that wight?		$4 \qquad \qquad \text{that was very - elay. So we will show 112}$
5	MD DEHNIMPEL. You and I think up yould		- that was your thay. So we will show its
6	MR. REHWINKEL. IES. And I think we would		
7	move actually the earlier for through toy were		(Whereupon, Exhibit No. 115 was received into
	identified for identification purposes. We would		/ evidence.)
8	now move 101 through 109 and 115 and 116 into the		8 THE COURT: And then I think the Commission
9	record.		9 talked about 110 and 111.
10	MR. BERNIER: So without going through them		10 MS. BROWNLESS: Yes, and we would ask that
11	individually, Judge, we raised objections to some		11 that be admitted at this time.
12	of them yesterday as we brought them up, and we		12 THE COURT: We will show 110 and 111 admitted.
13	would just stand on those objections and bring them		13 (Whereupon, Exhibit Nos. 110 & 111 were
14	up again in the PRO.		14 received into evidence.)
15	THE COURT: That's fine. We will show them		15 THE COURT: And I think that brings us
16	admitted with the understanding that there are		16 up-to-date.
17	aspects.		17 The witness has been sworn, and so whenever
18	So we will show 101 through 109 and 115 and		18 Public Counsel is ready.
19	116 admitted.		19 MR. DAVID: Thank you, Your Honor.
20	(Whereupon, Exhibit Nos. 101-109, 115 & 116		20 EXAMINATION
21	were received into evidence.)		21 BY MR. DAVID:
22	THE COURT: And let's		22 Q Please state your full name for the record,
23	MR. BREW: Excuse me, Your Honor. Your Honor,		23 and spell your last name, please.
24	PCS had offered Exhibit 113 for identification, and		24 A Yes, Richard A. Polich, P-O-L-I-C-H.
25	we would move that for admission as well.		25 Q Thank you.
114 W Premie	. 5th Avenue, Tallahassee, FL 32303 premier-reporting.com r Reporting (850) 894-0828 Reported by: Debbie Krick		114 W. 5th Avenue, Tallahassee, FL 32303 Premier Reporting (850) 894-0828 Premier Reported by: Debbie Krick
	297		298
1	And what is your educational background?		1 manager of rates. And so I was involved in that in
2	A I have a Bachelor's in Engineering in		2 several aspects both with consumers and also with
3	Mechanical Engineering, a Bachelor's in Engineering in		³ with an entity called Energy Michigan, which oftentimes
4	Nuclear Engineering and an MBA, all from the University		4 was filing in opposition to the utility's.
5	of Michigan.		5 I have also testified in proceedings in
6	Q And what is your current occupation?		6 Indiana. It was actually a Duke case involving a
7	A My current occupation is as consultant. Job		7 failure of a generator. There is I also testified in
8	title is managing director. I work for a company by the		8 Georgia and also at FERC.
9	name of GDS Associates.		9 0 All right. And did you in those, did you
10	0 And what service or services were you retained		10 appear for the utility, the regulator or
11	to provide in this case?		11 A A variety of aspects In Georgia. I was on
12	A I was requested by the Florida Office of		12 behalf of MARTA, which is the transportation
13	Public Coursel to review the failures at Dube Parton in		13 organization in Georgia
11	regards to the steam turbing parform an accommant of		14 In the case of I also regionted I also
1 6	these failures and do a calculation of revenues that		15 tootified in North Caroline or babils of the Attention
10	chose faitures and do a calculation of revenues that		15 Cestified in North Carolina on Denair of the Attorney
110	could potentially be recovered.		⊥° General's Uffice. And then I have also testified that

Q All right. And have you testified as a witness before in a regulatory proceeding, a utility

18 witness before in a regulatory proceeding, a utility 19 regulatory proceeding?

20 A Many times.

17

 21
 Q
 And can you give us some examples of the

 22
 venues in which you have testified?

23 A I did a significant amount of worked in

24 Michigan associated with rate design and regulatory.

25 $\,$ Part of that started with Consumers Energy when I was

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А

or your analysis in this case?

the -- the case at FERC involved actually testifying on

behalf of a group of utilities in a reactor power case.

that -- okay, 99 percent of the material that I reviewed

was material provided by Duke in discovery, as well as

testimony and various other documents that were made

20 $\,$ of the materials that you used to develop your opinions,

Q And can you give me just a general description

Yes. In general, I mean, most of the material

17

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			300
1	available to me.		calculations had included the replacement power costs
2	Q All right. And did you file or cause to be	2	during the time periods when the plant as in an outage.
3	filed direct testimony in this case on or about	3	And so I deleted those costs from the calculations and
4	September 13th of 2019?	4	it resulted in changes in both the recommended amount of
5	A Yes, I did.	5	the cost that could potentially be recoverable.
6	Q And did you file or cause to be filed with	6	And so going to page nine, the first change
7	that testimony nine exhibits identified on the	7	associated with that is on page nine, line two. The
8	comprehensive exhibit list filed within those exhibits	8	sentence reads right now: Caused by installation of the
9	68 through 76, inclusive?	9	pressure plate is over 16.84 million. I would like to
10	A Yes, I believe so.	10	change that to, after the word is around 12 million.
11	Q All right. And do you have any changes or	11	Q What was excuse me, could you clarify that
12	revisions to that testimony, or to any of those	12	again? Is from installation of the pressure plate is
13	exhibits?	13	over
14	A Yes, I do.	14	A Is around 12 million.
15	Q What are those?	15	Q 12, okay.
16	A Okay. The first change is on page seven, line	16	A I am sorry. No, 16 point 16 million. I am
17	19, there is a percentage in that line that says	17	sorry. 16 million.
18	25 percent. I would like to change that to 13 percent.	18	Q Okay. So just for clarity, is over 16.12
19	Q Okay.	19	million, is that what you were
20	A The second change and all subsequent changes	20	A Yes. There is two I worded it as around
21	are associated with the revision to Exhibit 9. After	21	16 million.
22	filing testimony, I was reviewing the calculations I	22	Q Oh, okay.
23	used for determining the replacement power costs that	23	MS. BROWNLESS: Excuse me, can you just read
24	that that associated with the derated Duke of the	24	that whole sentence the way it ought to be?
25	Bartow unit, and I discovered that inadvertently my	25	THE WITNESS: Okay, I can. Yes.
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1	The replacement the sentence which begins
2	on line one should read: The replacement power
3	costs associated with the 2017 outage and derate
4	caused by installation of the pressure plate is
5	around 16 million.
6	Sorry for the confusion.
7	Moving to the next set of changes, starting on
8	line on page 27, starting on line five, there is
9	a figure of 2,005,536. That figure should be
10	1,675,561.
11	On the next line, on line six, there is a
12	megawatt figure of 162,040. That figure should be
13	150,400.
14	All right. Moving to line 12, there is a
15	dollar amount of 2,545,049. That number should be
16	changed to 2,215,648. There is also a megawatt
17	figure on that same line of 213,280. That number
18	should be changed to 199,680.
19	Moving to line 20, there is a dollar amount of
20	that 1,189,552. That number should be changed to
21	1,125,573. The megawatt figure on that line of
22	128,480 should be changed to 125,800.
23	And the last change is on page 28, line four.
24	There is a dollar amount in there of 16.84 million.
25	That figure should be changed to 16,116,701 781.
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1 BY MR. DAVID: 2 Q Okay. Are those all the changes you have 3 to --4 A In addition, there should be a revised Exhibit 5 9. Q Correct, okay. 6 7 The RAP exhibits -- I mean, identified in your 8 testimony as RAP-9 and identified on the comprehensive 9 exhibit list as 76 has corresponding calculation 10 changes? 11 A Yes. 12 Q Okay. Okay. And with all of those changes 13 made, if I asked you today the same questions as I asked 14 in your direct testimony, would your answers be the same 15 other than, of course, like I said, the aforementioned 16 changes? 17 A Yes, they would. 18 Q And the changes that were made to CLE 19 exhibit -- CEL exhibit, excuse me, 76, RAP-9, did you 20 supply that information before today to, in discovery, 21 to Duke and staff? A I believe we have. 22 23 Q Are you prepared to give a summary of your 24 testimony and its conclusions? 25 A Yes, I am. 114 W. 5th Avenue, Tallahassee, FL 32303 Premier Reporting premier-reporting.com Reported by: Debbie Krick (850) 894-0828

	303				304
1	Q Okay. Go ahead.	ו־אוע		project is designed is you have for	ur of these.
2	A Okay. To understand my testimony, it's		2	Four combustion turbines and four	heated recovery
3	important to understand some of the background of the		3	steam generator, and of course, al.	l the ancillary
4	Bartow project, as well as how it's been configured.		4	services supplying steam to just of	ne steam turbine.
5	And what this leads towards is the fact that the		5	And this project was designed	such that you
6	statement contained in my testimony that 420-megawatt		6	could provide all the steam require	ements for this
7	output is a design limit on which the Bartow plant was		7	and produce 420 megawatts with just	t three CTs and
8	designed.		8	HRSGs. So essentially, you have 2	5 percent
9	Having designed thermal cycles for multiple		9	redundancy. You also have 25 perce	ent additional
10	power plants, the designer always wants to gets the		10	steam available to put into the st	eam turbine.
11	maximum output for a given plant investment at the best		11	And if that were the case, as	a designer, and
12	heat rate. It's a fundamental principle of what you do		12	as Progress Energy, in terms of de	signing this
13	in design. It has to do with how you put the project		13	project and putting it forth before	e the Public
14	together and what you want to do with it.		14	Service Commission, you want to bu	ild a project and
15	The Bartow project was Progress Energy's first		15	tout its dollars per kW as low as p	possible, because
16	combined cycle project and would have and they would		16	it shows the value of the project.	You as the
17	have wanted the most output for their investment. They		17	designer want to develop a project	that, for every
18	had already decided on installing four CTs when three		18	dollar you are putting into it, pro	oduces the
19	would have sufficed to power the Mitsubishi turbine.		19	maximum amount of megawatts.	
20	One of the things about this design is that		20	With as much steam capability	to power the
21	you can fully power that steam turbine with three		21	steam turbine, if that unit could p	produce
22	combustion turbines and heat recovery steam generators.		22	450 megawatts, the designer and the	e utility would
23	Can I approach the Exhibit for a second here?		23	have wanted that from day one.	
24	THE COURT: Sure.		24	They, Kiewit and Bibb/Kiew	it performed over
25	THE WITNESS: All right. So the way this		25	300 different heat analyses of how	this whole thing
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	305	_			306
1	is going to work. Not one of those analyses ever		1	often and throughout their testimo:	ny that
2	showed this steam turbine producing more than		2	420 megawatts was not a design con-	dition.
3	420 megawatts. If that steam turbine had that		3	Now, I have worked in this in	dustry many, many
4	capability, they would have produced a thermal		4	years, too many to tell sometimes,	but the fact
5	analysis to that effect.		5	that this proj that you had so m	uch steam
6	Bibb worked very close with Mitsubishi on how		6	available gives you amazing amount	of flexibility
7	this whole process works. There is correspondence		7	in how you operate it. And I thin	k this is a great
8	between Bibb and Mitsubishi as to what this package		8	plant design. Don't get me wrong,	but there are
9	can put out. There was information about how much		9	limits. And when you have a plant	of this type, of
10	steam can go to can be provided.		10	this type of design, you, as an op	erator, have to
11	Mitsubishi responded with this is the output.		11	be careful as to how you utilize t	hat capability.
12	420 megawatts was a design limit. If Mitsubishi		12	It is my feeling that, and my	experience that
13	thought this unit could produce more, they would		13	when you have a situation like this	s, it is
14	have told Bibb that and they would have designed it		14	important that you understand how	it's going to
15	with higher output.		15	function. And if you discover tha	t, hey, you know,
16	You had a case where this was an aftermarket		16	I can get potentially more out of	this, you should

17 unit. It was not designed to handle the amount of 18 steam that was built that was available to this 19 steam turbine. It was designed for a much smaller 20 steam flow. And it is my experience that 21 Mitsubishi knew that there were limitations as to 22 how much power and steam this could take, and that 23 they factored that into how this plant was 24 designed. And so did the EPC Kiewit/Bibb. This is 25 a critical issue, because Duke has contended very

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114 W. 5th Avenue, Tallahassee, FL 32303 Premier Reporting always pause, because steam turbines have a lot of

forces and dynamics that are happening inside of

them that we've discovered afterwards, you know.

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	307			308
1	answer that if, yes if the OEM comes back and			insurance policy, proceeded to upgrade the oper
2	says, yes, you can get more out of this and it		2	the operate output of the plant. It's just
3	breaks, then the issue is on their shoulders. It's		3	something you should do.
4	an insurance policy. A simple question, get it in		4	And other projects I have been associated
5	writing and then the issue is settled.		5	with utilities will push a steam turbine, and I
6	If Duke had done that, we would not be here		6	understand that. It's a legitimate thing to do
7	today, in simple terms, because the onus would have		7	because it's cheap capacity. But you also have
8	been on Mitsubishi at that point. It would have		8	responsibility to get back with the OEM and verify
9	been totally their responsibility. The fact that		9	that there isn't something inside of that unit that
10	Duke did not do that is a fundamental flaw in what		10	will break if you do it. And this is a fundamental
11	they chose to how they chose to operate this		11	issue in my testimony.
12	unit.		12	The other thing, too, is that the reason why I
13	And other projects I have been associated		13	am strongly of the opinion that 420 was the
14	with I have a project in Arkansas that we		14	merawatt limit is that when Duke finally did ask
15	oversee and they had a steam turbine that was		15	Mitsubishi can we produce more than 420 merawatts?
16	designed for 670 megawatts. That was the design		16	Mitsubishi said we need to do a study for that
17	conditions We went through a turbine ungrade		17	They came back and proposed a dollar amount that
10	conditions. We went through a turbine upgrade		10	They came back and proposed a dortal amount that
10	standard outage		10	of In one that says we don't know, we need to
20	Standard Outage.		19	Study LHIS.
20	we came out of that outage and discovered we		20	Again, that tells me that Mitsubishi felt they
21	had the potential for more megawatts out of that		21	nad a limit on this unit. And to and so I
22	unit. It was only IU megawatts, so we went from		22	don't I feel that that should have been an
23	670 to 680. Before we did that, we contacted the		23	operating condition from day one.
24	manufacturer of the steam turbine and said, do we		24	All right. If Duke had paused before going
25	have any problems if we do this? We got the		25	after 420 and asked Mitsubishi if the steam turbine
Premier Report	inter, rananassee, FL 32303 premier-reporting.com ing (850) 894-0828 Reported by: Debbie Krick	(Premier	Reporting (850) 894-0828 Reported by: Debbie Krick
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1 14 W. Sal Ave	(850) 894-0828 reported by: Debbie Krick 309 could operate above 420 megawatts, and put it in]	Premier I	Reporting (850) 894-0828 Reported by: Debbie Krick 310 310 310
1 2	could operate above 420 megawatts, and put it in writing, as I said, this would just take this whole		Premier I 1 2	Reporting (850) 894-0828 Reported by: Debbie Krick 310 Duke contends that, you know, that what happened in Period 5 when you put the L1 the
1 2 3	(850) 894-0828 Reported by: Debbie Krick could operate above 420 megawatts, and put it in writing, as I said, this would just take this whole issue off the table.		Premier I 1 2 3	Reporting (850) 894-0828 Reported by: Debble Krick 310 Duke contends that, you know, that what happened in Period 5 when you put the L1 the Type 1 blades back in, is evidence that this is not
1 1 2 3 4	could operate above 420 megawatts, and put it in writing, as I said, this would just take this whole issue off the table. Instead, Duke ignored the red line on the		Premier I 1 2 3 4	Reporting (850) 894-0828 Reported by: Debbie Krick 310 Duke contends that, you know, that what happened in Period 5 when you put the L1 the Type 1 blades back in, is evidence that this is not a true fact. But let's look at some issues here.
1 1 2 3 4 5	could operate above 420 megawatts, and put it in writing, as I said, this would just take this whole issue off the table. Instead, Duke ignored the red line on the unit, and they took their Ferrari and ran it, and	د 	Premier 1	Reporting (850) 894-0828 Those Type 1 blades in Period 5 failed in Reported by Debbe Kick
1 1 2 3 4 5 6	could operate above 420 megawatts, and put it in writing, as I said, this would just take this whole issue off the table. Instead, Duke ignored the red line on the unit, and they took their Ferrari and ran it, and something broke, but the interesting thing is it	<	Premier 1 1 2 3 4 5 6	Reporting (850) 894-0828 Reported by: Debble Kick 310 Duke contends that, you know, that what happened in Period 5 when you put the L1 the Type 1 blades back in, is evidence that this is not a true fact. But let's look at some issues here. Those Type 1 blades in Period 5 failed in 1,561 hours of operation. That's less than four
1 1 2 3 4 5 6 7	(850) 894-0828 Reported by: Debbie Know and could operate above 420 megawatts, and put it in writing, as I said, this would just take this whole issue off the table. Instead, Duke ignored the red line on the unit, and they took their Ferrari and ran it, and something broke, but the interesting thing is it didn't break right away, all right.		Premier 1 1 2 3 4 5 6 7	Reporting (850) 894-0828 (850) 894-0828 Duke contends that, you know, that what happened in Period 5 when you put the L1 the Type 1 blades back in, is evidence that this is not a true fact. But let's look at some issues here. Those Type 1 blades in Period 5 failed in 1,561 hours of operation. That's less than four percent of the hours that those same set of blades
1 1 2 3 4 5 6 7 8	could operate above 420 megawatts, and put it in writing, as I said, this would just take this whole issue off the table. Instead, Duke ignored the red line on the unit, and they took their Ferrari and ran it, and something broke, but the interesting thing is it didn't break right away, all right. If you look at what happened in Periods 1 and		Premier 1 1 2 3 4 5 6 7 8	Reporting (850) 894-0828 (850) 894-0828 The premier-reporting Com Reported by: Debbie Krick 10 10 10 10 10 10 10 10 10 10
1 1 2 3 4 5 6 7 8 9	<pre>could operate above 420 megawatts, and put it in writing, as I said, this would just take this whole issue off the table. Instead, Duke ignored the red line on the unit, and they took their Ferrari and ran it, and something broke, but the interesting thing is it didn't break right away, all right. If you look at what happened in Periods 1 and 2, they operated that unit for 62 months between</pre>		Premier 1 1 2 3 4 5 6 7 8 9	Duke contends that, you know, that what happened in Period 5 when you put the L1 the Type 1 blades back in, is evidence that this is not a true fact. But let's look at some issues here. Those Type 1 blades in Period 5 failed in 1,561 hours of operation. That's less than four percent of the hours that those same set of blades were able to operate in Periods 1 and 2. The reason why that's significant is and the other
1 1 2 3 4 5 6 7 8 9 10	(850) 894-0828 Reported by: Debbie Knick and the red line on the unit, and they took their Ferrari and ran it, and something broke, but the interesting thing is it didn't break right away, all right. If you look at what happened in Periods 1 and 2, they operated that unit for 62 months between the two periods, approximately 43,000 hours of		Premier 1 1 2 3 4 5 6 7 8 9 10	Reported by Debbe Kick Reported by Debbe Kick 310 Duke contends that, you know, that what happened in Period 5 when you put the L1 the Type 1 blades back in, is evidence that this is not a true fact. But let's look at some issues here. Those Type 1 blades in Period 5 failed in 1,561 hours of operation. That's less than four percent of the hours that those same set of blades were able to operate in Periods 1 and 2. The reason why that's significant is and the other thing is that those Type 1 blades that they put in
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I I 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	(850) 894-0823 (850) 894-0823 Reported by: Debble Knick Reported by: D		Premier I 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	Duke contends that, you know, that what happened in Period 5 when you put the L1 the Type 1 blades back in, is evidence that this is not a true fact. But let's look at some issues here. Those Type 1 blades in Period 5 failed in 1,561 hours of operation. That's less than four percent of the hours that those same set of blades were able to operate in Periods 1 and 2. The reason why that's significant is and the other thing is that those Type 1 blades that they put in in that time period failed quicker than any of the other blades that they put in. MR. BERNIER: Your Honor, I apologize, but I have to object. Nowhere does this testimony that he is summarizing appear in his direct testimony. I believe that is what we are doing here is, summarizing his direct testimony. This simply does not appear there. And that is the practice that we follow in front of the Commission, which I think we all agreed is what we are here to do.
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but so far he is just -- you know what I am saying,

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 is now requiring the sports: is starting, for the start is not part of the fact is starting, and is relative hard sail in the start is not the start i	4	saying, Judge, and not to be argumentative, but he	4 information that was provided in Duke's root cause	
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 B. SZENTINEL: YOUR ENDS, YE WELL - I would to some degree, schooldege Kr. Berning's other to yether yether end to greet i other yether yether end yether is in the yether yether is	11	just gone beyond the scope.	11 blades lasted longer during those two periods than	
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 international space of the space of	14	point, but yesterday, Mr. Swartz took great	14 blades lasted so long. All their RCA addresses	
 For us, in a probability what has placed as the place as the	15	liberties.	15 all is just the failures.	
fittinizally familiar with the way the fulfito derivation of the fulfito derivation derivation of the fulfito derivation der derivation der derivation der	16	For us, in a proceeding where the judge is not	16 And in my testimony, I came to the conclusion	
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A to take great liberies to account on his testinory, and I thick Hr. Polich is doing the asse thing, and I thick Hr. Polich is doing the asse thing, and I thick Hr. Polich is doing the asse thing, and is is for this reacon that we can to the and is is for this reacon that we can to the and is is for this reacon that we can to the and is is for this reacon that we can to the and is is for this reacon. and is is for this reacon that we can to the and is is for this reacon that we can to the and is is for this reacon that we can to the and is is for this reacon that we can to the and is is for this reacon. and is is for this reacon that we can to the and is is for this reacon. and is is for this. anore this. and is is for this. and is is for this. an	19	basis, we thought it was appropriate for Mr. Swartz	19 those blades' designs in Period 1 that allowed them	
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 It probably would be a good line for us to a consider the aumary and go to cross-examination. THE COURT: Chay. That sounds like a plan is the construction of the constr	21	and I think Mr. Polich is doing the same thing.	21 blades that the Period 5 blades were not identical	
1 conclusion his summary and go to cross-examination. 2 the COURT: Clay. The sounds like a plan 3 the COURT: Clay. The sounds like a plan 4 the conclusion that the failures in Period luce design 4 the conclusion that the failures in Period luce design 4 the conclusion that the failures in Period luce design 5 the conclusion that the failures in Period luce design 6 the conclusion that the failures in Period luce design 6 the conclusion that the failures in Period luce design 6 the conclusion that the failures in Period luce design 7 the conclusion that the failures in Period luce design 8 the conclusion that the failures in Period luce design 9 the conclusion that the failures in Period luce design 10 the conclusion that the failures in Period luce design 10 the conclusion that the failures in Period luce design 11 the conclusion that the failures in Period luce design 12 the conclusion that the failures in Period luce design 13 the conclusion that the failures in Period luce design 14 the conclusion that the failures in Period luce design 15 the conclu	22	It probably would be a good time for us to	22 enough to last as long.	
1 THE COURT: Okay. That sounds like a plan 1 The COURT: Okay. That sounds like a plan 1 The COURT: Chap. 1 The COURT: Okay. That sounds like a plan 1 The COURT: Chap. 1 The COURT: Okay. That sounds like a plan 1 The COURT: Chap. 1 The COURT: Chap. 2 The COURT: The replacement power could. 3 Tort the replacement power could. 4 Ks. MUID: Thank you. 5 Your Romer, I would like to move Mr. Polich's 6 direct testimony into vidence, please. And after 7 that, I would tender his for cross-examination. 7 THE COURT: Show that done. 9 (Mereupon, prefiled testimony was inserted.) 10 (Mereupon, I would tender his for cross-state and the sth	23	conclude his summary and go to cross-examination.	23 And it is for this reason that we came to the	
25 then. 1 100 mercode and and a second	24	THE COURT: Okay. That sounds like a plan	24 conclusion that the failures in Period 1 were due	
1 The With Stateward Reporting The Stateward Reporting The Stateward Report of Stateward Report Stateward Report of Stateward Report of Stateward Repo	25	then.	25 to overstressing the unit by putting too much steam	
11 M W Shares Tabanese, FL 2001 (B00) BL4020 Permittingenting control 1 1 10 1 through it and operating at 420 - in excess of 0 2 420 megawatts, and that buke should be responsible 0 3 for the replacement power costs. 0 4 M0. DAVID: Thank you. 0 5 Your Bonor, I would like to move Mr. Polich's 0 6 direct testimony into evidence, please. And after 1 7 that, I would cender his for cross-examination. 1 11 12 0 12 (Merceupon, prefiled testimony was insected.) 13 0 14 (COST). My baines address in 1850 Parkey Pher, Saite 800, Maries, 14 (COST). My baines address in 1850 Parkey Pher, Saite 800, Maries, 15 Garaga 3007. 16 0 17 0 18 0 19 0 19 0 10 0 10 0 11 0 12 0 13 0 14 (COST). My baines address in 1850 Parkey Pher, Saite 800, Maries, 16 0 17 0 18 </th <th></th> <th></th> <th></th> <th></th>				
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 In or the replacement power costs. MR. DAVID: Thank you. Your Bonor, I would like to move Mr. Polich's direct testimony into evidence, please. And after that, I would tender him for cross-examination. THE COURT: Show that done. (Whereupon, prefiled testimony was inserted.) (Whereupon) (Whereupon)<th>2</th><th>420 megawatts, and that buke should be responsible</th><th>OF</th><th></th>	2	420 megawatts, and that buke should be responsible	OF	
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9 (Whereupon, prefiled testimony was inserted.) 10 2 11	8	THE COURT. Show that done	Docket No. 20190001-EI	
2 Q. PLEASE STATE YOUR NAME, TITLE AND BUSINESS ADDRESS. 10 3 A. My name is Richard A. Polich. I am a Managing Director at GDS Associates, 11 12 3 A. Inc. ("GDS"). My business address is 1850 Parkway Place, Suite 800, Marietta, 13 5 Georgia, 30067. 6 14 6 7 Q. WHAT ARE YOUR DUTIES AND RESPONSIBILITIES AT GDS 16 8 ASSOCIATES? 9 A. My primary duties are within GDS's Power Supply Planning Department. 18 10 While employed by GDS, I have provided consulting services for areas such as: 11 • Generation Asset Management, 19 20 13 • Engineering analysis of generation projects, • 14 • Engineering analysis of sort evaluation, • Engineering management consulting services, • 20 13 • Engineering rowalation of waste to energy projects, • • 21 10 • Molular nuclear project cost evaluation, • • 22 11 • Energy management consulting service, regulatory disallowances, determination of produce, reveue requirements and plant in service, and • • 24	9	(Whereupon prefiled testimony was inserted)	1 I. <u>INTRODUCTION</u>	
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13 5 Georgia, 30067. 14 6 15 7 Q. WHAT ARE YOUR DUTIES AND RESPONSIBILITIES AT GDS 16 8 ASSOCIATES? 17 9 A. My primary dutis are within GDS's Power Supply Planning Department. 18 1 • Generation Asset Mangement, 19 20 • Engineering analysis of generation projects, 21 • Engineering evaluation of waste to energy projects, 22 14 • Energy management consulting services, regulatory, 23 • Moldar nuclear project cost sensessment and economic evaluation, 24 • Review of generation project design and construction.	12			
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TAR W AT AVAILABLE LONDROOMS 11 2020	13 14 15 16 17 18 19 20 21 22 23 24 25		 Inc. ("GDS"). My business address is 1850 Parkway Place, Suite 800, Marietta, Georgia, 30067. Q. WHAT ARE YOUR DUTIES AND RESPONSIBILITIES AT GDS ASSOCIATES? A. My primary duties are within GDS's Power Supply Planning Department. While employed by GDS, I have provided consulting services for areas such as: I Generation Asset Management, Engineering evaluation of waste to energy projects, Energy management consulting services, Nuclear decommissioning cost evaluation, Renewable energy project cost assessment and economic evaluation, Renewable energy project cost assessment and leant in service, and Review of generation project design and construction. 	
Premier Reporting (850) 894-0828 Reported by: Debbie Krick Disc Two 000	13 14 15 16 17 18 19 20 21 22 23 24 25		 Inc. ("GDS"). My business address is 1850 Parkway Place, Suite 800, Marietta, Georgia, 30067. 7 Q. WHAT ARE YOUR DUTIES AND RESPONSIBILITIES AT GDS ASSOCIATES? 9 A. My primary duties are within GDS's Power Supply Planning Department. 10 While employed by GDS, I have provided consulting services for areas such as: 11 Generation Asset Management, 12 Engineering analysis of generation projects, 13 Engineering evaluation of waste to energy projects, 14 Energy management consulting services, 15 Nuclear decommissioning cost evaluation, 16 Modular nuclear project cost evaluation, 17 Renewable energy project cost assessment and economic evaluation, 18 Testimony on rate of return, cost of service, regulatory disallowances, determination of prudence, revenue requirements and plant in service, and 20 Review of generation project design and construction. 	

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1	Q.	MR. POLICH, PLEASE SUMMARIZE YOUR FORMAL EDUCATIONAL.
2	А.	I graduated from the University of Michigan - Ann Arbor in August 1979 with
3		a Bachelor of Science Engineering Degree in Nuclear Engineering and a Bachelor of
4		Science Engineering Degree in Mechanical Engineering.
5		
6	Q.	PLEASE BRIEFLY DESCRIBE YOUR PROFESSIONAL EXPERIENCE.
7		I have over 40 years of work experience in the energy sector, performing duties
8		and services for a myriad of companies and organizations, and representing the interests
9		of private and public constituencies throughout the country.
0		In May 1978, I joined Commonwealth Associates, Inc., located in Jackson,
1		Michigan, as a Graduate Engineer and worked on several plant modification and new
2		plant construction projects.
3		In May 1979, I joined Consumers Power Inc., (now called Consumers Energy),
4		located in Jackson, Michigan, as an Associate Engineer in the Plant Engineering
5		Services Department.
6		In April 1980, I transferred to the Midland Nuclear Project and progressed
7		through various job classifications to Senior Engineer. I was also part of a small team
8		that evaluated the potential to repower the nuclear steam turbine with combustion
9		turbines. One of my responsibilities was to provide the initial thermal design for the
20		combined cycle project, utilizing one of the two existing nuclear steam turbines while
1		still providing process steam for Dow Chemical Company. This project is now known
2		as the Midland Cogeneration Venture, a 12-combustion turbine and steam turbine
3		project capable of providing 1,633 MW of capacity.

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317 analysis with renewable energy companies across the country, including: Noble 1 Environmental Power located in Centerbrook, Connecticut; Third Planet Windpower, 2 LLC located in Palm Beach Gardens, Florida: TradeWind Energy, LLC located in 3 Lenexa, Kansas; Windlab Developments USA located in Canberra, Australian Capital Territory, Australia; and Matinee Energy Inc. located in Tucson, Arizona, among 5 others 6 Other examples of my consulting work include evaluation of the Arkansas Weatherization Assistance Program for the Arkansas Energy Office and providing the 9 West Michigan Business Alliance with an evaluation of the business opportunities for 10 Western Michigan businesses in the renewable energy business sector. 11 In 2007, I served as primary author of a report on the economic impacts of 12 renewable portfolio standards and energy efficiency programs for the Department of 13 Environmental Quality - State of Michigan. 14 In 2011, I joined KEMA, Inc. ("KEMA") located in Burlington, Massachusetts, 15 as a Service Line Leader responsible for developing its renewable energy consulting 16 business. While at KEMA, I performed multiple renewable energy studies for the 17 Electric Power Research Institute, including a renewable energy options study for the 18 country of Saint Maarten (a constituent country of the Kingdom of the Netherlands). I 19 also assisted Lake Erie Energy Development Corporation in its successful application 20 to the U.S. Department of Energy for a multi-million dollar grant to develop an offshore 21 wind project in Lake Erie. 22 In 2013, I joined CLEAResult, located in Little Rock, Arkansas, as Director of 23 Operations. My primary responsibility involved supporting program operations in

4

2 Engineer and reached the level of Senior Market Representative. While in this 3 department, I analyzed the economic and engineering feasibility of customer 4 cogeneration projects. 5 In July 1992, I transferred to the Rates and Regulatory Affairs Department of 6 Consumers Energy as a Principal Rate Analyst. In that capacity, I performed studies 7 relating to all facets of development and design of Consumers Energy's gas, retail, electric and electric wholesale rates. During this period, I was heavily involved in the 8 9 development of Consumers Energy's Direct Access program and in the development 10 of Consumers Energy's Retail Open Access program. I also participated in the 11 development of Consumers Energy's revenue forecast. 12 In March 1998, I joined Nordic Energy, LLC ("Nordic"), located in Ann Arbor, 13 Michigan, as Vice President in charge of marketing and sales. My responsibilities included all aspects of obtaining new customers and enabling Nordic to supply 14 15 electricity to those customers. In May 2000, my responsibilities shifted to Operations 16 and Regulatory Affairs and my responsibilities included management of supply 17 purchases, transmission services, and development of new power projects. My Regulatory Affairs responsibilities also included overseeing regulatory and legislation 18 19 issues for the company.

In July 1987, I transferred to the Market Services Department as a Senior

In March 2003, I formed Energy Options & Solutions, based in Ann Arbor, Michigan, as a consulting concern focusing on providing engineering services and regulatory support. Through my work with Energy Options & Solutions, I gained extensive experience consulting in the areas of project development and economic

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1		assisting the company's Arkansas unit to successfully meet a 400% increase in energy
2		efficiency goals that it managed for Entergy. I was also responsible for managing the
3		company's natural gas energy efficiency programs in the State of Oklahoma.
4		In 2015, I joined the Georgia office of GDS Associates, Inc., a consulting group
5		focusing on utility engineering and consulting services, as Managing Director.
6		I have been a registered Professional Engineer since 1983 and I am licensed in
7		the State of Michigan.
8		My resume is included as Exhibit No(RAP-1).
9		
10	Q.	HAVE YOU TESTIFIED IN OTHER REGULATORY PROCEEDINGS?
11	А.	Yes, Exhibit No(RAP-2) contains a list of regulatory proceedings in which
12		I have provided testimony.
13		
14	Q.	WHAT IS THE NATURE OF YOUR BUSINESS?
15	А.	GDS Associates, Inc. ("GDS") is an engineering and consulting firm with
16		offices in Marietta, Georgia; Austin, Texas; Corpus Christi, Texas; Manchester, New
17		Hampshire; Madison, Wisconsin; Manchester, Maine; and Auburn, Alabama. GDS
18		provides a variety of services to the electric utility industry including power supply
19		planning, generation support services, rates and regulatory consulting, financial
20		analysis, load forecasting and statistical services. Generation support services provided
21		by GDS include fossil and nuclear plant monitoring, plant ownership feasibility studies,
22		plant management audits, production cost modeling and expert testimony on matters

1		relating to plant management, construction, licensing and performance issues in
2		technical litigation and regulatory proceedings.
3		
4	Q.	WHOM DO YOU REPRESENT IN THIS PROCEEDING?
5	А.	I am representing the Florida Office of Public Counsel ("OPC").
6		
7	Q.	WHAT WAS YOUR ASSIGNMENT IN THIS PROCEEDING?
8	А.	I was asked by the OPC to conduct a review and evaluation of Duke Energy
9		Florida, LLC's ("DEF's") operation of the Bartow Combined Cycle Power Plant
10		("BCC") located in Pinellas County, Florida. The review and evaluation included
11		assessment of the BCC steam turbine ("ST") mechanical problems which led to several
12		outages and derates. My testimony also includes an assessment of replacement power
13		costs for 2017 and 2018, an estimate for part of 2019 associated with periods in which
14		the BCC was not available to provide full capacity, and the cost of that replacement
15		power that DEF is seeking to recover from its ratepayers in this proceeding.
16		
17	Q.	DID OTHER GDS PERSONNEL ASSIST YOU IN THE ANALYSIS AND
18		DEVELOPMENT OF YOUR TESTIMONY IN THIS MATTER?
19	А.	No.
20		
21	Q.	ARE YOU SPONSORING ANY EXHIBITS?
22	А.	Yes, I am sponsoring the following exhibits:
23		1. Exhibit No(RAP-1) Richard A. Polich, P.E. Resume

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1	MHPS about operation of the ST in excess of 420 MW, until after the failure of the L0
2	blades was discovered.
3	DEF operated the BCC ST with the original design L0 blades for 63 months
4	after the plant entered initial operation-a period of only slightly over five years. After
5	the February 2012 outage, DEF operated BCC in a manner that generated an ST output
6	at or below the design of 420 MW with the original design L0 blades, for an additional
7	$28 \mbox{ months}$ (within that first $63 \mbox{ months}$ of operation). Inspection of these L0 blades in
8	2014 did not find snubber or z-lock damage as was found in February 2012. The
9	additional stresses on the L0 blades caused by DEF's operation of the ST in a manner
10	that generated output above the 420 MW design conditions impacted the L0 blades in
11	a way that shortened blade life. If DEF had operated the ST at BCC in accordance with
12	design output of 420 MW or less, I believe there is no engineering basis to conclude
13	that the original L0 blades would not still be in operation today. Likewise, DEF would
14	not have needed to undertake any of the subsequent outages to repair L0 blades,
15	including the outage in February 2017 to replace the L0 blades with the pressure plate.
16	Consequently, the BCC ST would currently be capable of producing its full output of
17	$420\ \text{MW}$ instead of being derated to $380\ \text{MW}$ and operating with a less-than-optimal
18	pressure plate.
19	As a result of the 2017 outage and the 40 MW reduction in BCC ST output
20	(derate) due to installation of the pressure plate, DEF incurred power costs for the
21	replacement MWh. DEF has failed to demonstrate that ratepayers should be responsible
22	for these costs since the 2017 outage and subsequent derate were the result of \ensuremath{DEF}
23	imprudently operating the BCC ST in excess of the manufacturer's 420 MW design

8

1		2.	Exhibit No(RAP-2) Richard Polich Regulatory Testimony List	
2		3.	Exhibit No(RAP-3) Bartow Combined Cycle Thermal Cycle	
3		4.	Exhibit No(RAP-4) Turbine Generator Output Curve	
4		5.	Exhibit No(RAP-5) BCC ST Operation Greater than 420 MW	
5		6.	Exhibit No(RAP-6) Bartow ST#1 L0 Blade Upgrade to Achieve 450 MW,	
6			dated September 18, 2013	
7		7.	Exhibit No(RAP-7) Bartow RCA Review, dated March 15, 2017	
8		8.	Exhibit No(RAP-8) Update on 40" Last Stage Blade, dated 2015	
9		9.	Exhibit No(RAP-9) Bartow Combined Cycle Replacement Power Costs	
10				
11	П.	TE	STIMONY SUMMARY	
12	0	PL	EASE SUMMARIZE YOUR TESTIMONY.	
	~·			
13	д.		My review of various documents provided by DEF regarding the BCC low	
13 14	А.	pre	My review of various documents provided by DEF regarding the BCC low ssure turbine L0 blade failures reveals that the cause of the blade failures initially	
13 14 15	А.	pre exp	My review of various documents provided by DEF regarding the BCC low ssure turbine L0 blade failures reveals that the cause of the blade failures initially erienced in 2012 was DEF's operation of the BCC ST beyond the ST's 420 MW	
13 14 15 16	А.	pre exp des	My review of various documents provided by DEF regarding the BCC low ssure turbine L0 blade failures reveals that the cause of the blade failures initially erienced in 2012 was DEF's operation of the BCC ST beyond the ST's 420 MW ign. The Root Cause Analysis ("RCA") provided by the steam turbine manufacturer,	
13 14 15 16 17	A.	pre exp des Mit	My review of various documents provided by DEF regarding the BCC low ssure turbine L0 blade failures reveals that the cause of the blade failures initially erienced in 2012 was DEF's operation of the BCC ST beyond the ST's 420 MW ign. The Root Cause Analysis ("RCA") provided by the steam turbine manufacturer, subishi Hitachi Power Systems ("MHPS"), explains that Duke's operation of the	
13 14 15 16 17 18	A.	pre exp des Mit BC	My review of various documents provided by DEF regarding the BCC low ssure turbine L0 blade failures reveals that the cause of the blade failures initially erienced in 2012 was DEF's operation of the BCC ST beyond the ST's 420 MW ign. The Root Cause Analysis ("RCA") provided by the steam turbine manufacturer, subishi Hitachi Power Systems ("MHPS"), explains that Duke's operation of the C ST to produce sufficient horsepower to generate more than 420 MW, subjected	
13 14 15 16 17 18 19	Α.	pre exp des Mit BC the	My review of various documents provided by DEF regarding the BCC low ssure turbine L0 blade failures reveals that the cause of the blade failures initially erienced in 2012 was DEF's operation of the BCC ST beyond the ST's 420 MW ign. The Root Cause Analysis ("RCA") provided by the steam turbine manufacturer, subishi Hitachi Power Systems ("MHPS"), explains that Duke's operation of the C ST to produce sufficient horsepower to generate more than 420 MW, subjected 13% L0 blades to forces that were 25% higher than the designed operating conditions.	Court Reporter:
 13 14 15 16 17 18 19 20 	A.	pre exp des Mit BC the DE	My review of various documents provided by DEF regarding the BCC low ssure turbine L0 blade failures reveals that the cause of the blade failures initially erienced in 2012 was DEF's operation of the BCC ST beyond the ST's 420 MW ign. The Root Cause Analysis ("RCA") provided by the steam turbine manufacturer, subishi Hitachi Power Systems ("MHPS"), explains that Duke's operation of the C ST to produce sufficient horsepower to generate more than 420 MW, subjected 13% L0 blades to forces that were 25% higher than the designed operating conditions. F operated the ST at BCC in excess of 420 MW from June 2009 until the February	Court Reporter: DK
 13 14 15 16 17 18 19 20 21 	Α.	pre exp des Mit BC the DE 201	My review of various documents provided by DEF regarding the BCC low ssure turbine L0 blade failures reveals that the cause of the blade failures initially erienced in 2012 was DEF's operation of the BCC ST beyond the ST's 420 MW ign. The Root Cause Analysis ("RCA") provided by the steam turbine manufacturer, subishi Hitachi Power Systems ("MHPS"), explains that Duke's operation of the C ST to produce sufficient horsepower to generate more than 420 MW, subjected 13% L0 blades to forces that were 25% higher than the designed operating conditions. F operated the ST at BCC in excess of 420 MW from June 2009 until the February 2 outage for a combined 2,973 hours. As of the time of filing this testimony, DEF	Court Reporter: DK

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1		conditions. The replacement power costs associated with the 2017 outage and derate Court	
2		caused by installation of the pressure plate is over \$16.84 million. The Florida Public DK	
3		Service Commission should not allow DEF to recover these costs from its rate payers.	
4			
5	Q.	PLEASE DEFINE THE TERM "DERATE" AS USED IN CONNECTION WITH	
6		REDUCTION IN ST OUTPUT.	
7	А.	Derate is a term commonly used in the utility industry when a generation facility	
8		is unable to generate MW at its normal operating level. The reduction in generation	
9		output is usually temporary and caused by equipment degradation or failures. For the	
10		purposes of my testimony, I will be using the term "derate" specifically to refer to	
11		reduction in the BCC ST generation capability from 420 MW to 380 MW. This is a	
12		derate of 40 MW for the BCC ST.	
13			
14	III.	DESCRIPTION OF BCC POWER PLANT	
15	Q.	PLEASE PROVIDE A GENERAL DESCRIPTION OF THE	
16		CONFIGURATION OF DEF'S BARTOW COMBINED CYCLE PLANT.	
17	А.	BCC is commonly referred to as a 4-on-1 combined cycle plant composed of	
18		four Siemens SGT6-5000-FD3 combustion turbines/generators ("CTs") and one	
19		Mitsubishi Hitachi Power Systems steam turbine/generator. Exhibit (RAP-3)	
20		shows the general configuration of BCC. Each CT is capable of producing almost 230	
21		MW gross output with injection of steam into the CT for power augmentation. Non-	
22		steam augmented power output of each CT is in the range of 180 MW. The exhaust of	
23		the CT enters a Voit Power VPPR2 heat recovery steam generator ("HRSG") that	

1		produces steam to power the ST and provide steam augmentation to the CTs. The
2		HRSG is composed of three different pressure sections: a high pressure ("HP") section
3		(approximately 3,000 psig maximum), an intermediate pressure ("IP") section
4		(approximately 1,100 psig maximum) and a low pressure ("LP") section
5		(approximately 135 psig maximum). Steam production in the HRSG can be increased
6		by using installed natural gas fired "duct burners" located within the HRSG. The ST
7		was designed to produce 420 MW gross generation. Exhaust steam from the ST enters
8		a condenser where the steam is cooled to liquid phase and then pumped back into the
9		HRSG. The generator output appears to have an upper gross generation limit of about
10		465 MW at a 0.95 power factor based upon the output curves in Exhibit No (RAP-
11		4).
12		
13	Q.	PLEASE PROVIDE A GENERAL DESCRIPTION OF THE BCC STEAM
14		TURBINE.
15	А.	The BCC ST contains three turbine sections, a generator, and various other
16		components used to control steam flow and operate the ST. HP steam from the HRSG
17		is first injected into the HP section of the steam turbine through the turbine control
18		valves. Exhaust steam from the ST HP section is sent back to the HRSG IP section to
19		be reheated and then sent back to the IP section of the ST. Exhaust steam from the IP
20		section of the ST then combines with steam from the HRSG LP section to enter the LP $$
21		section of the ST, exiting through the last set of turbine blades into the condenser.

1	Q.	PLEASE PROVIDE A GENERAL DESCRIPTION OF THE BCC LP ST
2		SECTION.
3	А.	The BCC LP ST section is a tandem flow ST with steam entering the middle
4		and flowing in opposite directions through mirror image LP sections. Each side of the
5		LP ST has four sets of blades, the last of which is the 40" L0 blade set that has
6		experienced the failures.
7		
8	IV.	OPERATING DESIGN OF BCC STEAM TURBINE
9	Q.	WHAT FACTORS ARE CRITICAL TO THE DESIGN OF A STEAM
10		TURBINE?
11	А.	Steam turbine design begins with the end users desired gross MW output and
12		the steam characteristics available to power the steam turbine. The design conditions
13		considered during the initial ST design include maximum steam pressure, temperature
14		and flow rate. From this, the ST manufacturer will work with the project thermal design
15		engineer to develop a set of HP, IP, and LP steam conditions that maximize ST
16		efficiency, minimize water content of the steam within the ST, and are capable of
17		allowing the ST to produce the desired MW output. There are a myriad of HP, IP, and
18		LP steam conditions for steam turbine design that allow production of a given MW.
18 19		LP steam conditions for steam turbine design that allow production of a given MW. Experience in plant and ST design, manufacturer-available ST packages, and

11

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WAS THIS THE APPROACH USED FOR THE BCC PROJECT? 0. No. Progress Energy, the original owner of BCC, purchased a "secondary 2 A. market" steam turbine that was designed and manufactured for a Tenaska combined 3 cycle project. However, the ST was never installed for that project and was instead 5 placed in storage by MHPS. The steam turbine was already constructed-presumably to meet the needs of Tenaska-so the design parameters were already fixed when it 6 was purchased by Progress Energy, DEF's predecessor. Therefore, as DEF knew or 7 should have known, intractable design limitations were incorporated into the as-built 8 9 ST. Discussions with MHPS apparently led Progress Energy, now DEF (references to 10 DEF through the remainder of this testimony interchangeably refers to Progress Energy 11 and Duke Energy Florida), to determine this steam turbine generator package would be 12 suitable for use in the BCC project. These discussions led to a project design in which 13 the ST maximum gross output was to be 420 MW. None of the analyses of ST operations performed by MHPS ever showed the ST package producing more than 420 14 15 MW. 16 WHY IS IT IMPORTANT THAT THE ST PACKAGE DESIGN ANALYSES 17 0. ONLY INDICATED A MAXIMUM OUTPUT OF 420 MW WHEN THE 18 19 GENERATOR WAS CAPABLE OF POTENTIALLY PRODUCING 465 MW. 20 Steam turbine internal components are subjected to steam conditions which А. 21 cause significant stress, erosion, and other dynamics which the manufacturer has 22 incorporated into the component design. Gross MW output is directly proportional to

provide that horsepower on a basis that is reliable and does not induce failure. 1 2 Otherwise, increasing the ST horsepower output can only be accomplished by placing higher stresses and dynamic forces on the ST components. In most turbines, one of the 3 4 critical components subject to very high stress and steam induced dynamics are the 5 turbine blades. The turbine blades are connected to the turbine shaft, which spins at 3,600 RPM in the BCC ST. The steam impinging on these blades exerts pressure and 6 7 dynamic forces that are not uniform. This lack of uniformity may be caused by the 8 spinning turbine blades, the way the steam is channeled to impinge on the blades, the 9 changes in steam characteristics between sets of blades, and the formation of water in 10 the steam as pressure and temperature drop. In addition, a ST does not always run at 11 full load and steam does not always have the same characteristics throughout the 12 operating load range as it does at full load. The ST manufacturer understands and takes 13 these steam dynamics into consideration and designs the ST blades to function without 14 failure over the design life of the blade, presuming the ST is operated within the 15 manufacturer's design conditions. It should also be understood that it is standard within 16 the industry for the manufacturer to include a level of design margin into the ST 17 components. Some of these design margins are mandated by code; others are based on 18 experience with operation and manufacturing processes and the expectation that higher 19 stresses likely will be placed on components when the power plant experiences an upset 20 such as a plant trip. This is why a ST package designed for 420 MW may not be able 21 to operate above the horsepower level needed to produce 420 MW without inducing 22 component failure. Component failure may not occur or be discovered right away, but

the horsepower the ST produces. As with a car engine, parts in the ST are designed to

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1		the component life will be reduced and the increased likelihood of failure is introduced
2		into the ST at especially susceptible places-like the L0 blades.
3		
4	v.	OPERATION OF BCC ST UP THROUGH FEBRUARY 2012
5	Q.	PLEASE DESCRIBE THE TYPICAL STARTUP AND TESTING
6		PROCEDURES FOR A POWER PROJECT SUCH AS BCC.
7	А.	In early 2009, the BCC project began operation prior to the commercial
8		operation date. Typical of a new power generation project, the plant proceeded through
9		various systems testing and progressed through various phases of testing of the CTs
10		and ST, including raising the ST MW generation up to designed output of 420 MW.
11		Also, during the testing and startup period or shortly after the project is declared to be
12		in commercial operation, various components will undergo testing to see if the
13		equipment meets specific guaranteed operating conditions contained in the equipment
14		contracts. Steam turbines go through a rigorous testing in accordance with American
15		Society of Mechanical Engineers ("ASME") test procedures to determine if the ST
16		meets the contractual performance guarantees. Based upon information provided by
17		DEF, the BCC ST was subjected to the ASME test procedures, and MHPS reported on
18		the June 16, 2009, test that the BCC ST met its guaranteed gross output of 420 MW.
19		
20	Q.	HOW WAS THE BCC ST OPERATED IN 2009 AFTER THE PLANT
21		ENTERED COMMERCIAL OPERATION?
22	А.	In June 2009, the BCC ST maximum output was 404.3 MW in accordance with
23		data provided by DEF, as shown in Exhibit No (RAP-5). In July 2009 DEF

14

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		329
1	Q.	HOW WAS THE BCC ST OPERATED IN 2012 UP THROUGH THE
2		FEBRUARY 2012 OUTAGE?
3	А.	The ST was operated close to 450 MW in both January and February 2012,
4		accumulating 77.9 hours of operation over 420 MW. Total operation in excess of ST $$
5		design conditions since plant commercial operation in 2009 through February 2012,
6		was almost 2,973 hours out of 21,734 hours of operation (from DEF Exhibit No. \JS -
7		1 (Docket No. 20180001-EI)). Over 13% of the operating hours in that initial period of
8		operating the newly completed BCC plant were in excess of design conditions.
9		
10	Q.	DID DEF INFORM MHPS IT INTENDED TO OPERATE THE BCC ST ON A
11		REGULAR BASIS IN EXCESS OF 420 MW?
12	А.	In response to OPC Fourth Set of Interrogatories, Interrogatory 21, DEF states;
13		"DEF did not correspond or discuss operating the steam turbine at 450 MW." As of the
14		filing of this testimony, DEF has not produced any documentation from MHPS that
15		shows MHPS acknowledging or agreeing that the BCC ST could be operated in excess
16		of 420 MW. In his 2018 testimony, DEF witness Jeffery Swartz includes Exhibit No.
17		(JS-1) (Docket No. 20180001-E1) which contains a Table A, titled "Bartow L-0
18		Events Summary" which breaks down the history of the BCC ST operation into five
19		(5) periods. In the first column, labeled "Period 1" under the row titled "Key Notes
20		from Period," the following note is provided:
21 22 23		At the start of this period, MHPS approved 4X1 (unfired) operations at 392 MW output, as well as 3X1 (duct fired) operation at 420 MW, supported by MHPS-provided heat balance documentation.

16

1		operated the ST for approximately 23.3 hours in excess of 420 MW design conditions
2		and in August 2009 for approximately 27.2 hours, reaching a maximum output of 429.2
3		MW. DEF operated the ST in excess of 420 MW for approximately 374.2 hours in
4		September and October of 2009, with peak generation of approximately 440 MW. In
5		November 2009, DEF operated the ST at maximum output of 440.2 MW. In summary,
6		for calendar year 2009, DEF operated the BCC ST for approximately 433.2 hours in
7		excess of 420 MW, peaking at 4.8% over design conditions.
8		
9	Q.	HOW DID DEF OPERATE THE BCC ST DURING 2010?
10	А.	Compared to 2009, DEF significantly increased the BCC ST output in January
11		2010 with the unit producing a maximum output of 446 MW, 6.3% higher than design
12		conditions. DEF operated the BCC ST in excess of 420 MW during each month in 2010
13		through November, with a maximum output of almost 455 MW, over 8% higher than
14		design conditions. In total, the BCC ST was operated approximately 940.3 hours in
15		excess of 420 MW in 2010.
16		
17	Q.	HOW DID DEF OPERATE THE BCC ST DURING 2011?
18	А.	DEF operated BCC ST in excess of 420 MW during every month except
19		February during 2011, accumulating 1,521.2 hours of operation over 420 MW. Peak
20		operation of the BCC ST appears to have been in April 2011, with the ST producing
21		457.6 MW, 9% in excess of design conditions. In total, the ST was operated in excess

22 of 440 MW for over 1,160 hours in 2011.

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1		This is further indication that MHPS was unaware of DEF's intent to operate—
2		or DEF's operation of-the BCC ST in excess of 420 MW. DEF has failed to provide
3		documentation as of the time of my testimony that MHPS provided DEF
4		documentation indicating that the ST could operate in excess of 420 MW.
5		
6	0.	WHY DID DEF STATE IT FELT THERE WERE NO ISSUES WITH
7		OPERATION OF THE BCC ST IN EXCESS OF 420 MW?
8	А.	MHPS provided DEF with operating conditions that specified operating
9		parameters for the ST. These operating parameters included a variety of conditions,
10		including HP and IP ST section inlet pressure and temperature conditions and
11		condenser design conditions. After DEF performed a review in 2017-2018 of its initial
12		operation of the BCC ST, DEF was of the opinion that, if steam conditions to the ST
13		were within the HP. IP. condenser pressure, and temperature operating parameters.
14		output of the BCC ST could be increased until these parameters were reached. DEF has
15		provided no contemporaneous documentation from the period prior to the February
16		2012 outage of DEF's operating the newly installed BCC that MHPS concurred in
17		DEF's retrospective claim. The result of DEF's decision was that it raised the
18		horsenower output of the ST such that it was producing over 450 MW, which is 9%
19		higher than MHPS design conditions
20		
21	0	WHAT HAPPENED IN FEBRUARY 2012 AT RCC?
22	х• А.	DEF scheduled a planned outage for valve work and inspection of the LP ST
23		blades. During the inspection of the L0 blades, damage was found on five of the L0

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	blades located on the generator end of the LP ST. The L0 blades are the last row of
	blades the steam passes through prior to entering the condenser and are the longest
	blades in the ST at 40".
Q.	WERE THERE SUBSEQUENT BLADE FAILURES AFTER FEBRUARY
	2012?
А.	Yes, as shown in DEF's 2018 Exhibit No(JS-1), there were subsequent
	blade failures, including failures of MHPS redesigned blades. In February 2017, BCC
	experienced an outage due to L0 blade failures, and DEF decided to install a "pressure
	plate" to replace the L0 blades until a solution was found to the blade failures. A
	pressure plate is a disk with engineered holes to reduce the steam energy, allowing it
	to decrease in pressure to condenser pressure. The pressure plate does not convert any
	of the steam force into turbine horsepower and results in a loss of turbine horsepower.
	This resulted in the BCC ST maximum output being limited to only 380 MW. This, in
	turn, is what caused a derate of the ST from 420MW to 380MW. This derate was a
	natural consequence of the cascading series of blade failures precipitated by DEF's
	operation of the ST in Period 1.
VI.	EVALUATION OF BCC STEAM TURBINE BLADE FAILURES
Q.	HOW MANY TIMES DID DEF DISCOVER PROBLEMS WITH THE BCC ST?
А.	DEF found damage to L0 blades on three other occasions after the initial blade
	damage was discovered in February 2012. As alluded to above, DEF separated the ST
	operating history into 6 periods. Period 1 starts with commercial operation and extends
	Q. A. VL Q. A.

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1		Since all the damaged blades in Period 1 were on the generator end of the ST,
2		the L0 blades were replaced only on that end of the ST with Type 1 blades. MHPS
3		informed DEF not to operate the ST above 420 MW and limited IP section exhaust
4		pressure to 118 psig. During Period 2, DEF only exceeded the 420 MW limit for 1.7
5		hours. Average maximum monthly load was only 396 MW during Period 2. The ST
6		was removed from service in September 2014 to install the Type 2 blades.
7		
8	Q.	WHAT WAS THE CONDITION OF THE L0 40" BLADES AT THE END OF
9		PERIOD 2?
10	А.	The Type 1 L0 40" blades used during Period 2 did not experience any broken
11		snubbers or z-locks. According to DEF documents, no significant damage was found.
12		
13	Q.	BASED UPON THE VARIOUS DOCUMENTS PROVIDED BY DEF, WHAT
14		WAS THE CAUSE OF THE L0 40" BLADE FAILURES UP UNTIL THE END
15		OF PERIOD 2 (NOVEMBER 2014)?
16	А.	The cause of the 40" L0 blade failures in the BCC LP ST during period 1 was
17		the result of DEF operating the unit in excess of the 420 MW design output. MHPS has
18		stated in multiple documents that operation of the ST, at horsepower levels sufficient
19		to generate greater than 420 MW resulted in overloading of the L0 blades. After over
20		2,600 (or up to 2,973) hours of operation in excess of 420 MW over a 63-month period,
21		the only type of failure that had manifested itself up to that point was the snubbers on
22		five blades of the generator end of the ST (See Exhibit No(JS-1). MHPS estimates
23		the loading on the L0 blade at BCC ranged from 15,000 lb/FT ² -h to 17,000 lb/FT ² -h

1		until the problems were found during the February 2012 outage. Period 2 began after
2		the February 2012 outage and extends until November 2014 when new L0 blades (Type
3		2 blades) were installed. Period 3 begins at the end of the 2014 outage and lasts until
4		April 2016 when problems were found with the Type 2 blades. Period 4 begins with
5		the installation of the second redesigned L0 blades (Type 3 blades) in June 2016 and
6		ends when blade failures were found in October 2016. Period 5 starts when DEF
7		decided to reinstall the original design Type 1 blades in December 2016 and ends in
8		January 2017 when the component called the burst diaphragm was damaged by parts
9		from these L0 blades. Period 6 began in April 2017 after the L0 blades were replaced
10		by a pressure plate and is expected to continue until the end of September of this year.
11		
11 12	Q.	WHAT ACTION DID DEF TAKE AFTER THE BLADE DAMAGE WAS
11 12 13	Q.	WHAT ACTION DID DEF TAKE AFTER THE BLADE DAMAGE WAS DISCOVERED IN FEBRUARY 2012?
11 12 13 14	Q. A.	WHAT ACTION DID DEF TAKE AFTER THE BLADE DAMAGE WAS DISCOVERED IN FEBRUARY 2012? Upon finding the 2012 blade failures, DEF engaged MHPS and several other
11 12 13 14 15	Q. A.	WHAT ACTION DID DEF TAKE AFTER THE BLADE DAMAGE WAS DISCOVERED IN FEBRUARY 2012? Upon finding the 2012 blade failures, DEF engaged MHPS and several other entities to determine the cause of the blade failures. MHPS conducted a Root Cause
11 12 13 14 15 16	Q. A.	WHAT ACTION DID DEF TAKE AFTER THE BLADE DAMAGE WAS DISCOVERED IN FEBRUARY 2012? Upon finding the 2012 blade failures, DEF engaged MHPS and several other entities to determine the cause of the blade failures. MHPS conducted a Root Cause Analysis ("RCA") of the failures. MHPS first stated in a report dated September 18,
11 12 13 14 15 16 17	Q. A.	WHAT ACTION DID DEF TAKE AFTER THE BLADE DAMAGE WAS DISCOVERED IN FEBRUARY 2012? Upon finding the 2012 blade failures, DEF engaged MHPS and several other entities to determine the cause of the blade failures. MHPS conducted a Root Cause Analysis ("RCA") of the failures. MHPS first stated in a report dated September 18, 2013, that "Mitsubishi estimated the cause of the [blade] cracking was overloading the
11 12 13 14 15 16 17 18	Q. A.	WHAT ACTION DID DEF TAKE AFTER THE BLADE DAMAGE WAS DISCOVERED IN FEBRUARY 2012? Upon finding the 2012 blade failures, DEF engaged MHPS and several other entities to determine the cause of the blade failures. MHPS conducted a Root Cause Analysis ("RCA") of the failures. MHPS first stated in a report dated September 18, 2013, that "Mitsubishi estimated the cause of the [blade] cracking was overloading the LP section based upon 450 MW which is over the design point of 420 MW." In this
11 12 13 14 15 16 17 18 19	Q. A.	WHAT ACTION DID DEF TAKE AFTER THE BLADE DAMAGE WAS DISCOVERED IN FEBRUARY 2012? Upon finding the 2012 blade failures, DEF engaged MHPS and several other entities to determine the cause of the blade failures. MHPS conducted a Root Cause Analysis ("RCA") of the failures. MHPS first stated in a report dated September 18, 2013, that "Mitsubishi estimated the cause of the [blade] cracking was overloading the LP section based upon 450 MW which is over the design point of 420 MW." In this report, MHPS estimates the ST was operated in excess of 420 MW for 2,600 hours,
11 12 13 14 15 16 17 18 19 20	Q. A.	WHAT ACTION DID DEF TAKE AFTER THE BLADE DAMAGE WAS DISCOVERED IN FEBRUARY 2012? Upon finding the 2012 blade failures, DEF engaged MHPS and several other entities to determine the cause of the blade failures. MHPS conducted a Root Cause Analysis ("RCA") of the failures. MHPS first stated in a report dated September 18, 2013, that "Mitsubishi estimated the cause of the [blade] cracking was overloading the LP section based upon 450 MW which is over the design point of 420 MW." In this report, MHPS estimates the ST was operated in excess of 420 MW for 2,600 hours, over 15% of the operating hours. This is consistent with, but still understates, the 2,973

___(RAP - 5).

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1		(Exhibit No(RAP-6), at 7, 19, and 20). Notably, the Period 1 snubber failures in
2		the L0 blades experienced at BCC had not been experienced at other MHPS plants
3		equipped with 40" L0 blades (See statements by MHPS in Exhibit No(RAP-7), at
4		7 and Exhibit No(RAP-8), at 8). Likewise, the range of operation and significantly
5		higher loadings imparted on the ST by DEF operating the ST in excess of design
6		conditions, was unique among the MHPS ST units. Operation of the BCC ST to
7		produce an output appreciably in excess of $420\mathrm{MW}$ resulted in forces on the L0 blades
8		that were 13% to 25% higher than the other MHPS units of similar design. Thus, it is
9		obvious that DEF's operation of the BCC ST above the 420 MW design was a material
10		cause of the failure of the L0 blades.
11		
11		
12	Q.	WHAT WOULD ST OPERATIONAL OUTCOME HAVE BEEN IF DEF
11 12 13	Q.	WHAT WOULD ST OPERATIONAL OUTCOME HAVE BEEN IF DEF OPERATED THE BCC ST AT OR BELOW THE ORIGINAL DESIGN
11 12 13 14	Q.	WHAT WOULD ST OPERATIONAL OUTCOME HAVE BEEN IF DEF OPERATED THE BCC ST AT OR BELOW THE ORIGINAL DESIGN CONDITIONS DURING PERIODS 1 & 2?
11 12 13 14 15	Q. A.	WHAT WOULD ST OPERATIONAL OUTCOME HAVE BEEN IF DEF OPERATED THE BCC ST AT OR BELOW THE ORIGINAL DESIGN CONDITIONS DURING PERIODS 1 & 2? Based upon the information provided in various documents and the RCA
11 12 13 14 15 16	Q. A.	WHAT WOULD ST OPERATIONAL OUTCOME HAVE BEEN IF DEF OPERATED THE BCC ST AT OR BELOW THE ORIGINAL DESIGN CONDITIONS DURING PERIODS 1 & 2? Based upon the information provided in various documents and the RCA conducted by MHPS, DEF has not demonstrated that the original L0 blades would have
11 12 13 14 15 16 17	Q. A.	WHAT WOULD ST OPERATIONAL OUTCOME HAVE BEEN IF DEF OPERATED THE BCC ST AT OR BELOW THE ORIGINAL DESIGN CONDITIONS DURING PERIODS 1 & 2? Based upon the information provided in various documents and the RCA conducted by MHPS, DEF has not demonstrated that the original L0 blades would have experienced even minimal degradation over the design life of these blades if it had
11 12 13 14 15 16 17 18	Q.	WHAT WOULD ST OPERATIONAL OUTCOME HAVE BEEN IF DEF OPERATED THE BCC ST AT OR BELOW THE ORIGINAL DESIGN CONDITIONS DURING PERIODS 1 & 2? Based upon the information provided in various documents and the RCA conducted by MHPS, DEF has not demonstrated that the original L0 blades would have experienced even minimal degradation over the design life of these blades if it had operated the BCC ST at or below the original design output of 420 MW. The Type 1
11 12 13 14 15 16 17 18 19	Q.	WHAT WOULD ST OPERATIONAL OUTCOME HAVE BEEN IF DEF OPERATED THE BCC ST AT OR BELOW THE ORIGINAL DESIGN CONDITIONS DURING PERIODS 1 & 2? Based upon the information provided in various documents and the RCA conducted by MHPS, DEF has not demonstrated that the original L0 blades would have experienced even minimal degradation over the design life of these blades if it had operated the BCC ST at or below the original design output of 420 MW. The Type 1 blades lasted for a period of only about five years after being subjected to stresses
112 133 14 15 16 17 18 19 20	Q .	WHAT WOULD ST OPERATIONAL OUTCOME HAVE BEEN IF DEF OPERATED THE BCC ST AT OR BELOW THE ORIGINAL DESIGN CONDITIONS DURING PERIODS 1 & 2? Based upon the information provided in various documents and the RCA conducted by MHPS, DEF has not demonstrated that the original L0 blades would have experienced even minimal degradation over the design life of these blades if it had operated the BCC ST at or below the original design output of 420 MW. The Type 1 blades lasted for a period of only about five years after being subjected to stresses significantly beyond original design. The impact of stress on steam turbine blades is a
112 13 14 15 16 17 18 19 20 21	Q.	WHAT WOULD ST OPERATIONAL OUTCOME HAVE BEEN IF DEF OPERATED THE BCC ST AT OR BELOW THE ORIGINAL DESIGN CONDITIONS DURING PERIODS 1 & 2? Based upon the information provided in various documents and the RCA conducted by MHPS, DEF has not demonstrated that the original L0 blades would have experienced even minimal degradation over the design life of these blades if it had operated the BCC ST at or below the original design output of 420 MW. The Type 1 blades lasted for a period of only about five years after being subjected to stresses significantly beyond original design. The impact of stress on steam turbine blades is a cumulative effect and when a blade as long as the L0 blades is subjected to much higher
112 13 14 15 16 17 18 19 20 21 22	Q.	WHAT WOULD ST OPERATIONAL OUTCOME HAVE BEEN IF DEF OPERATED THE BCC ST AT OR BELOW THE ORIGINAL DESIGN CONDITIONS DURING PERIODS 1 & 2? Based upon the information provided in various documents and the RCA conducted by MHPS, DEF has not demonstrated that the original L0 blades would have experienced even minimal degradation over the design life of these blades if it had operated the BCC ST at or below the original design output of 420 MW. The Type 1 blades lasted for a period of only about five years after being subjected to stresses significantly beyond original design. The impact of stress on steam turbine blades is a cumulative effect and when a blade as long as the L0 blades is subjected to much higher than design forces, the impact is not linear.

1	VII.	EVALUATION OF REPLACEMENT POWER COSTS ASSOCIATED WITH
2		BCC GENERATION LOSSES
3	Q.	HAS DEF DEMONSTRATED THAT ITS RATEPAYERS SHOULD BE
4		RESPONSIBLE FOR THE REPLACEMENT POWER COSTS
5		ASSOCIATED WITH OUTAGES AND REDUCED PRODUCTION FROM
6		THE BCC PLANT AS A RESULT OF THE LP ST L0 BLADE FAILURES?
7	А.	No, DEF has failed to demonstrate that it should not be responsible for
8		the costs resulting from its operation of the ST. As presented earlier in my
9		testimony, the failures of the original L0 blades are the result of DEF operating
10		the ST above the 420 MW design condition. All subsequent outages and derates
11		since 2012 have their origin in the operation of the ST in excess of 420 MW. DEF
12		has failed to demonstrate that had it operated the ST within original design
13		conditions the original blades would not still be in operation. If the original L0
14		blades had not failed due to DEF's operation of the BCC ST beyond the 420 $\rm MW$
15		design, DEF would not have installed the Type 2 and Type 3 blades, nor
16		experienced the associated outages. In addition, if the original L0 blades had not
17		failed due to DEF's operation during Period 1, the pressure plate would not be
18		currently installed, and the ST would be capable of producing its designed output
19		of 420 MW. DEF knew or should have known the designed generation capability
20		of the ST was only 420 MW from the thermal analysis performed prior to
21		operation and from the contract documents for the MHPS ST. These documents
22		show the unit was designed for output of 420 MW. If DEF had discussed operation
23		of the ST above 420 MW with MHPS prior to the initial operation at higher load,

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1	А.	BCC is one of DEF's most efficient and lower-cost operating units. Once
2		it is scheduled to produce power at full load, approximately 1,140 MW, any
3		additional generation needed to meet DEF's load will be more costly. As load
4		increases, so does the cost of generation up to the point the daily peak load occurs.
5		Since BCC is unable to produce the full 1,140 MW, the highest cost power in
6		every hour should be used to calculate replacement power costs. Thus, the
7		replacement power costs for the 40 MW derate of the BCC ST would be the cost
8		of DEF's highest 40 MW block of power supply. This is the correct method of
9		replacement power cost calculation for this derate because, if the ST were able to
10		produce the additional 40 MW, DEF would not be paying the highest cost $40 \mathrm{MW}$
11		block in that hour. In response to OPC Interrogatory 35, DEF provided the highest
12		cost power for each hour during the period of April 1, 2017 to August 31, 2019.
13		If DEF's highest hourly power cost was higher than the generation cost of BCC,
14		then BCC should be operating at maximum output during that hour. Using the
15		hourly BCC heat rate and daily natural gas prices provided by DEF in response to
16		OPC Interrogatory 44, the hourly generation cost for BCC was calculated. If the
17		hourly BCC generation cost was lower than the highest hourly power price for
18		DEF, then it is assumed DEF would be running at full load. The replacement
19		power cost is equal to the highest hourly price minus BCC's generation cost times
20		40 MW.
21		
22	Q.	HAS DEF PROVIDED AN ESTIMATE OF THE REPLACEMENT
23		POWER COSTS FOR THE BCC OPERATIONAL PERIOD AFTER

24

1		the problems encountered with the ST at BCC likely would have been avoided.
2		As of the filing of my testimony, DEF has not provided documentation that such
3		discussion actually occurred.
4		
5	Q.	HOW DOES THE REPLACEMENT OF THE LO BLADES WITH THE
6		PRESSURE PLATE IN THE BCC LOW PRESSURE TURBINE AFFECT
7		THE ST OPERATION?
8	А.	The replacement of the ST L0 blades in the LP with the pressure plate
9		results in a derate of the ST to 380 MW, according to DEF. This is a derate of 40
10		MW from the 420 MW original design condition.
11		
12	Q.	HOW DOES A DERATE OF THE BCC ST TO 380 MW AFFECT THE
12 13	Q.	HOW DOES A DERATE OF THE BCC ST TO 380 MW AFFECT THE SUPPLY OF POWER TO DEF CUSTOMERS?
12 13 14	Q. A.	HOW DOES A DERATE OF THE BCC ST TO 380 MW AFFECT THE SUPPLY OF POWER TO DEF CUSTOMERS? The reduction in BCC capability to produce full output has caused an
12 13 14 15	Q. A.	HOW DOES A DERATE OF THE BCC ST TO 380 MW AFFECT THE SUPPLY OF POWER TO DEF CUSTOMERS? The reduction in BCC capability to produce full output has caused an increase in power costs for DEF. Utilities schedule plant operation with the most
12 13 14 15 16	Q. A.	HOW DOES A DERATE OF THE BCC ST TO 380 MW AFFECT THE SUPPLY OF POWER TO DEF CUSTOMERS? The reduction in BCC capability to produce full output has caused an increase in power costs for DEF. Utilities schedule plant operation with the most economical plants dispatched first. If a plant is derated, another plant with higher
12 13 14 15 16 17	Q.	HOW DOES A DERATE OF THE BCC ST TO 380 MW AFFECT THE SUPPLY OF POWER TO DEF CUSTOMERS? The reduction in BCC capability to produce full output has caused an increase in power costs for DEF. Utilities schedule plant operation with the most economical plants dispatched first. If a plant is derated, another plant with higher power costs is used to replace the lost MWs, subjecting DEF's ratepayers to
12 13 14 15 16 17 18	Q.	HOW DOES A DERATE OF THE BCC ST TO 380 MW AFFECT THE SUPPLY OF POWER TO DEF CUSTOMERS? The reduction in BCC capability to produce full output has caused an increase in power costs for DEF. Utilities schedule plant operation with the most economical plants dispatched first. If a plant is derated, another plant with higher power costs is used to replace the lost MWs, subjecting DEF's ratepayers to higher power costs.
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12 13 14 15 16 17 18 19 20	Q. A. Q.	HOW DOES A DERATE OF THE BCC ST TO 380 MW AFFECT THE SUPPLY OF POWER TO DEF CUSTOMERS? The reduction in BCC capability to produce full output has caused an increase in power costs for DEF. Utilities schedule plant operation with the most economical plants dispatched first. If a plant is derated, another plant with higher power costs is used to replace the lost MWs, subjecting DEF's ratepayers to higher power costs. HOW SHOULD THE COST OF REPLACEMENT POWER FOR THE
12 13 14 15 16 17 18 19 20 21	Q. A. Q.	HOW DOES A DERATE OF THE BCC ST TO 380 MW AFFECT THE SUPPLY OF POWER TO DEF CUSTOMERS? The reduction in BCC capability to produce full output has caused an increase in power costs for DEF. Utilities schedule plant operation with the most economical plants dispatched first. If a plant is derated, another plant with higher power costs is used to replace the lost MWs, subjecting DEF's ratepayers to higher power costs. HOW SHOULD THE COST OF REPLACEMENT POWER FOR THE MWH BCC IS UNABLE TO PRODUCE DUE TO THE ST BEING

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1		INSTALLATION OF THE PRESSURE PLATE IN THE LP SECTION OF
2		THE ST?
3	А.	Yes, DEF provided in response to OPC Interrogatories 33 and 44, an
4		estimate of the replacement power costs due to the installation of the pressure
5		plate on BCC ST for the period April 10, 2017, through August 31, 2019. DEF's
6		calculation of the replacement power costs include an estimate of the portion of
7		the 40 MW derate that would have been generated if the L0 blades had been
8		installed, for each hour of the period, considered to be the hourly replacement
9		power. The estimated replacement power in DEF's calculation is not consistent
10		with how plants are dispatched based upon power costs. For example, DEF's
11		calculation shows ZERO replacement power on June 1, 2017, between the hours
12		of 11:00–22:00 despite the replacement power costs averaging $33.55/MWh,$
13		reaching a peak of \$46.62/MWh, and despite the cost for BCC to generate power
14		during this time period being only $22.68/MWh$. The replacement power price
15		over this period was more than 10.00 /MWh higher than the BCC operating costs;
16		yet DEF did not include any replacement power costs for this period in its
17		replacement power cost calculation. If the BCC ST had been available for full
18		load during this period, the additional 40 MW would have reduced power costs
19		by $$5,579$. Review of the analysis by DEF finds many periods like this in which
20		the replacement power cost was higher than BCC's cost of generation and that
21		DEF did not include any replacement power costs due to the installation of the
22		pressure plate on BCC ST, in the total replacement power cost calculation. As
23		such, DEF's replacement power costs are not a realistic representation of the

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___(RAP-9), lines 22-29.

1		replacement power costs DEF incurred as a result of the BCC ST 40 MW derate.
2		DEF has clearly failed to demonstrate that its method of calculating derate related
3		replacement power costs is reasonable.
4		
5	Q.	WHAT TIME PERIOD IS COVERED BY YOUR ANALYSIS OF
6		REPLACEMENT POWER COSTS?
7	А.	My estimate of replacement power costs for BCC covers three time
8		periods: 2017, including the 2017 outage of the BCC ST; 2018, including the
9		outage to repair the LP casing cracks due to the operation of the ST with the
10		pressure plate; and the 2019 forecasted replacement power costs for the lower ST
11		output associated with operation of the ST with the pressure plate, up to the fall
12		outage planned to begin September 28, 2019.
13		
14	Q.	HOW WERE THE REPLACEMENT POWER COSTS DETERMINED
15		FOR THE BCC OUTAGE THAT OCCURRED BETWEEN FEBRUARY 9
16		AND APRIL 8, 2017 ("BCC 2017 Outage")?
17	А.	In Docket 20180001-EI, in Document No. 07025-2018, DEF witness Mr.
18		Christopher A. Mendez provided testimony on page 5 for the replacement power
19		costs incurred during the BCC 2017 Outage. Based upon his testimony, the
20		replacement power costs were \$11.1 Million. I do not take issue with this number,
21		nor have I run production cost modeling analyses to verify it.

WHAT WERE THE REPLACEMENT POWER COSTS DUE TO BCC 1 Q. OPERATING WITH THE PRESSURE PLATE FOR THE REMAINDER 2 OF 2017? 3 4 А. The replacement power costs for the BCC 40 MW derate in 2017 after s1,675,561 installation of the pressure plate in the LP section of the ST was \$2,005,536. This 150,400 Court 5 **Reporter:** DŔ represents the costs for 162,040 MWh of replacement generation. The calculation 6 7 of these power costs are provided in Exhibit No. ___(RAP-9), lines 1-9. 8 9 Q. WHAT WERE THE REPLACEMENT POWER COSTS DUE TO BCC **OPERATING WITH THE PRESSURE PLATE FOR 2018?** 10 The replacement power costs for the BCC 40 MW derate in 2018 were \$2,215,648 11 Α. Court **\$2,215,648 199,680 \$2,545,049**. This represents the costs for 213,280 MWh of replacement Reporter: DK 12 generation. The calculation of these power costs are provided in Exhibit No. 13 ___(RAP-9), lines 10-21. 14 15 Q. WHAT WERE THE REPLACEMENT POWER COSTS DUE TO BCC 16 **OPERATING WITH THE PRESSURE PLATE FOR 2019, THROUGH** 17 AUGUST 31? 18 The replacement power costs for the BCC 40 MW derate in 2019 was Court \$1,125,573 125,800 Report 19 Α. \$1,125,573 125,800 Reporter: \$1,189,552. This represents the costs for 128,480 MWh of replacement DK 20

generation. The calculation of these power costs are provided in Exhibit No.

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	_			
1	Q.	WHAT IS THE TOTAL REPLACEMENT POWER COSTS SINCE DEF		
2		REPLACED THE LP ST LO BLADES WITH THE PRESSURE PLATE?		
3	А.	The total replacement power costs for the 2017 outage and the BCC ST \$16,116,781	Court	
4		derate for years 2017, 2018 and 2019 is \$16.84 million.	DK	
5				
6	Q.	DOES THAT CONCLUDE YOUR TESTIMONY?		
7	А.	Yes, it does. However, I reserve the right to file supplemental testimony		
8		to the extent any material new information is subsequently filed that was		
9		requested and was available, but was not provided prior to my testimony filing.		
		28		
		Disc Tw	o 000228	1 F

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1	THE COURT: And I guess, did we need to move a
2	revised Exhibit 9?
3	MR. DAVID: Yes.
4	MR. REHWINKEL: Your Honor, staff has
5	requested, and I think correctly so, that we
6	identify an exhibit, and we would just give it the
7	next exhibit number, and this would be his revised
8	RAP-9, which would be whatever the next number is.
9	THE COURT: 118.
10	MS. BROWNLESS: 117.
11	THE COURT: Okay, 117. We will mark it as
12	117, and without objection show it admitted.
13	(Whereupon, Exhibit No. 117 was marked for
14	identification and received into evidence.)
15	MR. DAVID: And, Your Honor, just to be clear,
16	when I moved the testimony in, that that includes
17	the updates he made.
18	THE COURT: He has got a notice on the record.
19	Yeah, we got that.
20	And how do we handle, Duke leads it off?
21	MR. BERNIER: Yep.
22	THE COURT: Okay.
23	EXAMINATION
24	BY MR. BERNIER:
25	Q Good morning, Mr. Polich.
114 W. Premie	. 5th Avenue, Tallahassee, FL 32303 premier-reporting.com r Reporting (850) 894-0828 Reported by: Debbie Krick

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1 A Good morning. 1 panel.	
2 Q Good to see you again. Just a couple of 2 Q But any exper	rience operating the steam
3 preliminary questions. 3 turbine?	
4 You do not have any experience designing steam 4 A No.	
5 turbines, is that correct? 5 Q You don't have	ve any specific operational or
6 A I have experience I let me rephrase 6 design experience with	a Mitsubishi steam turbine in
7 this. My experience with design of steam turbines 7 particular, is that cor	rrect?
8 involves the thermal cycles and how they match up with 8 A I have never	operated a Mitsubishi steam
9 the existing steam turbine that I was provided. 9 turbine.	
10 Q Thank you. 10 Q You have never	er provided expert testimony
11 But when it comes to physically designing the 11 regarding the design of	steam turbines, is that correct?
12 steam turbine, you don't have any experience doing that? 12 A I have not p:	ovided expert testimony on the
13 A Not direct. 13 design of steam turbing	25.
14 Q Thank you. 14 Q And you have	never provided expert testimony
15 Do you have any experience designing you do 15 regarding the operation	of steam turbines, is that
16 not have any experience designing steam turbine blades.	· · · · · · · · · · · · · · · · · · ·
17 is that correct?	ect.
18 A That is correct.	testified earlier during your
19 O Okay. You do not have any direct operational 19 summary that you review	ved documents and testimony in
20 every state to be and any access operational and a state operation of the state operation operation of the state operation	
21 A Define what you mean by direct 21 A Yes. I did	
22 0 Have you ever you do not have any 22 0 Did you physic	cally examine any of the damaged
23 experience sitting at the control panel operating the 23 blades?	
24 steam turbine?	
25 A L have supervised these who are at the control 25 O and you did y	oct speak or correspond with
	of speak of correspond with
345	346
1 anyone from Mitsubishi as part of your testimony for 1 which you are to operate	ce the steam turbine within, and
2 preparation, is that correct? 2 for the most part, the	megawatts is dependent upon how
3 A No, I did not. 3 you operate within those	se limits.
4 Q And you would agree that the steam turbines 4 A And I will st	cill stand by that testimony that
5 should be operated within the operating parameters 5 I still contend that the	ne megawatt output has limits
6 provided by the unit's manufacturer, is that correct? 6 because it is a critical	al factor in defining how much
7 A All the operating parameters, yes. 7 horsepower a steam turk	
8 Q And you also agree that the megawatt output of 8 stressers are within the	oine is producing and what the
	pine is producing and what the nat steam turbine. And so
9 the steam turbine is largely dependent on how you 9 megawatt output is a cr	bine is producing and what the nat steam turbine. And so sitical factor in operation of the
9 the steam turbine is largely dependent on how you 9 megawatt output is a cr 10 operate the unit within those parameters? 10 steam turbine.	pine is producing and what the nat steam turbine. And so ritical factor in operation of the
9 the steam turbine is largely dependent on how you 9 megawatt output is a c: 10 operate the unit within those parameters? 10 steam turbine. 11 A I do not. 11 Q Based on info	bine is producing and what the nat steam turbine. And so fitical factor in operation of the prmation you reviewed, did Duke
9 the steam turbine is largely dependent on how you 9 megawatt output is a c: 10 operate the unit within those parameters? 10 steam turbine. 11 A I do not. 11 Q Based on info 12 Q You do not? 12 Energy operate the steam	bine is producing and what the nat steam turbine. And so ditical factor in operation of the prmation you reviewed, did Duke um turbine within the pressures
9 the steam turbine is largely dependent on how you 9 megawatt output is a c: 10 operate the unit within those parameters? 10 steam turbine. 11 A I do not. 11 Q Based on info 12 Q You do not? 12 Energy operate the steat 13 A I do not. The megawatt output is an operating 13 and temperatures provide	bine is producing and what the mat steam turbine. And so ditical factor in operation of the prmation you reviewed, did Duke um turbine within the pressures Hed by the OEM?
9 the steam turbine is largely dependent on how you 9 megawatt output is a c: 10 operate the unit within those parameters? 10 steam turbine. 11 A I do not. 11 Q Based on info 12 Q You do not? 12 Energy operate the stear 13 A I do not. The megawatt output is an operating 13 and temperatures provide 14 parameter. 14 A Based on the	bine is producing and what the mat steam turbine. And so ditical factor in operation of the cormation you reviewed, did Duke aum turbine within the pressures ded by the OEM? data that I have reviewed, yes.
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9 the steam turbine is largely dependent on how you 9 megawatt output is a c: 10 operate the unit within those parameters? 10 steam turbine. 11 A I do not. 11 Q Based on info 12 Q You do not? 12 Energy operate the stear 13 A I do not. The megawatt output is an operating 13 and temperatures provid 14 parameter. 14 A Based on the 15 Q Do you remember when I took your deposition in 15 Q And am I corr 16 October? 16 DEF's operational prode	bine is producing and what the mat steam turbine. And so ditical factor in operation of the commation you reviewed, did Duke and turbine within the pressures ded by the OEM? data that I have reviewed, yes. cect that your opinion regarding since is limited to operation
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9 the steam turbine is largely dependent on how you 9 megawatt output is a c: 10 operate the unit within those parameters? 10 steam turbine. 11 A I do not. 11 Q Based on info 12 Q You do not? 12 Energy operate the steat 13 A I do not. The megawatt output is an operating 13 and temperatures provid 14 parameter. 14 A Based on the 15 Q Do you remember when I took your deposition in 15 Q And am I corr 16 October? 16 DEF's operational prude 17 A Yes, I do. 18 exhibit? 19 was: My understanding let me ask you what your 19 A I reviewed the 20 understanding of the difference between the expected 21 Q That's correct 21 Q That's correct 22 that your contention in 23 24 that your contention in	bine is producing and what the mat steam turbine. And so fittical factor in operation of the commation you reviewed, did Duke and turbine within the pressures ded by the OEM? data that I have reviewed, yes. feet that your opinion regarding ence is limited to operation at to as Period 1 in Mr. Swartz's the operation through all the et. My question is, am I correct a your testimony is that DEF was
9 the steam turbine is largely dependent on how you 9 megawatt output is a ci 10 operate the unit within those parameters? 10 steam turbine. 11 A I do not. 11 Q Based on info 12 Q You do not? 11 Q Based on info 13 A I do not. The megawatt output is an operating 13 and temperatures provid 14 parameter. 14 A Based on the 15 Q Do you remember when I took your deposition in 15 Q And am I corr 16 DEF's operational prude 17 during what is referred 18 exhibit? 19 was: My understanding let me ask you what your 19 A I reviewed the 20 output and the operating limits? 21 Q That's corred 21 output and the operating limits are dependent upon 23 imprudent in its operation 24 mediation. The operating limits are dependent upon 24 24 and the operating limits are dependent upon	bine is producing and what the mat steam turbine. And so ditical factor in operation of the commation you reviewed, did Duke mm turbine within the pressures Hed by the OEM? data that I have reviewed, yes. creat that your opinion regarding ence is limited to operation A to as Period 1 in Mr. Swartz's the operation through all the est. My question is, am I correct a your testimony is that DEF was cion in Period 1?
9 the steam turbine is largely dependent on how you 9 megawatt output is a c: 10 operate the unit within those parameters? 10 steam turbine. 11 A I do not. 11 Q Based on infe 12 Q You do not? 11 Q Based on infe 13 A I do not. The megawatt output is an operating 13 and temperatures provid 14 parameter. 14 A Based on the 15 Q Do you remember when I took your deposition in 15 Q And am I corr 16 October? 16 DEF's operational prude 19 was: My understanding let me ask you what your 19 A I reviewed the 20 understanding of the difference between the expected 20 periods. 21 21 output and the operating limits? 21 Q That's correct 22 And you said: There actually is not a direct 22 that your contention in 23 correlation. The operating limits are dependent upon 23 imprudent in its operating 24 various condi	bine is producing and what the mat steam turbine. And so ditical factor in operation of the cormation you reviewed, did Duke and turbine within the pressures led by the OEM? data that I have reviewed, yes. creat that your opinion regarding ence is limited to operation d to as Period 1 in Mr. Swartz's the operation through all the est. My question is, am I correct a your testimony is that DEF was tion in Period 1?

		VNEL	DENTIAE			
1	operating the steam turbine in Period 2, correct?			1		At the end of Period 3, was there damage to
2	A The pause is because I am recollecting some of			2	the blade:	s?
3	the conditions during Period 2. Let me look at			3	A	Yes, there was.
4	something here.			4	Q	Okay. And those blades were also supplied by
5	Q Sure.			5	Mitsubish	i, is that correct?
6	A Based upon the information provided by Duke in			6	A	Yes.
7	which with the exception of September of 2013 in			7	Q	And you agree that DEF was prudent in
8	which there was actually some testing being done, the			8	operating	the steam turbine in Period 4, is that
9	operation of that unit at all times was below the			9	correct?	
10	420-megawatt limit, so I would say yes.		1	0	A	Yes.
11	Q And notwithstanding that DEF prudently		1	1	Q	And notwithstanding that prudent operation, at
12	operated the machine during Period 2, at the conclusion		1	2	the end -	- at the conclusion of Period 4, DEF still
13	of Period 2, DEF still found damage to the blades; is		1	3	found dama	age; is that correct?
14	that right?		1	4	A	That's true.
15	A The damage was described as minor, but, yes,		1	5	Q	And you agree that DEF was prudent when
16	there was some minor.		1	6	operating	the steam turbine in Period 5, is that
17	Q And you agree that DEF was prudent when		1	7	correct?	
18	operating the steam turbine in Period 3, correct?		1	8	A	Period 5 is an anomaly that I am not certain I
19	A To the best of my knowledge, yes.		1	9	can agree	with.
20	Q And notwithstanding that prudent operation		2	0	Q	Do you remember when I deposed you in October,
21	during Period 3, at the conclusion of Period 3, DEF		2	1	sir?	
22	still found damage to those blades; is that correct?		2	2	A	Yeah.
23	A Those were a different design blade, and so		2	3	Q	Okay. And I asked you: Was Duke prudent, in
24	they are not correlated to Periods 1 and 2.		2	4	your opin:	ion, prudent in its operation of the unit in
25	Q Thank you.		2	5	Period 5?	And your answer was: Yes.
		J				51 00000
114 W Premie	.5th Avenue, Tallahassee, FL 32303 r Reporting (850) 894-0828 Reported by: Debbie Krick		114 Pre	mier	oth Avenue, Tallar Reporting	(850) 894-0828 Reported by: Debbie Krick
114 W Premie	Sth Avenue, Tallahassee, FL 32303 (850) 894-0828 premier-reporting.com Reported by: Debbie Krick 349]	11. Pre	mier	on Avenue, Tallar Reporting	(850) 894-0828 Reported by: Debbie Krick 350 When you get only four percent or less of the
114 W Premie	Sth Avenue, Tallahassee, FL 32303 r Reporting (850) 894-0828 Reported by: Debbie Krick 349 A Yes. MR. DAVID: Your Honor, if he would show the	1 2	11. Pre	1 2	hours of	(850) 894-0828 Reported by: Debbie Krick 350 When you get only four percent or less of the the same, quote/unquote, design set of blades
114 W Premie	5th Avenue, Tallahassee, FL 32303 r Reporting (850) 894-0828 Reported by: Debbie Krick 349 A Yes. MR. DAVID: Your Honor, if he would show the witness the deposition testimony, I think it might		11. Pre	1 2 3	hours of t	(850) 894-0828 Reported by: Debbie Krick 350 When you get only four percent or less of the the same, quote/unquote, design set of blades d in the first period, then it is not a direct
114 W Premie	5th Avenue, Tallahassee, FL 32303 r Reporting (850) 894-0828 Reported by: Debbie Krick 349 A Yes. MR. DAVID: Your Honor, if he would show the witness the deposition testimony, I think it might help.		11. Pre	1 2 3 4	hours of t as you did	(850) 894-0828 Reported by: Debbie Krick 350 When you get only four percent or less of the the same, quote/unquote, design set of blades d in the first period, then it is not a direct on. And the reason why I am not certain as to
114 W Premie 1 2 3 4 5	Sth Avenue, Tallahassee, FL 32303 r Reporting (850) 894-0828 reported by: Debbie Krick 349 A Yes. MR. DAVID: Your Honor, if he would show the witness the deposition testimony, I think it might help. THE COURT: Yeah, it might be helpful.		11. Pre	1 2 3 4 5	hours of t as you dic correlatio	(850) 894-0828 Reported by: Debbie Krick 350 When you get only four percent or less of the the same, quote/unquote, design set of blades d in the first period, then it is not a direct on. And the reason why I am not certain as to uke prudently followed everything is I don't
114 W Premie 1 2 3 4 5 6	5th Avenue, Tallahassee, FL 32303 r Reporting premier-reporting.com Reported by: Debbie Knok 349 A Yes. MR. DAVID: Your Honor, if he would show the witness the deposition testimony, I think it might help. THE COURT: Yeah, it might be helpful. MR. BERNIER: I will have to give you my copy,			1 2 3 4 5 6	hours of the correlation whether Diakov all the correct of the correlation of the correla	(850) 894-0828 Reported by: Debbio Krick 350 When you get only four percent or less of the the same, quote/unquote, design set of blades d in the first period, then it is not a direct on. And the reason why I am not certain as to uke prudently followed everything is I don't the dynamics that were going on inside of the
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1	the unit imprudently in Period 5?		1	, the st	eam turbine was operated both above and below
2	A I will agree with that.	2	4	20 megaw	watts at various times?
3	Q Okay. Thank you.	3		A	Yes.
4	So from the beginning of Period 2 through the	4		Q	And I believe on your Exhibit RAP-5, and
5	end of Period 5, which spans approximately April of 2012	5	м	ir. Swart	z testified to this yesterday, that it appears
6	to February of 2017, approximately five years, you would	6	t	hat it w	vas roughly half the time above 420 and roughly
7	agree that the steam turbine was operated prudently,	7	h	alf the	time below 420; without doing the math, does
8	correct?	8	t	hat sour	nd about right?
9	A I am sorry, could you repeat that question	9		A	That's close enough.
10	again?	10		Q	Okay. So using your definition that operation
11	Q I would be happy to.	11	0	ver 420	was imprudent, and because the steam turbine
12	So from the beginning of Period 2 through the	12	w	as opera	ted below 420 megawatts in Period 1 at some
13	end of Period 5, which spanned approximately five years,	13	р	oints, y	you have to agree that at some points during
14	you would agree that the steam turbine was operated	14	P	eriod 1,	using your definition, the steam turbine was
15	prudently, correct?	15	0	perated	prudently?
16	A I would agree that it wasn't operated	16		A	Yes.
17	imprudently.	17		Q	Okay. And you cannot identify when the Period
18	Q Fair enough. Thank you.	18	1	blades	were damaged, can you?
19	Now, if I understand your testimony correctly,	19		A	I cannot identify the exact instance in which
20	your contention is that the blade damage discovered in	20	t	hey fail	ed, and based on Mr. Swartz's testimony, he was
21	Period 1 was caused by operating the steam turbine in a	21	n	ot able	to in Period 1 also.
22	manner that produced over 420 megawatts; is that	22			The issue here, though, is the types of
23	correct?	23	f	ailures	we are talking about more than likely were
24	A That is correct.	24	С	umulativ	ve based upon the fracture pictures I saw. Even
25	Q And you would agree with me that during Period	25	t	hough I	did not inspect the blades, there were plenty
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1	of pictures and evidence in it, and my contention is
2	that when they failed was immaterial.
3	Q But you would agree with me that the Period 1
4	blades could have been damaged when the unit was being
5	operated below 420 megawatts, correct?
6	A There is always that potential.
7	Q So you would agree with me that the Period 1
8	blades could have been damaged during prudent operation,
9	correct?
10	A Yes.
11	Q But we do know that the damage in the later
12	periods occurred when the steam turbine was being
13	operated prudently, correct?
14	A The damage did occur when the when it was
15	operated within the operating parameters.
16	Q And have you seen any evidence that there was
17	any damage to any steam turbine component other than the
18	L0 blades?
19	A Other than other than, you know, subsequent
20	damage associated with parts moving around, no.
21	Q I am not sure I understand.
22	A Well, for example, in Period 5, when the
23	failure occurred, it threw the part out through the
24	steam turbine. So, yes, there was something else that
25	was damaged in the process.
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1 Fair enough. Okay. Just a couple others real 0 2 quickly. 3 You indicated that Bartow was Progress 4 Energy's first combined cycle? 5 A I believe it was. 6 Q But would you agree with me if I told you that 7 the Hines power blocks were commissioned prior to 8 Bartow? 9 A I was not aware of that. 10 Q And does the steam turbine itself produce 11 megawatts? 12 A No. 13 0 It's the generator that produces --14 The generator does produce the megawatts. А 15 Thank you. 0 16 And in general, are there factors beyond the 17 operation of the steam turbine that impact the megawatt 18 outputs of the generator? 19 One of the key ones that was discussed А 20 yesterday in Mr. Swartz's testimony, which is the issue 21 of power factor, he brings up a very interesting point, 22 although I think it's a red herring in this case, and 23 that is because power factor is a very interesting

25

You have four -- you have five different

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1	generators on this power plant, each of which is capable		1	Q And are there other variables beyond power
2	of producing a different power factor, and you have the		2	factor that impact generator output?
3	ability to adjust power factor based upon what's going		3	A The efficiency of the steam turbine, of
4	on. There is also dynamics associated with the		4	course, is always one. There is you know, it's
5	generator output which determines the power factor the		5	ancillary. The numbers that we talk about,
6	generator typically is producing.		6	420 megawatts, is a net output. So to the extent that
7	Now, Mr. Swartz yesterday brought up power		7	ancillary loads that are associated with that steam
8	factor which is a rather interesting issue, because if		8	turbine can affect that 420, quote/unquote, but, you
9	Duke is trying to raise this unit's output to		9	know, in transferring the horsepower from that steam
10	450 megawatts, if you were to adjust that to the unity		10	turbine to the generator, there aren't many aspects that
11	power factor that he discussed yesterday, that unit		11	can change that number.
12	could be producing 500 megawatts, which exceeds the		12	MR. BERNIER: If I could have just one minute.
13	generator capability.		13	THE COURT: Sure.
14	So I and if you look at all the		14	MR. BERNIER: Could we have five minutes?
15	documentation that's provided in this case, that power		15	THE COURT: Sure. Absolutely.
16	factor was never introduced. The 420 and 450 megawatts		16	(Brief recess.)
17	are the only numbers that are discussed in this case,		17	THE COURT: Okay. Back on the record.
18	and I think power factor is something that has not been		18	MR. BERNIER: Thank you for that break, Your
19	factored into any of the evidence, the RCA or anything		19	Honor. Just a couple more.
20	else.	:	20	BY MR. BERNIER:
21	Q You would agree with me that power factor was	:	21	Q Mr. Polich, you would agree with me that
22	included in those documents that were discussed	:	22	Mitsubishi was aware that Duke planned on operating the
23	yesterday?	:	23	steam turbine in a 4-on-1 configuration, correct?
24	A Only in terms that they were specified as .95		24	A Yes.
25	or .90.		25	Q Do you know that DEF didn't contact Mitsubishi
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1	about operating the unit over 420 megawatts in Period 1?
2	A There is no evidence that they asked
3	Mitsubishi to operate over 420.
4	Q But you don't know whether or not it did occur
5	or not?
6	A No, I don't.
7	Q And if I understand correctly, your contention
8	is that the blade damage discovered in the spring of
9	2017, after Period 5, was originated or caused by the
10	operation in Period 1, was that correct?
11	A No.
12	Q No. I am not sure I understand.
13	A Repeat the question one more time.
14	Q Sure. Am I correct that your contention is
15	that the damage that occurred in the spring of 2017,
16	after Period 5, was caused by Duke Energy's operation of
17	the unit above 420 megawatts in Period 1?
18	A No.
19	MR. BERNIER: Okay. We have nothing further.
20	Thank you.
21	THE COURT: Okay. Who's next? Okay.
22	MS. PUTNAL: No questions from FIPUG.
23	THE COURT: Nothing?
24	MS. PUTNAL: No questions from FIPUG.
25	THE COURT: Well, I guess redirect then.
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1	MS. BROWNLESS: Excuse me, we have two
2	questions.
3	THE COURT: Oh, I am sorry. I am sorry.
4	MS. BROWNLESS: Thank you.
5	EXAMINATION
6	BY MS. BROWNLESS:
7	Q Your Exhibit No. 5 in your testimony shows
8	operating data for the Bartow unit from June 2009 until
9	August of 2019, is that correct?
10	A Yes.
11	Q And you used this data to calculate the derate
12	replacement power cost that you are seeking to recover,
13	as found on your exhibit RAP-9, right?
14	A No.
15	Q You didn't use this data as the basis to
16	develop the replacement cost?
17	A No. The data in RAP-5 is strictly associated
18	with operation greater than 420 megawatts. Duke
19	provided another set of documents that showed what the
20	operations were on an hourly basis during the time
21	periods in question.
22	Q And that's what you used?
23	A And that's what I used for calculating
24	replacement power.
25	$\ensuremath{\mathtt{Q}}$ $% \ensuremath{\mathtt{I}}$ Is it your testimony that ratepayers should be

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1	compensated for megawatts that were not generated due to		1	Your supposition is that there was net benefit
2	DEF's operation of the steam turbine under		2	that Duke was not compensated for as a result of that.
3	420 megawatts?		3	If we were to follow that line of questioning to its
4	A Yes.		4	conclusion, you would be espousing that because the
5	Q And should DEF also receive credit for the		5	operation above 420 potentially reduced replacement
6	megawatts it produced over 420 megawatts in Periods 1		6	or reduced the power cost that customers were paying for
7	and 2?		7	and Duke should be compensated for that is actually
8	A No, because that wasn't subject of the		8	contrary to the regulatory compact between utilities and
9	proceeding, if I am correct.		9	their customers.
10	Q Well, I guess what I am trying to ask is you		10	And in rate-making and rate proceedings,
11	believe they should be they should pay for megawatts		11	utilities normally don't get a profit, which that would
12	they did not produce, but isn't it true that customers		12	be, for replace for power cost. But if utilities
13	also got the benefit of megawatts in excess of 420 in		13	imprudently incur power costs, they will be docked
14	Period 1?		14	they can be docked in fuel cost recovery proceedings.
15	A My testimony is dealing with periods after		15	Q So if I understand what you are saying, the
16	2016, and so Periods 1 and 2 would be prior to that.		16	standard is 420. If they do less than 420, they are
17	Q So you don't think it would be appropriate to		17	operating imprudently, and therefore should customers
18	use the data in RAP-5 to figure out how many megawatt		18	should be compensated for that, and if they are
19	hours were produced in excess of 420 in Periods 1 and 2?		19	operating above 420, you are not saying that customers
20	A Okay, to answer that question appropriately we		20	didn't benefit from those megawatts, are you?
21	would have to get into compensation and payments		21	A I didn't say that, no. Customers did I
22	associated with power cost recovery cases. To the		22	mean, customers to the extent and truth of the
23	extent that power cost recovery cases typically are		23	matter is I you know, without having the actual data,
24	dollar for dollar what the utility spends is what the		24	all right, my guess, based on the fact that Duke did
25	customer pays for.		25	operate the unit more than 420 was that their cost
	361	1		362
1	381 occurs associated with the stacking of their various		1	in writing.
1 2	361 occurs associated with the stacking of their various generation units indicated that it was more prudent to		1 2	in writing. Q Okay.
1 2 3	361 occurs associated with the stacking of their various generation units indicated that it was more prudent to operate Bartow above 420 to reduce the overall power		1 2 3	in writing. Q Okay. A It should have been something that allowed
1 2 3 4	381 occurs associated with the stacking of their various generation units indicated that it was more prudent to operate Bartow above 420 to reduce the overall power cost to customers. And so that was a prudent decision		1 2 3 4	in writing. Q Okay. A It should have been something that allowed Duke to go back to Mitsubishi from a warranty
1 2 3 4 5	381 occurs associated with the stacking of their various generation units indicated that it was more prudent to operate Bartow above 420 to reduce the overall power cost to customers. And so that was a prudent decision from that perspective, absent the fact that they were		1 2 3 4 5	in writing. Q Okay. A It should have been something that allowed Duke to go back to Mitsubishi from a warranty perspective, so that, you know, okay, we asked you. We
1 2 3 4 5 6	361 occurs associated with the stacking of their various generation units indicated that it was more prudent to operate Bartow above 420 to reduce the overall power cost to customers. And so that was a prudent decision from that perspective, absent the fact that they were violating the operating parameters of the unit, all		1 2 3 4 5 6	362 in writing. Q Okay. A It should have been something that allowed Duke to go back to Mitsubishi from a warranty perspective, so that, you know, okay, we asked you. We gave you the parameters we were going to operate under,
1 2 3 4 5 6 7	381 occurs associated with the stacking of their various generation units indicated that it was more prudent to operate Bartow above 420 to reduce the overall power cost to customers. And so that was a prudent decision from that perspective, absent the fact that they were violating the operating parameters of the unit, all right.		1 2 3 4 5 6 7	382 in writing. Q Okay. A It should have been something that allowed Duke to go back to Mitsubishi from a warranty perspective, so that, you know, okay, we asked you. We gave you the parameters we were going to operate under, and you came back and said that's okay, then the onus is
1 2 3 4 5 6 7 8	381 occurs associated with the stacking of their various generation units indicated that it was more prudent to operate Bartow above 420 to reduce the overall power cost to customers. And so that was a prudent decision from that perspective, absent the fact that they were violating the operating parameters of the unit, all right. Now, that is factored already in your power		1 2 3 4 5 6 7 8	362 in writing. Q Okay. A It should have been something that allowed Duke to go back to Mitsubishi from a warranty perspective, so that, you know, okay, we asked you. We gave you the parameters we were going to operate under, and you came back and said that's okay, then the onus is on Mitsubishi.
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1	MS. PUTNAL: Thank you.	FIDENTIA	1	A Yes.
2	THE COURT: I think we are to redirect.		2	Q In the course of your discovery in this case,
3	MR. REHWINKEL: Yes. Thank you, Your Honor.		3	did you see any evidence that Duke believed there was
4	Just a few questions.		4	either no damage or damage that was pretty typical and
5	EXAMINATION		5	the type that could have been smoothed out during the
6	BY MR. REHWINKEL:		6	during a planned outage?
7	Q Mr. Polich, can you tell me, I think you were		7	A Well, in fact, if you go to Duke's RCA Table
8	asked by Mr. Bernier if you had contacted Mitsubishi in		8	A, and you look at what was found in Period 2 and you
9	any part of this process; do you recall that?		9	come down to a line that says broken snubbers, there is
10	A Yes.		10	zero on the turbine end. There was zero on the governor
11	0 In your opinion, in your expert in your		11	end. You look at the broken %-lock, zero on the turbine
12	experience in the business, would it have been		12	end zero on the governor end. Moderate amount of
13	appropriate for you to have contacted Mitsubishi in this		13	surface fretting and galling observed, which is normal.
14	case?		14	Duke operated the machine within the
15	A No And, in fact, you know, if I had. I think		15	parameters of $$ and below 420 merawatts with the
16	there would have been some issues by Duke associated		16	excention of the one test that they performed during
17	with my doing that		17	that time period, and this was 28 months of operation
10	And in addition. I doubt Mitaubiabi would talk		10	21 000 bours and basically no demore
10	to me apurate because of the fact that a lot of the		10	21,000 hours, and basicarry no damage.
20	information I would have been eaching in matching water		20	Q Do you recard being asked about damage in
20	information i would have been seeking is probably under		20	Periods 2 through 5?
21	confidentiality and would not be so it would have		21	A les.
22	been useless for me to contact Mitsubishi.		22	Q Is it your opinion that the blades throughout
23	Q Mr. Bernier also asked you do you recall		23	Periods 2 Weil, throughout all five periods were
24	him asking you about whether damage was found in Period		24	similar enough for you to make a direct comparison about
0.5			1 0 5	
25	2?		25	prudent operation and impact on the blades?
25 114 W. Premie	2? 5th Avenue, Tallahassee, FL 32303 Reporting (850) 894-0828 Reported by: Debbie Krick		25 114 W. Premie	prudent operation and impact on the blades? 5th Avenue, Tallahassee, FL 32303 Reporting (850) 894-0828 Reported by: Debbie Kric
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20 you had any knowledge if Duke contacted Mitsubishi 21 during Period 1?

22 А Yes. 23 Okay. In the process of doing discovery in Q 24 the proceeding, did you ever hear Mr. Swartz state that, 25 for all I know, there may have been no discussion with

base-load generation for the next three years?

MR. BERNIER: Same objection, Your Honor.

MR. HERNANDEZ: It's also beyond the scope

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of --

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1	Honor.		1	Mr. David may have a question.
2	THE COURT: Sure.		2	FURTHER EXAMINATION
3	MR. REHWINKEL: There was I could ask a		3	BY MR. DAVID:
4	question in front of that one so you could		4	Q Mr. Polich, in your experience how long
5	understand, but the assertion the question by		5	once again, how long have you been an engineer?
6	the staff, which I think was an informational		6	A Since 1978.
7	question, was to know whether there was a benefit		7	Q Okay. In your experience, do prudent
8	that customers were unduly receiving from this		8	engineers base analyses on oral information?
9	excess generation. But to complete the picture,		9	A My hesitancy is because we will conduct
10	the Court needs to understand whether there was a		10	preliminary analyses based upon oral information. But
11	replacement power need that Duke might have been		11	in the case, especially when you are looking at design
12	filling by running the unit above 420, and thus		12	of a power plant or something like that, you are going
13	that would have all been taken care of in the fuel		13	to want confirmation especially if that information is
14	adjustment process and the ensuing proceedings.		14	being provided by an OEM, because your client is going
15	MR. BERNIER: I apologize, Your Honor, that is		15	to expect you to have that documentation and information
16	not at all relevant. I think she was asking		16	because utilities are regulated entities. Their
17	whether or not customers received the benefit of		17	operations are always under public scrutiny and
18	that added generation, and whether or not there was		18	questioning. And so an entity such as Duke would expect
19	an outage at another plant at another time is		19	their their owner their engineer on a project to
20	completely irrelevant. That's not what we are here		20	have that documentation because if there is questions
21	talking about today.		21	some point in the future, they are going to want to be
22	MR. REHWINKEL: I can withdraw the question.		22	able to provide the proper evidence if needed.
23	THE COURT: I am going to sustain. I think we		23	Q Thank you.
24	are kind of getting into the weeds here.		24	And to staff's line of questions, in your
25	MR. REHWINKEL: All right. That's all I have.		25	calculation of damages that was in, I believe it's now
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1	been identified as Exhibit 117, did you only take into
2	account when power was needed, or did you just take into
3	account the fact that they weren't producing 420, so
4	you so they you docked them for that?
5	A I did, yes. I did look at only when that
6	power would have been needed. There are definitely
7	hours in there in which, based upon the information
8	provided by Duke, I could identify those hours in which
9	the additional megawatts would not be necessary, and ${\tt I}$
10	excluded those hours from my calculations.
11	Q Okay. Last one.
12	In your opinion, did the operation of the
13	steam turbine in Period 1, the manner of operation of
14	the steam turbine in Period 1 affect the condition
15	performance of the steam turbine after that period,
16	including Periods 3 and beyond?
17	A Interesting question from the perspective of
18	how operation of a steam turbine in earlier periods
19	affects opera affects the way that steam turbine
20	performs in later periods.
21	Clearly, you know, by the time you get to
22	Period 5, this unit has been in operation for, you know,
23	eight some odd years, and there will be some wear on
24	components within that turbine. Duke has stated that
25	Mitsubishi did a very thorough analysis of those
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2	It doesn't mean that there wasn't some wear and tear
3	that occurred. And that wear and tear can affect how
4	the performance of a set of blades put in in subsequent
5	periods. The question is how much that can affect it.
6	MR. DAVID: No more.
7	THE COURT: Okay. Thank you, Mr. Polich.
8	THE WITNESS: Thank you.
9	(Witness excused.)
10	MR. DAVID: And, Your Honor, at this point, I
11	would like to move all of Mr the exhibits to
12	Mr. Polich's testimony in there, except I will
13	withdraw what's been identified as on the CEL as
14	Exhibit 76, since it was the incorrect one, and
15	offer exhibits 68 through 75 and Exhibit 117.
16	THE COURT: I think 117 we've already
17	admitted.
18	MR. DAVID: Okay. I just wanted to make sure
19	we are clear.
20	THE COURT: Without objection, we will show 68
21	through 75.
22	MR. DAVID: And withdraw 76, thank you.
23	THE COURT: Okay. 76 is out.
24	(Whereupon, Exhibit Nos. 68 - 75 were received
25	into evidence.)

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1 components and didn't find anything out of the ordinary.

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1	THE COURT: According to my script, we are up		L	docket before the Florida Public Service Commission?
2	to the rebuttal.	2	2	A Yes.
3	MR. BERNIER: Yes, sir. Duke Energy would	3	3	0 And do you have of a copy of that testimony
4	recall Mr. Swartz.	4	1	with you today?
5	THE COURT: Mr. Swartz, I will just remind you	5	5	A I do.
6	you are still under oath.	6	5	0 And I believe your testimony your rebuttal
7	THE WITNESS: Yes, sir.	7	7	testimony included exhibits JS-2. 3 and 4. is that
8	THE COURT. I am not going to swear you in	8	3	correct?
9	again I think it's like the flu, the vaccine only	9		A Yes, that's correct
10	last a couple of days	10)	0 And you have those with you today?
11		11		
12	JEFF SWARTZ	12	>	0 Do you have any changes to make to your
13	upp recalled as a witness, having been previously duly	12	2	y bo you have any changes to make to your
1.4	was recarred as a witness, having been previously dury	14	1	No charges
15	but the truth was even and testified as follows.	15		A No changes.
16	EXAMINATION	16	5	y III was to ask you the same questions here
17	DV MD DEDNIED.	17	7	Voc. they would
1.0	DI MA. DERNIER.	10	, ,	A res, they would.
10	Q Good morning again, Mr. Swartz.	10	2	Q OKAY.
20	A good morning.	19	, ,	MR. BERNIER. Judge, at this time, we would
20	Q I believe the judge has reminded you that you	20	,	ask that his reputtal testimony be read entered
21	remain under oath, is that correct?	21		into the record as though read.
22	A fes, that's correct.	22	2	THE COURT: AS II read. Hearing no objection,
23	Q Okay. Good deal.	23	2	we will show that done.
24	On or about September 26th of 2019, did you	24	± -	(Whereupon, prefiled testimony was inserted.)
25	cause to be filed rebuttal testimony in the 2009 fuel	25)	
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	REFORE THE ELODIDA BUDLIC CONVERTION			
2	REBUTAL TESTIMONY OF	2	0	What is the nurness of your testimony?
3	JEFFREY SWARTZ	3	A.	The overall purpose of my testimony is to rebut OPC witness Polich's incorrect
4	ON BEHALF OF	4		conclusion regarding the root cause of the L0 blade failures. DEF acted prudently at
5	DUKE ENERGY FLORIDA	5		all times with respect to the operation of the Bartow plant. I will clearly articulate why
6	DOCKET NO. 20190001-EI	6		the Commission should reject Mr. Polich's argument that DEF should bear any
7	September 26, 2019	7		replacement power costs related to either the Spring 2017 outage or operation of the
8		8		Bartow plant with pressure plates in place of the L0 blades in the steam turbine.
9	Q. By whom are you employed and in what capacity?	9		
10	A. I am employed by Duke Energy Florida ("DEF" or the "Company") as Vice President	10	Q.	Please provide a summary of your testimony.
11	- Generation.	11	A.	The Commission should reject Mr. Polich's opinion as to the cause of the steam turbine
12		12		("ST") blade failures because he disregarded or ignored key information. Specifically,
13	Q. Have you previously filed testimony in this docket?	13		he only considered operating conditions for the Period 1^{1} failure and disregarded key
14	A. Yes, I filed testimony related to the February 2017 outage of the Bartow Combined	14		facts obtained from later operating periods that contradict his ultimate opinion. As my
15	Cycle ("Bartow CC") Steam Turbine ("ST") in this docket on March 1, 2019.	15		rebuttal testimony and exhibits demonstrate, DEF operated the Bartow unit at all times

- Analysis ("RCA") regarding the same outage, which was attached to my testimony as 17
- Exhibit No. _(JS-1). This exhibit was then incorporated by reference into my March 18 1, 2019 testimony in the present docket. 19

Additionally, in last year's docket I filed testimony and sponsored DEF's Root Cause

20 21 Q. Have your duties or responsibilities with the Company changed since you last 22 filed testimony in this docket?

1

23 Α. No.

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17

¹ My testimony refers to various periods of operation, which are set forth in my Exhibit No. (JS-2), Table A. ² The OEM for the Bartow CC ST is Mitsubishi Hitachi Power Systems ("MHPS"). I will use "OEM" and "MHPS" in this testimony interchangeably. 2

within the operating parameters set forth by the steam turbine Original Equipment

Manufacturer ("OEM").2 After DEF initially discovered damage to the L0 blades, it

consulted with the OEM and adjusted operation to within new limits established by the

OEM. However, even when DEF operated at lower LP pressure limits with the same

type of blades as it did during Period 1, the L0 blades experienced damage. Mr. Polich

ignores the fact that the L0 blades later failed even when DEF operated the Bartow unit

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1		at a lower LP pressure and claims that DEF's operation of the Bartow unit beyond its
2		design during Period 1 caused the first blade failure. ³ The basis for his opinion appears
3		to be an earlier root cause analysis that was prepared without the benefit of the
4		additional information learned from continued operation of the unit in later periods.
5		Mr. Polich then concludes:
6 7 9 10 11 12 13 14		If DEF had operated the ST at BCC in accordance with design output of 420 MW or less, I believe there is no engineering basis to conclude that the original L0 blades would not still be in operation today. Likewise, DEF would not have needed to undertake any of the subsequent outages to repair L0 blades, including the outage in February 2017 to replace the L0 blades with the pressure plate. Consequently, the BCC ST would currently be capable of producing its full output of 420 MW instead of being derated to 380 MW and operating with a less-than-optimal pressure plate. ⁴
15		These statements completely fail to account for subsequent failures that occurred
16		without the ST being operated over, or even at, 420 MW of output. Contrary to Mr.
17		Polich's suggestion, it is evident that DEF operated the machine prudently at all times
18		and made a prudent decision to install the pressure plate in the spring of 2017 to allow
19		for event-free operation while a long-term path forward could be designed, tested, and
20		implemented. For those reasons, the Commission should reject Mr. Polich's contention
21		that DEF should not be permitted to collect the replacement power costs incurred as a
22		result of the 2017 outage and operation with the pressure plate and should approve
23		DEF's recovery of its costs as presented in its petitions and testimony in this docket.
24		
25	Q.	Are you sponsoring any exhibits?

⁸ DEF's "operation of the BCC ST beyond the ST's 420 MW design" caused the first blade failure. Polich Testimony, pg. 7, ll. 15-16. ⁴ *ld.* at pg. 8, ll. 11-18. 3

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1		indicates his awareness of the true design conditions that govern use of the ST,7 he,
2		nonetheless, returns to the erroneous conclusion that the nameplate capacity is a
3		"maximum" output threshold that cannot be breached.8 In actuality, the nameplate
4		capacity is simply the OEM's expected output resulting from the operational
5		parameters and other assumed values for variables that are given to fluctuation (such
6		as ambient temperature, humidity, temperature of cooling water, etc.), not a design
7		basis criteria for operating the ST.9
8		
9	Q.	If the ST operating parameters are not centered on its output, what are the
10		operating parameters established by the OEM for the Bartow ST?
11	Α.	When the ST was commissioned in 2009, the operating parameters were established by
12		the Mitsubishi ST operating manual as related to steam flow through the ST. When
13		DEF realized that operating parameters allowed for additional steam to flow through
14		the ST, resulting in additional megawatts for DEF's customers while staying within
15		those parameters, DEF started increasing the steam flow through the ST staying within
16		the known operational parameters. After the original blade type was found to have
17		cracking issues, DEF worked with Mitsubishi to establish additional operating limits
18		not found in the operating manual. Each operating Period identified in Exhibit No.
19		(JS-2) had different operating limitations.

⁷ See id, at p. 11, II, 11-17.
⁸ See id, at p. 12, II. 17-19.
⁹ Considering Mr. Polith's position that the ST had a MW output maximum that could not be breached without
⁹ Considering Mr. Polith's position that the ST had a MW output maximum that could not be breached without
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⁹ considering Mr. Polith's position that the ST had a MW output maximum that could not be breached without
⁹ considering Mr. Polith's not a 19.9 (noting the "Non-steam augmented power output of each CT is in the range of 180 MW.⁷]; p. 10. II. 9-10 (noting the "Generator output appears to have an upper gross generation limit of about 465 MW at a 0.95 power factor ... ").

5

- 1 A. Yes. I am sponsoring:
 - Exhibit No. _ (JS-2) Exhibit No. _ (JS-1) Revised as to Confidentiality Only (Confidential);

 - Exhibit No. _ (JS-3) Duke Energy Bartow ST 40" Upgrade Blade Test in Takasago Validation Rigor at MHPS (Confidential); and
- Exhibit No. _ (JS-4) Bartow RCA Summary, Sept. 22, 2017 (Confidential).

8 **Basic ST Operation**

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- Based on Mr. Polich's testimony, do you believe he understands how DEF controls 0. 10 11 the Bartow ST during operation?
- No, his testimony shows that he focuses on the MW output of the machine as the control 12 Α.
- 13 mechanism, where in practice the output is simply the byproduct of operating the unit
- 14 within the design parameters provided by the OEM. At multiple times in his testimony,
- Mr. Polich discusses the nominal nameplate rating of the Bartow ST (420 MW) as a 15
- "design output" or "design condition"⁵ and indicates his belief that the 420 MW 16
- nameplate represents the unit's "maximum gross output."6 However, thinking of the 17
- operating parameters of a ST solely in terms of MW output is either an over-18
- simplification or miscomprehension of the true operating parameters of the unit and/or 19
- the myriad variables that can impact the unit's output. Despite the fact that Mr. Polich 20

³ See e.g., *id.* at p. 8, l. 12; p.8, l. 10 ("generated output above the 420 MW design conditions"); p. 7, ll. 15-16 (noting the "ST's 420 MW design."); p. 8, l. 23-p. 9, l. 1 ("manufacturer's 420 MW design conditions."); p. 10, ll. 6-7 ("The ST was designed to produce 420 MW gross generation.").
⁸ /d. at p. 12, l. 13. 4

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1 •	Period 1 - Operational limits given to DEF were based on the turbine nameplate
2	data and those limits typical for steam turbine operation like vibration limits,
3	metal temperature ramp rate limits, seal system parameters, lube and hydraulic
4	system pressure temperature limits and many other parameters that are common
5	to this type of equipment. However, while parameters related to steam
6	pressures and temperatures are part of the nameplate rating, no flow-limits, and
7	in particular, no flow-limit for the LP turbine, were given to DEF. This is not
8	unusual as flow limits will normally be maintained if inlet pressure and
9	temperature limits are maintained. In a combined cycle application, that
10	normally means staying within the pressure and temperature limits of the HP
11	and IP turbines. There is only a small fraction of flow added by the HRSG LP
12	system. In short, there was no operational limit for the LP turbine flow or inlet
13	pressure for Period 1 that was known to DEF operations at that time.
14 •	Period 2 - MHPS established a LP inlet pressure limit for DEF to follow. The
15	LP pressure was inferred from the IP turbine exhaust pressure as no LP turbine
16	inlet pressure instrument existed during this time period. During each
17	succeeding time period, MHPS established a new LP pressure limit based on
18	their analysis for the blade type and modifications installed at that time. A
19	pressure transmitter was added to the LP turbine in the fall of 2016.
20 •	Periods 3-5 - MHPS for the first time established an "Avoidance Zone" ("AZ")
21	related to LP inlet pressure and condenser backpressure. For Period 3, MHPS
22	stated that the AZ should be avoided but did not provide any time limits or
23	recommendations to move the ST out of the AZ.

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For the time-period that the Bartow ST has been operating with the installed pressure plate, 1

- 2 MHPS has kept the LP inlet pressure parameter as a setpoint to not exceed even though the
- L0 blades have been removed. 3



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0. Did DEF operate the Bartow ST within the operating parameters established by 6 the OEM? 7

8 A Yes. Starting with commissioning and Period 1, DEF has followed all the known

9 operational limits for the steam turbine. Post-Period 1, DEF has made every reasonable

attempt to maintain the LP inlet pressure limit in place for the given Period. Hours 10

> equivalent to approximately 200 MW; in a 3x1 configuration, the ST would produce about 300 MW; and for 4x1 configuration, the ST would produce about 400 MW. In

> order to produce more megawatts, the auxiliaries (duct burning and Power Augmented Steam ("PAG")) would be used. These auxiliaries are described in more detail below.

> The ST is a follower much like a trailer follows a truck. In this example, the trailer can only go as fast as the truck that is pulling it and can only turn if the truck makes a turn.

> The four CTs exhaust into their respective HRSGs, the four HRSGs produce steam for the three sections of the ST. The HRSG produces high pressure ("HP") steam,

> intermediate pressure ("IP") steam, and low pressure ("LP") steam. The HP steam

enters the HP section of the ST, the IP steam enters the IP section of the ST, and the LP steam in the HRSG enters the LP section of the ST. The LP section of the ST also

receives exiting steam from the IP section of the turbine. During the commissioning process, the ST is "matched" with the three steam pipes (HP, IP, LP) coming from the

four HRSGs to produce the output of the machine in Megawatts. The output of the ST

in megawatts is a product of the steam pressure and flow. If the operator wants to

reduce the steam pressure and flow through the ST (i.e., to produce less Megawatts),

the operator reduces the CTs' output and thus the steam passing through the ST (and

1		above the pressure limit do exist for Period 3;10 however, during the testing period at
2		the outset of Period 3, MHPS needed to explore the entire range of operational
3		parameters in order to determine where dynamic stresses were above their limit at the
4		time, resulting in many of the hours within the then-unknown AZ. MHPS established
5		the AZ (additional instructions which consisted of a combination of LP inlet pressures
6		and condenser backpressures) as a result of the post-test analysis of strain gage data
7		gleaned from this testing, but MHPS was not able to analyze the data and communicate
8		the limits of the AZ until March of 2015, therefore resulting in additional hours in the
9		zone, albeit unbeknownst to DEF at the time of operation. Some additional run hours
10		in the AZ do appear during Period 3, but operators adjusted the CTs and HRSG duct
11		burner outputs to minimize time in the zone as they strove to maintain a high output
12		and benefit from the steam turbine without compromise to the LP turbine. MHPS's
13		instructions on time in the AZ was to limit the amount of time run there; it was not a
14		hard-fast limit, nor did MHPS provide Bartow operators a means to automatically keep
15		out of the AZ.
16		
17	Q.	If the plant operators do not control the ST by trying to reach a given level of MW
18		output, how is the unit controlled?
19	Α.	The ST is "controlled" by adjusting the output of the four combustion turbines ("CTs").
20		For example, in a 1x1 configuration (one CT and heat recovery steam generator
21		("HRSG") providing steam to the ST), the ST would receive enough steam to produce
22		approximately 100 MW; in a 2x1 configuration, the ST would receive the steam

¹⁰ The chart titled "Excessive Steam Flow" found in Appendix B of Exhibit No. ____(JS-2), shows the hours the unit was operated in the AZ for the respective Periods. 8

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1	using the steam in the CTs like a supercharger in a car and raising the output of the CT
2	generators. If the operator uses PAG, the output of the ST is initially reduced until duct
3	burning is introduced to produce more steam in the HRSG to send to the ST, raising
4	the output of the ST generator.
5	
6	The ST has two (2) High Pressure stop valves and two (2) Control Valves. When the
7	ST is online and steady state, all four (4) of these valves are open and stay open – no
8	matter what configuration the station is operating in (i.e., $4x1,3x1,2x1,or1x1$). A
9	combined cycle plant does not modulate its control valves to limit ST load, the control
10	valves are only used in startup or shutdown to maintain system pressure above a
11	minimum value. There are two automatic sub-systems associated with the ST to
12	prevent too much steam from entering any of the sections of the ST (HP, IP, and LP):
13	the "sky vents" and the condenser bypass system. The sky vents are located on the top
14	of the HRSGs, and they sense pressure in the HRSG and can release steam from the
15	HRSG in the event pressure rises above its setpoint. Use of the sky vents only occurs
16	during an emergency or unit startup. The condenser bypass system is an automatic
17	system designed to blend the HRSGs into and out of the ST. As the name suggests, the
18	condenser bypass system takes steam from the HRSG and, instead of the steam entering
19	the ST, it bypasses the ST and feeds directly into the condenser. The steam path
20	described here can be traced through the diagram attached to Mr. Polich's testimony as
21	Exhibit No (RAP-3).
22	

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19 the megawatts produced) is reduced after a short lag in time for the energy to dissipate. The operator can also produce more output from the ST by adding duct burning within 20 the HRSGs to produce more heat and therefore steam that is ultimately passed through 21 22 the ST. The operator can also use PAG, another auxiliary, to produce more output from 23 the power block. At first, PAG actually extracts steam from the IP section of the ST

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	1	In summary, the operator controls the CTs and the output of the CTs determine the	1		conditions, a given unit can produce more MWs of output during the winter while
	2	output of the ST. The operator's job is to make sure that the ST is operating as	2		operating within the same parameters as summer operation. Following Mr. Polich's
	3	efficiently as possible, producing the most output for our customers as possible, within	3		logic, if DEF operated the unit during the winter without changing any of the operation
	4	the steam pressure and flow limits (operating parameters) established by the OEM.	4		parameters (e.g., no additional steam is being produced and put through the machine)
	5	Prudent Operation of the Bartow CC for DEF's Customers	5		and the output increased from 419 MW to 421 MW,11 DEF would be required to "back
	6		6		off" operations in order to get the unit's output down below nameplate capacity; this
	7	Q. Is the distinction between operating to achieve a desired MW output as Mr. Polich	7		would "cost" customers the opportunity to receive the otherwise free differential in
	8	describes and following the operating guidelines as you are describing important?	8		output and would run counter to the goals of maximizing efficiency and value to
	9	 Yes, it is important because operating with an eye to the proper operating conditions 	9		customers.
1	0	allows an operator to maximize a unit's efficient output for customers. As Mr. Polich	10		
1	1	notes, the Bartow CC is one of the most efficient and lowest-cost generation units in	11	Q.	Did DEF's customers benefit from the Bartow ST producing more than 420 MW
1	2	DEF's generation fleet. Therefore, it is prudent for DEF to maximize its output for	12		during Period 1?
1	3	customers' benefit, so long as the operating conditions prescribed by the OEM are	13	Α.	Yes. When the Bartow ST was generating more than 420 MW during Period 1, it
1	4	complied with. Hence, when DEF became aware the unit was not being maximized	14		logically would have been dispatching in higher economic order than other generation.
1	5	according to the OEM's operating pressure, steam flow, and temperature guidelines,	15		Accordingly, DEF avoided operating or buying more expensive generation, and DEF's
1	6	the prudent course of action for the Company was to bring the unit's operation into line	16		customers received the benefit of this lower-cost power generation. This is of course
1	7	with those guidelines - regardless of whether DEF was achieving the nameplate output	17		how DEF should operate its generating fleet, as I describe above. In general, if DEF
1	8	previously.	18		were to operate its fleet in the manner described by Mr. Polich, DEF would not be
1	9		19		allowed to operate its units, including Bartow CC, in the most efficient manner. This
	0	If DEF were to operate the Bartow ST, or any other unit, according to Mr. Polich's	20		would result in higher energy costs for DEF's customers due to the need to generate or
3	1	concept of never breaching the nameplate "maximum" output, its customers would			
	2	potentially experience higher costs. A simple way to illustrate the point is to consider			
3	3	winter versus summer operation. Due to cooler temperatures and denser, heavier air		¹¹ Alt MW, incre	though in this example, the hypothetical increase in output for the ST during winter operation is set at 2 in practice winter operations with no change in operation parameters can result in an approximate 95 MW ease for the Bartow CC, with approximately 15 MW of the increase attributed to the ST.
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No (JS-2)) and MHPS' confidential documents, attached as Exhibit Nos (JS-3		1
and (JS-4). As can be seen from Exhibit No (JS-3), MHPS recognized that its early		2
RCAs did not identify the correct root cause of the damage. MHPS states "multiple		3
forced outrages were experienced due to last stage blade damage caused by high load		4
stimulus and high energy blending in the 4 on 1 configuration which was not fully		5
understood until conducting an extensive collaborative RCA. Once the root cause was		6
understood MHPS developed an upgraded 40" L-0 blade specifically to operate [in] the		7
conditions present at Bartow."12		8
	8	9
Why is the later-Period operating information important to understanding wha	Q.	10
occurred in earlier Periods?		11
Because as DEF and the OEM moved through the operating periods and learned more	Α.	12
information, the information and conclusions derived were incorporated into later blade		13
designs and operating limitations. After Period 1, MHPS believed as Mr. Polich now		14
believes that the blade failure was a result of over-loading on the blades. However, the		15
later-Period operating data directly refutes this conclusion. At multiple times in his		16
testimony, Mr. Polich states a variant of his conclusion: "If DEF had operated the SI		17
at BCC in accordance with the design output of 420 MW or less. I believe there is no		18
engineering basis to conclude that the original L0 blades would not still be in operation		19
today."13 Indeed. Mr. Polich opined that DEF had not "demonstrated that the origina		20

¹² Exhibit No. ___(J5-3), page 2, bullets 2 & 3.
 ¹³ Polich Testimony, p. 8, II. 11-13; see also id. at p. 22, II. 11-13 ("DEF has failed to demonstrate that had it operated the ST within original design conditions the original blades would still be in operation."); infra note 8.

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Disc Two 000190

purchase higher cost energy, which is currently being served through lower-cost

If the LO blade failures were not caused by operation of the unit beyond 420 MW,

As explained in my previous testimony and more thoroughly in Exhibit No. _ (JS-1)

and Exhibit No. __ (JS-2), the root cause of the blade failures, including the Period 1

failure Mr. Polich focused on in his testimony, was the lack of design margin in the blades. Specifically, a lack of design margin in dealing with the dynamic steam forces

present throughout the operating range of the steam turbine - both above and below

420 MW. These steam forces are often referred to as dynamic flutter. MHPS identified

dynamic flutter as the main root cause of the L0 blade failures in its later root cause

report, conducted after the 2017 outage, as seen on page 12 of my Exhibit No. __ (JS-

4). Said differently, the different types of blades used during each period were not

designed with sufficient operating margin to handle the steam flows, pressures and

transient conditions to handle the dynamic steam forces present in the machine while

it was being operated pursuant to the OEM's guidelines. I suspect that one of the reasons Mr. Polich reached his conclusion, which disregards the information gleaned

from later operating periods, is because he chose to focus solely on Period 1 operation

and he relied on early RCAs provided by the OEM rather than later-produced

documents that benefited from this additional information such as DEF's RCA (Exhibit

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efficient unit operation.

what was the cause?

• Root Cause of the L0 Blade Failure

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³⁸⁷ CONFIDENTIAL

1		L0 blades would have experienced even minimal degradation" had the unit been		1		same type of L0 blades (specifically, Type 1 blades ¹⁹); that is, the same type of blades	
2		operated "at or below the original design output of 420 MW."14		2		that Mr. Polich opined would not have failed in Period 1 had the ST not been operated	
3				3		beyond 420 MW failed in Period 5 even though the ST was always operated "at or	
4		These statements, and the general conclusion he reaches in his testimony, are		4	:	below the original design output of 420 MW"20 during that Period.	
5		conclusively refuted by the Period 5 operating experience. As shown on Exhibit No.		5			
6		(JS-2), specifically Table A on page 5 of 18, in Period 5 the ST was operated with		6		Simply put, Mr. Polich's contention that the original Type 1 blades from Period 1	
7		the same type of blades that were installed when the unit was operated in Period 1. The		7		would still be in operation, without even minimal degradation, had DEF only operated	
8		contrast between the results found in the two Periods shows why Mr. Polich's		8		the unit at or below 420 MW of output and that "all subsequent outages and derates	
9		conclusion is inaccurate. In Period 1, DEF operated the Bartow unit from June 2009		9		since 2012 have their origin in the operation of the ST in excess of 420 $\rm MWs^{*21}$ has	
10		to March 2012 according to the OEM's original operating conditions (steam pressures,		10		been conclusively refuted by the Period 5 experience - Mr. Polich may not "believe	
11		flows, and temperature - not to a maximum MW output), and as Mr. Polich points out,		11		there is [any] engineering basis to conclude" otherwise, but the facts and experience	
12		the unit achieved as much as 457.6 $\mathrm{MW^{15}}$ before DEF discovered blade damage in		12		gained in Period 5 cannot be ignored.	
13		2012. In Period 5, DEF operated the Bartow unit per new OEM-provided operating		13			
14		instructions that included reduced exhaust pressure operating limits, specifically a		14	Q.	Mr. Polich also contends, based on his conclusion that DEF's operation of the ST	
15		111.5 psig limit on the IP Exhaust, ¹⁶ that resulted in the ST achieving a maximum of		15		caused the original failure, that "all subsequent outages and derates since 2012	
16		402.1 MW of output. ¹⁷ Nonetheless, even with the new operating conditions, the		16		have their origin in the operation of the ST in excess of 420 MW." Do you agree	
17		blades failed after only 1,561 hours of operation leading to the February 2017 outage.18		17		with this statement?	
18				18	Α.	No. As discussed above, this is contradicted by the evidence of the later-Periods.	
19		This information is crucial to understanding the root cause of the failures, including the		19		However, if one were to assume for the sake of argument that Mr. Polich is correct, and	
20		Period 1 failure. As noted above, during both Periods 1 and 5 the ST operated with the		20		DEF improperly operated the machine leading to the 2012 failure, that would not	
	14 See	<i>id.</i> at p. 21, II. 16-18.			¹⁹ See assert	Exhibit No (RAP-8), page 4 of 12, for an explanation on the different types of blades. Contrary to the tions in Mr. Polich's testimony, see, e.g., p. 22, I. 15, "Type 2" blades were never installed in the Bartow ST.	
	¹³ See ¹⁶ Exhi	id. at p. 15, l. 21; Exhibit No (RAP-5). bit No (JS-2), Table A.			See Er blade	xhibit No (IS-2), Table A or Exhibit No (RAP-7), page 3 of 16, for discussions of the different types of is installed at the unit in the different operating periods.	
	17 Exhi 18 Exhi	bit No (RAP-5). bit No (IS-2), Table A.			²⁰ See ²¹ See	note 8, <i>supra.</i> Polich Testimony, p. 22, ll. 10-11.	
		15				16	
						- (* *	
		Disc Two 0001	91			Disc Two 000)192
		Disc Two 0001	91			Disc Two 000)192
5		Disc Two 0001	91	a - 54		Disc Two 000)192
		Disc Two 0001	91	9 36 54		Disc Two 000)192
1		establish a causal link between the original blade failure and subsequent outages - nor	91			Disc Two 000)192
1		Disc Two 0001 389 establish a causal link between the original blade failure and subsequent outages – nor does Mr. Polich suggest one. Rather, he offers a conclusory statement that ignores	91	1		Disc Two 000 390 clear that no communication with the OEM regarding output was warranted or to be expected for normal operations within the operating parameters. Moreover, it is)192
1 2 3		Disc Two 0001 setablish a causal link between the original blade failure and subsequent outages – nor does Mr. Polich suggest one. Rather, he offers a conclusory statement that ignores everything that occurred from Period 2 forward. In Periods 2-5, DEF operated the unit	91	1		clear that no communication with the OEM regarding output was warranted or to be expected for normal operations within the operating parameters. Moreover, it is important to note that when DEE notified MHPS of the blade failure events MHPS did)192
1 2 3		Disc Two 0001 sestablish a causal link between the original blade failure and subsequent outages – nor does Mr. Polich suggest one. Rather, he offers a conclusory statement that ignores everything that occurred from Period 2 forward. In Periods 2-5, DEF operated the unit according to the OEM's undated operating conditions, and in Periods 3 and 4 installed	91	1 2 3 4		Disc Two 000 390 clear that no communication with the OEM regarding output was warranted or to be expected for normal operations within the operating parameters. Moreover, it is important to note that when DEF notified MHPS of the blade failure events, MHPS did not respond by asking what MW output the ST was achieving at the time of the failures)192
1 2 3 4		Disc Two 0001 389 establish a causal link between the original blade failure and subsequent outages – nor does Mr. Polich suggest one. Rather, he offers a conclusory statement that ignores everything that occurred from Period 2 forward. In Periods 2-5, DEF operated the unit according to the OEM's updated operating conditions, and in Periods 3 and 4 installed redesigned blades that were intended to allow operation at the original operating	91	1 2 3 4		Jisc Two 000 390 clear that no communication with the OEM regarding output was warranted or to be expected for normal operations within the operating parameters. Moreover, it is important to note that when DEF notified MHPS of the blade failure events, MHPS did not respond by asking what MW output the ST was achieving at the time of the failures.)192
1 2 3 4 5		Disc Two 0001 389 establish a causal link between the original blade failure and subsequent outages – nor does Mr. Polich suggest one. Rather, he offers a conclusory statement that ignores everything that occurred from Period 2 forward. In Periods 2-5, DEF operated the unit according to the OEM's updated operating conditions, and in Periods 3 and 4 installed redesigned blades that were intended to allow operation at the original operating conditions. Mr. Polich does not attempt to challenge these facts, rather he fulls back	91	1 2 3 4 5		Disc Two 000 390 clear that no communication with the OEM regarding output was warranted or to be expected for normal operations within the operating parameters. Moreover, it is important to note that when DEF notified MHPS of the blade failure events, MHPS did not respond by asking what MW output the ST was achieving at the time of the failures. I also disagree with Mr. Polich's speculative assertion that "[i]f DEF had discussed)192
1 2 3 4 5 6		establish a causal link between the original blade failure and subsequent outages – nor does Mr. Polich suggest one. Rather, he offers a conclusory statement that ignores everything that occurred from Period 2 forward. In Periods 2-5, DEF operated the unit according to the OEM's updated operating conditions, and in Periods 3 and 4 installed redesigned blades that were intended to allow operation at the original operating conditions. Mr. Polich does not attempt to challenge these facts, rather he falls back on the locical fallows of "because the later events followed the first event must	91	1 2 3 4 5 6		Clear that no communication with the OEM regarding output was warranted or to be expected for normal operations within the operating parameters. Moreover, it is important to note that when DEF notified MHPS of the blade failure events, MHPS did not respond by asking what MW output the ST was achieving at the time of the failures. I also disagree with Mr. Polich's speculative assertion that "[i]f DEF had discussed operation of the ST above 420 MW with MHPS prior to the initial operation at higher)192
1 2 3 4 5 6 7 8		establish a causal link between the original blade failure and subsequent outages – nor does Mr. Polich suggest one. Rather, he offers a conclusory statement that ignores everything that occurred from Period 2 forward. In Periods 2-5, DEF operated the unit according to the OEM's updated operating conditions, and in Periods 3 and 4 installed redesigned blades that were intended to allow operation at the original operating conditions. Mr. Polich does not attempt to challenge these facts, rather he falls back on the logical fallacy of "because the later events followed the first, the first, event must base sourced them "	91	1 2 3 4 5 6 7		Clear that no communication with the OEM regarding output was warranted or to be expected for normal operations within the operating parameters. Moreover, it is important to note that when DEF notified MHPS of the blade failure events, MHPS did not respond by asking what MW output the ST was achieving at the time of the failures. I also disagree with Mr. Polich's speculative assertion that "[i]f DEF had discussed operation of the ST above 420 MW with MHPS prior to the initial operation at higher load, the problems encountered with the ST at BCC likely would have been avoided." ²²)192
1 2 3 4 5 6 7 8		Disc Two 0001 389 establish a causal link between the original blade failure and subsequent outages – nor does Mr. Polich suggest one. Rather, he offers a conclusory statement that ignores everything that occurred from Period 2 forward. In Periods 2-5, DEF operated the unit according to the OEM's updated operating conditions, and in Periods 3 and 4 installed redesigned blades that were intended to allow operation at the original operating conditions. Mr. Polich does not attempt to challenge these facts, rather he falls back on the logical fallacy of "because the later events followed the first, the first, event must have caused them."	91	1 2 3 4 5 6 7 8		Jisc Two 000 provide the problems encountered with the ST at BCC likely would have been avoided." ²² In order to make this assertion, Mr. Polich has to assume a number of premises that are)192
1 2 3 4 5 6 7 8 9		Disc Two 0001 389 establish a causal link between the original blade failure and subsequent outages – nor does Mr. Polich suggest one. Rather, he offers a conclusory statement that ignores everything that occurred from Period 2 forward. In Periods 2-5, DEF operated the unit according to the OEM's updated operating conditions, and in Periods 3 and 4 installed redesigned blades that were intended to allow operation at the original operating conditions. Mr. Polich does not attempt to challenge these facts, rather he falls back on the logical fallacy of "because the later events followed the first, the first, event must have caused them."	91	1 2 3 4 5 6 7 8 9		Disc Two 000 provide the problems of the ST at BCC likely would have been avoided. ¹²² In order to make this assertion, Mr. Polich has to assume a number of premises that are either dubious or, given the experience of Period 5, we know to be outright wrong.)192
1 2 3 4 5 6 7 8 9 10		establish a causal link between the original blade failure and subsequent outages – nor does Mr. Polich suggest one. Rather, he offers a conclusory statement that ignores everything that occurred from Period 2 forward. In Periods 2-5, DEF operated the unit according to the OEM's updated operating conditions, and in Periods 3 and 4 installed redesigned blades that were intended to allow operation at the original operating conditions. Mr. Polich does not attempt to challenge these facts, rather he falls back on the logical fallacy of "because the later events followed the first, the first, event must have caused them."	91	1 2 3 4 5 6 7 8 9 10		Disc Two 000 provide the second seco)192
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1 2 3 4 5 6 7 8 9 10 11 12 13 14		Disc Two 00011 399 establish a causal link between the original blade failure and subsequent outages – nor does Mr. Polich suggest one. Rather, he offers a conclusory statement that ignores everything that occurred from Period 2 forward. In Periods 2-5, DEF operated the unit according to the OEM's updated operating conditions, and in Periods 3 and 4 installed redesigned blades that were intended to allow operation at the original operating conditions. Mr. Polich does not attempt to challenge these facts, rather he falls back on the logical fallacy of "because the later events followed the first, the first, event must have caused them." Therefore, even if the Commission were to determine Mr. Polich was correct regarding operation of the unit in Period I, he has provided no basis to conclude and it does not logically follow that the remaining outages and derates were caused by, or naturally flow from, that event.	91	1 2 3 4 5 6 7 8 9 10 11 12 13 14		Disc Two 000 provide the problem of the provide the provided and provided the problem of the provided the problem of the provided the)192
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	Q.	establish a causal link between the original blade failure and subsequent outages – nor does Mr. Polich suggest one. Rather, he offers a conclusory statement that ignores everything that occurred from Period 2 forward. In Periods 2-5, DEF operated the unit according to the OEM's updated operating conditions, and in Periods 3 and 4 installed redesigned blades that were intended to allow operation at the original operating conditions. Mr. Polich does not attempt to challenge these facts, rather he falls back on the logical fallacy of "because the later events followed the first, the first, event must have caused them." Therefore, even if the Commission were to determine Mr. Polich was correct regarding operation of the unit in Period 1, he has provided no basis to conclude and it does not logically follow that the remaining outages and derates were caused by, or naturally flow from, that event. Are there other areas of Mr. Polich's testimony, beyond his conclusion regarding	91	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15		Disc Two 000 provide the problem of the provide the provided and provided the problem of the provided the pr)192
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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	Q. A.	Disc Two 00011 389 establish a causal link between the original blade failure and subsequent outages – nor does Mr. Polich suggest one. Rather, he offers a conclusory statement that ignores everything that occurred from Period 2 forward. In Periods 2-5, DEF operated the unit according to the OEM's updated operating conditions, and in Periods 3 and 4 installed redesigned blades that were intended to allow operation at the original operating conditions. Mr. Polich does not attempt to challenge these facts, rather he falls back on the logical fallacy of "because the later events followed the first, the first, event must have caused them." Therefore, even if the Commission were to determine Mr. Polich was correct regarding operation of the unit in Period 1, he has provided no basis to conclude and it does not logically follow that the remaining outages and derates were caused by, or naturally flow from, that event. Are there other areas of Mr. Polich's testimony, beyond his conclusion regarding the root cause of the failures, where you disagree? Yes. I disagree with Mr. Polich's contention that DEF was somehow required to, or imprudent not to, discuss its operation of the Bartow ST with the OEM, specifically regarding the MW output being achieved. As discussed herein, Mr. Polich's focus on this lack of communication is a symptom of his focus on the nameplate rating as a	91	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	Inst	Disc Two 0000 provide the production of the prod)192
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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	Q.	Disc Two 00011 S89 establish a causal link between the original blade failure and subsequent outages – nor does Mr. Polich suggest one. Rather, he offers a conclusory statement that ignores everything that occurred from Period 2 forward. In Periods 2-5, DEF operated the unit according to the OEM's updated operating conditions, and in Periods 3 and 4 installed redesigned blades that were intended to allow operation at the original operating conditions. Mr. Polich does not attempt to challenge these facts, rather he falls back on the logical fallacy of "because the later events followed the first, the first, event must have caused them." Therefore, even if the Commission were to determine Mr. Polich was correct regarding operation of the unit in Period 1, he has provided no basis to conclude and it does not logically follow that the remaining outages and derates were caused by, or naturally flow from, that event. Are there other areas of Mr. Polich's testimony, beyond his conclusion regarding the root cause of the failures, where you disagree? Yes. I disagree with Mr. Polich's contention that DEF was somehow required to, or imprudent not to, discuss its operation of the Bartow ST with the OEM, specifically regarding the MW output being achieved. As discussed herein, Mr. Polich's focus on this lack of communication is a symptom of his focus on the nameplate rating as a "maximum" output and failure to accept that units such as the Bartow ST are operated based on steam pressures and flows, which is standard industry procedure, and that the	91	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	Insta Q.	Disc Two odds)192
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	Q. A.	Disc Two 00011 <pdisc 00011<="" p="" two=""> <pdisc 00011<="" p="" two=""> <pdisc 00011<="" p="" two=""> <pd< td=""><td>91</td><td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21</td><td><u>Instr</u>Q.</td><td>Disc Two oddd</td><td>)192</td></pd<></pdisc></pdisc></pdisc>	91	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	<u>Instr</u> Q.	Disc Two oddd)192

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1 Q.

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Disc Two 000196

Mr. Polich has calculated replacement power costs that he contends should be

refunded to customers due to operation of the Bartow CC with the pressure plates.

Setting aside my belief that DEF's prudent actions should not result in a refund of

replacement power costs, if the Commission were to order a refund of replacement

power costs due to operation of Bartow CC with the pressure plates, I disagree with

Mr. Polich's inflated calculations.23 He contends that operation of the ST from April

2017 through August 2019 has cost customers approximately \$5.74M.24 In response

to a discovery request from OPC, DEF calculated the actual replacement power costs

for the MWh's not produced at Bartow for the period (owing purely to the derate,

Based on DEF's analysis of his calculation as he described his method,25 and using the

values he included in Exhibit No. (RAP-9), DEF has identified a number of issues

that Mr. Polich's analysis fails to capture. For example, his analysis appears to fail to

consider what configuration the Bartow CC was operating in at a given time, potential

system constraints impacting dispatch of the unit (including transmission reliability

restrictions),26 ambient temperature conditions, plant conditions such as feedwater

¹³ On page 25, lines 10-17, Mr. Polich describes a situation where DEF showed no replacement power costs for an 11-hour window on June 1, 2017. DEF believes Mr. Polich was referring to July 1, 2017, as the other metrics he cites align with that date.
¹⁴ \$2,005,536 (2017) + \$2,545,049 (2018) + \$1,189,552 (2019) = \$5,740,137. See id. at p. 27, II. 5, 12, & 20. It

should also be noted that Mr. Polich stated Mr. Menendez's testimony in Docket No. 20180001-El provide the costs of the 2017 Spring outage at \$11.1M – this is the system number; the retail portion of the total costs is

Costs of the 201 sping budge a Cystam - Onis is the system number, the retain poton of the Osia roots is approximately \$1.1.0M. See Document No. 70705-7018, Docket No. 2018000-14, at p. 7, 1, 1-2, ²³ See Polich Testimony, p. 24, II. 1-20. ²⁴ For example, there was no replacement power purchased on July 1, 2017 (discussed on page 25 of Mr. Polich's testimony) because the unit was not being dispatched high enough in the order to require replacement power.

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Do you agree with his calculation?

ignoring the question of prudence) of \$1,168,613.

1 A. Yes, I disagree with the assertion that operation of the ST with the pressure plates 2 installed has truly resulted in any lost MW when compared to the results achieved prior to their installation. After the February 2017 outage, DEF worked with the OEM to 2 4 identify and implement an interim solution that would allow the ST to resume 5 operation, ultimately resulting in the installation of a pressure plates in place of the L0 blades on March 22, 2017. The plates allow the ST to operate, thus increasing the 6 energy output of the Bartow CC above what was possible in simple cycle mode while a long-term path forward could be designed, tested, and implemented. 8 9 10 When it became apparent that not even re-installing the original blade design, which 11 had achieved the greatest run time, and operating at reduced operating parameters would result in event-free operation while the long-term solution work was ongoing, 12 DEF was faced with a decision: install an iteration of blades that had previously failed 13 in order to avoid a "derate" scenario (but risk further outages and potential damage to 14 the rest of the ST) or install the plates and receive event-free output, albeit reduced 15 from the nominal nameplate rating. 16 17 I believe DEF's decision to install the plates was prudent at the time it was made, and 18 I think the results have benefitted customers as opposed to causing additional costs due 19 to downtime from further L0 blade issues or potential catastrophic failure. Therefore, 20 I do not believe the Commission should order a refund of any costs incurred due to 21 operations after the plates' installation. 22 23

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Disc Two 000195

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				1	BY MR. BERNIER:
	1		limitations and any other environmental limits, to name a few. Failure to account for	2	Q Mr. Swartz, have you prepared a summary of
	2		these additional factors results in an artificially high estimate of the replacement power	3	your rebuttal testimony?
	3		costs for the MWh's not produced at Bartow. Therefore, DEF's estimate of	4	A Yes, I have.
	4		replacement power costs, which takes into consideration these factors, is a more	5	Q Could you go ahead and deliver that?
	5		accurate estimate.	6	A Good morning again, Judge Stevenson.
1	6		×	7	The purpose of my rebuttal testimony is to
	7	Q.	Does that conclude your testimony?	8	explain why Mr. Polich's conclusions regarding causation
	8	Α.	Yes.	9	are incorrect, and to provide further support for DEF's
	9		8	10	conclusion that the lack of blade design margin was the
	10			11	cause of the Bartow LO blade failures.
				12	As you have heard from Mr. Polich, his opinion
				13	is that DEF imprudently operated the Bartow steam
				14	turbine for two reasons, because the unit was operated
				15	in a manner that produced greater than 420 megawatts and
				16	because DEF failed to consult with Mitsubishi prior to
				17	doing so.
				18	However, DEF did not imprudently operate the
				19	Bartow steam turbine. As I have previously testified,
				20	DEF operated the steam turbine in accordance with
				21	Mitsubishi's operating parameters. Simply put, the
				22	megawatt output is not an operating parameter of the
				23	steam turbine, rather operators are trained to monitor
				24	and comply with original equipment manufacturer-
(i.e.)			. 21	25	established limits pertaining to steam pressures, flows
			Disc Two 000197	114 W. Premie	5th Avenue, Tallahassee, FL 32303 premier-reporting.com r Reporting (850) 894-0828 Reported by: Debbie Krick

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1	and temperatures.		
2	The megawatt output of the generator that		
3	results is a function of many factors. In fact,		
4	contrary to Mr. Polich's suggestion, DEF, like any		
5	prudent utility, was and should be pleased to find that	:	
6	operating within the established parameters was		
7	providing greater megawatt output than the minimum that	:	
8	was contractually guaranteed, because that means the		
9	machine was operating properly and efficiently. The		
10	extra megawatts produced are a benefit to customers,		
11	because it means those megawatts don't have to be		
12	produced with less efficient and more costly generating	r	
13	units.		
14	Moreover, Mr. Polich's opinion focuses on onl	·У	
15	Period 1, and completely fails to account for the		
16	experience gained and lessons learned from later		
17	operating periods.		
18	In order to validly conclude that the Period	1	
19	blades sustained damage because the unit was operated		
20	above 420 megawatts, one would have to explain why the		
21	later period blades also sustained damage without the		
22	unit being operated above that level.		
23	However, Mr. Polich does not try to explain		
24	these occurrences. Instead, he speculates that had the	9	
25	unit not been operated above 420 megawatts in Period 1,		
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397 That document continues on to say that after 2 the root cause was understood, Mitsubishi was able to 3 design upgraded LO blades specifically for the Bartow 4 unit 5 Mr. Polich also opined that DEF was imprudent 6 because it failed to contact Mitsubishi before operating 7 the steam turbine in a manner that produced more than 420 megawatts of generator output. This opinion rests 8 9 on the faulty premise that the capacity of the steam 10 turbine generator was somehow an operating parameter 11 that should not be breached without receiving prior 12 clearance from the equipment manufacturer. 13 As I have discussed, that is simply incorrect. 14 Rather, as long as the operator was staying within the 15 operating conditions established by the OEM, that is the 16 steam flows pressures and temperatures I discussed 17 earlier, no prudent operator would feel compelled to 18 contact the OEM to reverify the previously provided 19 operating parameters. 20 Additionally, in any conversation with the OEM 21 regarding operation beyond a given electrical output 2.2 level would revert instead to a discussion of the 23 operating parameters I have discussed above. Operators 24 and equipment manufacturers do not discuss operation of 25 a steam turbine in terms of electrical output, but in 114 W. 5th Avenue, Tallahassee, FL 32303 premier-reporting.com Reported by: Debbie Krick (850) 894-0828 Premier Reporting

the original blades would still be in service, which 2 allows him to conclude that everything that has occurred 3 at Bartow can be traced back to the first period. This conclusion ignores multiple intervening 4 5 facts, including the installation of new blades with increased design margins to operate at greater pressures 6 7 and more conservative operating parameters. What these facts tell us is that, notwithstanding DEF's compliance 8 9 with the reductions in operating parameters Mitsubishi 10 provided in each period, the LO blades continued to 11 suffer damage. 12 Importantly, in Period 5, when the unit 13 operated with the same type of blades as Period 1, and 14 the unit was operated according to the most conservative 15 operating parameters provided by Mitsubishi, never even 16 achieved 405 megawatts of generator output, the blades, 17 nonetheless, suffered damage. 18 This experience clearly refutes Mr. Polich's 19 conclusion, as is demonstrated by Mitsubishi's later 20 documentation attached to my testimony as Exhibit JS-3. 21 That document provides an overview of Mitsubishi's 22 newest blade design and clearly shows Mitsubishi's 23 ultimate position that it didn't fully understand the 24 cause of the LO blade failures until after the extensive 25 collaborative RCA was concluded.

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1	terms of pressures, temperatures and steam flows.
2	Thank you.
3	MR. BERNIER: Judge, we would now tender
4	Mr. Swartz for short cross.
5	THE COURT: With that restriction, Mr.
6	Rehwinkel.
7	MR. BERNIER: It's on the record, lawyer.
8	MR. REHWINKEL: I usually don't agree with Mr.
9	Bernier, but I agree with him, this will be short.
10	So I adhere to his restrictions.
11	EXAMINATION
12	BY MR. REHWINKEL:
13	Q Hello again, Mr. Swartz.
14	A Good morning.
15	Q Hopefully for the last time in this whole
16	process.
17	On, I guess, page nine of your rebuttal
18	testimony, you have a starting on line six, you have
19	a long discussion about Duke's view, or your view that
20	the steam turbine is a follower?
21	A Yes, sir.
22	Q Okay. And is that consistent also with page
23	17, lines 22 and three, where you say: And the output
24	is simply and that the output is simply a byproduct
25	of that operation; are those the same concepts?
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		ONFIL				
1	A They are.		1	A	I think heat balance case 24	is 4-on-1
2	Q Okay. So can you tell me if the Bartow plant		2	unfired,	and it showed 389 megawatts.	
3	produces sufficient steam with four CTs operating at		3	Q	But would you so is it yo	ur view that
4	full capacity and no supplemental filing firing of		4	that's p	robably correct, you wouldn't	have enough steam?
5	the HRSGs to power the steam turbine to produce		5	A	That's correct. For all	remember each of
6	420 megawatts?		6	those he	at balance cases have dozens o	f variables
7	A I don't know if it does that. Could you		7	Q	Sure.	
8	without duct firing, is that your question?		8	A	and there is different pi	eces of equipment
9	Q Yes. Let me just make sure that we get this		9	that are	in service. So, yes, for hea	t case 24, with
LO	right. Can the plant produce sufficient steam with four		10	all of th	hose different variables, 389 :	megawatts was the
.1	CTs firing at full capacity and no supplemental firing		11	predicte	d output.	
2	of the HRSGs to power the steam turbine to produce		12	Q	Okay. And doesn't the opera	tion of the steam
3	420 megawatts?		13	turbine a	above 400 megawatts require th	e HRSGs to have
4	A $\ $ I don't know what the operating output of the		14	some amo	unt of supplemental firing to	produce sufficient
5	generator would be at 4-on-1 configuration without duct		15	steam?		
6	firing. I don't know that operating parameter, or that		16	A	I don't know that.	
7	set point or what that capacity would be at the		17	Q	Do you know that not to be t	he case?
8	output.		18	A	I don't know that not to be	the case either.
Э	Q If Bibb's heat base what do we call those		19	Q	Well, do you at least need s	upplemental firing
0	things?		20	to get al	bove 420 megawatts at the unit	?
1	A The heat		21	A	Again, I don't know. There	is a lot of
2	Q Balance		22	differen	t combinations we can operate	this unit in, and
3	A Yes.		23	dependin	g if it's a winter operation o	r a summer
4	Q case 44 said that, would you accept that		24	operatio	n and what all the variables a	re, I just don't
5	subject to check?		25	know.		
W. mie	5th Avenue, Tallahassee, FL 32303 premier-reporting.com Reporting (850) 894-0828 Reported by: Debbie Krick 401	- - - - -	114 W. Premier	5th Avenue, Tall r Reporting	ahassee, FL 32303 (850) 894-0828	Reported by: Debbie
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W. W. 1 2 3 4 5 5 7 3 9 0 L 2 3 1 5 5 7 3 9 0 1 2 3 1 5 5 7 3 9 0 0 1 2 3 1 1 5 5 7 3 9 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1	Sth Avenue, Tallahassee, FL 3233 (650) 894-0628 Reported by: Debble Kidd 401 401 Q Did Duke ever get above 420 during Period 1 without supplemental firing? A I don't know. Q Do you know whether the unit, the steam turbine requires more supplemental firing when it's at 400 megawatts versus 420? A I don't know. There is a lot of factors that would go into that. And again, I just don't have that in-depth knowledge of all the variables taking place at that station to get a certain output. Q Isn't it true that Duke can limit the steam turbine output when operating above 400 megawatts by merely controlling the amount of supplemental firing? A If supplemental firing is in service, that is a control mechanism for output of the power block. That is accurate. MR. REHWINKEL: Okay. I have no further questions, Your Honor. EXAMINATION EY MR. MOYLE: Q Q Good morning. A Good morning. A Good morning.		114 W. Premier 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	Sth Avenue, Tall r Reporting to, that take qua: A Q through Duke teau were not A Q did thei: A Q looked a: A Q you know expert i: A	Anassee, FL 32303 (850) 894-0828 Office of Public Counsel spon rrel with any of his qualifica Not at all. And yesterday, when we were the people that have looked at m, seven-member root cause tear a part, correct? That's correct. And also Mitsubishi looked a r own root cause? That's correct. And also Mitsubishi looked a r own root cause? That's correct. And now Office of Public Cou o look at it, right? That's right. And that is the universe of ; t it, correct? Yes, that's accurate. And out of those groups, the , not affiliated or, you know, s OPC's witness, correct? Yes. MR. MOYLE: That's all I hav THE COURT: Anything from PC MR. BREW: Yes, thank you. EXAMINIZATION	402 sored, you don't tions, do you? talking, we went this issue in the m of which you t it, right? They nsel has hired an people that have only one that is, an independent e. S, Mr. Brew?

	403	
1	BY MR. BREW:	1 Q Okay. Thank you.
2	Q Good morning, Mr. Swartz.	2 Your rebuttal has three exhibits, JS-2, 3 and
3	A Good morning.	3 4. JS-2 is a reprint of the root cause analysis that
4	Q First, yesterday I handed you a document that	4 was provided earlier that was roughly discussed in
5	we didn't get to. Do you have it with you?	5 direct, right?
6	A I apparently stole them and put them over	6 A Correct.
7	there.	7 Q And JS-3 is entitled on the front page, Duke
8	MR. BERNIER: Do you have an exhibit number?	8 Energy Bartow ST 40-inch upgrade blade test in Takasago,
9	MR. BREW: Well, it's going to be 112. It's	9 which you would describe as a description of the newest
10	the thicker one.	10 blade design?
11	THE COURT: It's 112.	11 A Yes, that's correct.
12	THE WITNESS: Okay, I have it.	12 Q And so is that a description of the 40-inch
13	BY MR. BREW:	13 upgraded blades that have recently been installed at
14	Q All right. I just want to identify it first.	14 Bartow?
15	Would you agree that this is a document that	15 A Yes.
16	Duke provided under your signature in response to a	16 Q Okay. So is that was the winning bid and the
17	Public Counsel data request?	17 technology that was selected?
18	A Yes.	18 A It was.
19	Q And it's entitled on the first real page,	19 Q Okay. So if I can refer you to that document,
20	Bartow Steam Turbine Path Forward Recommendation, dated	20 page two of two, that's labeled introduction. Do you
21	May 29th, 2018 do you see that?	21 see it?
22	A Yes, I do.	22 A Yes, two of 22.
23	Q Okay. So this is a document that Duke	23 Q Two of 22, that's correct.
24	provided in discovery?	24 The first three statements in the
25	A Yes.	25 introduction, which is sort of a statement of the
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1	Q Okay. Well, JS-4 is Mitsubishi's root cause
2	analysis, right?
3	A It's says RCA summary.
4	Q Okay. So it's a summary of their position,
5	okay. So if you want to refer to a statement there, go
6	ahead.
7	A If you go to page 12 of 35 of that document.
8	And at the very bottom of page 12 of 35, in a red box in
9	bold print, because it's so important, root cause
10	analysis has identified all blade damage from Period 1
11	through Period 5 has been identified as dynamic loads
12	from non-synchronous self excited vibration, or flutter.
13	Q Okay. Do you agree with that?
14	A I do.
15	Q The document that I showed you, if you could
16	refer to that now.
17	A Okay.
18	Q And could we agree that this is a document
19	prepared by Duke Energy that is a summary of the
20	competing solutions for the permanent repair of the low
21	pressure turbine?
22	A Yes. As it says, it's a working draft of the
23	team that was working on that.
24	Q Okay. Could you refer to Bates number page
	16060

	-core
1	problem being addressed, do you agree with each of those
2	statements?
3	A Not completely, no.
4	Q Okay. And it was based on those statements
5	that Mitsubishi was designing a solution to, right?
6	A I think it was based on a lot more than those
7	statements, but that's part of it.
8	Q So moving further down, Mitsubishi says: To
9	achieve confidence in the capability/reliability of a
10	new blade, extensive testing was conducted.
11	Wasn't it done to resolve the problems that
12	were described up front in the first three bullets?
13	A Well, testing was conducted to make sure that
14	the new design was adequate to meet the needs of the
15	request for proposal.
16	Q Okay. Can we agree that the multiple forced
17	outages that we discussed yesterday were experienced due
18	to last stage blade damage caused by high load stimulus
19	and high energy blending of the 4-on-1 configuration?
20	A Could you say that again, please?
21	Q I am reading from the third bullet.
22	A Okay. I think there is a better spot in JS-4
23	in the Mitsubishi document that also has a similar
24	statement that I think much better explains it. If you
25	turn

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			408
1	A Okay, I am there.	1 Q That had actually been observed based on t	:he
2	Q Do you have it?	2 blade vibration and telemetry testing that had been	
3	A I do.	3 conducted in 2014?	
4	Q Okay. And this page contains Duke's	4 A Yes.	
5	categories for weighting and evaluating the proposed	5 Q Okay. And we discussed that, in fact, Duk	e
6	solutions to its turbine problem, right?	6 selected Mitsubishi's proposal to upgrade and redesi	.gn
7	A Yes, it does.	7 the blade as the solution?	
8	Q And specifically with respect to future	8 A Yes.	
9	operations, they placed a heavy weighting on	9 Q And the redesign of the blade has not chan	iged
10	restrictions of blending, restriction on condenser back	10 the level of loading or the condenser we discussed	
11	pressure and max flow limitations, right?	11 yesterday?	
12	A Yes.	12 A Correct.	
13	Q Okay. And those are precisely the situa	13 Q Okay. And as a part of the solution, Duke	•
14	the concerns that led to the original establishment of	14 required and Mitsubishi agreed to permanently instal	.1
15	the avoidance zone, isn't that right?	15 blade vibration monitoring?	
16	A Back pressure was part of the establishment of	16 A Yes.	
17	the avoidance zone. I don't see the LP inlet pressure	17 Q So that	
18	in that section.	18 A Let me correct that. Duke that was par	t of
19	Q Would that come in under max flow limitations?	19 what we it was a big part of the decision. We, D)uke,
20	A It would. Good point. Yes, sir. That's	20 wanted permanently mounted blade vibration monitorin	ıg
21	right.	21 system.	
22	Q Okay. So, in effect, the weighting criteria	22 Q Right.	
23	designed to resolve the underlying problems that had	23 A It wasn't it sounded like you were says	.ng
24	been observed?	24 Mitsubishi wanted that. Duke Energy wanted that.	
25	A Yes.	25 Q You wanted it, Mitsubishi agreed to do it?	,
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Correct.

Correct.

Correct.

It is. Yes.

Yes.

It's been installed?

of monitoring potential excessive blade vibration?

page 28 of 35. And again, this is -- we are talking

about this is a Mitsubishi prepared document, right?

achieve 450 megawatts available by October 2018, right?

upgraded blade that you discussed and is reviewed in

it's specifically the same, because during the process 19 of moving forward with the -- this is an RCA summary, so 20 Mitsubishi had an idea, but then later in time, Duke 21 Energy issued a request for proposals for the long-term 22 solution. What ultimately came back from Mitsubishi may 23 have been slightly different than this, but the concept

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The concept is the same?

Precisely so that you have an independent way

Okay. So if I can refer you to your JS-4,

Okay. And it's entitled upgraded blade to

Okay. And the upgraded blade is the very

The concept is the same. I don't know whether

А

Q

A

Q

A

Q

A

Q

А

0

А

JS-3?

24 is the same.

Q

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1 A Yeah. 2 Q So item No. 5 on that page, which is entitled 3 Bypass Operating Guidelines, do you see it? 4 A I do. 5 Q Could you read it, what it says under the 6 heading? 7 A If required based on telemetry test results, 8 operating guidelines for bypass can reduce blade 9 response by minimizing operation of C and D bypass at 10 mach number greater than 0.55. DCS controls update 11 strategy is an evaluation. 12 Q So do I take it from that that Mitsubishi was 13 saying that based on telemetry test results, once they 14 are in operation, you could still see operating 15 restrictions during certain high energy bypass? 16 A That's what they are saying here, is that if 17 the telemetry test shows that, we may have to change to
Q So item No. 5 on that page, which is entitle Bypass Operating Guidelines, do you see it? A I do. Q Could you read it, what it says under the heading? A If required based on telemetry test results, operating guidelines for bypass can reduce blade response by minimizing operation of C and D bypass at mach number greater than 0.55. DCS controls update strategy is an evaluation. Q So do I take it from that that Mitsubishi wa saying that based on telemetry test results, once they are in operation, you could still see operating restrictions during certain high energy bypass? A That's what they are saying here, is that if the telemetry test shows that, we may have to change to
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16 A That's what they are saying here, is that if 17 the telemetry test shows that, we may have to change t
17 the telemetry test shows that, we may have to change t
18 way we blend, especially the C and D HRSGs.
19 MR. BREW: Okay. Thank you, that's all I
20 have.
21 THE COURT: Anything?
22 MS. BROWNLESS: We have no questions, Your
23 Honor.
24 THE COURT: Okay.
25 MR. BERNIER: I do have a couple quickly.

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1	FURTHER EXAMINATION		F
2	BY MR. BERNIER:		
3	Q Mr. Swartz, Mr. Rehwinkel asked you a number		
4	of questions regarding the output of the Bartow plant		
5	based on operating in different configurations, do you		
6	recall that?		
7	A I do.		
8	Q Does the output of a power plant vary from the		
9	nominal rating?		
10	A It does, in fact, significantly. As I talked		1
11	about yesterday, if you were to look at nominal ratings		1
12	of the Duke Energy Florida fleet, we are around 10,000		1
13	megawatts in the summertime, and around 11,000 megawatts		1
14	in the wintertime. Huge variation.		1
15	Q And if Duke Energy, or frankly, any other		1
16	utility was to use the nominal rating of a plant or a		1
17	unit as a limit, what would be the operational		1
18	repercussions?		1
19	A It would be very significant. So using the		1
20	example I just gave, and we are at 10,000 megawatt		2
21	summer fleet and 11,000 megawatt winter fleet, if you		2
22	chose that the net rating has a limit and not use the		2
23	capability of the equipment, we would have to build more		2
24	power plants, which would be very costly to customers.		2
25	Q And Duke Energy was given operating		2
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1	plunge in?	
2	MR. BERNIER: I can tell you, Judge,	I didn't
3	intend to make a closing statement. I wa	s thinking
4	we would use that as our PRO.	
5	THE COURT: And that's fine. I mean	, if you
6	even want to submit supplemental, you kno	w, a
7	closing statement in writing with the PRO	, I mean,
8	that would be fine with me as well if you	don't
9	want to do it.	
10	MR. MOYLE: I'm happy to do it. It	would be
11	brief, but I think we can do it.	
12	THE COURT: Okay.	
13	MR. BERNIER: In that case, I will r	eserve the
14	right to make a closing statement based o	n what Mr.
15	Moyle says.	
16	THE COURT: Okay. Well, who should	we
17	start well, Mr. Moyle has stepped up,	so I
18	suppose	
19	MR. MOYLE: Yeah	
20	MR. REHWINKEL: I would say the Publ	ic Counsel
21	did not contemplate making any, and I thi	nk we
22	would stand on our written filing. And i	f we need
23	to make a supplemental statement that wou	ld have
24	been a closing today, we will do that in	our
25	THE COURT: I did just have one hous	ekeeping
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1	instructions for the Bartow steam turbine, is that
2	correct?
3	A Yes.
4	Q And they were written operating instructions,
5	is that correct?
6	A Yes, that's correct.
7	Q Okay. And at the end of Period 2, the Period
8	3 blades were being inserted in the machine, did Duke
9	Energy find damage to those Period 2 blades?
10	MR. REHWINKEL: Your Honor, I am going to
11	lodge an objection. I asked a series of questions
12	that were asked about whether supplemental firing
13	was needed to get the output of the unit above 400 $$
14	or 420. This recent question has nothing to do
15	with the scope of my cross-examination, and I think
16	it's outside.
17	THE COURT: That's a little beyond the scope.
18	MR. BERNIER: I would agree. I withdraw the
19	question.
20	We have nothing further.
21	THE COURT: Thank you, Mr. Swartz.
22	(Witness excused.)
23	THE COURT: And I believe that brings us to
24	closing statements. Do the parties want to take a
25	break before we get to that, or are you ready
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1	matter. Mr. Brew, did you want to move Exhibit
2	112?
3	MR. BREW: Yes, Your Honor, please. I wanted
4	to move what had been marked as Exhibit 112 for
5	identification into the record.
6	THE COURT: We will show 112 admitted.
7	(Whereupon, Exhibit No. 112 was received into
8	evidence.)
9	MR. MOYLE: Your Honor, another housekeeping
10	matter, the only document we used was the EIA $% \left({{{\left({{{}_{{\rm{T}}}} \right)}}} \right)$
11	document that we handed out yesterday. I don't
12	think it was marked, but
13	THE COURT: The glossary?
14	MR. MOYLE: Yeah, the glossary. If we could
15	go ahead and give that a number and move it.
16	THE COURT: Any objection to that? I think we
17	are up to 118 now. We will mark that as Exhibit
18	118 and show that admitted.
19	(Whereupon, Exhibit No. 118 was marked for
20	identification and received into evidence.)
21	MR. BERNIER: I am sorry, Judge, I need to
22	move Mr. Swartz's rebuttal exhibits in as well. I
23	believe they are 80, 81 and 82 yes, that's
24	correct on the comprehensive exhibit list.
25	THE COURT: And we will show those, 80, 81 and
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1	82 admitted, that's J-2, J-3 and J-4.		1	In my vernacular, too much steam	is, if you know a
2	(Whereupon, Exhibit Nos. 80-82 were received		2	chief cause here.	
3	into evidence.)		3	Duke said in their root caus	e analysis that
4	THE COURT: I think that's everything now.		4	the low pressure turbine excessiv	e steam flow. And
5	Mr. Moyle.		5	that has been listed. You have s	een that in these
6	MR. MOYLE: Thank you, Your Honor.		6	documents, both in the drafts, an	d it appears a lot
7	And thank you, we had, I think, an orderly		7	of places.	
8	hearing, and I want to compliment the Public		8	And then the OPC expert with	ess essentially
9	Service Commission, Ms. Brownless, for guiding us		9	said that they had generated more	than the
10	guiding us through this, and thank you for the time		10	420-megawatt and subjected the L0	blades to forces
11	and attention that you have given to us.		11	25 percent greater than designed	operating
12	I am a big fan of sticking to agendas, and she		12	conditions.	
13	had the closing statement in there, so I just want		13	So in slightly different way	s, I think you
14	to share a few thoughts. I won't belabor points.		14	have evidence before you that sug	gests that too
15	But I think at the outset, you asked a		15	much steam in an operation was	surely hasn't
16	question about burden of proof, and everyone agreed		16	been ruled out as a cause. And I	think there is a
17	that Duke has the burden of proof in this case.		17	lot of evidence that suggested it	was a cause.
18	And respectfully, we don't believe that that burden		18	The only independent expert	to look at this
19	was met for, you know, for a number of reasons.		19	has been OPC's witness. And Duke	folks are good
20	There have been three analyses of what caused		20	folks, as I think we said, but, y	ou know, they had
21	this problem. And there are sometimes different		21	an internal team of investigators	that looked at
22	words that were used. Just in the last witness,		22	it.	
23	the maximum flow limitations, the low pressure		23	During one of the witness' t	estimony, they
24	turbine exceeds the steam flow. Mr. Brew, I think		24	said, well, there might be some l	itigation. There
25	asked the witness, doesn't it mean too much steam?		25	was a settlement that was reached	. You know,
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	417				418
1	Mitsubishi said, well, Duke, you guys didn't		1	there was a line in one of the do	cuments that said,
2	operate it right. Duke said, well, we think		2	quote, we've had bad blends durin	g all five periods
3	Mitsubishi, you know, it was their fault.		3	of operation. And there has been	a lot of
4	And as we said, no one suggested that it's the		4	discussion about blending, and th	e steam, and I
5	ratepayers' fault, but in this situation, dealing		5	think it ties into the excessive	steam flow. But
6	with an amount that is about one percent of the		6	the witness, he said, well, you k	now, I interpret
7	amount that Duke has already recovered, we think		7	that to mean high pressure, I bel	ieve.
8	that Duke has not carried their burden of proof.		8	I mean, he was making an int	erpretation of the
9	And there is another issue that I wanted just		9	word, bad, that was just his view	because he was
10	to bring to the, you know, to the Court's attention		10	given a document that he didn't h	ave great insight
11	is and we didn't talk about it, but, you know,		11	into when it was being crafted an	d put together,

14 non-hearsay evidence. And the root cause report of 15 Duke, I would argue, was hearsay. It was a report 16 that was put together by seven Duke individuals. 17 There was testimony about who wrote it, who the 18 scribe was. And the witness, Mr. Swartz, for Duke, 19 he was asked a whole slew of questions, and he took 20 his best shot at it. But a lot of times he said, 21 well, I am assuming, and I am speculating, and it 2.2 was, I think, telling that the record, I believe 23 you will find, is full of those hedges on different 24 things when he was asked questions.

can be used if it is corroborated by other

hearsay is treated in Chapter 120 as something that

And I noted yesterday when I was crossing him,

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and is, you know, is rendering an opinion on a

So I think when you consider that in

conjunction with, you know, the burden of proof in

this case, that the evidence suggests that Duke did

not carry their burden, and for that reason, the

decision should be that they didn't carry their

And we will submit, either jointly or

I think, detail some of this, but we wanted to

we appreciate the opportunity to do so.

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separately, proposed recommended orders that will,

share this with you now while it's still fresh, and

burden to show that they were -- would be entitled

hearsay document.

to this money.

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1	THE COURT: Th	hank you.	CUI	1	megawatts, so t	the limiting factor was	the steam
2	MR. BREW: Tha	ank you, Your Honor.	I	2	turbine.		
3	appreciate the time	e to make a short st	atement.	3	On its own	initiative, it decide	d to push more
4	In many of our	r PSC dockets, Mr. M	oyle is known	4	steam through t	the steam turbine to ge	t more
5	for using a car and	alogy, so pardon me	if I steal	5	megawatts until	it broke.	
6	his thunder.			6	When they	asked Mitsubishi about	it, and you
7	You can drive	a four-cylinder For	d Fiesta like	7	will see that c	on the Table A on the re	oot cause
8	a V8 Ferrari, but :	it's not quite the s	ame thing.	8	analysis that w	ve referred to, the firs	st thing that
9	At 4,000 RPMs, in s	second gear, the Fer	rari is	9	Mitsubishi aske	d them do was to reduce	e the steam
10	already doing 60 ar	nd it's just warming	up. The	10	flow, reduce th	e inlet pressure from	the turbine.
11	Ford Fiesta, howeve	er, will be moaning	and begging	11	So in Peri	od 2, you will see that	t the first
12	you to slow down an	nd shift gears. And	that's kind	12	thing they esta	blished was a limit on	the pressure
13	of what we are tall	king about here.		13	coming into the	e low pressure segment.	
14	It's conceded	as fact that the ro	ot cause of	14	In Period	3, they added to that,	by not only
15	the Bartow low pres	ssure turbine proble	ms is	15	limiting the in	let pressure, but look	ing at the
16	excessive vibration	ns caused reputedly	over time.	16	condenser back	pressure. So they were	e still
17	The answer to the o	question is was this	due to the	17	Mitsubishi, whi	le they were trying to	figure out
18	way Duke ran the p	lant or is it due to	a design	18	what do about t	he blade design, parti	cularly in the
19	flaw? Well, the ar	nswer is both.		19	4-x-1 configura	tion, which is unique	to this plant,
20	The fact is is	s that Duke bought a	steam	20	and Duke had no	prior experience opera	ating in that
21	turbine that was al	lready built for a d	ifferent	21	configuration,	and Mitsubishi did not	have any
22	configuration that	was in storage, and	then hooked	22	experience in i	ts entire global fleet	with an
23	it up to a configu	ration, a four-by co	nfiguration	23	operation at th	nese steam pressures, th	he whole point
24	that it knew could	produce much more s	team than it	24	was to establis	sh that avoidance zone.	
25	needed. It had a g	generator that could	produce more	25	Now, what	they have come up with	is another
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1 blade design fix, but they haven't changed any of 2 the underlying conditions that are causing the high 3 energy blending, the limits in the condenser that 4 are causing those conditions in the first place. 5 So from our perspective, Duke clearly was at 6 fault for pushing excessive steam flow into the 7 turbine in the first place. The repair which has 8 been established which may or may not work, but the 9 early operation clearly impeded Duke's ability to 10 simply claim that Mitsubishi was entirely at fault. 11 And under those circumstances, it's not appropriate 12 to assign the cost to the consumers. 13 Thank you. 14 THE COURT: No other takers? Duke? 15 MR. BERNIER: I will be very brief. 16 I will discuss, I think, Mr. Moyle's 17 non-contemporaneous hearsay objection in our 18 closing -- or in our PRO. 19 And I would agree, I think, with part of what 20 Mr. Brew said, that as damage was found in the 21 blades, Mitsubishi did continue to lower the 2.2 operating parameters, but I think it's clear that 23 the only evidence in the record is that at all 24 times, Duke operated according to the limits that 25 Mitsubishi had provided, which is the industry

1 standard, and the blades failed. That's what the 2 root cause analysis shows, but the remainder we 3 will handle in our PRO. Δ THE COURT: Very good. 5 It's my understanding that the parties have 6 agreed that the PROs will be due 30 days from today, is that the agreement? I said it was --8 typically, we start our clock running from the filing of the transcript, but 30 days from today is 9 10 fine. 11 There was something else I wanted to ask you 12 and now I have forgotten. 13 MR. MOYLE: Ask can I ask a question on that? 14 THE COURT: Sure. 15 MR. MOYLE: In terms of the transcript, it's 16 going to go to the PSC, and then I am just 17 wondering when we will see it. 30 days is fine 18 provided we, you know, we see it. 19 THE COURT: You don't get the transcript on 20 the 25th day? 21 MR. MOYLE: Right. 22 MR. BERNIER: So can I -- because we have to 23 make a confidentiality filing, right, and it can't 24 go to the PSC until I make that filing, so what I 25 would propose, if this works -- I don't know if you

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1	need to take this down or not when you have the		1	MR. BERNIER: I appreciate you reminding me of
2	transcript prepared, let me know. I will make a		2	that. I had forgotten. We will follow the order
3	filing, and then when you provide it to Public		3	as drafted.
4	Service Commission, which will have to be in hard		4	THE COURT: I had forgotten and I entered the
5	copy, and you can send me a copy, I will get it to		5	order.
6	everybody that same day you provide it to me. That		6	MS. BROWNLESS: Right. And then there is
7	will give me the chance to make the confidentiality		7	post-hearing submittals, a hard copy of all of the
8	filing and then it can be filed with DOAH		8	proposed recommended orders shall be filed with the
9	confidentially as well. Does that work?		9	commission via nonelectronic means via
10	(Discussion off the record.)		10	hand-delivery, UPS, Federal Express, et cetera.
11	MS. BROWNLESS: In our joint motion for		11	A cover letter shall accompany the PRO stating
12	confidentiality, which Judge Stevenson has already		12	that the PRO contains confidential information and
13	approved, we discussed in paragraph 5A how		13	should not be made available to the general public
14	post-hearing submittals would be handled. We also		14	on DOAH's website. Parties with the exception of
15	discussed how the transcript would be handled, and		15	the PSC staff may be served electronically by any
16	that and this is what we said:		16	means agreeable to the parties. A hard copy of
17	When the transcript of the hearing is		17	each PRO shall be filed with the PSC clerk via
18	prepared, the PSC Clerk shall notify DEF, who shall		18	nonelectronic means with a cover letter. So
19	file a Notice of Intent for the transcript with the		19	THE COURT: We were better prepared than we
20	Commission Clerk and file the trans and file a		20	thought, or even remember.
21	RFCC I don't remember what that means for the		21	MS. BROWNLESS: That's what we worked out.
22	information request for confidential		22	MR. BERNIER: That was incredible.
23	classification, sorry. I lost my head there for		23	MR. REHWINKEL: So just to be just to
24	the information within 21 days thereafter as set		24	hopefully but the put a bow on this. We have an
25	forth in the rule. So		25	indeterminant date for when the transcript will
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	427		
1	CERTIFICATE OF REPORTER		
2	STATE OF FLORIDA)		
3	COULT OF LEON)		
4			
5	I, DEBRA KRICK, Court Reporter, do hereby		
6	certify that the foregoing proceeding was heard at the		
7	time and place herein stated.		
8	IT IS FURTHER CERTIFIED that I		
9	stenographically reported the said proceedings; that the		
10	same has been transcribed under my direct supervision;		
11	and that this transcript constitutes a true		
12	transcription of my notes of said proceedings.		
13	I FURTHER CERTIFY that I am not a relative,		
14	employee, attorney or counsel of any of the parties, nor		
15	am I a relative or employee of any of the parties'		
16	attorney or counsel connected with the action, nor am \ensuremath{I}		
17	financially interested in the action.		
18	DATED this 18th day of February, 2020.		
19			
20			
21	Debbri K Krici		
22			
23	DEBRA R. KRICK NOTARY PUBLIC		
24	COMMISSION #GG015952 EXPIRES JULY 27, 2020		
25			
114 W. Premier	Sth Avenue, Tallahassee, FL 32303 premier-reporting.com Reporting (850) 894-0828 Reported by: Debbie Krick]	