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Duke Energy (Bernier) - (CONFIDENTIAL) Proposed recommended order regarding DOAH Case No. 19-6022.

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STATE OF FLORIDA
DIVISION OF ADMINISTRATIVE HEARINGS

IN RE: FUEL AND PURCHASED POWER COST RECOVERY CLAUSE WITH GENERATING PERFORMANCE INCENTIVE FACTOR
_____ /

Case No. 19-6022

PSC Docket No. 20190001-EI

DUKE ENERGY FLORIDA, LLC'S, PROPOSED RECOMMENDED ORDER

Duke Energy Florida, LLC, hereby submits its Proposed Recommended Order for consideration by the Administrative Law Judge.[1]

RECOMMENDED ORDER

This case was heard on February 4-5, 2020, in Tallahassee, Florida, before Lawrence P. Stevenson, an Administrative Law Judge ("ALJ") assigned by the Division of Administrative Hearings ("DOAH").

APPEARANCES

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[1] The Hearing Transcript will be cited as "T. page#." Joint exhibits will be cited as "Jt. Ex. ___, p. ___." OPC's exhibits will be cited as "OPC Ex. __, p. __." FIPUG's exhibits will be cited as "FIPUG Ex.___, p.___." PCS Phosphate's exhibits will be cited as "PCS Phosphate Ex. __, p.___."

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STATEMENT OF THE ISSUES

Issue 1B. Whether DEF was prudent in its actions and decisions leading up to, and in restoring the Bartow Plant to service after, the Bartow Plant's February 2017 forced outage and, if not, what actions the PSC should take with respect to the replacement power costs incurred by DEF.

Issue 1C. Whether DEF has made prudent adjustments to account for replacement power costs associated with the derating of the Bartow Plant and whether additional adjustments should be made.

PRELIMINARY STATEMENT

Each year, the PSC opens a new fuel docket in order to determine the amount of fuel costs Florida regulated utilities may pass on to, and collect from, their customers. The PSC's 2019 fuel docket[2] included, among other issues, DEF's request to recover the replacement power costs incurred in connection with an unplanned outage to the steam turbine at DEF's Bartow Unit 4 combined cycle power plant (the "Bartow Plant") in February 2017. Issues 1B and 1C were raised as part of the 2019 fuel docket.

On November 5, 2019, the PSC held a final hearing in the 2019 fuel docket, during which all issues concerning DEF's request to recover its fuel and purchased power costs were addressed, with the exception of Issues 1B and 1C. Issue 1B and Issue 1C each involve extensive confidential testimony and exhibits. Because the PSC does not have the statutory authority to hold confidential hearings, it was unable to ensure that the testimony and exhibits related to Issues 1B and 1C would remain confidential if received during its public hearing. In light of DOAH's ability to hold confidential hearings, on November 8, 2019, the PSC referred Issues 1B and 1C to DOAH for an evidentiary hearing.[3]

On December 6, 2019, the parties filed a Joint Motion on Confidentiality setting forth their proposed procedures for the handling of confidential materials before, during and after the scheduled hearing in this case. This motion was granted by order dated December 9, 2019, and the proposed confidentiality procedures were adopted. The final hearing was held on February 4-5, 2020, in Tallahassee, Florida.

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[2] Docket No. 20190001-EI

[3] *See* Letter from Adam J. Teitzman, Florida Public Service Commission Clerk (Nov. 8, 2019).

At the final hearing, DEF called Jeff Swartz as its sole witness.[4] PSC did not call any witnesses. OPC called Richard Polich as its only witness.[5] FIPUG did not call any witnesses. PCS Phosphate did not call any witnesses.

Joint exhibits 80-82, and 114 were received in evidence. PSC exhibits 110-111 were received into evidence. OPC exhibits 68-75, 101-109, and 115-117 were received in evidence. FIPUG exhibit 118 was received in evidence. PCS Phosphate exhibit 112 and 113 were received into evidence.

A Confidential three-volume Transcript of the proceedings was filed on February 24, 2020. All parties thereafter timely filed Proposed Recommended Orders which have been duly considered by the undersigned in the preparation of this Recommended Order.

All references to the Florida Statutes shall be to the 2019 Florida Statutes ("Fla. Stat.") unless otherwise indicated.

FINDINGS OF FACT

A. The Parties.

1. DEF is a public utility as defined in section 366.02(1), Fla. Stat., and is subject to PSC's regulatory jurisdiction under Chapter 366, Fla. Stat.

2. PSC is the state agency authorized to regulate public utilities pursuant to Chapter 366, Fla. Stat.

[4] Mr. Swartz is the vice president of generation for DEF. His responsibilities include overall leadership and strategic and tactical planning to operate and maintain DEF's non-nuclear generation fleet. He holds a degree in mechanical engineering and has thirty-four years of power plant experience, including combustion turbine and steam turbine operation, eighteen years with DEF or its predecessors. Mr. Swartz has managed new utility projects from construction to operation and has extensive utility contract negotiation and management experience. T. 39-40. Importantly, Mr. Swartz has been responsible for overseeing the Bartow Plant since the beginning of calendar year 2012, and he was responsible for initiating the DEF root cause analysis (the "DEF RCA") referenced in greater detail below. T. 61-62.

[5] Mr. Polich is the managing director of GDS Associates, Inc., an engineering consulting firm with offices in various states. He holds a degree in mechanical engineering, has thirty years of experience as an energy industry engineer and has experience managing governmental, industrial and utility projects. T. 297-298.

3. OPC is statutorily authorized to represent the citizens of the state of Florida in matters before the PSC. § 350.0611(1), (3), & (5), Fla. Stat.

4. FIPUG is an association of industrial users of electricity in Florida, some of which are customers of DEF. T. 27.

5. PCS Phosphate operates a phosphate mine in Hamilton County, Florida, and is a customer of DEF. T. 31.

B. The Bartow Plant.

6. The Bartow Plant is a 4x1 (4 combustion turbines and 4 heat recovery steam generators ("HRSG") x 1 steam turbine) Combined Cycle Station. T. 42, 213-215, 234.

7. A combined cycle power plant uses both gas and steam turbines together to produce electricity. Combustion of natural gas in the gas turbine turns a generator producing electricity, and the waste heat from the gas turbine is routed to a HRSG. The HRSG produces steam that is then routed to the steam turbine which, in turn, generates extra power. T. 47-48, 235, 323.

8. Combined cycle plants can be set up in multiple configurations and can provide considerable operational flexibility and efficiency. For example, the Bartow Plant can operate in a 1x1, 2x1, 3x1, or a 4x1 configuration. In addition, when necessary, the gas turbines can operate in simple cycle mode to generate electricity when the steam turbine is off-line. T. 47-48, 235, 323.

9. The maximum output of the Bartow ST operating in a 4x1 configuration is approximately 468 megawatts ("MW"). T. 143-144, 277-278. The output of a steam turbine is limited by the maximum electrical output of the generator connected to the steam turbine. T. 256-257.

10. The output of a power plant can differ significantly from its nominal rating based on different variables, such as ambient temperature, cooling water temperature, and humidity levels, in

place during operation. For example, the nominal rating of the DEF power plant fleet is around 10,000 MW in the summertime and approximately 11,000 MW in the wintertime. T. 140, 411.

11. The general standard followed by operators in the utility industry is to operate power plants in general, and steam turbines specifically, within the operating parameters provided by the original equipment manufacturer while also striving to achieve the most efficiency for utility customers. T. 141. The output of the steam turbine is not an "operating parameter" provided by a manufacturer; rather the output is a product that follows from operation within the manufacturer-provided parameters and considering the other variables. T. 140-143, 281-282, 284.

C. DEF's Purchase of the Steam Turbine.

12. The steam turbine ("ST") in use at the Bartow Plant was manufactured and installed by Mitsubishi Hitachi Power Systems ("MHPS"). T. 42, 213-215, 234.

13. In May 2002, MHPS sold the ST to Tenaska Power Equipment, LLC ("Tenaska"), a company that intended to use the ST in a 3x1 combined cycle (3 combustion turbines x 1 steam turbine) power plant. Although Tenaska purchased the ST from MHPS, Tenaska never took delivery. Instead, MHPS maintained the ST in a climate-controlled warehouse in Japan until DEF purchased it in 2006. Jt. Ex. 109, p. 7577; T. 42, 213-215, 234.

14. In May 2006, DEF[6] purchased the ST from Tenaska. Jt. Ex. 109.

15. Before committing to purchase the ST, DEF contracted with MHPS to evaluate the ST design conditions in order to ensure the ST was compatible with the Bartow Plant's proposed 4x1 combined cycle design configuration. T. 42, 213-215, 234.

16. MHPS's evaluation of the ST's compatibility with the Bartow Plant involved, among other things, the review of over three hundred heat balances previously[7] developed by MHPS for the ST. T. 287.

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[6] The actual purchase was made by DEF's predecessor, Progress Energy Florida, Inc. ("PEF").
[7] MHPS developed the heat balances several years before DEF's purchase of the ST. T. 287

17. Heat balances are engineering calculations that predict how power plant equipment will operate assuming different variables involving the operation of components of a plant under varying initial and ambient conditions. T. 124, 127. As an example, the Bartow Plant can be operated in a 4x1, 3x1, 2x1, or 1x1 configuration, and the operators have various additional means of augmentation available as well (e.g., duct burning, Power Augmentation (PAG), etc.). T. 225, 287.

18. Each heat balance developed by MHPS for the ST was designed to project how the ST would operate under a specific set of variables. T. 122.

19. One such variable was power factor, which is a measure of the efficiency of how load current is converted to useful power. T. 132-133.

20. For each heat balance it generated for the ST, MHPS utilized a power factor number that ranged from .9 to .949. T. 132-134.

21. DEF operates the Bartow Plant at a power factor number that falls between .97 and .995.[8] T. 135.

22. Of the three hundred heat balances developed by MHPS for the ST, only two were included in the purchase agreement between MHPS and DEF for the ST (the "Purchase Agreement"). These two heat balances formed the basis of the liquidated damages provision of the Purchase Agreement. The first heat balance ("Heat Case 24") predicted that the ST with all four combustion turbines (4x1 configuration), no duct firing, and operated to a power factor of .949, would produce approximately 389 MW of output. The second heat balance ("Heat Case 48") predicted that the ST with three combustion turbines (3x1 configuration), plus duct firing, and operated to a power factor of .949 would produce approximately 420 MW of output. T. 130-132, 255, 278.

[8] A power factor of 1.0 is the most efficient power factor that can be achieved. T. 133.

23. After MHPS installed the ST at the Bartow Plant, it tested Heat Case 24 and Heat Case 48 in order to verify that the Bartow Plant would generate the contractually-guaranteed output of 389 MW under the configuration and parameters set for Heat Case 24 and 420 MW under the configuration and parameters set for Heat Case 48. T. 263, 268.

24. DEF maintains that by including Heat Case 24 and Heat Case 48 within the liquidated damages provision of the Purchase Agreement, MHPS and DEF clearly intended to establish a contractually guaranteed minimum output the ST would produce under the specific configurations and parameters set forth in each heat case. T. 136, 147, 167; Jt. Ex. 109, p. 12432. Indeed, the contractual requirement is found in section 3.2 of the Purchase Agreement, titled "Guaranteed Performance and other Guarantees for Acceptance Test." Jt. Ex. 109, p. 12432.

25. DEF further asserts that, prior to DEF's purchase of the ST, MHPS understood that DEF intended to operate the Bartow Plant and the ST in a 4x1 configuration with a power factor exceeding .949, which would result in the generation of more than 420 MW. T. 135-136, 147-148, 258, 278, 356.

26. In contrast, OPC, FIPUG and PCS Phosphate argue that MHPS established 420 MW as a maximum design limit for the ST. T. 303.

D. The Steam Turbine and the L-0 Blades.

27. The ST itself is made up of a high pressure/intermediate pressure section and a low-pressure section. Each of these turbine sections has a series of blades. As the steam passes through the blades, the steam exerts its force on the blades[9] which, in turn, cause a rotor to spin. The rotor is connected to a generator, and the generator produces electricity. T. 47-48, 323.

28. At issue in this proceeding is the low-pressure section, specifically the last stage of blades in the low-pressure section, which are referred to as the L-0 blades.[10] T. 47-48

[9] The ST spins at approximately 3,600 revolutions per minute. T. 51.
[10] Each of the L-0 blades at issue in this matter was manufactured by MHPS. T. 221.

29. The L-0 blades are the longest blades in the ST. The blades get longer as the steam flows through the ST because the steam is losing energy as it travels through the machine and more surface area of blade is needed to produce the force needed to spin the rotor. T. 50

30. Water erosion is the most common problem associated with last stage steam turbine blades, which are designed to have steam, rather than water, move through them. When steam in a turbine turns into water before impacting with the blades, this can lead to erosion and eventually cracking and failures in the blades. T. 175-176.

31. It is undisputed that a steam turbine should be operated within the specific operating parameters provided by the turbine's manufacturer. T. 345.

32. As discussed in greater detail below, since being placed into service, the ST has experienced five separate L-0 blade damage incidents. For ease of reference each of these blade damage incidents is identified herein by the corresponding time period during which the incident occurred as identified in DEF's RCA (Period 1 = June 2009 - March 2012; Period 2 = April 2012 - August 2014; Period 3 = December 2014 - April 2016; Period 4 = May 2016 - October 2016; and Period 5 = December 2016 - February 2017). Jt. Ex. 80, p. 5.

33. Each blade damage incident was discovered by DEF through proactive inspection or through the use of monitoring equipment before any catastrophic damage occurred to the ST. T. 52, 99, 185.

34. Each blade damage incident was accompanied by blade design modifications made by MHPS. T. 52-53.

35. During each succeeding period after Period 1,[11] MHPS modified the operating parameters of the ST to lower the permissible steam pressures within the ST, which resulted in a corresponding reduction in the electrical output generated by the Bartow Plant. T. 53.

[11] Period 3 is the exception. Period 3 began with the installation of newly designed blades and increased operating parameters intended to allow DEF to operate the ST to a minimum guaranteed output of 450 MW. Jt. Ex. 80.

36. As discussed below, each period concluded with the discovery of damage to the L-0 blades. The blade damage was restricted to the mid-span snubbers and z-locks[12] located on the blades. T. 50, 53.

37. During each blade change, DEF and MHPS were able to inspect the entire ST. They discovered no damage or issues with any component of the ST other than the L-0 blades. T. 286. Therefore, other than the L-0 blades, at no time during any period did DEF or MHPS ever replace any low-pressure turbine components (beyond ordinary maintenance requirements). T. 103.

38. These inspections of the ST occurred much more frequently than under normal circumstances; normally ST inspections occur at intervals of every 80,000 – 100,000 operating hours. T. 105, 113, 185.

39. Notably, despite repeated blade modifications and the implementation of increasingly stringent operating parameters, during each subsequent period, damage was discovered in the L-0 blades after shorter operating intervals than previous periods. For example, during Period 1, the L-0 blades operated for thirty four months; during Period 2, the L-0 blades operated for twenty eight months;[13] during Period 3, the L-0 blades operated for seventeen months; during Period 4, the L-0 blades operated for five months; and during Period 5, the L-0 blades operated for only two months. Jt. Ex. 80, p. 5.

D. DEF's operation of the ST between June 2009 and March 2012 (Period 1).

40. DEF first began commercial operation of the ST in June 2009. This initial period of operation extended until March 2012, a period of thirty-four months ("Period 1"). Jt. Ex. 80, p. 5; T. 73, 332.

[12] The mid-span snubbers are located at the middle of each L-0 blade and the z-locks are located at the end of each L-0 blade. T. 50.

[13] The Period 2 blades were removed during a planned outage to install the Period 3 blades. Jt. Ex. 80.

41. During Period 1, DEF operated the ST a total of 21,734 hours. It is undisputed that for approximately one-half of this time, DEF operated the ST at less than 420 MW; during the other half, DEF operated the ST at or above 420 MW. Jt. Ex. 80, p. 5; T. 285, 352.

42. The L-0 blades in place in the low-pressure portion of the ST during this period were the original L-0 blades installed by MHPS ("Type 1 Blades"). Jt. Ex. 80, p. 5; T. 331-332.

43. It is undisputed that MHPS provided DEF with no flow limits for the ST's low pressure turbine during Period 1. DEF did not find this unusual because, in its experience, flow limits will normally be maintained if inlet pressure and temperature limits are maintained. T. 377-378.

44. In March 2012, DEF conducted a routine inspection of the ST and found that five L-0 blades in the low-pressure portion of the ST had experienced moderate damage at the mid-span snubbers. DEF consulted with MHPS regarding the blade damage and, following MHPS's inspection of the L-0 blades, MHPS recommended replacing all of the L-0 blades on the affected end of the machine (all five blades were on the same row). Jt. Ex. 80, p. 5; T. 148, 330.

45. It is not possible to know at what point during Period 1 the L-0 blades were damaged. Consequently, it is not possible to know whether the blades were damaged when the ST was being operated below 420 MW or when the ST was being operated above 420 MW. T. 352.

46. OPC's witness Polich agreed that during Period 1, DEF operated the ST below 420 MW (which he acknowledged constituted prudent operation under his definition) for at least one-half of the Period 1 operation time. OPC witness Polich further conceded that the L-0 blades may have been damaged during Period 1 while DEF was operating the ST below 420 MW (i.e., during what Mr. Polich defined as prudent operation). T. 352.

47. DEF maintains that it was prudent in its operation of the ST throughout Period 1 because it operated the ST in accordance with the operating parameters specified by MHPS in the

ST's operating manual. It is undisputed that DEF operated the ST within the manufacturer's operating parameters related to steam pressures, operating temperatures and other parameters common to STs. T. 346, 377-378.

48. According to DEF, MHPS never advised DEF that it could not to operate the ST in excess of 420 MW. T. 272, 284.

49. OPC, FIPUG and PCS Phosphate take the position that DEF was imprudent in its operation of the ST during those portions of Period 1 when DEF operated the ST in excess of 420 MW. In support of this position, OPC, FIPUG and PCS Phosphate argue that 420 MW is the maximum output capacity for the ST because the heat balance tests conducted by MHPS for the ST never exceeded 420 MW and because, pursuant to the Purchase Agreement, MHPS guaranteed the ST would generate 420 MW. T. 312-313, 346, 351-352.

50. OPC further argues that DEF acted imprudently during Period 1 because it failed to consult with MHPS before attempting to operate the ST above 420 MW. T. 307.

E. DEF's operation of the ST between April 2012 and August 2014 (Period 2).

51. Period 2 commenced in April 2012 and ended in August 2014, a period of twenty-eight months. T. 332.

52. During Period 2, DEF operated the ST a total of 21,284 hours. For essentially this entire period, DEF operated the ST at less than 420 MW[14] and complied with MHPS's modified operating parameters for the period. Jt. Ex. 80, p. 5; T. 347.

53. At the beginning of Period 2, DEF and MHPS replaced all of the L-0 blades on the affected end of the low-pressure turbine with re-engineered Type 1 blades. In addition, MHPS imposed a 118-pound per square inch (psi) limit on the intermediate pressure turbine exhaust. At the time, there was a pressure instrument located at the ST's intermediate pressure exhaust, but there was no pressure instrument located at the low-pressure inlet. Due to this, the intermediate

[14] Technically, DEF operated the ST above 420 MW for less than 2 hours. Jt. Ex. 72.

pressure exhaust was used as a proxy for estimating the amount of pressure entering the low-pressure inlet. T. 150-151, 259, 332, 378.

54. This was the first time that MHPS imposed an operating parameter specific to the intermediate pressure turbine exhaust. T. 260.

55. This 118-psi pressure limitation reduced the power being generated by the ST below 420 MW, which prompted DEF to ask MHPS to determine whether anything could be done to allow generation at the same levels previously reached in Period 1. In response, MHPS performed a study and determined that they could redesign the L-0 blades to make them more robust and, consequently, allow the Bartow Plant to generate 450 MW output. T. 152, 277.

56. During a planned outage beginning in August 2014, MHPS replaced the Period 2, reengineered Type 1 blades with newly-designed heavy duty blades ("Type 3 blades"), thus beginning Period 3. During this planned outage, DEF and MHPS conducted an inspection of the Period 2 (reengineered Type 1) blades. Jt. Ex. 80, p. 5.

57. Despite the fact that DEF operated the ST under 420 MW for virtually the entire period and complied with MHPS's modified operating parameters during the entirety of this period, DEF and MHPS discovered moderate damage to several of the reengineered Type 1 blades. Jt. Ex. 80, p. 5.

58. Between Period 2 and Period 3, MHPS and DEF installed temporary blade vibration monitoring equipment in the ST to allow for telemetry testing, which DEF and MHPS expected would help them to understand why the L-0 blades were experiencing damage. T. 101, 244.

59. An additional purpose of installing the telemetry instrumentation was to develop further operating parameters that might be needed to protect the ST and the L-0 blades. T. 244.

60. It is undisputed that DEF's operation of the ST during Period 2 was prudent at all times. T. 347.

F. DEF's operation of the ST between December 2014 and April 2016 (Period 3)

61. Period 3 commenced in December 2014 and ended seventeen months later in April 2016. T. 332.

62. During Period 3, DEF operated the ST a total of 10,286 hours. DEF never exceeded 420 MW of output, except for a short time period (240 hours) during which MHPS and DEF intentionally operated above 420 MW for the purpose of identifying dynamic stresses within the ST. Jt. Ex. 80, p. 5; T. 380.

63. During Period 3, MHPS performed extensive telemetry testing on the ST. Based on the results of this telemetry testing, MHPS established a new operating parameter for the ST, which MHPS termed an "avoidance zone" (the "Avoidance Zone"). T. 245, 378.

64. Specifically, the Avoidance Zone established steam loading limitations to avoid certain operating conditions based upon combinations of low-pressure turbine inlet pressure and condenser pressure that exhibited undesirable blade flutter during the telemetry testing; this load limitation was not in existence during Period 1 or Period 2.[15] T. 109, 245, 270, 378.

65. MHPS created the Avoidance Zone based on the telemetry testing conducted at the start of Period 3. The testing was conducted in part because MHPS calculated the Bartow ST experienced approximately 15,000 foot pounds per hour per square foot ("lb./hr-ft^2") and MHPS's experience with 40-inch L-0 blades was limited to operation at approximately 12,000 lb./hr-ft^2 of calculated steam mass flow on last stage blades; MHPS was uncertain what impact, if any, L-0 blades would experience above that level of operation. T. 107-109, 112.

66. MHPS calculated that operation of the ST at 420 MW creates between 15,000 and 17,000 lb./hr-ft^2 of steam mass flow on the L-0 blades. T. 107-109.

[15] Although DEF had no way of knowing whether or not it was operating the ST within the Avoidance Zone during Periods 1 and 2 (T. 286; Jt. Ex. 80, p. 5), DEF and MHPS were able to back-calculate the foot pounds per hour per square foot created by operation of the ST during Period 1 and determine that DEF operated within the Avoidance Zone during Period 1. T. 107-109; Jt. Ex. 80, p. 5.

67. DEF has no way of measuring the foot pounds per hour per square foot of steam going through the ST while it is being operated because this is not an operating parameter that can be viewed real-time on a gauge. Instead, foot pounds per hour per square foot is a calculated number. T. 285

68. As set forth above, DEF never exceeded 420 MW of output during Period 3 other than briefly during telemetry testing with MHPS. In addition, DEF operated the ST within the operating parameters established by MHPS for this period, including the newly created Avoidance Zone (once communicated to DEF). T. 347-348

69. Nonetheless, at the conclusion of Period 3, DEF and MHPS examined the ST and determined that several of the Type 3 L-0 blades had experienced damage. Jt. Ex. 80, p. 5.

70. Following this, DEF and MHPS concluded that all of the L-0 blades should be changed once again. Jt. Ex. 80, p. 5.

71. It is undisputed that DEF's operation of the ST during Period 3 was prudent at all times. T. 347-348.

G. DEF's operation of the ST between June 2016 and October 2016 (Period 4).

72. Period 4 commenced in June 2016 and ended five months later in October 2016. Jt. Ex. 80, p. 5; T. 332.

73. During Period 4, DEF operated the ST a total of 2,942 hours. DEF did not exceed 420 MW of output during this period and operated the ST within the operating parameters established by MHPS for this period.[16] Jt. Ex. 80, p. 5; T. 348.

74. At the beginning of Period 4, DEF and MHPS installed a new set of L-0 blades ("Type 3 v2 blades"), which included some design improvements MHPS made to the original Type 3 blade design. Jt. Ex. 80, p. 5; T. 332.

[16] Technically, DEF operated the ST within the Avoidance Zone for 1.15 hours during this period. Jt. Ex. 80, p. 5. However, DEF was instructed to minimize, not eliminate, time in the Avoidance Zone. T. 111.

75. Just five months after the commencement of Period 4, DEF detected vibration changes in the low-pressure turbine. When the changes were detected, DEF stopped operation of the ST in order to inspect the L-0 blades. During this inspection, DEF and MHPS, once again, found several damaged L-0 blades. Jt. Ex. 80, p. 5; T. 206.

76. At the time of this blade damage, DEF was operating the ST below 420 MW and within the operating parameters established by MHPS for this period. Jt. Ex. 80, p. 5; T. 208.

77. It is undisputed that DEF's operation of the ST during Period 4 was prudent at all times. T. 348.

H. DEF's operation of the ST between December 2016 and February 2017 (Period 5).

78. Period 5 commenced in December 2016 and ended two months later in February 2017. Jt. Ex. 80, p. 5; T. 332.

79. During Period 5, DEF operated the ST a total of 1,561 hours. DEF never exceeded 420 MW of output during this period and operated the ST within the operating parameters established by MHPS for this period. Jt. Ex. 80, p. 5; T. 348-350.

80. At the beginning of Period 5, DEF and MHPS re-installed Type 1 L-0 blades in the ST. T. 332

81. The Type 1 blades installed during Period 5 were the same as the Type 1 blades used during Period 1. Up to this point, of all the blades installed in the ST, the Type 1 blades experienced the longest period of uninterrupted operation. The only difference between the Period 1 Type 1 blades and the Period 5 Type 1 blades is that the latter had a softening of the blade edges,[17] but the snubbers and z-locks and the materials used to manufacture the blades were identical. T. 101-102.

[17] MHPS softened the blade edges on the Type 1 blades after concluding that this minor modification would prevent additional blade failures. T. 101-102.

82. On February 9, 2017, the ST was removed from service when DEF detected the presence of sodium in the steam water cycle (i.e., salt water). During this shutdown, DEF performed an inspection of the ST and discovered a failed low-pressure turbine rupture disk and damage to the L-0 blades. DEF concluded that part of an L-0 blade snubber or z-lock tip broke off and ruptured the low-pressure turbine rupture disk. This resulted in a forced outage that lasted until April 8, 2017. T. 40-41.

83. Based on this sequence of events, DEF was able to determine with certainty that the blade damage during Period 5 occurred on February 9, 2017. At the time, DEF was operating the ST below 420 MW and within the operating parameters established by OEM for this period. Jt. Ex. 80, p. 5.

84. It is undisputed that DEF's operation of the ST during Period 5 was prudent at all times. T. 348-350.

I. DEF's operation of the ST between April 2017 and December 2019.

85. During the forced outage of the ST, DEF continued to operate the Bartow Plant with the gas turbines running in simple cycle mode. T. 41, 43, 54.

86. DEF took three primary actions in the wake of the Period 5 outage: a root cause analysis ("RCA") team was established to investigate the incident and prepare an RCA; a restoration team was formed to bring the ST back on-line; and a team was formed to evaluate a long-term solution for the ST. T. 42.

87. In April 2017, DEF and MHPS installed pressure plates in place of the L-0 blades as an interim solution that would bring the ST back into operation quickly and give MHPS and DEF enough time to develop a permanent solution. T. 44, 54, 198. Because each previous iteration of blades had suffered damage, DEF did not believe re-installing any of the available types of blades would allow for event-free operation while a long-term solution could be devised. T. 200-201, 391.

88. A pressure plate is a non-rotating plate that has holes drilled into it; it reduces the pressure of the steam passing through a steam turbine so the steam does not damage the unit's condenser. A pressure plate does not use the steam passing through it to produce electricity and, therefore, decreases the efficiency of a steam turbine. T. 55, 331.

89. Although OPC acknowledges that DEF's operation of the ST during Periods 2 through 5 was prudent, it maintains that the installation of the pressure plates in the ST would not have been necessary had DEF operated the ST at or below 420 MW during the entirety of Period 1. T. 321, 331, 348-350.

90. OPC further suggests that all blade damage that occurred in the ST from Period 1 through Period 5 somehow flowed directly from DEF's operation of the ST above 420 MW during Period 1. T. 335.

91. OPC does not, however, attempt to explain how the operation of the ST during Period 1 caused the blade damage that occurred during each subsequent period and resulted in the installation of the pressure plate. Importantly, this argument fails to account for critical intervening events that occurred during the five-year interval between Period 1 and Period 5, which included prudent operation of the ST during each period, multiple blade replacements, several inspections of the ST by both DEF and MHPS, and the implementation of numerous additional reductions in operating parameters by MHPS.

92. While the pressure plates were installed, the ST operated below 380 MW at all times. T. 250.

93. Although the pressure plates reduced the output of the Bartow Plant, this interim measure ultimately allowed DEF to operate the ST without interruption and event-free for more than two years while a long-term solution could be identified, engineered, tested, and installed. T. 55, 250.

J. DEF's operation of the ST since December 2019.

94. In December 2019, MHPS installed redesigned L-0 blades (Type 5) that were extensively tested by MHPS and witnessed by DEF subject matter experts. These new, redesigned blades are currently installed in the ST. T.198, 251.

95. In addition to new redesigned L-0 blades, MHPS and DEF have installed a permanently-mounted blade vibration monitoring device in the ST for monitoring operating conditions of the L-0 blades so that modifications of operating parameters can be made proactively if warranted based on the data. T. 199.

96. As of the date of the final hearing in this case, DEF had operated the Bartow Plant with the redesigned L-0 blades without incident on a 1x1, 2x1 and 3x1 configuration, but had not operated with all four combustion turbines. T. 252.

K. DEF's RCA.[18]

97. Beginning in March 2012, DEF formed an RCA team consisting of seven individuals with expertise in engineering, operations and process, and human performance. T. 43, 57.

98. The DEF RCA team examined several potential causes for the repeated incidents of

[18] During its closing statement, for the first time in the course of these proceedings, FIPUG raised a contention that DEF had not carried its burden of proof because its RCA was hearsay and thus could only corroborate other non-hearsay evidence. T 417. For a number of reasons, this contention is without merit. First, because the record indicates the DEF RCA (Jt. Ex. 80) is the type of information DEF relies upon in the normal course of its business and was created using industry-standard practices (T. 43, 57-59), it is admissible in administrative proceedings and may form the basis of a finding of fact. § 120.569(2)(g), Fla. Stat. ("all other evidence of a type commonly relied upon by reasonably prudent persons in the conduct of their affairs shall be admissible, whether or not such evidence would be admissible in a trial in the courts of Florida. . . "); Second, even if the RCA were hearsay and section 120.569(2)(g) did not apply, which it clearly does, I find that the business-record exception to the hearsay rule applies and the RCA would be admissible in a Florida court. § 90.803(6)(a), Fla. Stat. Finally, assuming the RCA was not otherwise admissible (which it is) and that it constituted hearsay without a valid exception (which it does not), FIPUG waived any hearsay objection by failing to voice the objection contemporaneously with discussion of the document. § 90.104(1)(a), Fla. Stat.; *see Krysiak v. City of Kissimmee*, 2020 Fla. App. LEXIS 1775, *13 (Fla. 1st DCA Feb. 13, 2020) ("The failure to make a contemporaneous objection to the admissibility of evidence can result in waiver so that hearsay evidence can be considered…").

L-0 blade damage, both operational and design in nature.[19] Among the potential causes investigated and determined not to be the cause of L-0 blade damage was the possibility that too much steam was being introduced into the low-pressure turbine. T. 78.

99. Ultimately, the DEF RCA team concluded that the L-0 blades were not designed with sufficient design margin to function at the dynamic stress level within the ST while operated according to the operating parameters provided by MHPS. T. 238.

100. The term "design margin" refers to a tolerance level built into a piece of equipment that allows the equipment to be operated at a certain amount above or below a prescribed operating limit without causing damage to the equipment. T. 219.

101. It is standard within the steam turbine manufacturing industry for the manufacturer to include a level of design margin into steam turbine components. T. 326.

L. MHPS's RCA.

102. MHPS performed its own, independent RCA to attempt to identify the source of the L-0 blade damage. T. 216.

103. Initially, MHPS's RCA hypothesized that the L-0 blades were damaged because the steam mass flow loading on the L-0 blades was excessive. T. 216.

104. Notably, in conjunction with this initial assessment, MHPS did not conclude that DEF had operated the ST in violation of the operating parameters it provided DEF for the ST. Instead, MHPS surmised that DEF's operation of the ST within the prescribed operating parameters resulted in a higher-than-anticipated foot pounds per hour per square foot of steam mass flow loading on the L-0 blades. T. 97, 386.

[19] The DEF RCA process produced various working papers, each of which reflected proposed, potential causes of blade damage. Some of these proposed causal factors were discarded during the RCA process as testing, analysis or operational evidence ruled them out. T. 89-90, 181.

105. As subsequently acknowledged by MHPS, its initial assessment of the cause of the L-0 blade damage was mistaken:

> multiple forced outages were experienced due to last stage blade damage caused by high load stimulus and high energy blending in the 4 on 1 configuration which was not fully understood until conducting an extensive collaborative RCA.

T. 97, 386.

106. In its final RCA, MHPS explained that the root cause of the L-0 blade damage in each period was excessive vibration or flutter[20] on the L-0 blades. T. 99, 218, 241, 385. MHPS's RCA dated September 22, 2017 states: "Root Cause Analysis has identified all blade damage from Period 1 thru Period 5 has been identified as Dynamic Loads from Non-Synchronous Self Excited Vibration (Flutter)". Jt. Ex. 82, p. 12 of 35.

107. Once MHPS understood the root cause of the L-0 blade damage, MHPS developed an L-0 blade specifically designed to operate in the unique conditions present at the Bartow Plant. T. 97; Jt. Ex. 83. These new blades were installed during a Fall 2019 planned outage. T 198.

CONCLUSIONS OF LAW

A. Authority.

108. DOAH has jurisdiction in this proceeding pursuant to sections 120.569 and 120.57(1), Fla. Stat.

B. Nature of the Proceeding.

109. Pursuant to section 120.57(1)(k), Fla. Stat., this is a de novo proceeding intended to formulate final agency action and not to review action taken earlier and preliminarily.

C. Standing.

[20] Blade flutter or vibration can have many different causes. MHPS did not identify the cause of blade flutter. T. 218.

110. As previously determined by the PSC, each of the parties to this matter has standing to participate in this proceeding.[21]

D. Burden of Proof.

111. As the utility seeking to recover its fuel costs, DEF has the burden of proving by a preponderance of the evidence that it was prudent in its actions and decisions. *In Re: Investigation into Extended Outage of Fla. Power & Light Company's St. Lucie Unit No. 1.*, 85 FPSC 12:284 (Dec. 23, 1985); *Fla. Power Corp. v. Cresse*, 413 So. 2d 1187, 1191 (Fla. 1982).

112. The standard for determining prudence is what a reasonable utility manager would have done, in light of the conditions and circumstances that were known, or should have been known, at the time the decision was made. *S. Alliance for Clean Energy v. Graham*, 113 So. 3d 742, 750 (Fla. 2013). Hindsight cannot form the basis of a prudence determination. *Fla. Power Corp. v. Public Service Com'n*, 456 So. 2d 451, 452 (Fla. 1984)

E. Whether DEF was prudent in its actions and decisions leading up to and in restoring the Bartow plant to service after the Bartow Plant's February 2017 forced outage and, if not, what actions the PSC should take with respect to the replacement power costs incurred by DEF.

113. Before DEF purchased the ST, MHPS represented to DEF that the ST would be compatible with the Bartow Plant.

114. At the time DEF purchased the ST, MHPS provided DEF with specific operating parameters for the ST relating to steam pressures, operating temperatures and other parameters common to STs. When the L-0 blades experienced damage during the course of each period of operation, MHPS modified these operating parameters in an effort to prevent further blade damage.

115. DEF consistently operated the ST in compliance with each of the parameters established by MHPS.

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[21] *See* Letter from Adam J. Teitzman, Florida Public Service Commission Clerk (Nov. 8, 2019).

116. None of the parameters established by MHPS for the ST's operation limited operation of the ST to 420 MW of output.

117. Even assuming DEF should have known that operation of the ST above 420 MW was unreasonable, the evidence does not establish with any degree of certainty that the L-0 blades installed in the ST experienced damage as a consequence of DEF's operation of the ST above 420 MW.

118. The only period during which DEF operated the ST above 420 MW for a significant interval of time was Period 1. None of the parties presented evidence from which it can be concluded that the damage to the L-0 blades during this period occurred while the ST was being operated above 420 MW. Indeed, as acknowledged by OPC, the damage to the Period 1 blades may have occurred while DEF operated the ST below 420 MW, which OPC's witness admitted constituted prudent operation.

119. MHPS and DEF both assessed the blade damage during Periods 1 through 5 and both independently concluded that operation of the ST above 420 MW was not the cause of the blade damage during any period. In its RCA, DEF concluded that the blades were damaged as a consequence of inadequate design margins. MHPS concluded that the unique conditions present at the Bartow Plant, including high load stimulus and high energy blending, required an upgraded L-0 blade that was capable of operating under those unique conditions. From the conclusion reached by MHPS, one can deduce that the L-0 blades installed in the ST during Periods 1 through 5 were inadequate for operation within the Bartow ST.

120. Importantly, the evidence conclusively establishes that all L-0 blades damaged during Periods 2 through 5 experienced damage while the ST was operated at or below 420 MW, which reinforces the conclusion that the cause of the blade damage during each period was not DEF's operation of the ST but was, instead, the inadequate design of the L-0 blades.

121. The argument by OPC that the Period 1 blades would still be in use today if DEF had operated the ST at or below 420 MW during Period 1 fails to account for the blade damage that occurred during Periods 2 through 5 under operating conditions that were well below 420 MW and otherwise complied with all established operating parameters.

122. Of particular significance is the fact that during Period 5, the ST was operated with the same Type 1 blade that was used during Period 1. It is notable that during Period 1, DEF operated the ST for a period of thirty-four months in accordance with MHPS's original operating parameters and the ST achieved as much as 457.6 MW before DEF discovered damage to the blades. In contrast, during Period 5, DEF operated the ST pursuant to more-restrictive operating parameters that limited the ST's output to only 402.1 MW, and the same Type 1 blades failed after only two months of operation. The fact that the Type 1 blades failed during Period 5 even though the ST was always operated at or below 420 MW refutes any argument that the same Type 1 blades would not have failed during Period 1 if the ST had been operated below 420 MW.

123. In order to agree with the assertion by OPC that DEF should have spoken with MHPS before operating the ST above 420 MW, one must first accept as true the premise that 420 MW was an operating parameter for the ST. It is standard industry procedure to operate STs based on operating parameters related to steam pressures, flows and temperatures. It is not, however, standard industry procedure to operate STs based on output of an ST. Output is a byproduct of the operation of an ST and is not an operational limit. Operators and equipment manufacturers do not discuss the operation of STs in terms of electrical output, but in terms of operating parameters.

124. The goal of a reasonable utility manager should be to maximize the output of a utility plant while operating within the plant's known operating parameters. It would be imprudent for a utility manager to constrain the efficiency of a utility plant based on an arbitrary electrical output number.

125. The contention that all blade damage that occurred in the ST from Period 1 through Period 5 somehow flowed directly from DEF's operation of the ST above 420 MW during Period 1 is not supported by the facts in evidence. There is no causal link between the Period 1 operation of the ST and the damage experienced by the L-0 blades during subsequent periods. Such a groundless contention cannot form the basis for denying a utility's fuel cost recovery. *In Re: Fuel & Purchased Power Cost Recovery Clause with Generation Performance Incentive Factor (Crystal River 3 1989 Outage)*, 91 FPSC 12:165, *12 (Dec. 9, 1991).

126. Although the facts in evidence do not support the conclusion, if one were to assume for the sake of argument that DEF's operation of the ST above 420 MW during Period 1 was imprudent, if that "imprudent" operation did not cause the Period 5 outage then the "imprudent" operation could not be a basis for disallowance of the replacement power costs at issue; without a causal link from the "imprudent" operation to the blade damage and period 5 replacement power costs, the replacement power costs at issue could not be said to be a result of the Company's mismanagement and therefore there is no basis to bar recovery of those costs.

127. As stated above, there is no evidence linking the Period 1 operation of the ST to the Period 5 outage.

128. During each period of operation, DEF reasonably consulted with, and followed the recommendations made by, MHPS regarding the operation of the ST. Indeed, throughout each period of the ST's operation, DEF relied upon MHPS to identify the L-0 blades to be used in the ST, to install testing equipment in the ST that would help identify the source of the blade damage, and to establish operating parameters for the ST.

129. Following the February 2017 outage, DEF, once again, consulted with MHPS to determine the best course of action for restoring the Bartow ST to service.

130. There was no entity or person with greater expertise regarding the operation of the ST upon whom DEF could have reasonably relied. Under the circumstances, DEF acted prudently in relying upon MHPS's expertise concerning the operation of the ST leading up to, and in restoring the Bartow ST to service after, the February 2017 forced outage. *In Re: Fuel & Purchased Power Cost Recovery Clause with Generation Performance Incentive Factor (Crystal River 3 1989 Outage)*, 91 FPSC 12:165, *11 (Dec. 9, 1991)(finding that utility's reliance upon vendor's superior expertise regarding the installation of coolant pump seals was prudent, despite the fact that seal failure caused outage); *In Re: Investigation into Extended Outage of Florida Power and Light Company's St. Lucie Unit No. 1*, 85 FPSC 284, *7 (Dec. 23, 1985)(finding that utility acted prudently when it relied upon the expertise of a contracted engineer when it decided to include a thermal shield in the design of its plant).

131. Given the information available to DEF from MHPS and industry sources regarding the operation of the ST, DEF acted prudently in the operation of the Bartow ST leading up to, and in restoring the Plant to service after, the February 2017 forced outage. As such, DEF should be permitted to recover its claimed replacement power costs.

F. Whether DEF has made prudent adjustments to account for replacement power costs associated with the derating of the Bartow Plant and whether additional adjustments should be made.

132. This issue asks whether DEF should be required to make an adjustment to account for operation of the ST with pressure plates in place of the L-0 Blades.

133. As discussed above, the evidence of record establishes that DEF prudently operated the unit during all periods.

134. No party to this proceeding has challenged the prudence of installing, and operating the ST with, pressure plates in place of the last stage blades from April 2017 until September 2019. Rather, OPC has argued that if DEF had prudently operated the ST during Period 1, no damage

would have occurred to the original L-0 Blades and therefore installation of pressure plates would not have been necessary.

135. For the reasons discussed above, I do not agree with OPC's position. As DEF was prudent in its operation of the ST during each period, the damage to the blades was not DEF's fault. Because DEF did not believe any version of the L-0 blades available in the Spring of 2017 would allow event-free operation while a long-term solution was identified, engineered, and installed, it determined the best course of action was to install the pressure plates which allowed the ST to provide electricity for DEF's customers. This decision was prudent.

136. Because DEF prudently installed, and operated the ST with, pressure plates in place of the L-0 Blades from April 2017 through September 2019, no adjustment for replacement power costs for the reduced output is warranted.

RECOMMENDATION

Based on the foregoing Findings of Fact and Conclusions of Law, it is RECOMMENDED that the Florida Public Service Commission enter a final order finding that DEF acted prudently in the operation of the Bartow Plant leading up to, and in restoring the Plant to service after, the February 2017 forced outage, finding that no adjustment is warranted to account for replacement power costs associated with the derating of the Bartow Plant resulting from operation of the ST with the pressure plates installed, and permitting DEF to recover its prudently incurred fuel and replacement power costs with no adjustment.

DONE AND ENTERED this ____ day of April 2020, in Tallahassee, Leon County, Florida.

_____

Lawrence P. Stevenson

Administrative Law Judge

Division of Administrative Hearings

The DeSoto Building

1230 Apalachee Parkway

Tallahassee, Florida 32399-3060

Filed with the Clerk of the Division of Administrative Hearings this ____ day of April 2020.

NOTICE OF RIGHT TO SUBMIT EXCEPTIONS

All parties have the right to submit written exceptions within 15 days from the date of this Recommended Order. Any exceptions to this Recommended Order should be filed with the agency that will issue the Final Order in this case.

Respectfully submitted this ____ day of March 2020.

/s/ Matthew R. Bernier

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