



SIERRA CLUB

June 11, 2024

Via electronic delivery

Adam Teitzman
Director, Office of Commission Clerk
Florida Public Service Commission
2540 Shumard Oak Blvd.
Tallahassee, Florida 32399-0850

Re: **Docket No. 20240025-EI**
Petition for Rate Increase by Duke Energy Florida, LLC

Dear Mr. Teitzman,

Enclosed for filing on Sierra Club's behalf is the Direct Testimony of Rose Anderson in the above referenced docket. Should you have any questions regarding this filing, please contact me.

Sincerely,

/s/ Tony Mendoza

Tony Mendoza
Patrick Woolsey
2101 Webster Street Suite 1300
Oakland, CA 94612
(415) 977-5589
(415) 977-5757
tony.mendoza@sierraclub.org
patrick.woolsey@sierraclub.org

Sari Amiel
Sierra Club
50 F St. NW, Eighth Floor
Washington, DC 20001
(301) 807-2223
sari.amiel@sierraclub.org

Qualified Representatives for Sierra Club

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

Petition for Rate Increase by
Duke Energy Florida, LLC

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)

Docket No. 20240025-EI

Direct Testimony of

Rose Anderson

On Behalf of

Sierra Club

June 11, 2024

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LIST OF EXHIBITS

- RA-1: Resume of Rose Anderson
- RA-2: Duke Energy Florida’s Public Responses to Sierra Club Interrogatories
- RA-3: Duke Energy Florida’s 2024 Ten-Year Site Plan
- RA-4: 2020 Crystal River North Retirement Study
- RA-5: Duke Energy Florida’s Response to Off. of Pub. Counsel (“OPC”) POD 1-7
attach. “B-13 CWIP – REDACTED.xlsx”
- RA-6: Benjamin Borsch Deposition Transcript (Excerpted)
- RA-7: Reginald Anderson Deposition Transcript (Excerpted)
- RA-8: U.S. EPA, *Final Carbon Pollution Standards to Reduce Greenhouse Gas
Emissions from Power Plants*, Apr. 25, 2024
- RA-9: Florida Reliability Coordinating Council, 2022 Load & Resource Reliability
Assessment Report, FRCC-MS-PL-397
- RA-10: Duke Energy Carolinas and Duke Energy Progress, Effective Load Carrying
Capability (ELCC) Study, Astrapé Consulting, Apr. 25, 2022

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1 **1. INTRODUCTION AND PURPOSE OF TESTIMONY**

2 **Q Please state your name and occupation.**

3 A My name is Rose Anderson. I am a Principal Associate at Synapse Energy
4 Economics (“Synapse”). My business address is 485 Massachusetts Avenue, Suite
5 3, Cambridge, Massachusetts 02139.

6 **Q Please describe Synapse Energy Economics.**

7 A Synapse is a research and consulting firm specializing in energy issues including
8 electric generation, transmission and distribution system reliability, ratemaking
9 and rate design, electric industry restructuring and market power, electricity
10 market prices, stranded costs, efficiency, renewable energy, environmental
11 quality, and nuclear power.

12 Synapse’s clients include state consumer advocates, public utilities commission
13 staff, attorneys general, environmental organizations, federal government
14 agencies, and utilities.

15 **Q Please summarize your work experience and educational background.**

16 A At Synapse, I review planning assumptions and modeling in utility integrated
17 resource plans (“IRPs”). I evaluate utility rate case requests and engage in
18 stakeholder IRP processes. My focus is on the economics of thermal generators
19 and on the development of utility portfolios that minimize cost and risk while
20 providing customers with reliable service.

21 Before joining Synapse, I performed economic analysis at the Oregon Public
22 Utility Commission and at McCullough Research, an energy economics

1 consulting firm. In my role on the Oregon Public Utility Commission staff, I
2 prepared testimony and comments with recommendations for commissioners on
3 utility integrated resource plans, power cost proceedings, rate cases, tariff filings,
4 and Requests for Proposals (“RFP”).

5 I have experience running the EnCompass and Aurora utility planning models and
6 reviewing modeling inputs and outputs from these and other utility models.

7 A copy of my current resume is attached as Exhibit RA-1.

8 **Q On whose behalf are you testifying in this case?**

9 A I am testifying on behalf of Sierra Club.

10 **Q Have you testified previously before the Florida Public Service Commission?**

11 A No. I have testified in proceedings at the Oregon Public Utility Commission and
12 Nevada Public Utilities Commission.

13 **Q What is the purpose of your testimony in this proceeding?**

14 A I evaluate Duke Energy Florida’s (“DEF” or “the Company”) coal-fired Crystal
15 River North power plant, which consists of Units 4 and 5. I analyze the
16 reasonableness of Duke’s proposed continued spending at Crystal River North
17 Units 4 and 5 based on my analysis of the economics of continuing to operate
18 those units. I outline the savings from early retirement and procurement of
19 replacement resources as needed, and how early retirement avoids environmental
20 compliance costs that those units would otherwise incur. I discuss methods of
21 increasing customer savings and mitigating the impacts of accelerated
22 depreciation at Crystal River North from an earlier retirement of the plant.

1 Finally, I argue that the Company could create ratepayer benefits by performing a
2 study of the winter capacity contribution of solar.

3 **Q How is your testimony structured?**

4 A Section 2 summarizes my findings and recommendations. In Section 3, I provide
5 relevant background on Crystal River North. In Section 4, I outline DEF's
6 requests in this rate case to continue to operate the plant on coal and include the
7 associated costs in rates. In Section 5, I explain why retirement of Crystal River
8 North earlier than 2034 is likely to benefit customers. In Section 6, I present my
9 analysis on the projected economics of the Crystal River North plant over the next
10 decade. In Section 7, I outline the risks of continuing to rely on the Crystal River
11 North plant, including risks from fuel price volatility and fuel supply disruptions,
12 and future environmental regulation risk. In Section 8, I discuss ways to avoid the
13 potential adverse rate impacts of accelerated depreciation, and highlight that
14 obtaining funding under the U.S. Department of Energy's ("DOE") Energy
15 Infrastructure Reinvestment ("EIR") program could result in over a hundred
16 million dollars in additional savings for customers. Finally, in Section 9, I argue
17 that DEF should evaluate the winter capacity contribution of solar.

18 **Q What documents do you rely upon for your analysis, findings, and**
19 **observations?**

20 A My analysis relies upon the application, testimonies, and other materials filed by
21 DEF in this rate case, the Company's 2023 Ten-Year Site Plan ("TYSP"),
22 discovery responses received from DEF, and publicly available data.

1 **2. FINDINGS AND RECOMMENDATIONS**

2 **Q Please summarize your findings.**

3 A My primary finding are:

- 4 1. Retiring Crystal River North as soon as possible, but by 2030 at the latest,
5 instead of its currently planned retirement date of 2034, will have
6 substantial benefits for customers.
- 7 2. Retiring Crystal River North by 2030 and replacing it with solar energy
8 and capacity contracts would reduce system costs, while also reducing the
9 risks associated with fuel prices and environmental regulations.
- 10 3. I estimate that retiring Crystal River North in 2030, for example, could
11 save customers approximately \$155 million.
- 12 4. In this rate case, the Company is requesting significantly more operations
13 and maintenance (“O&M”) spending than has historically been necessary
14 to operate the Crystal River North coal units.
- 15 5. The Company’s resource planning would likely benefit from a more
16 rigorous consideration of the ability of solar to contribute to resource
17 adequacy, including during winter.
- 18 6. Funding the Crystal River North retirement and replacement through the
19 U.S. DOE EIR loan program would potentially generate more than \$123
20 million in *additional* savings for customers, resulting in a total customer
21 benefit of \$278 million.

1 **Q Please summarize your recommendations.**

2 A In my testimony, I offer the following recommendations:

3 1. I recommend that the Company commit to cease burning coal and retire
4 Crystal River North by the end of 2030.

5 2. Because benefits from an U.S. DOE EIR loan could surpass one hundred
6 million dollars, I recommend that the Commission direct DEF to submit
7 an application for EIR financing before the program’s application
8 deadline. This application should include the retirement of Crystal River
9 North by 2030 and replacement with renewable energy.

10 3. The Company should offer a reasonable justification for the increase in
11 O&M for the Crystal River North coal units, or its revenue requirement
12 should be revised downward to more closely match historical spending.

13 4. Given that DEF expects to soon have thousands of megawatts (“MW”) of
14 solar on its system, the Company should perform a study of the capacity
15 contribution of solar, including during winter.

16 **3. BACKGROUND ON CRYSTAL RIVER NORTH**

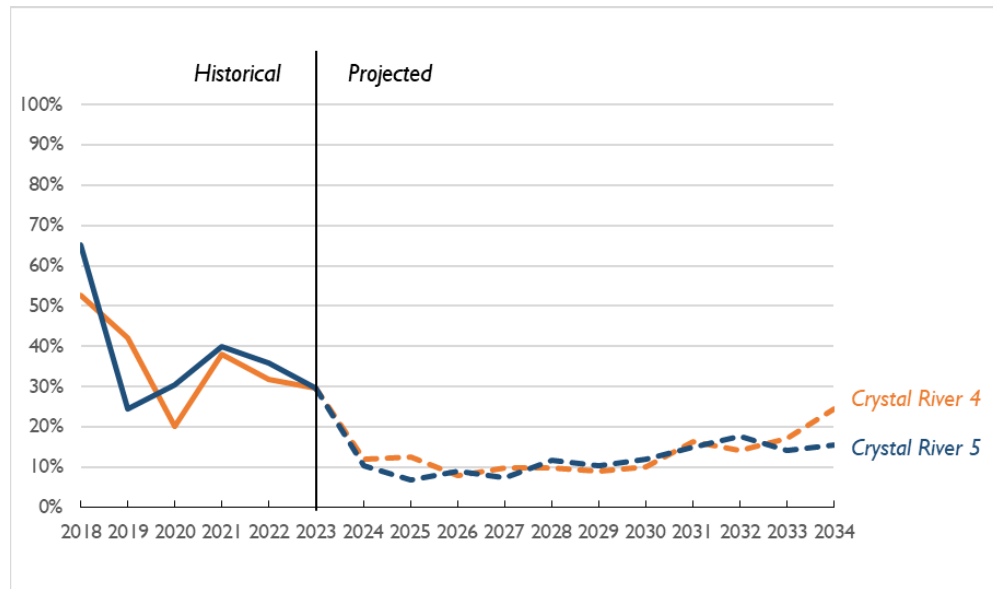
17 **Q Please describe the current Crystal River North plant.**

18 A Crystal River North consists of Crystal River Units 4 and 5, which are two coal-
19 fired units located in Citrus County, Florida. Units 4 and 5 have capacities of
20 approximately 739 MW each, for a combined total of approximately 1,478 MW.
21 The plant is owned by DEF. Crystal River Units 4 and 5 were built in 1982 and
22 1984 and are 42 and 40 years old, respectively.

1 **Q** **Please describe the recent historical and projected utilization of Crystal**
2 **River North.**

3 **A** As shown in Figure 1 below, the annual capacity factors at Crystal River Units 4
4 and 5 have ranged between 25 percent and 42 percent since 2019, and in the past
5 few years have displayed a steadily decreasing trend.¹ The current capacity
6 factors are around 30 percent. Over the next decade, DEF projects the units'
7 utilization will continue to fall, and remain between 8 percent and 20 percent
8 through 2033.²

9 **Figure 1. Capacity Factors at Crystal River North Units 4 and 5**



10

11

Source: EIA Form 923 and DEF Responses to SC ROG 1-7 (Ex. RA-2).

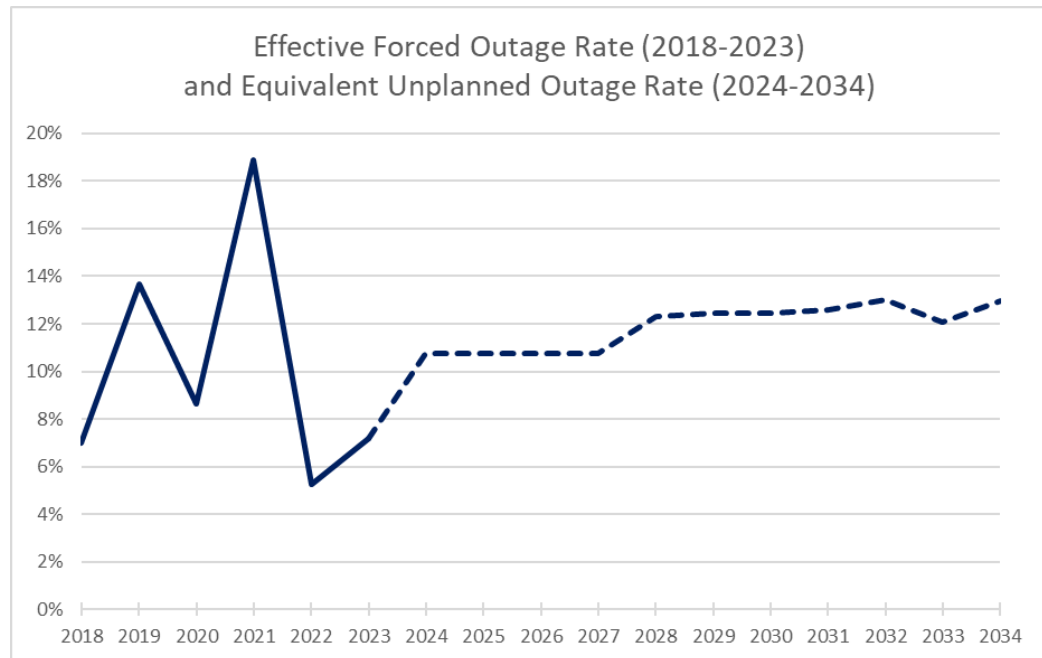
¹ Energy Information Agency. Form 923.

² DEF Response to SC ROG 1-7(d) (Ex. RA-2).

1 **Q How reliable has Crystal River North been in recent years, and how reliable**
2 **are the Units expected to be in the future?**

3 **A**As shown in Figure 2 below, Crystal River North Units 4 and 5 have a combined
4 effective forced outage rate that has ranged from about 5 percent to about 19
5 percent over the last five years.³ This upper range is above the Company's
6 projected future outage rates, which range between 11 and 13 percent over the
7 next decade, with an increase in expected forced outages as the plant approaches
8 retirement.⁴

9 **Figure 2. Forced Outage Rate at Crystal River North**



10
11 *Source: DEF Responses to SC ROGs 1-6(i) and 1-7(g),(h) (Ex. RA-2).*

³ DEF Response to SC ROG 1-6(i) (Ex. RA-2).

⁴ DEF Response to SC ROG 1-7(g), (h) (Ex. RA-2).

1 **Q What is the Company’s plan for the retirement of Crystal River North?**

2 A The Company’s 2024 Ten-Year Site Plan states that Crystal River Units 4 and 5
3 will be retired in 2034.⁵

4 **Q What analysis has the Company performed to support the 2034 retirement**
5 **date?**

6 A In 2020, DEF performed an economic analysis of Crystal River North retirement
7 dates. The Company compared a 2042 retirement with 2034, 2029, and 2026
8 retirement dates for units at Crystal River North and evaluated replacement of the
9 units with conventional generation and with solar and battery storage.⁶ The 2020
10 study found that the 2034 retirement would reduce risks to customers associated
11 with fuel price volatility and environmental regulation relative to a 2042
12 retirement, while allowing time for the construction of replacement resources.⁷
13 Subsequently, the 2034 retirement date was included in the 2021 rate case
14 settlement.⁸ DEF acknowledges that it has not conducted any new retirement
15 analysis since that 2020 study.⁹ As explained in greater detail below, economic
16 conditions and new environmental regulations have made the continued operation
17 of Crystal River North coal units a riskier and costlier proposition for DEF’s
18 customers.

⁵ DEF Ten-Year Site Plan at 3-49 (Apr. 2024) [hereinafter “DEF 2024 TYSP”] (Ex. RA-3).

⁶ DEF Response to SC ROG 1-1 and 1-2. (Ex. RA-2); *see also* DEF Response to Sierra Club Request for Production of Documents (“SC POD”) 1-4, attach. “CRN Presentation for 12152020”, Bates Nos. 20240025-SIERRACLUBPOD1-00000066-105 (Ex. RA-4).

⁷ DEF Response to SC ROG 1-1 and 1-2 (Ex. RA-2).

⁸ DEF Response to SC ROG 1-1 (Ex. RA-2).

⁹ DEF Response to SC ROG 1-1 (Ex. RA-2).

1 **4. COMPANY REQUESTS FOR CRYSTAL RIVER NORTH IN THIS RATE CASE**

2 **Q What is DEF requesting in this docket related to Crystal River North?**

3 A DEF is requesting to recover the costs of operating and maintaining these units in
4 each of the 2025, 2026, and 2027 Test Years, including additional ongoing capital
5 expenditures (“capex”) and O&M spending.¹⁰

6 **Q Please discuss the level of capital expenditure DEF is requesting for Crystal**
7 **River North in this rate case.**

8 A In response to discovery questions regarding the amount of capital expenditure
9 included in rate base for Crystal River North, the Company provided data on total
10 Plant in Service, which represents the total value of all of the assets at a plant.¹¹
11 My review of the Plant in Service data provided by the Company indicates that
12 Plant in Service total for Crystal River North in 2025 is expected to be \$34
13 million higher than Plant in Service for Crystal River North at the beginning of
14 2024.¹² This implies the addition of around \$34 million in capex in 2024. This is
15 consistent with DEF’s historical capex at Crystal River North, which was around
16 \$30 million annually from 2019 through 2023.¹³

¹⁰ DEF Minimum Filing Requirements, Schedule B-8, Monthly Plant Balances Test Year – 13 Months.

¹¹ DEF Response to SC ROG 1-3(a), 3-76(c) (Ex. RA-2).

¹² DEF Response to SC ROG 1-3(a), 1-5 (Ex. RA-2).

¹³ DEF Response to SC ROG 1-6(n) (Ex. RA-2).

1 **Q Please discuss the O&M requested for recovery in this rate case.**

2 A DEF is requesting about \$47 million in non-fuel O&M spending in the 2025 and
3 2026 Test Years, and about \$45.5 million in the 2027 Test Year.¹⁴ This reflects an
4 increase of 46 percent above historical O&M spending at the plant, which has
5 been \$31.4 million a year on average from 2018 through 2023.¹⁵ DEF should
6 explain the reason for this increase in O&M spending in its rebuttal testimony, or
7 its revenue requirement should be revised downward to more closely match
8 historical spending.

9 **Q How might an earlier retirement date for Crystal River North affect the**
10 **numbers in these rate case requests, and why is it important for DEF to**
11 **support its requests with an up-to-date retirement evaluation?**

12 A In this rate case, Crystal River North's retirement date is relevant because utilities
13 typically ramp down spending in the last years of a coal plant's life. DEF should
14 consider such a decrease in spending when it calculates its test year spending as
15 part of a rate case. Notably, coal plant economics have changed since the last time
16 DEF evaluated Crystal River North's retirement dates, which was in 2020. Given
17 the new environmental rules discussed in Section 5 of my testimony, and the
18 results of my economic analysis of Crystal River North in Section 6 of my
19 testimony, I find that the Company has substantial reasons to evaluate retiring
20 Crystal River North before 2034.

21 If Crystal River North were retired in 2030, for example, DEF might have an
22 opportunity to save money for its ratepayers by reducing its level of spending in
23 the 2025, 2026, and/or 2027 test years, as the plant approaches its end of life.

¹⁴ DEF Response to SC ROG 1-4 (Ex. RA-2).

¹⁵ DEF Supplemental Response to SC ROG 1-6(j), (k) (Ex. RA-2).

1 DEF's revenue requirement in these test years could be reduced accordingly.
2 However, because DEF has not performed a recent study of early retirement for
3 Crystal River North, it is not possible to know whether the Company's requested
4 level of spending at Crystal River North is justified. DEF's O&M spending
5 projections for Crystal River North in this rate case could be unreasonably high
6 due to the Company's reliance on an outdated 2020 retirement study.

7 **Q Does the Company provide any support in this rate case for its ongoing**
8 **spending at Crystal River North or its selection of a 2034 retirement date for**
9 **those units?**

10 A No. DEF appears to rely exclusively on its 2020 study. DEF's testimony and other
11 filed materials in this rate case do not appear to provide any support for the level
12 of ongoing spending at Crystal River North that DEF is projecting. In response to
13 discovery requests regarding the basis for the planned 2034 retirement date, the
14 Company referred to its 2020 analysis of Crystal River North retirement dates,
15 and confirmed that it has not performed a new study of the retirement timing for
16 Crystal River North since then.¹⁶ However, that 2020 analysis is out of date.
17 There have been key market and regulatory changes, including new incentives for
18 clean energy resources made available under the Inflation Reduction Act,
19 volatility in fossil fuel markets, and new U.S. Environmental Protection Agency
20 ("EPA") regulations impacting coal-fired power plants, including new EPA
21 greenhouse gas standards for coal-burning power plants. All of these factors likely
22 render obsolete the 2020 retirement study for Crystal River North.

¹⁶ DEF Response to SC ROG 1-1 (Ex. RA-2).

1 **5. EARLY RETIREMENT OF CRYSTAL RIVER NORTH**

2 **Q Why should DEF evaluate retirement of these units earlier than 2034?**

3 A First, the U.S. EPA recently finalized greenhouse gas standards, which will
4 require coal generators to install equipment to reduce greenhouse gas emissions if
5 they plan to retire after 2032.¹⁷ Under the rule, existing coal plants that do not
6 retire by 2032 must reduce emissions consistent with 40 percent co-firing on gas
7 (a 16 percent reduction in emission rate) by 2030.¹⁸ Accordingly, in order to keep
8 operating until the planned 2034 retirement date, DEF would be required to
9 retrofit Crystal River North to co-fire on gas by 2030.¹⁹ Not only would gas co-
10 firing increase the capital investment needed to keep the plant going, it would also
11 expose the Company to the volatility of gas markets, which have experienced
12 supply disruptions and price increases in recent years. As an alternative, DEF
13 could move Crystal River North's retirement date earlier to avoid all compliance
14 costs associated with the greenhouse gas rule. This would avoid several years of
15 fixed and variable O&M costs, coal price risks, and regulatory risks associated
16 with Crystal River North.

¹⁷ New Source Performance Standards for Greenhouse Gas Emissions From New, Modified, and Reconstructed Fossil Fuel-Fired Elec. Generating Units; Emission Guidelines for Greenhouse Gas Emissions From Existing Fossil Fuel-Fired Elec. Generating Units, 89 Fed. Reg. 39798 (May 9, 2024).

¹⁸ *Id.* at 39838.

¹⁹ See U.S. EPA, *Final Carbon Pollution Standards to Reduce Greenhouse Gas Emissions from Power Plants* at 6 (Apr. 25, 2024), available at <https://www.epa.gov/system/files/documents/2024-04/cps-presentation-final-rule-4-24-2024.pdf>. (Exhibit RA-8).

1 **Q Will DEF face any resource adequacy concerns if it retires Crystal River**
2 **North in 2030?**

3 A No, DEF can maintain a 20 percent capacity reserve margin (that it is currently
4 required to meet) and high level of reliability discussed in its Ten-Year Site Plan
5 by procuring replacement capacity and energy for Crystal River North by 2030.
6 For example, if the Company maintained some or all of its 1,422 MW of
7 contracted winter capacity imports,²⁰ then it would likely not need any other new
8 capacity resources to safely retire Crystal River North early. Alternatively, the
9 Company could seek new capacity contracts, procure new battery storage or other
10 firm capacity resources through an RFP, or advance planned capacity acquisitions
11 by a few years.

12 Utilities regularly issue RFPs for resources with online dates one to five years in
13 the future.²¹ A 2030 retirement would provide the Company with time to ensure it
14 has adequate capacity and energy to replace Crystal River North.

15 **6. CRYSTAL RIVER NORTH ECONOMIC ANALYSIS**

16 **Q How have Crystal River North's operating costs compared to the value the**
17 **plant has provided to the DEF system in recent years?**

18 A Based on the Company's own data, I find that the net value of Crystal River North
19 has been decreasing since 2018, as explained below. Coal fuel costs have

²⁰ DEF 2024 TYSP at 3-8 (Ex. RA-3).

²¹ Portland Gen. Elec., *Procuring Clean Energy* (2023), available at <https://portlandgeneral.com/about/who-we-are/resource-planning/procuring-clean-energy>; PacifiCorp, *2022 All-Source RFP* (Apr. 3, 2024), available at <https://www.pacificorp.com/suppliers/rfps/2022-all-source-rfp.html>.

1 increased on an average dollar per megawatt-hour (“MWh”) basis, while Crystal
2 River North’s capacity factor has decreased.

3 **Q Explain the methodology you used to develop this historical analysis.**

4 I used public data, as well as data provided by the Company in discovery, to
5 calculate the cost and estimate the value of Crystal River North between 2018 and
6 2023. To estimate energy value, I used average values for energy purchases that
7 DEF has made over the last six years.²² For capacity value, I used the weighted
8 average price of the two largest contracts the Company currently has with third
9 parties for capacity.²³ These estimates are meant to serve as proxies for the cost of
10 replacement energy and capacity. Further, I use the Company’s historical data for
11 fuel costs, O&M costs, and capital costs.²⁴ I net the generator costs and value to
12 find the historical net value (or cost) for each year.

13 **Q How is Crystal River North projected to perform going forward?**

14 A My analysis suggests that the energy and capacity from Crystal River North can
15 be cost-effectively replaced with energy from solar generators and capacity from
16 bilateral contracts at any time (Figure 3). In fact, according to my analysis, the net
17 present value (“NPV”) cost of keeping Crystal River North online past 2029 is
18 about \$94 million in 2023 dollars. In my analysis, the value of these coal units for
19 customers is negative in nearly every year through 2034.

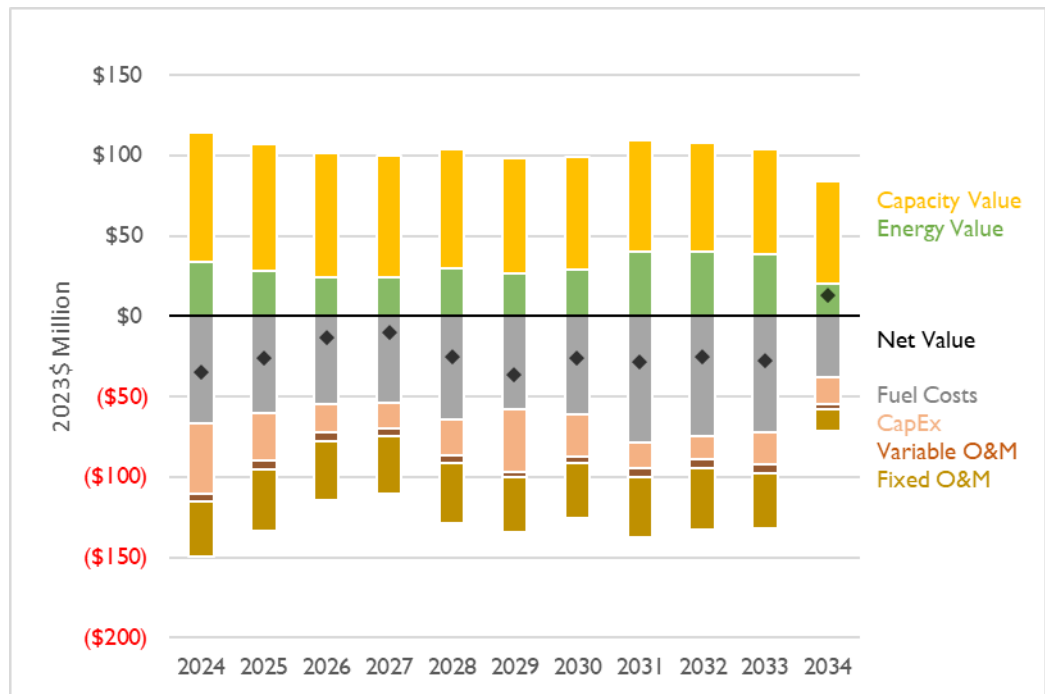
20

²² DEF Response to SC ROG 1-26(a), attach. “SC ROG 1-26a-b Annual Off System Energy Purchases_Sales 2018-2023”, Bates No. 20240025-SIERRACLUBROG1-00000025 (Ex. RA-2).

²³ DEF Response to SC ROG 1-24, attach. “Sierra Club Interrogatory 1-24”, Bates No. 20240025-SIERRACLUBROG1-00000022 (Ex. RA-2).

²⁴ DEF Response to SC ROG 1-6(l), (n) (Ex. RA-2).

Figure 3. Projected Performance of Crystal River North



Source: DEF Response to SC ROG 1-7, attach. "SC ROG 1-7(a-h_k) Crystal River Units 4_5 Forecasted Generation_Fuel Costs 2024-2034", Bates No. 20240025-SIERRACLUBROG1-0000001, attach. "SC ROG 1-7(m) CRN U4 U5 Investments 2024-2027", Bates Nos. 20240024-SIERRACLUBROG1-00000002-3, attach. "Sierra Club ROG 1 - Q7 i and j", and attach. "Sierra Club Interrogatory 1-24", attach. Bates No. 20240025-SIERRACLUBROG1-00000022); Lawrence Berkeley Lab'y, Photovoltaic PPA Prices, available at <https://emp.lbl.gov/pv-ppa-prices> (last visited June 10, 2024).

- 10 **Q Explain the methodology you used to develop this prospective analysis.**
- 11 **A** I used public data, as well as data provided by the Company, to compare the
- 12 energy and capacity value of Crystal River North to forecast costs at Crystal River
- 13 North from 2024 to 2034.

1 For a capacity value forecast, I used the costs of capacity contracts the Company
2 currently has with third parties to replace the capacity of Crystal River North.²⁵
3 For an energy value forecast, I used data on the average actual costs of solar
4 power purchase agreements (“PPAs”) in the Southeast from 2019 through 2023.²⁶
5 I included enough solar energy to replace the average expected annual generation
6 at Crystal River North of 1,700 gigawatt-hours (“GWh”) per year. This is
7 equivalent to 815 MW of solar with a 22 percent annual capacity factor. I used
8 solar energy as a replacement resource because it is a clean and low-cost source of
9 energy that is not subject to emissions-related regulatory risk or fuel price risk.

10 For variable and fixed O&M, coal fuel costs, and forecast annual generation, I
11 used cost data provided by DEF in discovery.²⁷ For the capital expenditure
12 forecast, I used historical spending levels²⁸ because the forecast provided by the
13 Company was substantially lower than historical spending and did not appear to
14 be a realistic forecast, as explained further below (on page 24).

15 I netted the generator costs and the generator value to find the forecast net value
16 (or cost) of the plant for each year.

²⁵ DEF Response to SC ROG 1-24, attach. “Sierra Club Interrogatory”, Bates No. 20240025-SIERRACLUBROG1-00000022 (Ex. RA-2).

²⁶ Lawrence Berkeley Lab’y, *Photovoltaic PPA Prices*, available at <https://emp.lbl.gov/pv-ppa-prices> (last visited June 10, 2024).

²⁷ DEF Response to SC ROG 1-7, attach. “SC ROG 1-7(a-h_k) Crystal River Units 4_5 Forecasted Generation_Fuel Costs 2024-2034,” Bates No. 20240025-SIERRACLUBROG1-0000001, attach. “SC ROG 1-7(m) CRN U4 U5 Investments 2024-2027,” Bates Nos. 20240024-SIERRACLUBROG1-00000002-3, attach. “Sierra Club ROG 1 - Q7 i and j” (Ex. RA-2).

²⁸ DEF Response to SC ROG 1-6(n) (Ex. RA-2).

1 **Q** **PPA prices have increased in recent years. Why does your analysis use an**
2 **average cost that is lower than the most recent cost data available for solar**
3 **PPAs in the Southeast?**

4 A It is true that in recent years, solar PPA costs in the Southeast have increased,
5 likely due to increased demand and various supply constraints. However, DEF
6 does not need to sign a PPA with a third party to procure solar energy. The
7 Company can build large-scale solar projects and earn an authorized rate of
8 return. This should keep costs closer to the actual cost of a solar project and
9 prevent the Company from paying any excessively high solar PPA costs.

10 In my analysis, a \$25.16/MWh value is used as a proxy for the cost to DEF of
11 procuring a large-scale solar project. This is the average solar PPA price in the
12 Southeast based on data from Lawrence Berkeley Laboratory for 2019 through
13 2023. For comparison, the levelized cost of solar, inclusive of the value of
14 Inflation Reduction Act tax credits, is now expected to be between \$19 and \$23
15 per MWh in 2028.²⁹

16 **Q** **Why do you use historical capex costs in your forecast instead of using the**
17 **forecast provided by DEF?**

18 Since 2018, capital spending has been about \$37 million per year on average at
19 Crystal River North.³⁰ From 2024 to 2028, DEF projects that its capital spending
20 will promptly decrease to about \$14 million per year on average beginning in

²⁹ U.S. Energy Info. Admin., *Levelized Costs of New Generation Res. in the Annual Energy Outlook 2023* at 8, available at https://www.eia.gov/outlooks/aeo/electricity_generation/pdf/AEO2023_LCOE_report.pdf.

³⁰ DEF Response to SC ROG 1-6(n) (Ex. RA-2).

1 2024.³¹ It is not totally clear why DEF provided a capex forecast that is about 60
2 percent lower on average than historical costs. However, based on the Company's
3 response to discovery, it appears that DEF's "projection" of capex spending
4 includes only the amount of Construction Work in Progress ("CWIP") from this
5 rate case, and does not actually reflect the amount the Company is likely to spend
6 on capex at Crystal River North.³² Given that the Company's projected capital
7 costs deviate significantly from historical spending, and given that the Company's
8 projected capex appears to only include CWIP and not any other capital, I found
9 that the historical cost data was likely to be most representative of the Company's
10 spending in future years. Further, using the Company's forecast of capex on a
11 going-forward basis through 2034 would not change my findings that Crystal
12 River North is operating at a net cost to customers.

13 **Q What do you conclude from your findings about the economics of continuing**
14 **to operate Crystal River North?**

15 A My analysis suggests that the continued operation of Crystal River North is not in
16 the best interest of DEF customers. Retirement of Crystal River North in any year
17 before 2034 would reduce net costs by preventing future spending on O&M and
18 capex, by replacing any needed energy and capacity at lower cost, and by
19 reducing the risk of incurring additional costs from compliance with future
20 environmental regulations. If there were no other major capital projects required
21 at the plant, the savings to ratepayers from retiring Crystal River North in 2030
22 would be about \$94 million.

³¹ DEF Response to SC ROG 1-7, attach. "SC ROG 1-7(m) CRN U4 U5 Investments 2024-2027", Bates Nos. 20240024-SIERRACLUBROG1-00000002-3 (Ex. RA-2).

³² See DEF Response to League of United Latin Am. Citizens of Fla. ("LULAC") ROG 1-10(a); See also DEF Response to Off. of Pub. Counsel ("OPC") POD 1-7, attach. "B-13 CWIP – REDACTED.xlsx", tab "UI – Additions" (Ex. RA-5).

1 **Q How does the EPA’s recently finalized Clean Air Act greenhouse gas rule**
2 **affect the results of your analysis?**

3 A As noted above, EPA’s greenhouse gas rule requires coal generators retiring after
4 2032 and before 2039 to meet a carbon dioxide emissions standard equivalent to
5 emissions from 40 percent co-firing with gas by 2030.³³ The cost of this upgrade
6 will likely be about \$72 million.³⁴ When this estimated cost of gas co-firing
7 conversion in 2030 is included in my analysis, the NPV savings of closing the
8 plant in 2030, and avoiding the investment in the conversion, increases to \$155
9 million.

10 **7. RISKS OF KEEPING CRYSTAL RIVER NORTH ONLINE THROUGH 2034**

11 **Q Explain the risks of DEF continuing to operate its coal plant at Crystal River**
12 **North.**

13 A Operating a coal plant carries fuel price and regulatory risks. Fuel prices can vary
14 unexpectedly, increasing costs for customers due to factors outside the
15 Company’s control. Because coal plants have emissions that are subject to
16 regulation, they risk hefty environmental compliance costs to meet environmental
17 regulations that limit emissions and pollutants. In addition, fossil fuels can be
18 subject to global market forces, such as was seen with gas prices during the onset
19 of the 2022 war in Ukraine. The domestic coal industry has also faced challenges

³³ U.S. EPA, *Final Carbon Pollution Standards to Reduce Greenhouse Gas Emissions from Power Plants* at 6 (Apr. 25, 2024), available at <https://www.epa.gov/system/files/documents/2024-04/cps-presentation-final-rule-4-24-2024.pdf>. (Exhibit RA-8).

³⁴ Sargent & Lundy, *Nat. Gas Co-Firing Memo* at 15 (Mar. 2023), available at <https://www.epa.gov/system/files/documents/2024-04/attachment-5-11-natural-gas-co-firing-methodology.pdf>.

1 to meet demand, given changing market conditions. This may result in higher coal
2 prices going forward.

3 **Q Explain the risks posed to ratepayers by fuel price volatility.**

4 A Continuing to operate Crystal River North will expose DEF customers to fuel
5 price risk, whether or not the Company retrofits the plant to co-fire on gas.
6 Resources that require fuel to operate, such as coal and gas generators, are subject
7 to fuel price risk throughout their lifetimes. Although coal can be stored on site to
8 hedge against price volatility, fuel storage capacity is finite and carries a cost. In
9 addition, supply is limited in some parts of the country. Coal prices are often
10 subject to multi-year contracts, so their volatility tends to be lower in the short
11 term, whereas gas prices can vary greatly by the day. Hedging can be used to
12 manage volatility in the gas market, but comes at a cost premium.

13 **Q Explain the risks posed to ratepayers from continued reliance on coal.**

14 A The coal market has seen dramatic price volatility in some parts of the United
15 States over the past few years.³⁵ There have also been labor challenges both at the
16 mines and the railroad companies that transport the coal. Additionally, as more
17 coal plants across the United States retire and the demand for coal decreases, this
18 trend, combined with labor challenges, could result in consolidation or bankruptcy
19 among coal companies and subsequently higher coal prices.³⁶

³⁵ U.S. Energy Info. Admin., *Coal Mkts.* (June 10, 2024), available at <https://www.eia.gov/coal/markets/>.

³⁶ Duke Energy, *Carolinas Res. Plan, App. F: Coal Retirement Analysis* (2023), available at <https://www.duke-energy.com/-/media/pdfs/our-company/carolinas-resource-plan/appendix-f-coal-retirement-study.pdf?rev=4c1c4df441a14248b2e23ba0368d9855>.

1 Coal use was down in 2023 and never reached more than 20 percent of power
2 market share (through October).³⁷ This is novel because market share had been
3 around 20 percent each month between 2020 and 2022, and prior to 2020, coal
4 had never comprised less than a 20 percent market share in any month.³⁸
5 Additionally, increased environmental regulation could result in higher costs and
6 higher risks. Higher regulatory risk impacts not just resource planning economics,
7 but also company risk profiles, which can lead to downgraded credit ratings and
8 impact access to capital.

9 Additionally, break-downs of parts and a lack of continued support from
10 manufacturers based on the old age of coal plant technology can result in
11 sustained outages and challenges in quickly repairing units and getting them back
12 online.

13 **8. UNDEPRECIATED PLANT BALANCE AND THE ENERGY INFRASTRUCTURE**
14 **REINVESTMENT PROGRAM**

15 **Q Please summarize your findings regarding undepreciated plant balance and**
16 **the EIR.**

17 **A** As I have shown above, early retirement of Crystal River North will provide
18 benefits to customers. Strictly accelerating depreciation of the balance to align the
19 book life with an earlier economic retirement date for the plant, though, may
20 result in rate shock to customers. Fortunately, there are other tools and

³⁷ Seth Feaster, *Coal Use at U.S. Power Plants Continues Downward Spiral; Full Impact on Mines to be Felt in 2024*, Inst. for Energy Econ. and Fin. Analysis (Nov. 2, 2023), available at <https://ieefa.org/resources/coal-use-us-power-plants-continues-downward-spiral-full-impact-mines-be-felt-2024>.

³⁸ *Id.*

1 alternatives utilities can use to manage and mitigate the impacts to ratepayers, as I
2 will discuss below.

3 **Q Please describe the approximate effect on DEF's annual revenue**
4 **requirement of accelerating the Crystal River North depreciation end date**
5 **from 2034 to 2030 without any other efforts to manage ratepayer impacts.**

6 As of 2024, the undepreciated book value of Crystal River North is approximately
7 \$1.3 billion.³⁹ Changing the depreciation end date from 2034 to 2030 would
8 accelerate and shorten the plant's depreciation schedule and bring forward some
9 of those costs. Because customers would need to pay these costs sooner instead of
10 later, the present value revenue requirement ("PVR") would increase. This
11 would reduce the direct benefits of early retirement, but would not offset the
12 benefits to customers of reduced fuel price volatility and regulatory risks.

13 Accelerated depreciation is a fairly typical way to deal with cost recovery when a
14 retirement date is moved forward. But because of the impact on customers,
15 utilities often utilize other methods to mitigate the impacts of accelerated
16 depreciation from an early retirement.

17 **Q What potential methods are there to reduce the impacts of accelerated**
18 **depreciation?**

19 A The impacts of accelerated depreciation can be reduced through the use of a
20 regulatory asset or through EIR funding.

21 A regulatory asset is sometimes used to recover a retiring plant's undepreciated
22 balance using a somewhat longer timeframe than the plant's operational lifetime.

³⁹ DEF Response to SC ROG 1-5 (Ex. RA-2).

1 For example, Crystal River North could be retired in 2030, while its plant balance
2 is recovered in a regulatory asset through 2032. Because customers have longer to
3 pay off the plant balance, the rate impact of acceleration is decreased. For
4 example, Southwestern Electric Power Company has a regulatory asset for the
5 Balance of the Dolet Hills Power Plant.⁴⁰

6 As I will describe in more detail below, the U.S. DOE’s EIR program can allow a
7 plant balance to be recovered over a longer timeframe and at a lower rate of
8 return, and this should not require approval from a state legislature.

9 **Q Please provide a general overview of the EIR program.**

10 A The EIR program, established under the Inflation Reduction Act, provides DOE
11 with \$250 billion in loan authority that it can deploy to “retool, repower,
12 repurpose, or replace” fossil infrastructure.⁴¹ The loans are available at just above
13 the federal government’s cost of borrowing with repayment periods of up to 30
14 years—which means they offer a significantly cheaper method of financing the
15 undepreciated balance of coal plants than accelerated depreciation or the use of a
16 regulatory asset.⁴² Per statute, utilities are required to pass through the savings
17 enabled under the EIR to their customers.⁴³

⁴⁰ Tex. Pub. Util. Comm’n Order, Control No. 51415, Item No. 705.

⁴¹ U.S. Dep’t of Energy, Loan Programs Off., *Program Guidance for Title 17 Clean Energy Fin. Program* at 7 (May 19, 2023), available at <https://www.energy.gov/lpo/articles/program-guidance-title-17-clean-energy-program#page=1> [hereinafter “U.S. DOE, Loan Programs Off., *Programs Guidance for Title 17 Clean Energy Fin. Program*”].

⁴² *Id.* at 8.

⁴³ U.S. Dep’t of Energy, Loan Programs Off., *Energy Infrastructure Reinvestment*, available at <https://www.energy.gov/lpo/energy-infrastructure-reinvestment> (last visited June 10, 2024).

1 EIR loans are intended to finance investment in replacement generation capacity,
2 distribution upgrades, or other investments that can help enable greenhouse gas
3 emission reductions. And while the total loan amount is capped at 80 percent of
4 the replacement project cost, the funding can be used to both lower the project
5 costs for replacement resources and address legacy asset plant balances. In other
6 words, the loans can be used to refinance the outstanding asset balances of
7 existing legacy coal units.⁴⁴

8 **Q How might the EIR program help customers avoid the increased revenue**
9 **requirement from accelerated depreciation?**

10 A The EIR program provides low-cost loans for utilities that have plans to retire
11 fossil fuel assets and replace them with clean energy.⁴⁵ The low cost of capital
12 can help reduce the costs of new resources. The loans may potentially also be
13 used to refinance plant balances—moving some of the plant balance to a
14 dedicated surcharge financed at a lower rate and recovered over a longer
15 timeframe—and thus avoid the cost increase associated with accelerated
16 depreciation for customers.

⁴⁴ Christina Fong et al., *The Energy Infrastructure Reinvestment Program: Fed. Fin. for an Equitable, Clean Econ*, RMI (Feb. 16, 2024), available at <https://rmi.org/the-energy-infrastructure-reinvestment-program-federal-financing-for-an-equitable-clean-economy/> [hereinafter “Christina Fong et al., *The Energy Infrastructure Reinvestment Program: Fed. Fin. for an Equitable, Clean Econ*”].

⁴⁵ U.S. DOE, Loan Programs Off., *Programs Guidance for Title 17 Clean Energy Fin. Program* at 6.

1 **Q Approximately how much might the EIR save customers if it were used to**
2 **help fund the replacement of Crystal River North with renewable energy?**

3 A A recent analysis by the Rocky Mountain Institute looks at a similar utility
4 procurement and retirement scenario to the one that DEF customers are facing.⁴⁶
5 The analysis finds that an EIR loan, combined with a dedicated rate surcharge to
6 help support early retirement and replacement, could avoid the effects of
7 accelerated depreciation and save an additional \$123 million or more for
8 ratepayers.⁴⁷ Based on this, I believe that the EIR program has the potential to
9 deliver a similar level of savings to DEF ratepayers if the Company submits an
10 application and uses an EIR loan to facilitate the retirement and replacement of
11 Crystal River North.

12 **Q Please further explain the savings that could be achieved using EIR funding.**

13 A The Rocky Mountain Institute study referenced above examines a case study of
14 Alliant Energy's retirement of a coal asset and replacement with renewable
15 energy in Iowa. Alliant's resource plan has a similar cost to the approximately
16 815 MW of solar that would be needed to replace the energy of Crystal River
17 North. There are two potential ways to use the EIR program to support a
18 retirement and replacement plan similar to Alliant's.

19 The first approach to using EIR funding to support Alliant's plan would be to use
20 low-cost EIR funding to finance 20 percent of the renewable additions and create
21 a dedicated rate surcharge for customers to repay the loan. This example assumes

⁴⁶ Christina Fong et al., *The Energy Infrastructure Reinvestment Program: Fed. Fin. for an Equitable, Clean Econ.*

⁴⁷ *Id.*

1 that Alliant finances only 20 percent of its planned \$855 million investment in
2 new renewables through EIR, while the EIR program can potentially cover up to
3 80 percent of project costs.⁴⁸ Financing 20 percent of new renewables through the
4 EIR program would allow Alliant to earn its usual rate of return on 80 percent of
5 the new renewable investment, and customers would save \$57 million after
6 transaction costs.⁴⁹ This is a cautious estimate of potential customer benefits
7 because it does not maximize the amount of the EIR loan.

8 The second approach increases customer benefits by also using EIR funding to
9 address some of the undepreciated plant balance at a retiring coal plant. Alliant's
10 Lansing plant is estimated to have a \$256 million undepreciated balance. By
11 adding this amount to Alliant's EIR loan, the Lansing undepreciated balance
12 could be removed from the utility's books and recovered through a dedicated
13 surcharge financed at EIR loan rates and recovered over up to 30 years. The total
14 EIR loan amount would still be less than 80 percent of new project costs, as
15 required, and the utility would still earn a rate of return on 80 percent of the new
16 capital investment. However, ratepayers would enjoy up to 30 years to repay the
17 EIR loan at a lower interest rate, instead of paying increased costs from
18 accelerated depreciation. Total customer savings for Alliant from using EIR
19 funding in this way would be \$123 million.⁵⁰

20 DEF could realize a similar amount of savings by using the EIR to fund the earlier
21 retirement of Crystal River and its replacement with alternatives. In addition to
22 the \$155 million in benefits from 2030 retirement of Crystal River that I estimate

⁴⁸ U.S. DOE, Loan Programs Off., *Programs Guidance for Title 17 Clean Energy Fin. Program* at 9.

⁴⁹ *Id.*

⁵⁰ Christina Fong et al., *The Energy Infrastructure Reinvestment Program: Fed. Fin. for an Equitable, Clean Econ.*

1 in my economic analysis above, adding this conservative estimate of \$123 million
2 in additional savings from the EIR program would result in a total customer
3 benefit of about \$278 million.

4 **Q Has DEF applied for EIR funding or evaluated the potential to utilize**
5 **funding from the EIR program to finance replacement resources or**
6 **refinance undepreciated plant balances?**

7 A No. DEF has not applied for EIR funding and currently has no plans to do so.⁵¹
8 DEF has also not conducted any analysis of the potential benefits from the EIR
9 program.⁵²

10 **Q What is your recommendation regarding EIR funding?**

11 A DEF should use EIR funds to reduce the costs of new renewable generation and
12 re-finance a portion of the Crystal River North plant balance. To begin this
13 process, DEF should submit an application to DOE's Loan Program Office for
14 EIR funding. The Commission should direct DEF to evaluate potential funding
15 from the EIR program and apply for funding.

⁵¹ DEF response to SC ROG 4-95 (Ex. RA-2).

⁵² *Id.*

1 **9. WINTER CAPACITY CONTRIBUTION OF SOLAR**

2 **Q Please describe the Company's winter capacity position now and through**
3 **2030.**

4 A DEF currently has a 37 percent winter capacity reserve margin.⁵³ This is much
5 higher than the 20 percent reserve margin that DEF agreed to adopt in a 1999
6 Stipulation.⁵⁴ The Company's winter reserve margin is expected to decrease
7 gradually to 23 percent by 2030 as its demand grows and some resources are
8 removed from service.⁵⁵

9 **Q How does DEF calculate its winter reserve margin?**

10 A The winter reserve margin in the Company's TYSP appears to be calculated based
11 on a comparison of the Company's forecast peak winter load to the amount of
12 firm resource capacity available each winter in the EnCompass model's capacity
13 expansion run. The reserve margin is the amount of excess capacity expected to
14 be available above the forecast peak load.

15 **Q Please discuss the EnCompass model planning exercise in the TYSP.**

16 A In the TYSP, DEF uses the EnCompass model to develop a portfolio of planned
17 resources to meet system needs over the next ten years.⁵⁶ The model is designed
18 to create a portfolio that meets system needs reliably at the lowest cost. DEF

⁵³ DEF 2024 TYSP at 3-8 (Ex. RA-3).

⁵⁴ Order No. PSC-99-2501-S-EU. Attachment A at 2.

⁵⁵ DEF 2024 TYSP at 3-8 (Ex. RA-3).

⁵⁶ DEF 2024 TYSP at 3-48 (Ex. RA-3).

1 states that EnCompass is given a 20 percent reserve margin requirement.⁵⁷ DEF
2 states that the 20 percent reserve margin typically results in an EnCompass
3 portfolio that meets a high reliability standard without further resource
4 additions.⁵⁸ This indicates that a 20 percent reserve margin is generally more than
5 adequate for planning a reliable system for DEF.

6 **Q How does DEF treat the winter capacity contribution of solar in its**
7 **EnCompass modeling and reserve margin calculation?**

8 A DEF assumes that the firm capacity contribution of solar resources is zero in the
9 winter.⁵⁹ However, DEF has not performed any analysis to support that
10 assumption.⁶⁰ That means that even if solar facilities help DEF meet demand
11 during some peak winter hours, the solar in DEF's modeling and reporting will
12 receive no credit for the capacity value it provides.

13 **Q What reason might DEF have for using a zero value for capacity**
14 **contribution of solar?**

15 A DEF may be using a zero value for solar winter capacity contribution in part
16 because the Florida Reliability Coordinating Council ("FRCC") says that for

⁵⁷ DEF 2024 TYSP at 3-47 (Ex. RA-3).

⁵⁸ *Id.*

⁵⁹ Benjamin Borsch Deposition Transcript Vol. 2 (May 30, 2024) at 159:11-14 (Ex. RA-6); Reginald Anderson Deposition Transcript Vol. 2 (May 24, 2024) at 171:13-16 (Ex. RA-7); DEF Response to SC ROG 30, attachment "SC ROG-1 Q30 Excel" at 5, Bates No. 20240025-SIERRACLUBROG1-00000033 (Ex. RA-2).

⁶⁰ Borsch Deposition Transcript Vol. 2 (May 30, 2024) at 161:12-16.

1 winter, solar typically receives no firm capacity value.⁶¹ It is not clear that DEF or
2 the FRCC have done any analysis to show that solar has no capacity contribution
3 in winter. It may be a simplifying assumption used for convenience. And the
4 FRCC notes the need for ongoing study, stating, “This firm capacity contribution
5 from solar will continue to be monitored as solar becomes a larger and larger part
6 of FRCC member company’s resource mix[.]”⁶²

7 This lack of analysis by DEF is concerning, especially since the Company’s sister
8 utilities, Duke Energy Progress and Duke Energy Carolinas, hired Astrapé to
9 conduct an Effective Load Carrying Capability (“ELCC”) study as part of their
10 most recent IRP process.⁶³ This study found a winter solar capacity value of
11 between 6.1 and 3.4 percent based on the unique characteristics of that system.⁶⁴
12 DEF should utilize the same level of rigor in its resource planning in Florida that
13 Duke Energy uses elsewhere in the country.

14 **Q What evidence do you have that solar does have some winter capacity**
15 **contribution?**

16 **A** DEF Witness Benjamin Borsch noted that solar likely provides 2-3 percent of
17 capacity contribution in the winter—yet Duke assumes a capacity contribution of

⁶¹ Florida Reliability Coordinating Council, 2022 Load & Resource Reliability Assessment Report, FRCC-MS-PL-397, at 28, available at: https://www.floridapsc.com/pscfiles/website-files/PDF/Utilities/Electricgas/TenYearSitePlans/2022/FRCC_Presentation.pdf.

⁶² *Id.*

⁶³ Duke Energy Carolinas and Duke Energy Progress Effective Load Carrying Capability (ELCC) Study, Astrapé Consulting (April 25, 2022), available at: <https://starwl.ncuc.gov/NCUC/ViewFile.aspx?Id=9713b7f8-ebc3-4b97-ac34-154d65df98cf>. (Exhibit RA-10).

⁶⁴ *Id.* at 10.

1 zero percent.⁶⁵ Additionally, as mentioned above, the results from Duke's ELCC
2 study in the Carolinas indicate that utilities in the southeastern United States have
3 found solar to have a small but meaningful winter capacity contribution.

4 This is relevant because by 2034, DEF expects to have more than 6,100 MW of
5 solar online.⁶⁶ If this solar provides a 2 percent capacity contribution, giving it
6 proper credit for this contribution could reduce DEF's winter capacity need by
7 about 122 MW. At an approximate cost of \$1,422/kW for new capacity, that is
8 equivalent to potentially saving customers \$174 million in installed costs alone.⁶⁷

9 **Q What do you recommend regarding winter capacity?**

10 A I recommend that DEF perform or commission an ELCC study of the capacity
11 contribution of solar, including during winter. A rigorous analysis would likely
12 reduce the amount of incremental capacity that DEF needs to meet its 20 percent
13 reserve margin. It will also potentially save ratepayers millions of dollars by
14 avoiding procuring capacity that they do not need to reliably serve load.

15 **Q Does this conclude your testimony?**

16 Yes.

⁶⁵ Borsch Deposition Transcript (May 30, 2024), Vol. 2, at 160:14-161:11 (Ex. RA-6).

⁶⁶ DEF 2024 TYSP at 1 (Ex. RA-3).

⁶⁷ DEF 2024 TYSP at 3-31 (Ex. RA-3).

Exhibit RA-1:
Resume of Rose Anderson

**Rose Anderson, Principal Associate**

Synapse Energy Economics | 485 Massachusetts Avenue, Suite 3 | Cambridge, MA 02139 | 617-812-1573
randerson@synapse-energy.com

PROFESSIONAL EXPERIENCE

Synapse Energy Economics Inc., Cambridge, MA. *Principal Associate*, September 2023 – Present.

- Provide research and analysis on integrated resource planning.
- Assess the economics of generation resources compared to alternatives and market purchases.
- Write expert testimony on power plant economics and integrated resource planning.

Oregon Public Utility Commission, Salem, OR. *Senior Economist*, October 2019 – September 2023;
Senior Renewables Analyst, May 2018 – October 2019, *Utility Analyst*, September 2016 – May 2018.

Senior Economist:

- Prepared written comments and testimony.
- Lead OPUC staff review of utility Integrated Resource Plans (IRP) and resource acquisition proceedings.
- Evaluated utility production cost and capacity expansion modeling.
- Mentored OPUC staff regarding resource economics and best practices for review of utility filings.

Senior Renewables Analyst:

- Prepared written comments and testimony.
- Lead staff review and critical analysis of utility IRPs.
- Analyzed IRP modeling assumptions.
- Developed Excel model of rate impacts.

Utility Analyst:

- Reviewed and analyzed utility rate filings and workpapers for compliance.
- Prepared testimony in rate case and power cost filings.
- Reviewed utility production cost modeling inputs/outputs/workpapers.
- Lead and participated in review of power cost filings.

McCullough Research, Portland, OR. *Research Associate*, June 2013 – January 2015.

- Acquired, cleaned, and analyzed energy data sets in MS SQL and Excel.
- Researched nuclear energy and presented findings in a report.
- Analyzed bidding data from the MISO market.

EDUCATION

University of California, Davis. Davis, California

Master of Science in Agricultural and Resource Economics, 2016

University of Puget Sound, Tacoma, Washington

Bachelor of Arts in International Political Economy, 2007

PUBLICATIONS AND PRESENTATIONS

Public Utilities Commission of Nevada (Docket No. 23-08015): Direct Testimony of Rose Anderson on behalf of Sierra Club. December 19, 2023.

Oregon Public Utility Commission (Docket No. LC 79): Final Comments regarding NW Natural's 2021 Integrated Resource Plan. On behalf of Oregon Public Utility Commission Staff. March 30, 2023.

Oregon Public Utility Commission (Docket No. LC 79): Opening Comments regarding NW Natural's 2021 Integrated Resource Plan. On behalf of Oregon Public Utility Commission Staff. December 30, 2022.

Oregon Public Utility Commission (Docket No. LC 77): Final Comments and Staff Report regarding PacifiCorp's 2021 Integrated Resource Plan. On behalf of Oregon Public Utility Commission Staff. February 11, 2022.

Oregon Public Utility Commission (Docket No. LC 77): Opening Comments regarding PacifiCorp's 2021 Integrated Resource Plan. On behalf of Oregon Public Utility Commission Staff. December 3, 2021.

Oregon Public Utility Commission (Docket No. UM 2059): Staff Report regarding PacifiCorp's Application for Approval of its 2020 Request for Proposal. On behalf of Oregon Public Utility Commission Staff. October 6, 2021.

Oregon Public Utility Commission (Docket No. UM 2059): Comments regarding PacifiCorp's Application for Approval of its 2020 Request for Proposal. On behalf of Oregon Public Utility Commission Staff. August 19, 2021.

Oregon Public Utility Commission (Docket No. LC 70): Comments regarding PacifiCorp's Application for Approval of its 2019 Integrated Resource Plan. On behalf of Oregon Public Utility Commission Staff. August 18, 2021.

Oregon Public Utility Commission (Docket No. LC 71): Staff Report regarding The Third Update to NW Natural's 2018 Integrated Resource Plan. On behalf of Oregon Public Utility Commission Staff. July 12, 2021.

Oregon Public Utility Commission (Docket No. LC 71): Opening Comments regarding The Third Update to NW Natural's 2018 Integrated Resource Plan. On behalf of Oregon Public Utility Commission Staff. May 14, 2021.

Oregon Public Utility Commission (Docket No. UM 2059): Comments regarding PacifiCorp's Application for Approval of its 2020 Request for Proposal. On behalf of Oregon Public Utility Commission Staff. December 8, 2020.

Oregon Public Utility Commission (Docket No. UM 2059): Comments regarding PacifiCorp's Application for Approval of its 2020 Request for Proposal. On behalf of Oregon Public Utility Commission Staff. December 4, 2020.

Oregon Public Utility Commission (Docket No. UM 2005): Presentation of Rose Anderson on Integrated Resource Planning. On behalf of Oregon Public Utility Commission Staff. June 11, 2020.

Oregon Public Utility Commission (Docket No. LC 70): Comments regarding PacifiCorp's Application for Approval of its 2019 Integrated Resource Plan. On behalf of Oregon Public Utility Commission Staff. April 29, 2021.

Oregon Public Utility Commission (Docket No. LC 70): Report regarding PacifiCorp's Application for Approval of its 2019 Integrated Resource Plan. On behalf of Oregon Public Utility Commission Staff. April 17, 2020.

Oregon Public Utility Commission (Docket No. UM 2059): Report regarding PacifiCorp's Application for Approval of its 2020 Request for Proposal. On behalf of Oregon Public Utility Commission Staff. April 1, 2020.

Oregon Public Utility Commission (Docket No. LC 70): Comments regarding PacifiCorp's Application for Approval of its 2019 Integrated Resource Plan. On behalf of Oregon Public Utility Commission Staff. March 6, 2020.

Oregon Public Utility Commission (Docket No. LC 70): Comments regarding PacifiCorp's Application for Approval of its 2019 Integrated Resource Plan. On behalf of Oregon Public Utility Commission Staff. March 4, 2020.

Oregon Public Utility Commission (Docket No. LC 70): Comments regarding PacifiCorp's Application for Approval of its 2019 Integrated Resource Plan. On behalf of Oregon Public Utility Commission Staff. January 10, 2020

Oregon Public Utility Commission (Docket No. LC 70): Comments regarding PacifiCorp's Application for Approval of its 2019 Integrated Resource Plan. On behalf of Oregon Public Utility Commission Staff. October 25, 2019.

Oregon Public Utility Commission (Docket No. LC 71): Final Comments regarding NW Natural's 2018 Integrated Resource Plan. On behalf of Oregon Public Utility Commission Staff. December 31, 2018.

Oregon Public Utility Commission (Docket No. LC 70): Staff Report for the December 28, 2018 Special Public Meeting. On behalf of Oregon Public Utility Commission Staff. December 13, 2018.

Oregon Public Utility Commission (Docket No. LC 71): Opening Comments regarding NW Natural's 2018 Integrated Resource Plan. On behalf of Oregon Public Utility Commission Staff. October 15, 2018.

Oregon Public Utility Commission (Docket No. UE 230): Report of Rose Anderson on PGE's schedule 145 update request. On behalf of Oregon Public Utility Commission Staff. December 14, 2017.

Oregon Public Utility Commission (Docket No. UE 315): Report of Rose Anderson regarding PacifiCorp's request for revised rates. On behalf of Oregon Public Utility Commission Staff. December 9, 2016.

McCullough, R., Oursland, G., Anderson, R. *Nuclear Winter*. Electricity Policy. December 2014.

McCullough, R., Vatter, M., Anderson, R., Heimensen, J., Long, S., May, C., Nisbet, A., Oursland, G. *Economic Analysis of the Columbia Generating Station*. December 2013.

TESTIMONY

Oregon Public Utility Commission (Docket No. UE 420): Opening Testimony of Rose Anderson regarding PacifiCorp's 2024 Transition Adjustment Mechanism. On behalf of Oregon Public Utility Commission Staff. June 23, 2023.

Oregon Public Utility Commission (Docket No. UE 399): Rebuttal Testimony of Rose Anderson regarding PacifiCorp's Request for a General Rate Revision. On behalf of Oregon Public Utility Commission Staff. August 11, 2022.

Oregon Public Utility Commission (Docket No. UE 399): Opening Testimony of Rose Anderson regarding PacifiCorp's Request for a General Rate Revision. On behalf of Oregon Public Utility Commission Staff. June 22, 2022.

Oregon Public Utility Commission (Docket No. UE 390): Rebuttal Testimony of Rose Anderson regarding PacifiCorp's 2022 Transition Adjustment Mechanism. On behalf of Oregon Public Utility Commission Staff. July 30, 2021.

Oregon Public Utility Commission (Docket No. UE 390): Opening Testimony of Rose Anderson regarding PacifiCorp's 2022 Transition Adjustment Mechanism. On behalf of Oregon Public Utility Commission Staff. June 09, 2021.

Oregon Public Utility Commission (Docket No. UE 374): Rebuttal Testimony of Rose Anderson regarding PacifiCorp's Request for a General Rate Revision. On behalf of Oregon Public Utility Commission Staff. July 24, 2020.

Oregon Public Utility Commission (Docket No. UE 374): Opening Testimony of Rose Anderson regarding PacifiCorp's Request for a General Rate Revision. On behalf of Oregon Public Utility Commission Staff. June 4, 2020.

Oregon Public Utility Commission (Docket No. UE 339): Opening Testimony of Rose Anderson regarding PacifiCorp's 2019 Transition Adjustment Mechanism. On behalf of Oregon Public Utility Commission Staff. June 11, 2018.

Oregon Public Utility Commission (Docket No. UE 333): Opening Testimony of Rose Anderson regarding Idaho Power's 2018 Annual Power Cost Update. On behalf of Oregon Public Utility Commission Staff. February 12, 2018.

Oregon Public Utility Commission (Docket No. UG 325): Opening Testimony of Rose Anderson regarding Avista's Request for a General Rate Revision. On behalf of Oregon Public Utility Commission Staff. July 20, 2017.

Oregon Public Utility Commission (Docket No. UE 319): Opening Testimony of Rose Anderson regarding Portland General Electric's Request for a General Rate Revision. On behalf of Oregon Public Utility Commission Staff. June 16, 2017.

Resume updated September 2023

Exhibit RA-2:
Duke Energy Florida's Public Responses to
Sierra Club Interrogatories

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Petition for rate increase by Duke Energy
Florida, LLC.

Docket No. 20240025-EI

Dated: May 6, 2024

**DUKE ENERGY FLORIDA, LLC'S RESPONSE TO
SIERRA CLUB'S FIRST SET OF INTERROGATORIES (NOS. 1-38)**

Duke Energy Florida, LLC ("DEF") responds to Sierra Club's First Set of Interrogatories to DEF (Nos. 1-38), as follows:

INTERROGATORIES

Topic: Crystal River coal units

1. Please provide a narrative description of the analysis, data, or information that DEF relies on to conclude that continued operation of Crystal River units 4 and 5 is in the best interests of its ratepayers.

Response:

DEF prepared a detailed analysis of the potential retirement timeline for Crystal River Units 4 and 5 in 2020. This study considered two primary retirement scenarios, retirement in 2029 and retirement in 2034 as compared to the previous retirement year of 2042. The study considered replacement generation needs and options, operation of the units, fuel supply, dispatch of the overall generation portfolio, ongoing operational costs including identified major maintenance events, remaining net book value and impacts of recovery periods on customer rates. That study relied on the then current Ten-Year Site Plan and its supporting forecasts along with supporting financial information.

The study selected 2034 as the appropriate target retirement date. Key elements in driving these results included the assessment of alternative generation. This assessment showed that a retirement in 2029 would strongly favor the selection of a large natural gas fired combined cycle unit as the primary replacement to provide both energy and capacity. The analysis at the time showed that deferring the retirement to 2034 allowed adequate time for the construction of additional solar to provide energy replacing the energy being generated from the coal units. In addition, the analysis showed that the capacity during non-solar hours would be replaced with a mix of combustion turbines and batteries. DEF's forecasts at the time showed that the delay to 2034 would give time for the relative price of batteries

to decline to the point that batteries would be the larger portion of this mix. DEF also identified that the 2034 retirement appeared to create a balanced impact on customer rates. In support of this approach, DEF negotiated a partial acceleration of the Crystal River depreciation, which was incorporated into the DEF 2021 rate settlement.

Since 2021, DEF has not performed a new study of the retirement timing for Crystal River units 4 and 5. DEF annually reviews the support for the 2034 retirement date during the Ten-Year Site Plan process. DEF's review considers future capacity needs to serve load, the plans and alternatives for replacement generation, and changes in the Crystal River situation including operational condition and fuel supply.

2. For each retirement study or unit condition assessment provided in response to Sierra Club Document Production Request No. 3, provide the following:
 - a. State which modeling software was used to conduct the analysis.
 - b. State the date that the analysis was performed.
 - c. State whether the units were modeled with an economic (market) or self-commitment (must run) status for each year of the analysis.
 - d. State the date of each forecast or projection used in the analysis.
 - e. State the regulation or rationale behind each retirement date(s) studied.
 - f. Identify all transmission grid updates or changes that would be needed to allow for the retirement of Crystal River units 4 and 5.

Response:

- a. Capacity expansion and production cost modeling were conducted with the Planning and Risk Suite of models from ABB.
- b. June 2021
- c. The Crystal River units are dispatched against the DEF system marginal costs in an economic manner. There is a must run requirement in the scenarios which is in effect only when the Citrus County Combined Cycle units are not in service.
- d. Two retirement dates were studied in the analysis, 2029 and 2034.
- e. No specific environmental regulation in force at that time, or currently, requires the retirement of Crystal River units 4 and 5. The dates were selected in recognition of anticipated regulatory pressures, economic shifts in generation including risks to future fuel supply, and carbon reduction targets set by Duke Energy including contribution to the enterprise goal of 50% CO2 emissions reductions by 2030 and the target to be out of coal fired generation by 2035.
- f. No specific transmission upgrades were considered in evaluating the retirements of Crystal River units 4 and 5. Specific transmission upgrades would depend on the selection and location of replacement generation. For the purposes of the evaluation performed, it was assumed that replacement generation would be located in a manner that would minimize transmission upgrades.

3. For Crystal River units 4 and 5, please provide the following:
- a. The amount of capital cost that DEF has included in the test year rate base;
 - b. The amount of capital cost that DEF included in the test year in its previous rate case; and
 - c. An explanation of the change in capital cost from the last rate case to this one.

Response:

- a. DEF has included \$2,841 million in the test year rate base as of December 2025 for Crystal River units 4 and 5. Please see MFR B-8, Page 16 of 37, Line 84 “CR Total”.
- b. DEF included \$2,781 million in the test year rate base as of December 2023 for these units in its 2021 settlement agreement. Please see MFR B-8, Page 1 of 45, Line 44 “Total Crystal River 4&5”, submitted in Docket No. 20210016-EI.
- c. The timing and scope of capital outages at Crystal River will impact the amount of capital expenditures needed for the outages at the plant and as a result will impact the growth in Electric Plant in Service.

4. For Crystal River units 4 and 5, please provide the following:
- a. The amount of non-fuel operating & maintenance (O&M) costs that are included in the test year in this rate case;
 - b. The amount of non-fuel O&M costs included in the test year in DEF’s previous rate case; and
 - c. An explanation of the change in non-fuel O&M cost from the last rate case to this one.

Response:

- a. CR 4&5 non-fuel O&M in the rate case test years 2025-2027:
Calendar Year 2025 – \$47,283,000
Calendar Year 2026 – \$46,781,000
Calendar Year 2027 - \$45,451,000
- b. DEF has been operating under the 2021 Settlement Agreement, where MFR’s were submitted for years 2022 and 2023 but not 2024 in Docket No. 20210016. MFR’s do not include O&M costs by generating unit but do include non-fuel O&M for steam production plant, which includes CR 4&5 and Ancloste. For the 2021 settlement, non-fuel steam production O&M by account can be found on MFR C-6, Page 3 of 8, lines 18 through 31, and for the current rate case can be found on MFR C-6, Page 2 of 5, lines 17 through 30. MFR C-8 provides the reason for O&M expense changes that exceed 1/20th of one percent of total operating expenses.

- c. Please see MFR C-41 for the O&M benchmark variance by function for each of the three test periods and the variance explanation for O&M that exceeds the benchmark. Steam Production O&M is below the O&M benchmark for Test Period 2027, and Test Period 2026, and \$2.9M above the benchmark for Test Period 2025. Please see MFR C-41 for variance explanations.
5. For both Crystal River unit 4 and unit 5, please provide the remaining book value (plant balance) at the start of 2024 and the expected undepreciated book value for each year of the remaining operating life of each unit.

Response:

Crystal River 4 and 5 are both expected to retire in 2034. The asset management system used to track the existing plant in service assets does not maintain the assets at the individual unit level. As a result, Duke Energy Florida is providing the plant balance at the start of 2024 and the expected undepreciated book value for each year thereafter for the combined units. In addition, the below plant in service balance are based on current balances and do not include capital expenditures that will occur between 2024 and 2034.

Year	Plant In Service	Est. Annual Depreciation	Est. Accumulated Depreciation	Est. Net Book Value (Undepreciated Book Value)
2023	2,806,678,000		1,380,986,000	1,425,692,000
2024	2,806,678,000	135,275,247	1,516,261,247	1,290,416,753
2025	2,806,678,000	135,275,247	1,651,536,493	1,155,141,507
2026	2,806,678,000	135,275,247	1,786,811,740	1,019,866,260
2027	2,806,678,000	135,275,247	1,922,086,987	884,591,013
2028	2,806,678,000	135,275,247	2,057,362,234	749,315,767
2029	2,806,678,000	135,275,247	2,192,637,480	614,040,520
2030	2,806,678,000	135,275,247	2,327,912,727	478,765,273
2031	2,806,678,000	135,275,247	2,463,187,974	343,490,026
2032	2,806,678,000	135,275,247	2,598,463,220	208,214,780
2033	2,806,678,000	135,275,247	2,733,738,467	72,939,533
2034	2,806,678,000	72,939,533	2,806,678,000	-

6. For Crystal River units 4 and 5, please provide the following historical data for the years 2018 to 2023 for each unit:
- a. Installed capacity;

- b. Unforced capacity;
- c. Hourly generation (in MW);
- d. Annual Generation (in MWh);
- e. Capacity factor;
- f. Equivalent Availability Factor (EAF);
- g. Heat rate (average);
- h. Forced or random outage rate;
- i. Effective forced outage rate (EFORd);
- j. Fixed O&M costs;
- k. Non-fuel variable costs;
- l. Fuel costs (by fuel type);
- m. Any energy or capacity market revenue from participation in an organized market;
- n. All historical capital expenditures (including environmental projects) since 2018 by year; and
- o. Sustaining capital since 2018 by year.
- p. If these categories do not comprise all costs associated with these units, please explain, and quantify the other costs of the units since 2018 by year.

Response:

A. Calendar Year 2018—2023: 1,478

B. DEF does not know what “Unforced capacity” means.

C. DEF does not have an hourly generation.

D.

2018	2019	2020	2021	2022	2023
7,634,724,000	4,321,613,560	3,287,271,000	5,042,303,000	4,374,635,000	3,828,944,000

E.

2018	2019	2020	2021	2022	2023
60.44%	34.21%	25.95%	39.92%	34.63%	30.31%

F.

2018	2019	2020	2021	2022	2023
83.03%	71.84%	69.38%	73.85%	77.89%	79.50%

G.

2018	2019	2020	2021	2022	2023
9976.8	10204.255	10699.353	10690.347	10979.421	10910.32

H.

2018	2019	2020	2021	2022	2023
6.47%	12.21%	7.63%	16.58%	1.82%	5.05%

I.

2018	2019	2020	2021	2022	2023
7.00%	13.65%	8.65%	18.89%	5.24%	7.16%

J. Not available - O&M is reported in total

K. Not available - O&M is reported in total

L.

	2018	2019	2020	2021	2022	2023
Coal	232,090,553	161,620,864	128,688,321	163,564,338	219,770,258	190,943,233
Fuel Oil	4,612,147	5,511,953	5,714,130	6,608,035	7,815,905	9,700,149

M. DEF is not a member of an organized RTO/ISO market, so there is no energy or capacity market revenue specifically attributed to Crystal River 4 and 5 for participation in that type of market. DEF transacts energy bilaterally with counterparties in the Southeast when economically advantageous to do so or necessary for system reliability. DEF generally transacts as a whole system recognizing that multiple units could potentially respond to a purchase or sale of energy dependent upon system conditions and unit characteristics. The response to SC ROG 1-26 a&b provides a high-level view of DEF's short-term activity in the bilateral energy market.

N.

2018	2019	2020	2021	2022	2023
81,390,301	44,764,220	31,005,380	19,233,851	18,021,969	25,463,652

O. DEF does not know what "sustaining capital" means. Please see the response to subpart N for historical capital spend.

P. N/A

7. For Crystal River units 4 and 5, please provide the following projected data for the years 2024 through 2034:
- a. Installed capacity;
 - b. Unforced capacity;
 - c. Generation (in MWh);
 - d. Capacity factor;
 - e. Equivalent Availability Factor (EAF);
 - f. Heat rate (average);
 - g. Forced or random outage rate;
 - h. Effective forced outage rate (EFORd);
 - i. Fixed O&M costs;
 - j. Non-fuel variable costs;
 - k. Fuel costs (by fuel type);
 - l. Any energy or capacity market revenue from participation in an organized market;
 - m. All forecast capital expenditures (including environmental projects) by year; and
 - n. All forecast sustaining capital by year.
 - o. If these categories do not comprise all costs associated with these units, please explain, and quantify the other costs of the units by year.

Response:

- a. Please see the attached document bearing Bates number 20240025-SIERRACLUBROG1-00000001.
Much of the requested unit performance data for the period 2025-2027 can be found in Schedule F-8 of the Minimum Filing Requirement (MFR) documents submitted with the rate case filing, pages 356 - 376. Some of that data is repeated here for convenience
- b. Please see the response and attachment provided in subpart a.
- c. Please see the response and attachment provided in subpart a.
- d. Please see the response and attachment provided in subpart a.
- e. Please see the response and attachment provided in subpart a.
- f. Please see the response and attachment provided in subpart a.

- g. Please see the response and attachment provided in subpart a.
- h. Please see the response and attachment provided in subpart a.
- i. Please see the response and attachment provided in subpart a.
- j. Please see the response and attachment provided in subpart a.
- k. Please see the response and attachment provided in subpart a.
- l. N/A. DEF is not a member of an organized RTO/ISO market, so there is no forecasted energy or capacity market revenue specifically attributed to Crystal River 4 and 5 for participation in that type of market. DEF transacts energy bilaterally with counterparties in the Southeast when economically advantageous to do so or necessary for system reliability. DEF generally transacts as a whole system recognizing that multiple units could potentially respond to a purchase or sale of energy dependent upon system conditions and unit characteristics. See response to SC ROG 1-26 c & d for additional information.
- m. Please see the attached document bearing Bates numbers 20240025-SIERRACLUBROG1-00000002 through 20240025-SIERRACLUBROG1-00000003. The Company does not have a forecast of capital for 2028-2034.
- n. Please refer to the response and attachment for subpart m. for all project information.
- o. Please refer to the response and attachment for subpart m. for all project information.

Much of the requested unit performance data for the period 2025-2027 can be found in Schedule F-8 of the Minimum Filing Requirement (MFR) documents submitted with the rate case filing, pages 356 - 376. Some of that data is repeated here for convenience

- 8. Please provide a description of any major capital projects expected at Crystal River units 4 or 5 over the next 10 years. Include information about the expected timeline and cost of such projects.

Response:

Please see the DEF's response to Sierra Club ROG 1-7, which includes project descriptions, in-service dates, and project cash flow by year.

- 9. Please provide a list of all outages that occurred over the past 5 years at Crystal River units 4 and 5. Include the following:
 - a. Date and time outage began and ended;
 - b. Duration of outage;
 - c. Unit derating (in MW);
 - d. Whether the outage was forced or unforced;

- e. Explanation for the outage; and
- f. Replacement power costs.

Response:

For a-e, please see the attached document bearing Bates numbers 20240025-SIERRACLUBROG1-00000004 through 20240025-SIERRACLUBROG1-00000011.

f. Through the annual fuel proceedings, DEF previously identified replacement power costs associated with Crystal River Unit 4 in calendar years 2019 and 2021 in the retail amounts of approximately \$1.6M and \$16.2M, respectively. DEF has not identified any related to Crystal River Unit #5. Note that DEF does not calculate replacement power for planned outages.

10. Regarding the Company's operation of Crystal River units 4 and 5:

- a. Provide a narrative of how DEF makes decisions regarding unit commitment (that is, decisions to turn the plant on and off) and unit dispatch (that is, decisions to ramp the plant up or down). If there are any differences in decision-making processes by unit, please explain.
- b. Indicate whether the Company conducts daily unit commitment analysis to determine how to commit and dispatch the plant.

Response:

a. DEF utilizes security constrained economic dispatch of its generation fleet to meet system requirements. In summary, the Company performs a detailed daily process to determine the unit commitment plan that economically and reliably meets the Company's projected system needs over the next seven days.

To do this, the Company utilizes a production cost model to determine an optimal unit commitment plan to meet system requirements economically and reliably. The model minimizes the production costs needed to serve the projected customer demand within reliability and other system constraints over the 7-day forecast period. Inputs to the model include, but are not limited to, the following: 1) forecasted customer energy demand; 2) the latest forecasted fuel prices, reflective of market supply chain dynamics; 3) variable transportation rates; 4) planned maintenance and refueling outages at the generating units; 5) generating unit parameters such as, but not limited to, minimum load, maximum load, heat rate, ramp rate, variable O&M, start-up costs and shut-down costs, 6) reliability constraints such as units run to maintain day-ahead planning reserves or units required to run for transmission or voltage support; 7) expected market conditions associated with power purchases and off-system sales opportunities.; and 8) projected variable renewable resource contributions (i.e. solar). The production cost model produces the optimized hourly unit commitment plan for the 7-day forecast period. The unit commitment plan is prepared daily and adjusted, as needed, throughout any given day to respond to changing real time system conditions.

The unit commitment plan also provides the starting point for dispatch, but dispatch is then also subject to real time adjustments due to changing system conditions. Changing real time system conditions are incorporated into the security constrained economic dispatch algorithm in the Company's Energy Management System ("EMS") by the ECC as they occur to ensure the most security constrained economic real time dispatch response.

b. See response to subpart a.

11. Please provide a narrative description of how the Company procures coal for Crystal River units 4 and 5.

- a. Are spot market purchases part of the fueling strategy? If so, from what market are the purchases made? Provide the average purchase price in each year from 2021 through 2023.
- b. Please provide a narrative description of the coal contracts in place for coal supply to Crystal River units 4 and 5. Provide the name of the counterparty and the quantity and price of coal, along with any minimum take requirements.

Response:

Duke Energy Florida's coal procurement strategy is designed to assure that the Company procures a reliable supply of appropriate quality coal for its coal generating facility at the lowest cost reasonably possible. Coal is generally purchased under long-term contracts of one to three years in length. The Company secures both its long-term and spot (one year or less) coal supply from producers through competitive bid processes that are evaluated thoroughly considering the following:

1. conformity to the technical and commercial aspects of the specifications (e.g., coal specifications, delivery schedules, warranties, etc.);
2. coal quality and quantity assurances (or guarantees) by the bidder;
3. prices and conditions of pricing;
4. any exceptions to the specifications and resulting penalties;
5. supplier operations and/or shipping capabilities;
6. historic supplier performance and financial viability;
7. supplier flexibility (i.e. quantity, term, location); and
8. any other considerations applicable under the circumstances.

The producer (or producers) whose coal offers the best value, particularly with regard to overall utilization costs, is selected for further negotiations to produce contracts.

The Company uses methods and strategies that ensure the lowest cost reasonably possible, including the use of staggered terms on long-term contracts, a diversified mix of suppliers, and contractual terms and conditions that provide price certainty and competitiveness. Duke Energy Florida works to diversify its sourcing of suppliers and mines to ensure

reliable supply and efficient transportation and works with suppliers to incorporate additional flexibility into the supply contracts. The Company's Coal Procurement Group stays informed as to the current market alternatives for spot and long-term coal supply through frequent communication with the coal producers and mining operations, coupled with, on-going monitoring of pricing information documented in industry publications such as industry newsletters, trade publications, regulatory filings, and the weekly spot market pricing indices published by brokers and traders.

- a. Yes. Duke Energy Florida conducts spot market solicitations as needed to supplement term contract purchases, taking into account changes in projected coal burns and existing coal inventory levels in order to maintain adequate inventory and provide a reliable source of electricity for customers. Spot coal supply is solicited from potential suppliers from all regions and the producer (or producers) whose coal offers the best value, particularly with regard to overall utilization costs, is selected for further negotiations to produce contracts as discussed in the Company's response to SC ROG 1-11, above. Please see documents bearing Bates number 20240025-SIERRACLUBROG1-00000012 for average purchase price in each year from 2021 through 2023. The documents are confidential: redacted versions are attached hereto and unredacted copies have been submitted with the Florida Public Service Commission along with DEF's Notice of Intent to Request Confidential Classification dated May 3, 2024.
- b. Please see documents provided in subpart a.

Topic: Environmental Regulation and Policy

12. Please provide a description of how any proposed or recently finalized federal environmental regulations may affect Crystal River units 4 and 5, including, but not limited to: the U.S. Environmental Protection Agency (EPA)'s Effluent Limitation Guidelines (ELG Rule); EPA's Mercury and Air Toxics Standards (MATS); EPA's regional haze standards; EPA's proposed new Clean Air Act section 111 rule, which would limit greenhouse gas emissions from certain fossil fuel plants; and EPA's updated coal ash rule, which is anticipated to be released in early May 2024 and would likely require retrofitting or closure of legacy coal ash ponds.
 - a. How is the Company planning to comply with each new regulation, to the extent they are applicable to Crystal River units 4 and 5?

Response:

Duke Energy has closely followed the development of the Effluent Limitation Guidelines (ELG Rule), the Mercury and Air Toxics Standard (MATS Rule), the proposed Clean Air Act Section 111 Rules, and updates to the Coal Combustion Residual (CCR) rule. The

company supported comments provided to the U.S. EPA through a number of trade organizations and submitted comments on behalf of the company for each of these proposed regulations. On April 25, 2024 the EPA issued the updated Rules. As the Rules were just published, Duke Energy is in the process of reviewing them and will be developing compliance plans over the coming months/years depending on potential challenges to the Rules.

As for Regional Haze compliance, Crystal River Unit Nos. 4 and 5 have taken a reduced SO₂ emission limit to comply with these provisions and no additional action is expected.

13. Please describe the impact that any of the federal rules identified in response to Interrogatory No. 12 above, as well as any Florida legislation or regulations governing environmental protection or pollution, will have on Crystal River units 4 and 5 if such rule is fully implemented.

Response:

As mentioned in the response to Sierra Club Interrogatory No. 1-12 above, Duke Energy currently reviewing the Rules.

14. If the Company does not have a plan for complying with EPA's new section 111 greenhouse gas rule, or with any other federal or state rule identified in response to Interrogatory Nos. 12 or 13, please explain why not.

Response:

Please see response to Interrogatory 12. Duke Energy closely evaluated impacts from the proposed regulations outlined in response to Interrogatory No. 12 and this analysis informed the comments that the company has provided to U.S. EPA.

15. Has Duke Energy Florida evaluated the potential to use the U.S. Department of Energy's Energy Infrastructure Reinvestment (EIR) loan program to facilitate and reduce the costs associated with early retirement and replacement of any of its existing or retired coal units?

Response:

No.

16. Has Duke Energy Florida communicated with the Department of Energy to discuss questions and opportunities associated with the EIR program? If so, please briefly describe the communication. If not, please explain why not.

Response:

No. Given that DEF has a reliability need to continue to operate CR 4 and 5, it has not considered the EIR loan guarantee program at this time

Topic Keyword: New and existing energy supply

17. For each new generation facility for which the Company is requesting rate recovery in this rate case, please provide:
- a. The generator size in MW;
 - b. The \$/kW overnight capital cost of each generator; and
 - c. The expected \$/kW-yr fixed O&M costs of each generator.

Response:

Please see attachment bearing Bates numbers 20240025-SIERRACLUBROG1-00000013 through 20240025-SIERRACLUBROG1-00000014.

Documents bearing Bates number 20240025-SIERRACLUBROG1-00000013 is confidential: redacted versions are attached hereto and unredacted copies have been submitted with the Florida Public Service Commission along with DEF's Notice of Intent to Request Confidential Classification dated May 3, 2024. This provides the capacity (MW-ac) and overnight cost for the 2025-2027 solar assets. Detailed related to the annual O&M costs are provided in response to LULAC POD 1-2.

18. Please provide the fuel type, capacity in MW, and Commercial Online Date for each owned or contracted generating resource added to DEF's portfolio from 2019 through 2024. State whether each resource is owned or contracted.

Response:

Please see attachment bearing Bates number 20240025-SIERRACLUBROG1-00000015 which provides the requested information for the DEF owned solar projects with commercial operation dates from 2019-2027.

19. Please provide the Company's two most recent commodity (e.g., natural gas and coal), peak demand, and load forecasts. Indicate the date each forecast was completed.

Response:

See attached " bearing Bates numbers 20240025-SIERRACLUBROG1-00000016 through 20240025-SIERRACLUBROG1-00000019 for forecasts as of 2/13/2024 and 3/12/2024.

The Company's forecasting models, inputs, assumptions, and results used to support the rate case, including commodity, load, and peak demand, are described in Schedule F-5 through F-8 of the Minimum Filing Requirement documents submitted with the rate case.

The Company's fuel price forecasting methodology utilizes known observable market prices for the applicable forward periods that are selected as of a specific Close of Business date. The Company does not generate its own commodity price forecast; instead, the Company obtains its forward market price curves from industry recognized third-party forward market source providers for natural gas, fuel oil and coal

The load forecasting process used to develop load and peak demand is accomplished through an econometric modeling process that employs historic and projected input data addressing economic conditions, demographics, weather, electric price levels, and in some instances, specific customer operating plans. See Schedule F-5 through F-8 of the Minimum Filing Requirement documents submitted with the rate case for more details.

20. Does the Company purchase energy from a market hub? If so, please specify which hub(s) and how much energy was purchased at each hub during on-peak and off-peak hours in each month from 2019 through 2023.

Response:

DEF does not purchase energy from a market hub. DEF transacts energy bilaterally with counterparties in the Southeast when economically advantageous to do so or necessary for system reliability. DEF purchases energy that is fully delivered to DEF's transmission system or at a transmission interface agreed upon with the counterparty. Total energy purchased short-term by DEF is identified in the response to SC ROG 1-26 a&b.

21. Please provide historical monthly average on-peak and off-peak energy market prices for 2019 through 2023.

Response:

DEF is not in an organized RTO/ISO market so there is no published historical monthly on-peak and off-peak energy market price for the period 2019-2023.

22. Please provide the Company's two most recent power market price forecasts. Include off-peak and on-peak prices if available. Indicate the date each forecast was completed.

Response:

Please see attached file bearing Bates numbers 20240025-SIERRACLUBROG1-00000020 through 20240025-SIERRACLUBROG1-00000021.

Duke Energy Florida is a vertically integrated utility company, operating outside of a Regional Transmission Organization (RTO) (e.g., PJM, MISO). While the Company does

engage in bilateral energy transactions with neighboring counterparties in the Southeast when economically advantageous to do so or necessary for system reliability, nearly all customer load is served with native generation. Consequently, power market purchase and sale volumes are small. Given the small transaction volume, forecasted power market prices have minimal impact on projected system operations and cost or other long range planning activities. Even so, the Company does model power prices intended to be representative of transaction opportunities with neighbors to capture the potential impacts of off-system purchases and sales.

To do so, the company has developed a proprietary statistical model of the relationship between actual regional natural gas prices (FGT Zone 3) and average monthly on- and off-peak power prices (i.e. market heat rate) as indicated by potential transaction prices marked by the Company's power traders. This model is then applied to market forward prices for FGT Zone 3 as of a specific Close of Business date to estimate forward monthly on- and off-peak power prices that form the forward power market curves included in response to Sierra Club Interrogatory No. 22.

23. When planning its resource portfolio, does the Company plan to use spot market purchases or short-term contracts to meet a portion of its capacity needs? Please explain why or why not.

Response:

In its long-term planning, DEF does not generally use spot market or short-term contract purchases as part of the resource plan. Because DEF does not participate in an organized market (RTO/ISO), there is no reliable projection of the availability of such contracts beyond the immediate term. DEF considers the opportunity to make economic short-term energy purchases or, as necessary, reliability capacity purchases in its seasonal and short-term planning. Because of the dynamic nature of bilateral purchase opportunities, these are not considered as part of long-term reliability planning.

24. Does the Company have capacity contracts with third parties? If so, please list each contract, its capacity in MW, the fuel type of any associated generator, the cost of the capacity in \$/MW-year, and whether the capacity is considered firm capacity.

Response:

Yes, the Company has third-party capacity contracts. Please see the table attached bearing Bates number 20240025-SIERRACLUBROG1-00000022.

25. Please provide the maximum price per MWh the Company paid for market energy in each month from 2019 through 2023.

Response:

Please see the table attached bearing Bates number 20240025-SIERRACLUBROG1-00000023.

26. Please provide the following for Duke Energy Florida:
- a. Total annual off system energy purchases in GWh and dollars since 2018;
 - b. Total annual off system energy sales in GWh and dollars since 2018;
 - c. Projected annual off system energy purchases in GWh and dollars from now through 2034; and
 - d. Projected annual off system energy sales in GWh and dollars from now through 2034.

Response:

a & b Please see the table attached bearing Bates numbers 20240025-SIERRACLUBROG1-00000024 through 20240025-SIERRACLUBROG1-00000025.

c & d. Please see the table attached bearing Bates number 20240025-SIERRACLUBROG1-00000026.

27. Please provide the capacity factor of each of the in-service solar resources included in this rate case.

Response:

Please see attachment bearing Bates number 20240025-SIERRACLUBROG1-00000027. Tab ROG 1-27 includes the requested information for the DEF in-service solar resources as of the date of the rate case filing. This includes all solar resources currently in operation.

28. Please provide the expected capacity factor of each resource included in this multi-year rate plan that is not yet in service.

Response:

Please see attachment bearing Bates number 20240025-SIERRACLUBROG1-00000028. Tab ROG 1-28 includes the requested information for the DEF solar resources not yet in operation included as part of Solar Growth for 2024-2027.

29. Please provide the capacity factors of the three solar resources the company procured most recently, previous to this rate case.

Response:

The three most recently procured/constructed solar resources that are placed in service and have completed capacity testing are Bay Ranch, Hardeetown and High Springs Solar Energy Center(s). Each project, which was procured in development and constructed by DEF, has a designed year 1 capacity factor of 28.0%.

Topic: Resource Planning and Resource Adequacy

30. Please provide a load and resources table from now through 2034, or the furthest year DEF has available, showing the Company's projected peak demand and firm capacity available by year. List firm capacity by resource/fuel type. Include the Company's reserve margin in the table.

Response:

Please see attachment bearing Bates numbers 20240025-SIERRACLUBROG1-00000029 through 20240025-SIERRACLUBROG1-00000040

31. Please provide a narrative explanation of how the Company calculates its available firm capacity for purposes of system planning. Does the Company include an estimate of firm capacity for variable renewable energy or storage resources?

Response:

Please see the response to Sierra Club Interrogatory 1-32.

32. Does the Company calculate Capacity Contribution, Effective Load Carrying Capacity, or another metric of firm capacity for its generators for planning purposes? Please provide that value for the Company's existing generators and any new generators included in this rate case.

Response:

DEF addresses Capacity Contribution for each of its units based on technology type. The capacity contribution is evaluated based on the ability of each unit to reliably contribute to the system load at the time of the seasonal peak, generally marked as the peak hour of summer and winter. For all fuel fired units, DEF assumes 100% contribution to capacity. The contribution of solar units is based on an evaluation of the contribution of the solar at the time of the net peak. DEF recognizes that as solar penetration increases, including both DEF and customer owned PV, the relationship between the solar production and the coincident load peak will change. DEF modeling derives an equivalent summer non-coincident, but on-peak-hour capacity value equal to 25% of the facility's nameplate rating for planned PV installations in 2025 and 2026 and 12.5% for the 2027 projects. For a detailed description of DEF's methodology for ascribing firm capacity to solar PV generating units, see DEF's response to LULAC interrogatory 1-12. DEF has ascribed a

90% capacity contribution to new utility scale transmission connected batteries. This value is in line with values being used by other Florida utilities.

33. Please provide a narrative explanation of how the Company ensures that it will have enough capacity to meet demand in the future while maintaining a cost-effective system for customers. Include answers to the following:
- a. How frequently does the Company assess its resource adequacy?
 - b. How far into the future does the Company plan for resource adequacy?
 - c. What standard does the Company use? For example, is it a 1 day in 10 years standard or a different metric?
 - d. Does DEF use a planning reserve margin (PRM) when making resource decisions? If so, please provide the margin the Company currently uses and a narrative explanation of how that PRM was determined to be appropriate for planning purposes.

Response:

This subject is discussed in detail in Chapter 3 of the annual DEF Ten-Year Site Plan, available at: [FloridaPSC \(state.fl.us\)](http://FloridaPSC.state.fl.us)

DEF employs an Integrated Resource Planning (IRP) process to determine the most cost-effective mix of supply- and demand-side alternatives that will reliably satisfy our customers' future demand and energy needs. DEF's IRP process incorporates state-of-the-art computer models used to evaluate a wide range of future generation alternatives and cost-effective conservation and dispatchable demand-side management programs on a consistent and integrated basis.

The process begins with the development of various forecasts, including demand and energy, fuel prices, and economic assumptions. Future supply- and demand-side resource alternatives are identified, and extensive cost and operating data are collected to enable these to be modeled in detail. These alternatives are optimized together to determine the most cost-effective plan for DEF to pursue over the next ten years that meets the reliability criteria for our customers.

The IRP provides DEF with substantial guidance in assessing and optimizing the Company's overall resource mix on both the supply side and the demand side. When a decision supporting a significant resource commitment is being developed (e.g., plant construction, power purchase, DSM program implementation), the Company will move forward with directional guidance from the IRP and delve much further into the specific levels of examination required. This more detailed assessment will typically address very specific technical requirements and cost estimates, detailed corporate financial considerations, and the most current dynamics of the business and regulatory environments.

Forecasts and Assumptions

The evaluation of possible supply- and demand-side alternatives, and development of the optimal plan, is an integral part of the IRP process. These steps together comprise the integration process that begins with the development of forecasts and collection of input data. Base forecasts that reflect DEF's view of the most likely future scenario are developed. Additional future scenarios along with high and low forecasts may also be developed. Computer models used in the process are brought up to date to reflect this data, along with the latest operating parameters and maintenance schedules for DEF's existing generating units. This establishes a consistent starting point for all further analysis.

Reliability Criteria

Utilities require a margin of generating capacity above the firm demands of their customers in order to provide reliable service. Periodic scheduled outages are required to perform maintenance and inspections of generating plant equipment. At any given time during the year, some capacity may be out of service due to unanticipated equipment failures resulting in forced outages of generation units. Adequate reserve capacity must be available to accommodate these outages and to compensate for higher than projected peak demand due to forecast uncertainty and abnormal weather. In addition, some capacity must be available for operating reserves to maintain the balance between supply and demand on a moment-to-moment basis.

DEF plans its resources in a manner consistent with utility industry planning practices and employs both deterministic and probabilistic reliability criteria in the resource planning process. A Reserve Margin criterion is used as a deterministic measure of DEF's ability to meet its forecasted seasonal peak load with firm capacity. DEF plans its resources to satisfy a minimum 20% Reserve Margin criterion.

Supply-Side Screening

Potential supply-side resources are screened to determine those that are the most cost-effective. Data used for the screening analysis is compiled from various industry sources and DEF's experiences. The wide range of resource options is pre-screened to set aside those that do not warrant a detailed cost-effectiveness analysis. Typical screening criteria are costs, fuel source, technology maturity, environmental parameters (e.g., emissions, possible climate impact), and overall resource feasibility.

Economic evaluation of generation alternatives is performed using the Capacity Expansion module of the EnCompass Power Planning Software licensed from Anchor Power Solutions. This optimization tool evaluates revenue requirements for specific resource plans generated from multiple combinations of future resource additions that meet system reliability criteria and other system constraints. Capacity expansion models are used to identify cost-effective system resources. However, additional modeling in a detailed production cost model is necessary to verify the resource selections with respect to cost, reliability, and environmental compliance as well as to conduct an overall assessment of the performance of the portfolio.

Demand-Side Screening

Like supply-side resources, the impacts of potential demand-side resources are also factored into the integrated resource plan. The projected MW and MWH impacts for demand-side management resources are based on the energy efficiency measures and

energy management programs included in DEF's 2015 DSM Plan and meet the goals established by the FPSC in December 2019 (Docket 20190018-EG).

Resource Integration and the Integrated Optimal Plan

The cost-effective generation alternatives are then optimized together with the demand-side portfolios developed in the screening process to formulate integrated optimal plans. The optimization program considers possible future combinations of supply- and demand-side alternatives that meet the Company's reliability criteria in each year of the ten-year study period and reports those that provide both flexibility and reasonable revenue requirements (rates) for DEF's customers. Candidate base plans are then evaluated using the production cost module of EnCompass. Production cost models maintain full chronology and load requirements in all hours simulating the hour-to-hour operation of the system. This provides hourly modeling of the portfolio dispatch and provides insights into the detailed energy production cost of a given portfolio, the emissions profile and helps to identify potential issues with unit operation and reliability.

a-c. DEF has not prepared a utility or BA specific LOLP study in the last several years. Because of the high level of integration of the DEF system into the FRCC system as a whole, the extensive use of reserve sharing and the existence of a single reliability coordinator for the state, it is more relevant to review data that incorporates the behavior of the entire interlinked system. In addition, over many years, DEF has established that maintaining the 20% utility reserve margin agreed to in previous PSC orders provides DEF with adequate resources to assure an LOLP below the 1 day in ten years target that is the industry standard. FRCC performs a state-wide LOLP analysis every other year in even numbered years. DEF, along with all FRCC members, contributes data to that analysis and participates in review of the results. Additional discussion of this subject can be found in DEF's response to LULAC Interrogatory 1-9.

d. DEF uses a planning reserve margin of 20%. This margin is mandated by the PSC in Docket No. 19981890-EU issued December 22, 1999.

34. What model or models does the Company use to assess resource adequacy?

Response:

FRCC uses the Tie-Line and Generation Reliability (TIGER) program along with an enhancement Java shell program that adds load forecast variations to determine loss of load probability (LOLP) and loss of load hours (LOLH). Please also see DEF's response to FL Rising's and LULAC's ROG 1-9.

35. Please provide the Company's historical monthly peak (MW) and monthly energy demand (MWh) load data for the years 2019 through 2023.

Response:

Please see attachment bearing Bates numbers 20240025-SIERRACLUBROG1-00000041 through 20240025-SIERRACLUBROG1-00000042.

36. Please provide the Company's forecast monthly peak (in MW) and monthly energy demand (in MWh) from 2024 through 2034.

Response:

Please see attachment bearing Bates numbers 20240025-SIERRACLUBROG1-00000042 through 20240025-SIERRACLUBROG1-00000045.

37. Has DEF assessed whether adding renewables or storage at the Crystal River site could create benefits for customers, including reducing their electricity rates, given that the historical retirement of thermal units at Crystal River qualifies the location as an "energy community" and allows new resources located there to receive substantial bonus tax credits under the Inflation Reduction Act?

Response:

DEF has considered the opportunity to site projects in the energy community area at Crystal River. At this time, no suitable sites for solar PV development have been identified. DEF has selected a site in the energy community zone for the location of the planned 100 MW 2027 battery included in this rate case. This area does include areas which could potentially be developed for additional battery energy storage. Accordingly, some future batteries in the DEF plan are coded as "energy community" projects. As the specifics of these projects emerge, DEF will consider the opportunity to reduce costs to our customers through the additional tax credits available for energy community location. These advantages will be assessed in light of other project attributes including transmission, land costs, and other project development characteristics.

38. Please provide the Company's estimated total available firm capacity in 2024. Include workpapers demonstrating the calculation of firm capacity.

Response:

Please see DEF's responses to Sierra Club interrogatories 1-30 and 1-32.

AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA

COUNTY OF CUMBERLAND

I hereby certify that on this _____ day of _____, 2024, before me, an officer duly authorized in the State and County aforesaid to take acknowledgments, personally appeared NED ALLIS who is personally known to me or has produced _____ as identification, and he acknowledged before me that he provided the answers to interrogatory number 5 from Sierra Club's First Set of Interrogatories to Duke Energy Florida, LLC (NOS 1-38) in Docket No. 20240025-EI, and that the responses are true and correct based on his personal knowledge.

In Witness Whereof, I have hereunto set my hand and seal in the State and County aforesaid as of this ____ day of _____, 2024.

Ned Allis

Notary Public
Commonwealth of Pennsylvania

My Commission Expires:

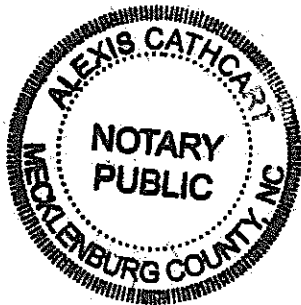
AFFIDAVIT

STATE OF NORTH CAROLINA

COUNTY OF MECKLENBURG

I hereby certify that on this 1st day of May, 2024, before me, an officer duly authorized in the State and County aforesaid to take acknowledgments, personally appeared NICOLE AQUILINA who is personally known to me or has produced drivers license as identification, and she acknowledged before me that she provided the answers to interrogatory number 6n from Sierra Club's First Set of Interrogatories to Duke Energy Florida, LLC (NOS 1-38) in Docket No. 20240025-EI, and that the responses are true and correct based on her personal knowledge.

In Witness Whereof, I have hereunto set my hand and seal in the State and County aforesaid as of this 1st day of May, 2024.



Nicole Aquilina
Nicole Aquilina
Alexis Cathcart
Notary Public
State of North Carolina

My Commission Expires:

4/20/2026

AFFIDAVIT

STATE OF FLORIDA

COUNTY OF PINELLAS

I hereby certify that on this _____ day of _____, 2024, before me, an officer duly authorized in the State and County aforesaid to take acknowledgments, personally appeared BENJAMIN BORSCH who is personally known to me or has produced _____ as identification, and he acknowledged before me that he provided the answers to interrogatory numbers 1-2, 6m, 7a-j & l, 10, 19-26, 30-38 from Sierra Club's First Set of Interrogatories to Duke Energy Florida, LLC (NOS 1-38) in Docket No. 20240025-EI, and that the responses are true and correct based on his personal knowledge.

In Witness Whereof, I have hereunto set my hand and seal in the State and County aforesaid as of this ____ day of _____, 2024.

Benjamin Borsch

Notary Public
State of Florida, at Large

My Commission Expires:


AFFIDAVIT


STATE OF NORTH CAROLINA

COUNTY OF MECKLENBURG

I hereby certify that on this 29 day of April, 2024, before me, an officer duly authorized in the State and County aforesaid to take acknowledgments, personally appeared KENNETH DAVIN who is personally known to me or has produced _____ as identification, and he acknowledged before me that he provided the answers to interrogatory numbers 6m, 7l, 20, 21, 25, 26(a,b) from Sierra Club's First Set of Interrogatories to Duke Energy Florida, LLC (NOS 1-38) in Docket No. 20240025-EI, and that the responses are true and correct based on his personal knowledge.

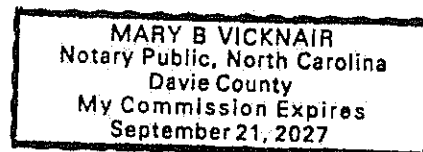
In Witness Whereof, I have hereunto set my hand and seal in the State and County aforesaid as of this 29th day of April, 2024.


Kenneth Davin


Notary Public
State of North Carolina

My Commission Expires:

09/21/2027



AFFIDAVIT

STATE OF NEW YORK

COUNTY OF _____

I hereby certify that on this ____ day of _____, 2024, before me, an officer duly authorized in the State and County aforesaid to take acknowledgments, personally appeared VANESSA GOFF who is personally known to me or has produced _____ as identification, and she acknowledged before me that she provided the answers to interrogatory numbers 17, 18, and 27-29 from Sierra Club's First Set of Interrogatories to Duke Energy Florida, LLC (NOS 1-38) in Docket No. 20240025-EI, and that the responses are true and correct based on her personal knowledge.

In Witness Whereof, I have hereunto set my hand and seal in the State and County aforesaid as of this ____ day of _____, 2024.

Vanessa Goff_____
Notary Public
State of New York, at LargeMy Commission Expires:

AFFIDAVIT

STATE OF FLORIDA

COUNTY OF PINELLAS

I hereby certify that on this 30th day of April, 2024, before me, an officer duly authorized in the State and County aforesaid to take acknowledgments, personally appeared MARCIA OLIVIER who is personally known to me, and she acknowledged before me that she provided the answers to interrogatory numbers 3 and 4b from Sierra Club's First Set of Interrogatories to Duke Energy Florida, LLC (NOS 1-38) in Docket No. 20240025-EI, and that the responses are true and correct based on her personal knowledge.

In Witness Whereof, I have hereunto set my hand and seal in the State and County aforesaid as of this 30th day of April, 2024.



Marcia Olivier
Marcia Olivier

[Signature]
Notary Public
State of Florida, at Large

My Commission Expires:

0000AFFIDAVIT

STATE OF NORTH CAROLINA

COUNTY OF MECKLENBURG

I hereby certify that on this 29 day of April, 2024, before me, an officer duly authorized in the State and County aforesaid to take acknowledgments, personally appeared PAIGE SWOFFORD who is personally known to me or has produced _____ as identification, and she acknowledged before me that she provided the answers to interrogatory numbers 15-16 from Sierra Club's First Set of Interrogatories to Duke Energy Florida, LLC (NOS 1-38) in Docket No. 20240025-EI, and that the responses are true and correct based on her personal knowledge.

In Witness Whereof, I have hereunto set my hand and seal in the State and County aforesaid as of this 29th day of April, 2024.



Paige Swofford
Paige Swofford

Teresa Ray
Notary Public
State of North Carolina

My Commission Expires:

01/21/29

AFFIDAVIT

STATE OF FLORIDA

COUNTY OF PINELLAS

I hereby certify that on this 29th day of April, 2024, before me, an officer duly authorized in the State and County aforesaid to take acknowledgments, personally appeared PATRICIA WEST who is personally known to me, and she acknowledged before me that she provided the answers to interrogatory numbers 12-14 from Sierra Club's First Set of Interrogatories to Duke Energy Florida, LLC (NOS 1-38) in Docket No. 20240025-EI, and that the responses are true and correct based on her personal knowledge.

In Witness Whereof, I have hereunto set my hand and seal in the State and County aforesaid as of this 29th day of April, 2024.

Patricia West
Patricia West
3
Notary Public
State of Florida, at Large

My Commission Expires:

July 11th, 2027

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Petition for rate increase by Duke Energy
Florida, LLC.

Docket No. 20240025-EI

Dated: May 29, 2024

**DUKE ENERGY FLORIDA, LLC'S SUPPLEMENTAL RESPONSE TO
SIERRA CLUB'S FIRST SET OF INTERROGATORIES (NOS. 1-38)**

Duke Energy Florida, LLC ("DEF") responds to Sierra Club's First Set of Interrogatories to DEF (Nos. 1-38), specifically 6 (j-k), as follows:

INTERROGATORIES

6. For Crystal River units 4 and 5, please provide the following historical data for the years 2018 to 2023 for each unit:

- j. Fixed O&M costs;
- k. Non-fuel variable costs;

Response:

Total Annual O&M at Crystal River Station
(Amounts in thousands):

2018 30,809
2019 26,913
2020 24,931
2021 23,722
2022 34,364
2023 29,339

The Company does not have the breakdown between fixed O&M and non-fuel variable costs for the actual costs provided. The costs above are total costs.

Duke Energy Florida, LLC
Sierra Club Rate Case ROG 1-7(a,b, c, d, e, f, g, h, and k)
Crystal River Units 4 & 5 Projected Data 2024 - 2034

Much of the requested unit performance data for thr period 2025-2027 can be found in Schedule F-8 of the Minimum Filing Requirement (MFR) documents submitted with the rate case filing, pages 356 - 376. Some of that data is repeated here for convenience.

a & b. Installed Capacity (Net Summer Capacity) ¹											
	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Crystal River 4	712	712	712	712	712	712	712	712	712	712	712
Crystal River 5	698	698	698	698	698	698	698	698	698	698	698
c. Generation (MWh)											
	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Crystal River 4	751,276	782,612	489,542	615,702	625,340	573,097	638,455	1,021,401	892,590	1,074,681	634,420
Crystal River 5	651,576	417,368	566,365	462,041	731,808	643,598	740,695	929,113	1,107,806	877,065	399,375
d. Capacity Factor											
	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Crystal River 4	12%	12%	8%	10%	10%	9%	10%	16%	14%	17%	24%
Crystal River 5	10%	7%	9%	7%	12%	10%	12%	15%	18%	14%	15%
e. Equivalent Availability Factor (EAF)											
	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Crystal River 4	87%	89%	72%	90%	77%	84%	77%	84%	84%	84%	84%
Crystal River 5	72%	72%	88%	81%	90%	83%	90%	83%	90%	73%	91%
f. Average Heat Rate (BTU/KWh)											
	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Crystal River 4	11,581	11,418	11,740	11,723	12,213	12,128	12,084	11,422	11,386	11,269	11,035
Crystal River 5	11,086	11,093	11,039	11,148	10,956	10,944	10,985	10,888	10,685	10,731	10,478
g & h. Equivalent Unplanned Outage Rate (EUOR) ²											
	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Crystal River 4	10.8%	10.8%	10.8%	10.8%	15.0%	16.4%	15.3%	16.4%	16.4%	16.4%	16.6%
Crystal River 5	10.7%	10.7%	10.7%	10.7%	9.6%	8.5%	9.6%	8.8%	9.6%	7.7%	9.3%
k. Coal Fuel Costs (\$000)											
	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Crystal River 4	37,142	41,751	27,518	34,029	35,592	33,372	35,235	51,099	42,668	51,537	30,558
Crystal River 5	32,213	22,266	31,836	25,536	37,366	33,817	37,159	44,308	49,697	40,052	18,266
k. Distillate Oil Fuel Costs (\$000)											
	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Crystal River 4	1,079	741	422	775	611	542	471	793	401	736	499
Crystal River 5	936	395	489	581	614	544	317	399	482	494	249

- Notes
1.

Duke Energy Florida does not participate in a Regional Transmission Organization (RTO) (e.g., PJM) and has not calculated an Unforced Capacity (UCAP) for its generation units.
2.

The Company's production cost models use an Equivalent Unplanned Outage Rate (EUOR) for their forecasts instead of an Equivalent Demand Forced Outage Rate (EFORd) or Effective Equivalent Demand Forced Outage Rate (EEFORd). The EUOR represents the percentage of time a unit is unavailabe, outside of planned/scheduled outages, due to forced and maintenance outages, as well as unplanned derates.

7. For Crystal River 4 and 5, please provide the following projected data for the years 2024 through 2034:

i. Fixed O&M costs

j. Non-fuel variable costs

RESPONSE:

Total O&M	<u>2024</u>	<u>2025</u>	<u>2026</u>	<u>2027</u>
Crystal River 4 and 5	40,834	46,276	45,838	44,509

Fixed O&M (\$000)	<u>2028</u>	<u>2029</u>	<u>2030</u>	<u>2031</u>	<u>2032</u>	<u>2033</u>	<u>2034</u>
Crystal River 4	18,445	18,928	19,263	23,965	24,171	21,391	8,317
Crystal River 5	24,679	20,747	21,140	21,524	23,227	22,541	9,175
	43,124	39,675	40,403	45,489	47,398	43,932	17,492

Variable O&M (\$000)	<u>2028</u>	<u>2029</u>	<u>2030</u>	<u>2031</u>	<u>2032</u>	<u>2033</u>	<u>2034</u>
Crystal River 4	2,345	2,187	2,467	3,615	3,202	3,888	2,299
Crystal River 5	2,478	2,230	2,660	3,297	3,819	3,060	1,405
	4,822	4,417	5,127	6,912	7,022	6,948	3,704

Crystal River North (U4 and U5) Projects
Capital Investments for Years 2024 to 2027

Total:				\$ 16,240,862	\$ 18,060,729	\$ 17,053,032	\$ 5,038,441
Row #	Generation Station	Investment Name	In-Service Date (ISD)	2024	2025	2026	2027
1	Crystal River North	CRN FGD Ball Mill Capital Parts Rep	11/1/2024	\$ 605,531	\$ -	\$ -	\$ -
2	Crystal River North	SmartGenCRNORAT Kelmans	12/31/2024	\$ 305,231	\$ -	\$ -	\$ -
3	Crystal River North	SmartGenCRNWWTSBOP Vib	11/30/2024	\$ 229,196	\$ -	\$ -	\$ -
4	Crystal River North	CRN Replace 24 and 25 TP Roofs	3/1/2024	\$ 159,000	\$ -	\$ -	\$ -
5	Crystal River North	Crusher 03 Replacement	12/23/2025	\$ -	\$ 242,119	\$ -	\$ -
6	Crystal River North	Replace Unit 4 Flame Scanners	11/30/2026	\$ -	\$ -	\$ 475,699	\$ -
7	Crystal River North	BALL MILL LINER REPLACEMENT	4/1/2024	\$ 192,210	\$ -	\$ -	\$ -
8	Crystal River North	401 Aux Transformer Cooler	5/1/2024	\$ 200,379	\$ -	\$ -	\$ -
9	Crystal River North	CR4 SCR Ash Sweeper Installation	4/27/2026	\$ -	\$ -	\$ 319,708	\$ -
10	Crystal River North	CRN 2024 Region GMA	12/31/2023	\$ 416,377			
11	Crystal River North	CRN 2024 Capital Optimization	12/31/2023	\$ 5,100,000			
12	Crystal River North	CRN 2024 IT/Cyber	12/31/2024	\$ 107,773			
13	Crystal River North	Template CR4 TurbineBFPT Valves	4/15/2024	\$ 769,497	\$ -	\$ -	\$ -
14	Crystal River North	CR4 Pulv Auto Wheel Loading System	12/31/2027	\$ -	\$ -	\$ -	\$ 1,111,704
15	Crystal River North	CR4 Gas Recirc Fan Rotor Replace	12/31/2027	\$ -	\$ -	\$ -	\$ 735,674
16	Crystal River North	407 Pulverizer Capital Part Repl	12/31/2024	\$ 698,486	\$ -	\$ -	\$ -
17	Crystal River North	Template CR4 BOP Outage	12/31/2026	\$ -	\$ -	\$ 5,439,844	\$ -
18	Crystal River North	CRN 2026 Region GMA	12/31/2023			\$ 413,000	
19	Crystal River North	CRN 2026 Capital Optimization	12/31/2023			\$ 6,460,000	
20	Crystal River North	CRN 2026 IT/Cyber	12/31/2026			\$ 108,413	
21	Crystal River North	CR4 Bottom Ash Sluice Gate Repl	4/26/2024	\$ 608,856	\$ -	\$ -	\$ -
22	Crystal River North	CR4 CA A AR Pump Replacement	5/31/2024	\$ 434,316	\$ -	\$ -	\$ -
23	Crystal River North	CR4 CA B AR Pump Replacement	5/31/2024	\$ 511,753	\$ -	\$ -	\$ -
24	Crystal River North	CR4 CA D AR Pump Replacement	5/31/2024	\$ 511,753	\$ -	\$ -	\$ -
25	Crystal River North	CR4 CA E AR Pump Replacement	5/31/2024	\$ 511,753	\$ -	\$ -	\$ -
26	Crystal River North	CR4 Precip TR set Replacement (60)	3/31/2024	\$ 232,266	\$ -	\$ -	\$ -
27	Crystal River North	CR4 Precip Conds Internals replac	4/30/2025	\$ 1,786,465	\$ 1,045,785	\$ 102,600	\$ -
28	Crystal River North	CR4 Burner Replacement	4/15/2024	\$ 64,219	\$ -	\$ -	\$ -
29	Crystal River North	Replace CR4 CCW HE Iso Valves	4/15/2024	\$ 130,549	\$ -	\$ -	\$ -
30	Crystal River North	U5 Abs Sec Hydro Capital replace	10/1/2025	\$ -	\$ 166,177	\$ -	\$ -
31	Crystal River North	CR5 SCR Ash Sweeper Installation	4/27/2026	\$ -	\$ -	\$ 314,501	\$ -
32	Crystal River North	CR5 CA A AR PUMP REPLACEMENT	3/30/2026	\$ -	\$ -	\$ 373,048	\$ -
33	Crystal River North	CR5 CA E AR PUMP REPLACEMENT	3/30/2025	\$ -	\$ 363,947	\$ -	\$ -
34	Crystal River North	Template CR5 2025 BOP Outage	3/17/2025	\$ -	\$ 4,990,595	\$ -	\$ -
35	Crystal River North	CRN 2024 Region GMA	12/31/2023		\$ 413,000		
36	Crystal River North	CRN 2025 Capital Optimization	12/31/2023		\$ 5,700,000		
37	Crystal River North	CRN 2025 IT/Cyber	12/31/2025		\$ 112,300		
38	Crystal River North	CR5 IsoPhase Bus Upgrade	12/8/2025	\$ -	\$ 1,309,724	\$ -	\$ -

Row #	Generation Station	Investment Name	In-Service Date (ISD)	2024	2025	2026	2027
39	Crystal River North	SMARTGENCRN U5 GEN MONITOR GFM	12/30/2025	\$ -	\$ 149,542	\$ -	\$ -
40	Crystal River North	CR5 Pulv Auto Wheel Loading System	12/31/2027	\$ -	\$ -	\$ -	\$ 1,114,171
41	Crystal River North	CR5 Flue Gas Recirc Fan Rotor Repl	12/31/2027	\$ -	\$ -	\$ -	\$ 787,320
42	Crystal River North	505 Pulverizer Capital Parts Repl	12/31/2025	\$ -	\$ 733,282	\$ -	\$ -
43	Crystal River North	CR5 Replace the BA Sluice Gates	12/30/2023	\$ 214,684	\$ -	\$ -	\$ -
44	Crystal River North	Replace CR5 CCW HE Iso Valves	11/25/2023	\$ 130,549	\$ -	\$ -	\$ -
45	Crystal River North	HCAD CRN Storage Building	12/31/2026	\$ -	\$ -	\$ 258,125	\$ -
46	Crystal River North	CRN Misc Capital Blanket 2024	12/31/2024	\$ 1,289,573	\$ -	\$ -	\$ -
47	Crystal River North	CRN Misc Capital Blanket 2025	12/31/2025	\$ -	\$ 1,289,573	\$ -	\$ -
48	Crystal River North	CRN Captial Blanket 2026	12/31/2026	\$ -	\$ -	\$ 1,289,573	\$ -
49	Crystal River North	CRN Misc Capital Blanket 2027	12/31/2027	\$ -	\$ -	\$ -	\$ 1,289,573
50	Crystal River North	CSS 501 DEWTRING DRAIN RPLCMNT	3/3/2026	\$ -	\$ -	\$ 263,470	\$ -
51	Crystal River North	CSS 502 DEWTRING DRAIN RPLCMNT	3/3/2026	\$ -	\$ -	\$ 263,470	\$ -
52	Crystal River North	CSS CRUSHER 04 BREAKER RPLCMNT	12/23/2024	\$ 256,070	\$ -	\$ -	\$ -
53	Crystal River North	HCADEng sump at Train unloader	12/1/2026	\$ -	\$ -	\$ 145,582	\$ -
54	Crystal River North	CRN D10T Replacement	8/1/2025	\$ -	\$ 770,310	\$ -	\$ -
55	Crystal River North	CSS 2024 Conveyor Capital Blanket	12/31/2024	\$ 774,375	\$ -	\$ -	\$ -
56	Crystal River North	CSS 2025 Conveyor Capital Blanket	12/31/2025	\$ -	\$ 774,375	\$ -	\$ -
57	Crystal River North	CSS 2026 Conveyor Capital Blanket	12/31/2026	\$ -	\$ -	\$ 826,000	\$ -

Sierra Club Interrogatory 1-24.

Third-party contract/facility	Contracted Capacity (MW)	Fuel	Capacity Cost \$/MW-yr	Firm Capacity?
Orange Cogen	104	NG	775,000	Yes
Pasco County Resource Recovery	23	MSW	1,349,000	Yes
Pinellas County Resource Recovery	55	MSW	1,349,000	Yes
Polk Power Partners	115	NG	976,000	Yes
Vandolah	669	NG	61,000	Yes
Shady Hills	521	NG	52,000	Yes
Notes				
Third-party contracts continue into 2024. Capacity costs are current from 2023 YE totals.				

Duke Energy Florida, LLC
Sierra Club Rate Case ROG 1-26 a& b
Total Annual Short-Term Off-system Energy Purchases and Sales in MWhs and Dollars
Historical Data for 2018 through 2023

Year	Purchase	Total Purchase
	Quantity (MWh)	
		Spend (\$)
2018	245,840	\$ 11,215,425
2019	117,603	\$ 4,460,380
2020	117,120	\$ 3,527,249
2021	588,268	\$ 31,879,062
2022	583,612	\$ 62,014,384
2023	471,464	\$ 28,521,997

Year	Sale	Total Sale
	Quantity (MWh)	
		Energy Charges (\$)
2018	59,816	\$ 5,271,570
2019	151,161	\$ 6,664,636
2020	132,534	\$ 3,980,548
2021	400,762	\$ 13,890,730
2022	434,859	\$ 26,328,122
2023	321,439	\$ 9,981,320

Notes: Includes Short-Term purchases (Day Ahead, Real-Time, SEEM). Excludes Long Term purchases (QF, PPA, Tolling, Wholesale).

Duke Energy Florida, LLC

Sierra Club Rate Case ROG 1-26 a& b

Total Annual Long-Term Off-system Energy Purchases and Sales in MWhs and Dollars

Historical Data for 2018 through 2023

Year	Purchase Quantity (MWh)	Total Purchase Spend (\$)
2018	6,586,832	\$ 304,351,466
2019	4,884,648	\$ 195,015,441
2020	4,248,933	\$ 151,797,873
2021	4,098,221	\$ 212,721,322
2022	4,664,052	\$ 399,365,515
2023	3,354,180	\$ 179,375,460

Notes: Includes PURPA Qualifying Facilities and long-term Purchase Power Agreements.

Year	Sale Quantity (MWh)	Total Sale Energy Charges (\$)
2018	2,324,114	\$ 58,668,550
2019	2,918,833	\$ 74,208,989
2020	2,886,787	\$ 73,796,736
2021	3,301,669	\$ 122,534,948
2022	4,704,491	\$ 311,981,913
2023	2,278,842	\$ 80,151,055

Notes: Includes long-term requirement service contracts.

Summer Load and Resources by Fuel Type - Based on 2023 Fall Assumptions											
2024 TYSP	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Summer Peak Demand	9,851	9,696	9,659	9,659	9,791	9,980	10,151	10,269	10,493	10,714	10,967
Demand Response											
AC	288	293	297	302	303	304	305	305	306	307	308
HEAT											
INTER	402	402	402	402	402	402	402	402	402	402	402
Standby	91	94	97	100	103	107	110	113	116	119	122
Voltage Red											
WaterHtr_PP	70	71	73	74	74	74	74	75	75	75	75
Total	851	860	869	878	882	886	891	895	899	903	907
Summer Firm Peak Demand											
9,000	8,836	8,790	8,781	8,908	9,093	9,260	9,374	9,595	9,811	10,060	
Coal											
Crystal 4	712	712	712	712	712	712	712	712	712	712	
Crystal 5	698	698	698	698	698	698	698	698	698	698	
Total	1,410	1,410	1,410	1,410	1,410	1,410	1,410	1,410	1,410	1,410	-
Natural Gas											
Anclote 1	508	508	508	508	508	508	508	508	508	508	508
Anclote 2	505	505	505	505	505	505	505	505	505	505	505
Bartow CC 1 0	1,043	1,132	1,132	1,132	1,132	1,132	1,132	1,132	1,132	1,132	1,132
Bartow CC 1 PAG	69	120	120	120	120	120	120	120	120	120	120
Citrus CC 1	742	742	764	764	764	764	764	764	764	764	764
Citrus CC 1 Duct	65	65	65	65	65	65	65	65	65	65	65
Citrus CC 2	742	742	764	764	764	764	764	764	764	764	764
Citrus CC 2 Duct	61	61	61	61	61	61	61	61	61	61	61
Hines CC 1	501	501	501	501	501	501	501	501	501	501	501
Hines CC 2	532	597	597	597	597	597	597	597	597	597	597
Hines CC 3	523	523	588	588	588	588	588	588	588	588	588
Hines CC 4	525	525	577	577	577	577	577	577	577	577	577
Osprey	223	223	539	539	539	539	539	539	539	539	539
Osprey DF	22	22	53	53	53	53	53	53	53	53	53
Tigerbay 1	199	199	221	221	221	221	221	221	221	221	221
BARTOW_P 2	41	41	41	41	41	41	41	41	41	41	
BARTOW_P 4	45	45	45	45	45	45	45	45	45	45	
DEBARY 7	74	74	74	74	74	74	74	74	74	74	74
DEBARY 8	75	75	75	75	75	75	75	75	75	75	75
DEBARY 9	76	76	76	76	76	76	76	76	76	76	76
INT CITY 7	78	78	78	78	78	78	78	78	78	78	78
INT CITY 8	77	77	77	77	77	77	77	77	77	77	77
INT CITY 9	77	77	77	77	77	77	77	77	77	77	77
INT CITY 10	74	74	74	74	74	74	74	74	74	74	74
INT CITY 12	73	73	73	73	73	73	73	73	73	73	73
INT CITY 13	73	73	73	73	73	73	73	73	73	73	73
INT CITY 14	73	73	73	73	73	73	73	73	73	73	73
SUWANNEE_P 1	48	48	48	48	48	48	48	48	48	48	
SUWANNEE_P 2	48	48	48	48	48	48	48	48	48	48	
SUWANNEE_P 3	49	49	49	49	49	49	49	49	49	49	
U OF FL 1	44	44	44	44	44	44	44	44	44	44	44
New CT 1									430	859	1,289
New CT 2											395
Battery 2 Hours				90	90	90	90	90	90	90	90
Battery 4 Hours											790
Total	7,285	7,491	8,021	8,111	8,111	8,111	8,111	8,111	8,540	8,970	10,353
Distillate Oil											
BARTOW_P 1	41	41	41								
BARTOW_P 3	41	41	41								
BAYBORO_P 1	44	44	44								
BAYBORO_P 2	21	21	21								
BAYBORO_P 3	43	43	43								
BAYBORO_P 4	43	43	43								
DEBARY 2	45	45	45								
DEBARY 3	45	45	45								
DEBARY 4	46	46	46								

Summer Load and Resources by Fuel Type - Based on 2023 Fall Assumptions											
DEBARY 5	45	45	45								
DEBARY 6	46	46	46								
DEBARY 10	72	72	72	72	72	72	72	72	72	72	72
INT CITY 1	45	45	45	45	45	45	45	45	45	45	
INT CITY 2	46	46	46	46	46	46	46	46	46	46	
INT CITY 3	46	46	46	46	46	46	46	46	46	46	
INT CITY 4	46	46	46	46	46	46	46	46	46	46	
INT CITY 5	45	45	45	45	45	45	45	45	45	45	
INT CITY 6	47	47	47	47	47	47	47	47	47	47	
INT CITY 11	140	140	140	140	140	140	140	140	140	140	140
Total	947	947	947	487	487	487	487	487	487	487	212

Sun											
Solar DEF Bailey Mill			19	19	19	18	18	18	18	18	18
Solar DEF Bay Ranch	42	42	42	42	42	41	41	41	41	41	40
Solar DEF Bay Trail	42	42	42	42	42	41	41	41	41	41	40
Solar DEF Charlie Creek	42	42	42	42	41	41	41	41	41	40	40
Solar DEF Columbia	42	42	41	41	41	41	41	40	40	40	40
Solar DEF County Line		43	42	42	42	42	42	41	41	41	41
Solar DEF Debary	33	33	33	32	32	32	32	32	32	31	31
Solar DEF Duette	42	42	42	41	41	41	41	41	40	40	40
Solar DEF Falmouth	43	42	42	42	42	42	41	41	41	41	41
Solar DEF Fort Green	33	33	33	33	33	33	32	32	32	32	32
Solar DEF Half Moon			19	19	19	18	18	18	18	18	18
Solar DEF Hamilton	42	41	41	41	41	41	40	40	40	40	40
Solar DEF Hardeetown	42	42	42	42	42	41	41	41	41	41	40
Solar DEF High Spring	42	42	42	42	42	41	41	41	41	41	40
Solar DEF Hildreth	42	42	42	42	42	41	41	41	41	41	40
Solar DEF Lake Placid	25	25	25	25	25	25	24	24	24	24	24
Solar DEF Mule Creek	43	42	42	42	42	42	41	41	41	41	41
Solar DEF NEW 1 PTC			56	112	112	111	110	110	109	109	108
Solar DEF NEW 2 PTC				37	75	74	74	74	73	73	72
Solar DEF NEW 3 PTC					30	67	112	171	230	289	348
Solar DEF Osc Perry Suw	8	8	8	8	8	7	7	7	7	7	7
Solar DEF Rattler			19	19	19	18	18	18	18	18	18
Solar DEF Sandy Creek	42	42	42	42	41	41	41	41	41	40	40
Solar DEF Santa Fe	42	42	42	41	41	41	41	41	40	40	40
Solar DEF St Pete Pier	0	0	0	0	0	0	0	0	0	0	0
Solar DEF Sundance		19	19	19	18	18	18	18	18	18	18
Solar DEF Trenton	42	42	41	41	41	41	41	40	40	40	40
Solar DEF Twin Rivers	42	42	42	41	41	41	41	41	40	40	40
Solar DEF Winquepin	43	42	42	42	42	42	41	41	41	41	41
SPS - Solar					15	30	45	44	44	44	44
SPS - Battery					40	80	120	120	120	120	120
Total	776	833	941	1,030	1,148	1,234	1,329	1,383	1,436	1,489	1,543

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Total UO Capacity	10,418	10,681	11,319	11,038	11,155	11,242	11,336	11,390	11,873	12,356	12,108

Natural Gas											
NSG Vand CT 1	164	164	164								
NSG Vand CT 2	164	164	164								
NSG Vand CT 3	164	164	164								
NSG Vand CT 4	164	164	164								
Shady Hills 1											
Shady Hills 2											
Shady Hills 3											
Mulberry	115										
Orange Cogen	104	104									
Total	874	759	655	-	-	-	-	-	-	-	-

MSW											
Pasco County	23	-	-	-	-	-	-	-	-	-	-
Pinellas County	55	-	-	-	-	-	-	-	-	-	-
Total	78	-	-	-	-	-	-	-	-	-	-

Firm Purchases	952	759	655	-	-	-	-	-	-	-	-
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Summer Load and Resources by Fuel Type - Based on 2023 Fall Assumptions

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Total Firm Capacity-Summer	11,369	11,440	11,974	11,038	11,155	11,242	11,336	11,390	11,873	12,356	12,108
Summer Firm Peak Demand	9,000	8,836	8,790	8,781	8,908	9,093	9,260	9,374	9,595	9,811	10,060
Total Reserve MWs	2,369	2,603	3,184	2,257	2,247	2,149	2,076	2,016	2,279	2,545	2,048
Summer Reserve Magin	26.3%	29.5%	36.2%	25.7%	25.2%	23.6%	22.4%	21.5%	23.8%	25.9%	20.4%

Firm Capacity	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Coal	1,410	1,410	1,410	1,410	1,410	1,410	1,410	1,410	1,410	1,410	-
Natural Gas	8,159	8,249	8,675	8,111	8,111	8,111	8,111	8,111	8,540	8,970	10,353
Distillate Oil	947	947	947	487	487	487	487	487	487	487	212
Sun	776	833	941	1,030	1,148	1,234	1,329	1,383	1,436	1,489	1,543
MSW	78	-	-	-	-	-	-	-	-	-	-
	11,369	11,440	11,974	11,038	11,155	11,242	11,336	11,390	11,873	12,356	12,108

Firm Capacity	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Coal	12%	12%	12%	13%	13%	13%	12%	12%	12%	11%	0%
Natural Gas	72%	72%	72%	73%	73%	72%	72%	71%	72%	73%	86%
Distillate Oil	8%	8%	8%	4%	4%	4%	4%	4%	4%	4%	2%
Sun	7%	7%	8%	9%	10%	11%	12%	12%	12%	12%	13%
MSW	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Winter Load and Resources by Fuel Type - Based on 2023 Fall Assumptions											
2024 TYSP	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Winter Peak Demand	10,109	10,360	10,384	10,437	9,959	10,078	10,247	10,312	10,425	10,516	10,693
Demand Response											
AC											
HEAT	508	514	520	527	527	528	529	530	531	531	532
INTER	388	388	388	388	388	388	388	388	388	388	388
Standby	87	90	93	96	100	103	106	109	112	115	119
Voltage Red	115	116	116	117	118	120	122	124	125	126	128
WaterHtr_PP	138	140	142	143	144	144	144	144	144	145	145
Total	1,237	1,248	1,260	1,272	1,277	1,283	1,289	1,295	1,300	1,306	1,312
Winter Firm Peak Demand	8,872	9,112	9,124	9,165	8,682	8,795	8,957	9,017	9,125	9,210	9,381
Coal											
Crystal 4	721	721	721	721	721	721	721	721	721	721	721
Crystal 5	721	721	721	721	721	721	721	721	721	721	721
Total	1,442	1,442	1,442	1,442	1,442	1,442	1,442	1,442	1,442	1,442	1,442
Natural Gas											
Anclote 1	521	521	521	521	521	521	521	521	521	521	521
Anclote 2	514	514	514	514	514	514	514	514	514	514	514
Bartow CC 1 0	1,194	1,323	1,323	1,323	1,323	1,323	1,323	1,323	1,323	1,323	1,323
Bartow CC 1 PAG	65	35	35	35	35	35	35	35	35	35	35
Citrus CC 1	860	860	860	882	882	882	882	882	882	882	882
Citrus CC 1 Duct	65	65	65	65	65	65	65	65	65	65	65
Citrus CC 2	860	860	860	882	882	882	882	882	882	882	882
Citrus CC 2 Duct	69	69	69	69	69	69	69	69	69	69	69
Hines CC 1	521	521	521	521	521	521	521	521	521	521	521
Hines CC 2	549	549	614	614	614	614	614	614	614	614	614
Hines CC 3	535	535	535	600	600	600	600	600	600	600	600
Hines CC 4	544	544	596	596	596	596	596	596	596	596	596
Osprey	245	229	585	585	585	585	585	585	585	585	585
Osprey DF		16	41	41	41	41	41	41	41	41	41
Tigerbay 1	230	230	230	252	252	252	252	252	252	252	252
BARTOW_P 2	53	53	53	53	53	53	53	53	53	53	53
BARTOW_P 4	58	58	58	58	58	58	58	58	58	58	58
DEBARY 7	93	93	93	93	93	93	93	93	93	93	93
DEBARY 8	94	94	94	94	94	94	94	94	94	94	94
DEBARY 9	94	94	94	94	94	94	94	94	94	94	94
INT CITY 7	90	90	90	90	90	90	90	90	90	90	90
INT CITY 8	88	88	88	88	88	88	88	88	88	88	88
INT CITY 9	88	88	88	88	88	88	88	88	88	88	88
INT CITY 10	86	86	86	86	86	86	86	86	86	86	86
INT CITY 12	89	89	89	89	89	89	89	89	89	89	89
INT CITY 13	91	91	91	91	91	91	91	91	91	91	91
INT CITY 14	90	90	90	90	90	90	90	90	90	90	90
SUWANNEE_P 1	65	65	65	65	65	65	65	65	65	65	65
SUWANNEE_P 2	64	64	64	64	64	64	64	64	64	64	64
SUWANNEE_P 3	65	65	65	65	65	65	65	65	65	65	65
U OF FL 1	50	50	50	50	50	50	50	50	50	50	50
New CT 1										469	938
New CT 2											
Battery 2 Hours					90	90	90	90	90	90	90
Battery 4 Hours											
Total	8,030	8,129	8,627	8,758	8,848	8,848	8,848	8,848	8,848	9,317	9,786
Distillate Oil											
BARTOW_P 1	50	50	50	50							
BARTOW_P 3	51	51	51	51							
BAYBORO_P 1	58	58	58								
BAYBORO_P 2	27	27	27								
BAYBORO_P 3	57	57	57								
BAYBORO_P 4	56	56	56								
DEBARY 2	57	57	57	57							
DEBARY 3	59	59	59	59							
DEBARY 4	59	59	59	59							

Winter Load and Resources by Fuel Type - Based on 2023 Fall Assumptions											
DEBARY 5	58	58	58	58							
DEBARY 6	59	59	59	59							
DEBARY 10	88	88	88	88	88	88	88	88	88	88	88
INT CITY 1	61	61	61	61	61	61	61	61	61	61	61
INT CITY 2	60	60	60	60	60	60	60	60	60	60	60
INT CITY 3	61	61	61	61	61	61	61	61	61	61	61
INT CITY 4	62	62	62	62	62	62	62	62	62	62	62
INT CITY 5	59	59	59	59	59	59	59	59	59	59	59
INT CITY 6	60	60	60	60	60	60	60	60	60	60	60
INT CITY 11	161	161	161	161	161	161	161	161	161	161	161
Total	1,203	1,203	1,203	1,005	612	612	612	612	612	612	612

SUN											
Solar DEF Bailey Mill	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Bay Ranch	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Bay Trail	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Charlie Creek	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Columbia	-	-	-	-	-	-	-	-	-	-	-
Solar DEF County Line	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Debary	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Duette	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Falmouth	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Fort Green	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Half Moon	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Hamilton	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Hardeetown	-	-	-	-	-	-	-	-	-	-	-
Solar DEF High Spring	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Hildreth	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Lake Placid	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Mule Creek	-	-	-	-	-	-	-	-	-	-	-
Solar DEF NEW 1 PTC	-	-	-	-	-	-	-	-	-	-	-
Solar DEF NEW 2 PTC	-	-	-	-	-	-	-	-	-	-	-
Solar DEF NEW 3 PTC	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Osc Perry Suw	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Rattler	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Sandy Creek	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Santa Fe	-	-	-	-	-	-	-	-	-	-	-
Solar DEF St Pete Pier	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Sundance	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Trenton	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Twin Rivers	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Winquepin	-	-	-	-	-	-	-	-	-	-	-
SPS - Solar	-	-	-	-	-	-	-	-	-	-	-
SPS - Battery						72	144	216	216	216	216
Total	-	-	-	-	-	72	144	216	216	216	216

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Total UO Capacity	10,675	10,774	11,272	11,205	10,902	10,974	11,046	11,118	11,118	11,587	12,056

Natural Gas											
NSG Vand CT 1	175	175	175	175							
NSG Vand CT 2	175	175	175	175							
NSG Vand CT 3	175	175	175	175							
NSG Vand CT 4	175	175	175	175							
Shady Hills 1	175										
Shady Hills 2	175										
Shady Hills 3	175										
Mulberry	115										
Orange Cogen	104	104									
Total	1,442	803	699	699	-	-	-	-	-	-	-

MSW											
Pasco County	23	-	-	-	-	-	-	-	-	-	-
Pinellas County	55	-	-	-	-	-	-	-	-	-	-
Total	78	-	-	-	-	-	-	-	-	-	-

Firm Purchases	1,520	803	699	699	-	-	-	-	-	-	-
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Winter Load and Resources by Fuel Type - Based on 2023 Fall Assumptions

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Total Firm Capacity-Winter	12,195	11,577	11,971	11,904	10,902	10,974	11,046	11,118	11,118	11,587	12,056
Winter Firm Peak Demand	8,872	9,112	9,124	9,165	8,682	8,795	8,957	9,017	9,125	9,210	9,381
Total Reserve MWs	3,323	2,465	2,847	2,739	2,220	2,179	2,089	2,100	1,993	2,377	2,676
Winter Reserve Magin	37.4%	27.1%	31.2%	29.9%	25.6%	24.8%	23.3%	23.3%	21.8%	25.8%	28.5%

Firm Capacity	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Coal	1,442	1,442	1,442	1,442	1,442	1,442	1,442	1,442	1,442	1,442	1,442
Natural Gas	9,472	8,932	9,326	9,457	8,848	8,848	8,848	8,848	8,848	9,317	9,786
Distillate Oil	1,203	1,203	1,203	1,005	612	612	612	612	612	612	612
Sun	-	-	-	-	-	72	144	216	216	216	216
MSW	78	-	-	-	-	-	-	-	-	-	-
	12,195	11,577	11,971	11,904	10,902	10,974	11,046	11,118	11,118	11,587	12,056

Firm Capacity	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Coal	12%	12%	12%	12%	13%	13%	13%	13%	13%	12%	12%
Natural Gas	78%	77%	78%	79%	81%	81%	80%	80%	80%	80%	81%
Distillate Oil	10%	10%	10%	8%	6%	6%	6%	6%	6%	5%	5%
Sun	0%	0%	0%	0%	0%	1%	1%	2%	2%	2%	2%
MSW	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Summer Load and Resources - Based on 2023 Fall Assumptions											
2024 TYSP	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Summer Peak Demand	9,851	9,696	9,659	9,659	9,791	9,980	10,151	10,269	10,493	10,714	10,967
Demand Response											
AC	288	293	297	302	303	304	305	305	306	307	308
HEAT											
INTER	402	402	402	402	402	402	402	402	402	402	402
Standby	91	94	97	100	103	107	110	113	116	119	122
Voltage Red											
WaterHtr_PP	70	71	73	74	74	74	74	75	75	75	75
Total	851	860	869	878	882	886	891	895	899	903	907
Summer Firm Peak Demand	9,000	8,836	8,790	8,781	8,908	9,093	9,260	9,374	9,595	9,811	10,060
Steam Units											
Crystal 4	712	712	712	712	712	712	712	712	712	712	
Crystal 5	698	698	698	698	698	698	698	698	698	698	
Anclote 1	508	508	508	508	508	508	508	508	508	508	508
Anclote 2	505	505	505	505	505	505	505	505	505	505	505
Total	2,423	2,423	2,423	2,423	2,423	2,423	2,423	2,423	2,423	2,423	1,013
Combined Cycles											
Bartow CC 1 0	1,043	1,132	1,132	1,132	1,132	1,132	1,132	1,132	1,132	1,132	1,132
Bartow CC 1 PAG	69	120	120	120	120	120	120	120	120	120	120
Citrus CC 1	742	742	764	764	764	764	764	764	764	764	764
Citrus CC 1 Duct	65	65	65	65	65	65	65	65	65	65	65
Citrus CC 2	742	742	764	764	764	764	764	764	764	764	764
Citrus CC 2 Duct	61	61	61	61	61	61	61	61	61	61	61
Hines CC 1	501	501	501	501	501	501	501	501	501	501	501
Hines CC 2	532	597	597	597	597	597	597	597	597	597	597
Hines CC 3	523	523	588	588	588	588	588	588	588	588	588
Hines CC 4	525	525	577	577	577	577	577	577	577	577	577
Osprey	223	223	539	539	539	539	539	539	539	539	539
Osprey DF	22	22	53	53	53	53	53	53	53	53	53
Tigerbay 1	199	199	221	221	221	221	221	221	221	221	221
Total	5,247	5,453	5,983	5,983	5,983	5,983	5,983	5,983	5,983	5,983	5,983
Combustion Turbines											
BARTOW_P 1	41	41	41								
BARTOW_P 2	41	41	41	41	41	41	41	41	41	41	
BARTOW_P 3	41	41	41								
BARTOW_P 4	45	45	45	45	45	45	45	45	45	45	
BAYBORO_P 1	44	44	44								
BAYBORO_P 2	21	21	21								
BAYBORO_P 3	43	43	43								
BAYBORO_P 4	43	43	43								
DEBARY 2	45	45	45								
DEBARY 3	45	45	45								
DEBARY 4	46	46	46								
DEBARY 5	45	45	45								
DEBARY 6	46	46	46								
DEBARY 7	74	74	74	74	74	74	74	74	74	74	74
DEBARY 8	75	75	75	75	75	75	75	75	75	75	75
DEBARY 9	76	76	76	76	76	76	76	76	76	76	76
DEBARY 10	72	72	72	72	72	72	72	72	72	72	72
INT CITY 1	45	45	45	45	45	45	45	45	45	45	
INT CITY 2	46	46	46	46	46	46	46	46	46	46	
INT CITY 3	46	46	46	46	46	46	46	46	46	46	
INT CITY 4	46	46	46	46	46	46	46	46	46	46	
INT CITY 5	45	45	45	45	45	45	45	45	45	45	
INT CITY 6	47	47	47	47	47	47	47	47	47	47	
INT CITY 7	78	78	78	78	78	78	78	78	78	78	78
INT CITY 8	77	77	77	77	77	77	77	77	77	77	77
INT CITY 9	77	77	77	77	77	77	77	77	77	77	77
INT CITY 10	74	74	74	74	74	74	74	74	74	74	74
INT CITY 11	140	140	140	140	140	140	140	140	140	140	140
INT CITY 12	73	73	73	73	73	73	73	73	73	73	73

Summer Load and Resources - Based on 2023 Fall Assumptions											
INT CITY 13	73	73	73	73	73	73	73	73	73	73	73
INT CITY 14	73	73	73	73	73	73	73	73	73	73	73
SUWANNEE_P 1	48	48	48	48	48	48	48	48	48	48	
SUWANNEE_P 2	48	48	48	48	48	48	48	48	48	48	
SUWANNEE_P 3	49	49	49	49	49	49	49	49	49	49	
U OF FL 1	44	44	44	44	44	44	44	44	44	44	44
New CT 1									430	859	1,289
New CT 2											395
Total	1,972	1,972	1,972	1,512	1,512	1,512	1,512	1,512	1,942	2,371	2,690

Solar Unis											
Solar DEF Bailey Mill			19	19	19	18	18	18	18	18	18
Solar DEF Bay Ranch	42	42	42	42	42	41	41	41	41	41	40
Solar DEF Bay Trail	42	42	42	42	42	41	41	41	41	41	40
Solar DEF Charlie Creek	42	42	42	42	41	41	41	41	41	40	40
Solar DEF Columbia	42	42	41	41	41	41	41	40	40	40	40
Solar DEF County Line		43	42	42	42	42	42	41	41	41	41
Solar DEF Debary	33	33	33	32	32	32	32	32	32	31	31
Solar DEF Duette	42	42	42	41	41	41	41	41	40	40	40
Solar DEF Falmouth	43	42	42	42	42	42	41	41	41	41	41
Solar DEF Fort Green	33	33	33	33	33	33	32	32	32	32	32
Solar DEF Half Moon			19	19	19	18	18	18	18	18	18
Solar DEF Hamilton	42	41	41	41	41	41	40	40	40	40	40
Solar DEF Hardeetown	42	42	42	42	42	41	41	41	41	41	40
Solar DEF High Spring	42	42	42	42	42	41	41	41	41	41	40
Solar DEF Hildreth	42	42	42	42	42	41	41	41	41	41	40
Solar DEF Lake Placid	25	25	25	25	25	25	24	24	24	24	24
Solar DEF Mule Creek	43	42	42	42	42	42	41	41	41	41	41
Solar DEF NEW 1 PTC			56	112	112	111	110	110	109	109	108
Solar DEF NEW 2 PTC				37	75	74	74	74	73	73	72
Solar DEF NEW 3 PTC					30	67	112	171	230	289	348
Solar DEF Osc Perry Suw	8	8	8	8	8	7	7	7	7	7	7
Solar DEF Rattler			19	19	19	18	18	18	18	18	18
Solar DEF Sandy Creek	42	42	42	42	41	41	41	41	41	40	40
Solar DEF Santa Fe	42	42	42	41	41	41	41	41	40	40	40
Solar DEF St Pete Pier	0	0	0	0	0	0	0	0	0	0	0
Solar DEF Sundance		19	19	19	18	18	18	18	18	18	18
Solar DEF Trenton	42	42	41	41	41	41	41	40	40	40	40
Solar DEF Twin Rivers	42	42	42	41	41	41	41	41	40	40	40
Solar DEF Winquepin	43	42	42	42	42	42	41	41	41	41	41
Total	776	833	941	1,030	1,093	1,125	1,164	1,218	1,272	1,325	1,379

Solar plus Storage											
SPS - Solar					15	30	45	44	44	44	44
SPS - Battery					40	80	120	120	120	120	120
Total	-	-	-	-	55	110	165	164	164	164	164

Storage Resources											
Battery 2 Hours				90	90	90	90	90	90	90	90
Battery 4 Hours											790
Total	-	-	-	90	90	90	90	90	90	90	880

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Total UO Capacity	10,418	10,681	11,319	11,038	11,155	11,242	11,336	11,390	11,873	12,356	12,108

PPAs											
NSG Vand CT 1	164	164	164								
NSG Vand CT 2	164	164	164								
NSG Vand CT 3	164	164	164								
NSG Vand CT 4	164	164	164								
Shady Hills 1											
Shady Hills 2											
Shady Hills 3											
Total	655	655	655	-	-	-	-	-	-	-	-

MSW											
Pasco County	23	-	-	-	-	-	-	-	-	-	-

Summer Load and Resources - Based on 2023 Fall Assumptions											
Pinellas County	55	-	-	-	-	-	-	-	-	-	-
Total	78	-	-	-	-	-	-	-	-	-	-
QF											
Mulberry	115										
Orange Cogen	104	104									
Total	219	104	-	-	-	-	-	-	-	-	-
Firm Purchases	952	759	655	-	-	-	-	-	-	-	-
	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Total Firm Capacity-Summer	11,369	11,440	11,974	11,038	11,155	11,242	11,336	11,390	11,873	12,356	12,108
Summer Firm Peak Demand	9,000	8,836	8,790	8,781	8,908	9,093	9,260	9,374	9,595	9,811	10,060
Total Reserve MWs	2,369	2,603	3,184	2,257	2,247	2,149	2,076	2,016	2,279	2,545	2,048
Summer Reserve Magin	26.3%	29.5%	36.2%	25.7%	25.2%	23.6%	22.4%	21.5%	23.8%	25.9%	20.4%

Winter Load and Resources - Based on 2023 Fall Assumptions											
2024 TYSP	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Winter Peak Demand	10,109	10,360	10,384	10,437	9,959	10,078	10,247	10,312	10,425	10,516	10,693
Demand Response											
AC											
HEAT	508	514	520	527	527	528	529	530	531	531	532
INTER	388	388	388	388	388	388	388	388	388	388	388
Standby	87	90	93	96	100	103	106	109	112	115	119
Voltage Red	115	116	116	117	118	120	122	124	125	126	128
WaterHtr_PP	138	140	142	143	144	144	144	144	144	145	145
Total	1,237	1,248	1,260	1,272	1,277	1,283	1,289	1,295	1,300	1,306	1,312
Winter Firm Peak Demand											
8,872	9,112	9,124	9,165	8,682	8,795	8,957	9,017	9,125	9,210	9,381	
Steam Units											
Anclote 1	521	521	521	521	521	521	521	521	521	521	521
Anclote 2	514	514	514	514	514	514	514	514	514	514	514
Crystal 4	721	721	721	721	721	721	721	721	721	721	721
Crystal 5	721	721	721	721	721	721	721	721	721	721	721
Total	2,477	2,477	2,477	2,477	2,477	2,477	2,477	2,477	2,477	2,477	2,477
Combined Cycles											
Bartow CC 1 0	1,194	1,323	1,323	1,323	1,323	1,323	1,323	1,323	1,323	1,323	1,323
Bartow CC 1 PAG	65	35	35	35	35	35	35	35	35	35	35
Citrus CC 1	860	860	860	882	882	882	882	882	882	882	882
Citrus CC 1 Duct	65	65	65	65	65	65	65	65	65	65	65
Citrus CC 2	860	860	860	882	882	882	882	882	882	882	882
Citrus CC 2 Duct	69	69	69	69	69	69	69	69	69	69	69
Hines CC 1	521	521	521	521	521	521	521	521	521	521	521
Hines CC 2	549	549	614	614	614	614	614	614	614	614	614
Hines CC 3	535	535	535	600	600	600	600	600	600	600	600
Hines CC 4	544	544	596	596	596	596	596	596	596	596	596
Osprey	245	229	585	585	585	585	585	585	585	585	585
Osprey DF		16	41	41	41	41	41	41	41	41	41
Tigerbay 1	230	230	230	252	252	252	252	252	252	252	252
Total	5,737	5,836	6,334	6,465	6,465	6,465	6,465	6,465	6,465	6,465	6,465
Combustion Turbines											
BARTOW_P 1	50	50	50	50							
BARTOW_P 2	53	53	53	53	53	53	53	53	53	53	53
BARTOW_P 3	51	51	51	51							
BARTOW_P 4	58	58	58	58	58	58	58	58	58	58	58
BAYBORO_P 1	58	58	58								
BAYBORO_P 2	27	27	27								
BAYBORO_P 3	57	57	57								
BAYBORO_P 4	56	56	56								
DEBARY 2	57	57	57	57							
DEBARY 3	59	59	59	59							
DEBARY 4	59	59	59	59							
DEBARY 5	58	58	58	58							
DEBARY 6	59	59	59	59							
DEBARY 7	93	93	93	93	93	93	93	93	93	93	93
DEBARY 8	94	94	94	94	94	94	94	94	94	94	94
DEBARY 9	94	94	94	94	94	94	94	94	94	94	94
DEBARY 10	88	88	88	88	88	88	88	88	88	88	88
INT CITY 1	61	61	61	61	61	61	61	61	61	61	61
INT CITY 2	60	60	60	60	60	60	60	60	60	60	60
INT CITY 3	61	61	61	61	61	61	61	61	61	61	61
INT CITY 4	62	62	62	62	62	62	62	62	62	62	62
INT CITY 5	59	59	59	59	59	59	59	59	59	59	59
INT CITY 6	60	60	60	60	60	60	60	60	60	60	60
INT CITY 7	90	90	90	90	90	90	90	90	90	90	90
INT CITY 8	88	88	88	88	88	88	88	88	88	88	88
INT CITY 9	88	88	88	88	88	88	88	88	88	88	88
INT CITY 10	86	86	86	86	86	86	86	86	86	86	86
INT CITY 11	161	161	161	161	161	161	161	161	161	161	161
INT CITY 12	89	89	89	89	89	89	89	89	89	89	89

Winter Load and Resources - Based on 2023 Fall Assumptions											
2024 TYSP	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
INT CITY 13	91	91	91	91	91	91	91	91	91	91	91
INT CITY 14	90	90	90	90	90	90	90	90	90	90	90
SUWANNEE_P 1	65	65	65	65	65	65	65	65	65	65	65
SUWANNEE_P 2	64	64	64	64	64	64	64	64	64	64	64
SUWANNEE_P 3	65	65	65	65	65	65	65	65	65	65	65
U OF FL 1	50	50	50	50	50	50	50	50	50	50	50
New CT 1										469	938
New CT 2											
Total	2,461	2,461	2,461	2,263	1,870	1,870	1,870	1,870	1,870	2,339	2,808
Solar Unis	0	0	0	0	0	0	0	0	0	0	0
Solar DEF Bailey Mill	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Bay Ranch	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Bay Trail	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Charlie Creek	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Columbia	-	-	-	-	-	-	-	-	-	-	-
Solar DEF County Line	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Debary	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Duette	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Falmouth	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Fort Green	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Half Moon	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Hamilton	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Hardeetown	-	-	-	-	-	-	-	-	-	-	-
Solar DEF High Spring	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Hildreth	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Lake Placid	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Mule Creek	-	-	-	-	-	-	-	-	-	-	-
Solar DEF NEW 1 PTC	-	-	-	-	-	-	-	-	-	-	-
Solar DEF NEW 2 PTC	-	-	-	-	-	-	-	-	-	-	-
Solar DEF NEW 3 PTC	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Osc Perry Suw	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Rattler	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Sandy Creek	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Santa Fe	-	-	-	-	-	-	-	-	-	-	-
Solar DEF St Pete Pier	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Sundance	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Trenton	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Twin Rivers	-	-	-	-	-	-	-	-	-	-	-
Solar DEF Winquopin	-	-	-	-	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	-	-	-	-	-
Solar plus Storage											
SPS - Solar											
SPS - Battery						72	144	216	216	216	216
Total	-	-	-	-	-	72	144	216	216	216	216
Storage Resources											
Battery 2 Hours					90	90	90	90	90	90	90
Battery 4 Hours											
Total	-	-	-	-	90	90	90	90	90	90	90
	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Total UO Capacity	10,675	10,774	11,272	11,205	10,902	10,974	11,046	11,118	11,118	11,587	12,056

PPA											
NSG Vand CT 1	175	175	175	175							
NSG Vand CT 2	175	175	175	175							
NSG Vand CT 3	175	175	175	175							
NSG Vand CT 4	175	175	175	175							
Shady Hills 1	175										
Shady Hills 2	175										
Shady Hills 3	175										
Total	1,223	699	699	699	-	-	-	-	-	-	-

MSW

Winter Load and Resources - Based on 2023 Fall Assumptions											
2024 TYSP	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Pasco County	23	-	-	-	-	-	-	-	-	-	-
Pinellas County	55	-	-	-	-	-	-	-	-	-	-
Total	78	-	-	-	-	-	-	-	-	-	-
QF											
Mulberry	115										
Orange Cogen	104	104									
Total	219	104	-	-	-	-	-	-	-	-	-
Firm Purchases	1,520	803	699	699	-	-	-	-	-	-	-
	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Total Firm Capacity-Winter	12,195	11,577	11,971	11,904	10,902	10,974	11,046	11,118	11,118	11,587	12,056
Winter Firm Peak Demand	8,872	9,112	9,124	9,165	8,682	8,795	8,957	9,017	9,125	9,210	9,381
Total Reserve MWs	3,323	2,465	2,847	2,739	2,220	2,179	2,089	2,100	1,993	2,377	2,676
Winter Reserve Magin	37.4%	27.1%	31.2%	29.9%	25.6%	24.8%	23.3%	23.3%	21.8%	25.8%	28.5%

6/25/20 at 1700 hour

8/19/21 at 1700 hour

6/15/22 at 1700 hour

8/11/23 at 1800 hour

47. Witness Anderson's testimony notes that DEF occasionally purchases power in lieu of starting up older, less efficient generating units. How often does DEF elect to purchase power rather than starting up Crystal River units 4 and 5?

- a. Please list the dates on which Duke has purchased power in lieu of starting up these two older coal units.

Response:

DEF will sometimes purchase power in lieu of starting up older, less efficient gas and oil simple cycle combustion turbines for short periods of time. However, DEF does not have access to power purchases of large enough volume and long enough duration to economically avoid starting up baseload type generation, such as Crystal River 4 and 5, that would be required to run for extended periods of time. Therefore, DEF does not elect to purchase power as an alternative to starting up Crystal River Units 4 and 5.

- a) As DEF is generally unable to purchase power of large enough volume and for long enough duration to economically displace starts on Crystal River 4 and 5, there are no dates to report.

48. Witness Anderson explains that, through DEF's long-range planning process, DEF invests "Capex and O&M in the fleet's most efficient and responsive units first." Would Crystal River units 4 and 5 be considered relatively less efficient (*i.e.*, would not fall within the category of DEF's "most efficient" units), as compared with DEF's other units?

- a. If so, how are capital investments in environmental compliance at Crystal River units 4 and 5 prioritized relative to investments at DEF's more efficient plants?
- b. If a new federal rule requiring, for example, additional remediation of coal ash or additional emission reductions from coal plants requires environmental compliance measures to be implemented at Crystal River units 4 and 5, would these measures be prioritized over the Capex and O&M expenses associated with DEF's more efficient units?

Response:

As DEF's only remaining coal units, Crystal River Units 4 and 5 are less efficient when compared to the Company's combined cycle units from a capacity factor perspective

but are needed to ensure reliable service as DEF continues to transition to a cleaner, more efficient fleet.

a. DEF adheres to all environmental regulations and policies. Environmental compliance, safety and reliability projects are the highest priority projects for capital funding regardless of location or type of facility.

b. Please see DEF's objections filed simultaneously with this response.

49. Witness Borsch calculates reductions in DEF's total SO₂, NO_x, and CO₂ emissions since 2005.

a. Has DEF calculated its projected SO₂, NO_x, and CO₂ emission reductions if it were to retire Crystal River units 4 and 5?

i. If so, please provide those estimated reductions.

Response:

a. DEF has estimated its projected system's SO₂, NO_x, and CO₂ emission reductions if it were to retire Crystal River units 4 and 5 (CRN) in year 2034 (2024 TYSP).

i. The estimated reductions compared to 2005 emissions are:

Tons	SO ₂	NO _x	CO ₂
2005	155,543	57,609	29,439,666
2035	71	2,347	13,910,193

	SO ₂	NO _x	CO ₂
2035	-99.95%	-95.93%	-52.75%

Variance reflects all DEF system changes from 2005 to 2035 (e.g. other unit retirements and solar additions), including retirement of CR4 & 5.

50. Exhibit JTK-2 indicates that one of the decommissioning costs at Crystal River is "closure of the ash landfill" and lists specific remediation measures that are involved in closing the ash landfill. How did DEF decide which remediation measures to include in this list?

a. Is this list of remediation measures based on requirements set forth in any state or federal rule?

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Petition for rate increase by Duke Energy
Florida, LLC.

Docket No. 20240025-EI

Dated: May 16, 2024

**DUKE ENERGY FLORIDA, LLC'S RESPONSE TO
SIERRA CLUB'S THIRD SET OF INTERROGATORIES (NOS. 76-90)**

Duke Energy Florida, LLC ("DEF") responds to Sierra Club ("Sierra Club") Third Set of Interrogatories to DEF (Nos. 76-90) as follows:

INTERROGATORIES

Topic: Crystal River

76. Please provide the amount of sustaining capital cost that DEF has included in the rate base for Crystal River Units 4 and 5:
- a. For the prior year ended 12/31/2024;
 - b. For the historical test year ended 12/31/2023; and
 - c. For each projected test year.

Response:

Please note: DEF does not differentiate capital into "sustaining capital."

- a. Please reference the attachment "DEF Generation Capital Investment '24-27" provided in response to LULAC ROG 1-10.
 - b. Please reference the response to Sierra Club ROG 1-6.
 - c. Please reference the attachment "DEF Generation Capital Investment '24-27" provided in response to LULAC ROG 1-10.
77. Please describe the types of agreements and transactions that provide fuel for Crystal River Units 4 and 5.

- b. Please describe the parts and controls replacements that the Company plans to undertake.
- c. Please explain the basis for the Company's assertion that "[t]hese parts and controls replacements are necessary to prevent failure and unit shutdown prior to exceeding the air permit."
- d. If these parts and controls replacements did not occur, how long could Crystal River Unit 4 continue to operate while remaining in compliance with the air permit?

Response:

- a. The precipitator controls degraded over 40 years, and replacement materials were not available from DEF's vendors due to being obsolete.
 - b. DEF replaced failed collector plates, internal support structures and electrical components, all collapsed collector plates, and modernized the obsolete precipitator controls.
 - c. DEF needed to improve precipitator opacity performance at Crystal River Units 4&5.
 - d. These replacements and upgrades were needed to extend the life of this equipment and maintain environmental compliance until the Crystal River North Units are expected to be retired in 2034. DEF could not continue to operate the units reliably beyond 2024 without replacing structure components and modernizing its equipment.
95. Has Duke conducted any analyses on costs that could be avoided through the U.S. Department of Energy's Energy Infrastructure Reinvestment ("EIR") program?
- a. If so, for which generation units has Duke undertaken these analyses?
 - b. Does Duke have any plans to apply for funding via the EIR program?

Response:

- a. No, Duke Energy has not conducted an analysis on the EIR program.
 - b. N/A.
 - c. Not at this time.
96. Regarding Duke's disposal of coal ash at Crystal River:
- a. How much does DEF estimate it will cost to properly move all existing coal ash into lined basins?
 - b. How much does DEF estimate it will cost to properly dispose of new coal ash?

Exhibit RA-3:
Duke Energy Florida's 2024 Ten-Year Site Plan



Stephanie A. Cuello
SENIOR COUNSEL

April 22, 2024

VIA ELECTRONIC DELIVERY

Adam J. Teitzman, Commission Clerk
Florida Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, Florida 32399-0850

Re: Ten-Year Site Plan as of December 31, 2023; Undocketed

Dear Mr. Teitzman:

Pursuant to Rule 25-22.071, F.A.C., please find enclosed for filing Duke Energy Florida, LLC's, 2024 Amended Ten-Year Site Plan. DEF discovered an inadvertent error in the coal price forecast, which caused a change to Schedules 5, 6.1, 6.2 and a portion of 9.

Thank you for your assistance in this matter and if you have any questions, please feel free to contact me at (850) 521-1425.

Sincerely,

/s/ Stephanie A. Cuello

Stephanie A. Cuello

SAC/clg
Attachments

cc: Greg Davis, GDavis@psc.state.fl.us and Phillip Ellis, PEllis@psc.state.fl.us, Division of Engineering, FPSC

Duke Energy Florida, LLC Ten-Year Site Plan

April 2024

2024-2033

**Submitted to:
Florida Public Service Commission**



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CODE IDENTIFICATION SHEET**Generating Unit Type**

BA - Battery Storage
CC - Combined Cycle
COG - Cogeneration Facility
CT - Combustion Turbine
GT - Gas Turbine
NP - Steam Power - Nuclear
PV – Photovoltaic
SPP - Small Power Producer
SPS – Solar (PV) Plus Storage
ST - Steam Turbine - Non-Nuclear

Fuel Type

BIO – Biomass
BIT - Bituminous Coal
DFO - No. 2 Distillate Fuel Oil
MSW - Municipal Solid Waste
NG - Natural Gas
NUC - Nuclear (Uranium)
RFO - No. 6 Residual Fuel Oil
SO – Solar PV
WH - Waste Heat

Fuel Transportation

PL - Pipeline
RR - Railroad
TK - Truck
UN - Unknown
WA - Water

Future Generating Unit Status

A - Generating unit capability increased
D – Generating unit capability decreased
FC - Existing generator planned for conversion to another fuel or energy source
P - Planned for installation but not authorized; not under construction
RP - Proposed for repowering or life extension
RT - Existing generator scheduled for retirement
T - Regulatory approval received but not under construction
U - Under construction, less than or equal to 50% complete
V - Under construction, more than 50% complete

EXECUTIVE SUMMARY

Duke Energy Florida's (DEF) 2024 Ten-Year Site Plan (TYSP) provides a description of the future electric generating unit additions and retirements selected to meet projected DEF customer resource needs for 2024 through 2033. DEF's plan continues the multi-year progress in the transition to a cleaner and more cost-effective generating fleet. In the near term, DEF anticipates the expiration of high-priced legacy contracts and retirement of numerous older simple cycle combustion turbine (CT) units offset by a planned investment in new solar, storage, and solar plus storage generation. Looking out beyond the ten-year horizon, DEF anticipates the retirement of the remaining two coal fired generating units and the potential to replace most of the energy supplied by those units with energy generated from future solar generating projects.

DEF's planned investments in renewable generation will enable fuel savings for customers, energy diversification, and will continue DEF's commitment towards a lower carbon future. Through this TYSP, DEF is planning to extend the successful deployment of utility scale solar projects approved by the Florida Public Service Commission (FPSC) in 2017 and 2021, which will bring over 1,400 MW of solar generating capacity to the DEF system through early 2024. Over the remainder of the ten-year planning period, DEF projects the addition of at least 450 MW per year of utility scale solar. By the end of the period, DEF expects to have more than 6,100 MW of utility scale solar generating capacity online.

DEF's measured and steady pace of projected solar generation adoption will combine with the increasingly clean gas fired generating fleet. DEF is beginning efficiency enhancements that will reduce fleet fuel consumption while adding close to 400 MW in highly efficient combined cycle generating capacity. Even with the additional CC upgrades, DEF anticipates a reduction in the fossil fuel fired generation of approximately 1,500 MW over the planning period.

In addition to improvements to the existing asset portfolio and the planned solar, DEF continues to build upon its pilot battery program approved in 2017. This program installed 50 MW of batteries from 2021 to 2023. These batteries provide a variety of services including solar energy storage and smoothing, grid support and voltage control, and deferral of potential new distribution investments. These assets also have the capability to enable islanding to support an amount of

local load in the event of grid separation. A transmission-tied grid scale battery energy storage unit is planned to be placed in service in 2027. This unit combines over 200 MWh of energy storage and a 100 MW capacity to provide grid stabilization during periods of solar volatility and energy shifting to lower cost of energy based on time of day. In addition, DEF continues to plan batteries paired with solar units in 2028-2030 to further balance the system and provide reliability resources supporting the large amount of planned solar generation.

DEF will accelerate the addition of four combustion turbines between years 2032 and 2033 that will replace some of the generation from Crystal River North that is planned to be retired in year 2034.

DEF plans to meet the power needs of its customers cost-effectively while adding an increasing portfolio of non-carbon emitting assets. The future solar and storage in this expansion plan along with increased efficiency in conventional generation provides energy diversity by reducing natural gas consumption while maintaining reliable and dispatchable capacity.

INTRODUCTION

Section 186.801 of the Florida Statutes (F.S.) requires electric generating utilities to submit a TYSP to the FPSC. The TYSP includes historical and projected data pertaining to the utility's load and resource needs as well as a review of those needs. DEF's TYSP is compiled in accordance with FPSC Rules 25-22.070 through 25-22.072, Florida Administrative Code (F.A.C.).

DEF's TYSP is based on the projections of long-term planning requirements that are dynamic in nature and subject to change. These planning documents should be used for general guidance concerning DEF's planning assumptions and projections and should not be taken as an assurance that particular events discussed in the TYSP will materialize or that particular plans will be implemented. Information and projections pertinent to periods further out in time are inherently subject to greater uncertainty.

This TYSP document contains four chapters as indicated below:

- **CHAPTER 1 - DESCRIPTION OF EXISTING FACILITIES**

This chapter provides an overview of DEF's generating resources as well as the transmission and distribution system.

- **CHAPTER 2 - FORECAST OF ELECTRICAL POWER DEMAND AND ENERGY CONSUMPTION**

Chapter 2 presents the history and forecast for load and peak demand as well as the forecast methodology used. Demand-Side Management (DSM) savings and fuel requirement projections are also included.

- **CHAPTER 3 - FORECAST OF FACILITIES REQUIREMENTS**

The resource planning forecast, transmission planning forecast as well as the proposed generating facilities and bulk transmission line additions status are discussed in Chapter 3.

- **CHAPTER 4 - ENVIRONMENTAL AND LAND USE INFORMATION**

Preferred and potential site locations along with any environmental and land use information are presented in this chapter.

CHAPTER 1

*DESCRIPTION OF
EXISTING FACILITIES*



CHAPTER 1

DESCRIPTION OF EXISTING FACILITIES

EXISTING FACILITIES OVERVIEW

OWNERSHIP

Duke Energy Florida, LLC (DEF or the Company) is a wholly owned subsidiary of Duke Energy Corporation (Duke Energy).

AREA OF SERVICE

DEF has an obligation to serve approximately 1.9 million customers in Florida. Its service area covers approximately 20,000 square miles in west central Florida and includes the densely populated areas around Orlando, as well as the cities of St. Petersburg and Clearwater. DEF is interconnected with 21 municipal and nine rural electric cooperative systems who serve additional customers in Florida. DEF is subject to the rules and regulations of the Federal Energy Regulatory Commission (FERC), the Nuclear Regulatory Commission (NRC), and the FPSC. DEF's Service Area is shown in Figure 1.1.

TRANSMISSION/DISTRIBUTION

The Company is part of a nationwide interconnected power network that enables power to be exchanged between utilities. The DEF transmission system includes approximately 5,300 circuit miles of transmission lines. The distribution system includes approximately 18,000 circuit miles of overhead distribution conductors and approximately 14,000 circuit miles of underground distribution cable.

ENERGY MANAGEMENT and ENERGY EFFICIENCY

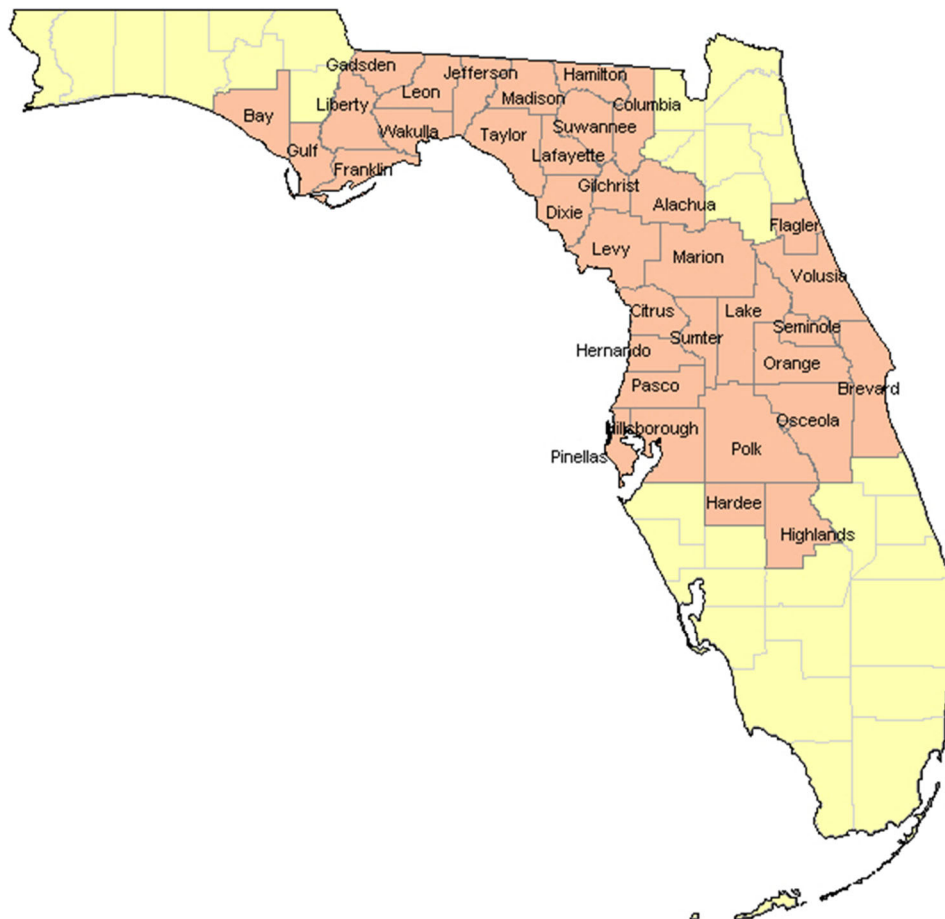
The Company's residential Energy Management program represents a demand response (DR) type of program where participating customers help manage future load growth and costs. Approximately 433,000 customers participated in the residential Energy Management program during 2023, contributing about 638 MW of winter peak-shaving capacity for use during high load periods. DEF's currently approved DSM portfolio of programs consist of five residential programs

(four energy efficiency and one demand response), six commercial and industrial programs (three energy efficiency and three demand response) and one research and development program.

TOTAL CAPACITY RESOURCE

As of December 31, 2023, DEF had total summer firm capacity resources of 11,750 MW consisting of installed capacity of 10,290 MW and 1,460 MW of firm purchased power. Additional information on DEF's existing generating resources can be found in Schedule 1 and Table 3.1 (Chapter 3).

FIGURE 1.1
DUKE ENERGY FLORIDA
County Service Area Map



DUKE ENERGY FLORIDA

SCHEDULE 1
EXISTING GENERATING FACILITIES

AS OF DECEMBER 31, 2023

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	UNIT	LOCATION	UNIT	FUEL	FUEL TRANSPORT	ALT. FUEL			COM'L IN-	EXPECTED	GEN. MAX.	NET CAPABILITY	
PLANT NAME	NO.	(COUNTY)	TYPE	PRI.	ALT.	PRI.	ALT.	DAYS USE	SERVICE	RETIREMENT	NAMEPLATE	SUMMER	WINTER
									MO./YEAR	MO./YEAR	KW	MW	MW
<u>STEAM</u>													
ANCLOTE	1	PASCO	ST	NG		PL			10/74		556,200	508	521
ANCLOTE	2	PASCO	ST	NG		PL			10/78		556,200	505	514
CRYSTAL RIVER	4	CITRUS	ST	BIT		WA	RR		12/82		739,260	712	721
CRYSTAL RIVER	5	CITRUS	ST	BIT		WA	RR		10/84		739,260	698	721
											Steam Total	2,423	2,477
<u>COMBINED-CYCLE</u>													
P L BARTOW	4	PINELLAS	CC	NG	DFO	PL	TK	*	6/09		1,254,200	1,112	1,259
CITRUS COUNTY COMBINED CYCLE	PB1	CITRUS	CC	NG		PL			10/18		985,150	807	925
CITRUS COUNTY COMBINED CYCLE	PB2	CITRUS	CC	NG		PL			11/18		985,150	803	929
HINES ENERGY COMPLEX	1	POLK	CC	NG		PL			4/99		546,500	501	521
HINES ENERGY COMPLEX	2	POLK	CC	NG	DFO	PL	TK	*	12/03		548,250	532	549
HINES ENERGY COMPLEX	3	POLK	CC	NG	DFO	PL	TK	*	11/05		561,000	523	535
HINES ENERGY COMPLEX	4	POLK	CC	NG	DFO	PL	TK	*	12/07		610,500	525	544
OSPREY ENERGY CENTER POWER PLANT	1	POLK	CC	NG		PL			5/04		644,300	245	245
TIGER BAY	1	POLK	CC	NG		PL			8/97		278,100	199	230
											CC Total	5,247	5,737
<u>COMBUSTION TURBINE</u>													
BARTOW	P1	PINELLAS	CT	DFO		WA		*	5/72	6/2027 **	55,400	41	50
BARTOW	P2	PINELLAS	CT	NG	DFO	PL	WA	*	6/72		55,400	41	53
BARTOW	P3	PINELLAS	CT	DFO		WA		*	6/72	6/2027 **	55,400	41	51
BARTOW	P4	PINELLAS	CT	NG	DFO	PL	WA	*	6/72		55,400	45	58
BAYBORO	P1	PINELLAS	CT	DFO		WA		*	4/73	10/2026 **	56,700	44	58
BAYBORO	P2	PINELLAS	CT	DFO		WA		*	4/73	10/2026 **	56,700	21	27
BAYBORO	P3	PINELLAS	CT	DFO		WA		*	4/73	10/2026 **	56,700	43	57
BAYBORO	P4	PINELLAS	CT	DFO		WA		*	4/73	10/2026 **	56,700	43	56
DEBARY	P2	VOLUSIA	CT	DFO		TK		*	12/75-4/76	6/2027 **	73,440	45	57
DEBARY	P3	VOLUSIA	CT	DFO		TK		*	12/75-4/76	6/2027 **	73,440	45	59
DEBARY	P4	VOLUSIA	CT	DFO		TK		*	12/75-4/76	6/2027 **	73,440	46	59
DEBARY	P5	VOLUSIA	CT	DFO		TK		*	12/75-4/76	6/2027 **	73,440	45	58
DEBARY	P6	VOLUSIA	CT	DFO		TK		*	12/75-4/76	6/2027 **	73,440	46	59
DEBARY	P7	VOLUSIA	CT	NG	DFO	PL	TK	*	10/92		103,500	74	93
DEBARY	P8	VOLUSIA	CT	NG	DFO	PL	TK	*	10/92		103,500	75	94
DEBARY	P9	VOLUSIA	CT	NG	DFO	PL	TK	*	10/92		103,500	76	94
DEBARY	P10	VOLUSIA	CT	DFO		TK		*	10/92		103,500	72	88
INTERCESSION CITY	P1	OSCEOLA	CT	DFO		PL,TK		*	5/74		56,700	45	61
INTERCESSION CITY	P2	OSCEOLA	CT	DFO		PL,TK		*	5/74		56,700	46	60
INTERCESSION CITY	P3	OSCEOLA	CT	DFO		PL,TK		*	5/74		56,700	46	61
INTERCESSION CITY	P4	OSCEOLA	CT	DFO		PL,TK		*	5/74		56,700	46	62
INTERCESSION CITY	P5	OSCEOLA	CT	DFO		PL,TK		*	5/74		56,700	45	59
INTERCESSION CITY	P6	OSCEOLA	CT	DFO		PL,TK		*	5/74		56,700	47	60
INTERCESSION CITY	P7	OSCEOLA	CT	NG	DFO	PL	PL,TK	*	10/93		103,500	78	90
INTERCESSION CITY	P8	OSCEOLA	CT	NG	DFO	PL	PL,TK	*	10/93		103,500	77	88
INTERCESSION CITY	P9	OSCEOLA	CT	NG	DFO	PL	PL,TK	*	10/93		103,500	77	88
INTERCESSION CITY	P10	OSCEOLA	CT	NG	DFO	PL	PL,TK	*	10/93		103,500	74	86
INTERCESSION CITY	P11	OSCEOLA	CT	DFO		PL,TK		*	1/97		148,500	140	161
INTERCESSION CITY	P12	OSCEOLA	CT	NG	DFO	PL	PL,TK	*	12/00		98,260	73	89
INTERCESSION CITY	P13	OSCEOLA	CT	NG	DFO	PL	PL,TK	*	12/00		98,260	73	91
INTERCESSION CITY	P14	OSCEOLA	CT	NG	DFO	PL	PL,TK	*	12/00		98,260	73	90
SUWANNEE RIVER	P1	SUWANNEE	CT	NG	DFO	PL	TK	*	10/80		65,999	48	65
SUWANNEE RIVER	P2	SUWANNEE	CT	NG	DFO	PL	TK	*	10/80		65,999	48	64
SUWANNEE RIVER	P3	SUWANNEE	CT	NG	DFO	PL	TK	*	11/80		65,999	49	65
UNIVERSITY OF FLORIDA	P1	ALACHUA	GT	NG		PL			1/94		43,000	44	50
											CT Total	1,972	2,461

* APPROXIMATELY 2 TO 3 DAYS OF OIL USE TYPICALLY TARGETED FOR ENTIRE PLANT.

** DATES FOR RETIREMENT ARE APPROXIMATE AND SUBJECT TO CHANGE

DUKE ENERGY FLORIDA

SCHEDULE 1

EXISTING GENERATING FACILITIES

AS OF DECEMBER 31, 2023

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	UNIT	LOCATION	UNIT	FUEL	FUEL TRANSPORT	ALT. FUEL	SERVICE	RETIREMENT	GEN. MAX.	NET CAPABILITY	SUMMER	WINTER	
PLANT NAME	NO.	(COUNTY)	TYPE	PRI	ALT.	PRI	ALT.	DAYS USE	MO./YEAR	MO./YEAR	KW	MW	MW
SOLAR													
OSCEOLA SOLAR FACILITY	PV1	OSCEOLA	PV	SO					5/16		3,800	2	0
PERRY SOLAR FACILITY	PV1	TAYLOR	PV	SO					8/16		5,100	2	0
SUWANNEE RIVER SOLAR FACILITY	PV1	SUWANNEE	PV	SO					11/17		8,800	4	0
HAMILTON SOLAR POWER PLANT	PV1	HAMILTON	PV	SO					12/18		74,900	42	0
TRENTON SOLAR POWER PLANT	PV1	GILCHRIST	PV	SO					12/19		74,900	42	0
LAKE PLACID SOLAR POWER PLANT	PV1	HIGHLANDS	PV	SO					12/19		45,000	25	0
ST PETERSBURG PIER	PV1	PINELLAS	PV	SO					12/19		350	0	0
COLUMBIA SOLAR POWER PLANT	PV1	COLUMBIA	PV	SO					3/20		74,900	42	0
DEBARY SOLAR POWER PLANT	PV1	VOLUSIA	PV	SO					5/20		74,500	33	0
SANTA FE SOLAR POWER PLANT	PV1	COLUMBIA	PV	SO					3/21		74,900	42	0
TWIN RIVERS SOLAR POWER PLANT	PV1	HAMILTON	PV	SO					3/21		74,900	42	0
DUETTE SOLAR POWER PLANT	PV1	MANATEE	PV	SO					10/21		74,500	42	0
SANDY CREEK SOLAR POWER PLANT	PV1	BAY	PV	SO					5/22		74,900	42	0
FORT GREEN SOLAR POWER PLANT	PV1	HARDEE	PV	SO					6/22		74,900	33	0
CHARLIE CREEK SOLAR POWER PLANT	PV1	HARDEE	PV	SO					8/22		74,900	42	0
BAY TRAIL SOLAR POWER PLANT	PV1	CITRUS	PV	SO					9/22		74,900	42	0
HILDRETH SOLAR POWER PLANT	PV1	SUWANNEE	PV	SO					4/23		74,900	42	0
HIGH SPRINGS SOLAR POWER PLANT	PV1	ALACHUA	PV	SO					4/23		74,900	42	0
HARDEETOWN SOLAR POWER PLANT	PV1	LEVY	PV	SO					4/23		74,900	42	0
BAY RANCH SOLAR POWER PLANT	PV1	BAY	PV	SO					4/23		74,900	42	0
Solar Total											648	0	
TOTAL RESOURCES (MW)												10,290	10,675

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CHAPTER 2

*FORECAST OF
ELECTRIC POWER DEMAND
AND ENERGY CONSUMPTION*



CHAPTER 2
FORECAST OF ELECTRIC POWER DEMAND
AND
ENERGY CONSUMPTION

OVERVIEW

The information presented in Schedules 2, 3, and 4 represents DEF's history and forecast of customers, energy sales (GWh), and peak demand (MW). In general, this discussion refers to DEF's base forecast.

The DEF forecast utilized economic data from July 2023. From a macro perspective, the U.S. economy was characterized by several significant trends and changes. The labor market was at full employment. The Federal Reserve had actively increased interest rates since early 2022 in an effort to control inflation (3.6% as of July 2023). Additionally, the central bank had been reducing its holdings of financial assets. Interest rates on ten-year Treasury bonds were near their expected long-term levels, and fiscal policy, despite a temporary suspension of the debt limit, was projected to be somewhat expansionary with the passage of the Inflation Reduction Act. The U.S. dollar remained strong due to monetary policy and global uncertainties. From a low in Q2 2020 to a peak in Q2 2021, inflation adjusted corporate profits remained above pre-pandemic levels. Global oil prices were expected to stay below \$100 per barrel. The pandemic's impact was waning, and the ongoing Russian war's influence on global markets was predicted to decrease.

In mid-2023, Florida's economy held its position as one of the top performers in the region. Job growth had slowed slightly over the past quarter, but Florida had outperformed nearly all states in the region during the past six- and 12-month periods. Every major industry had been performing well throughout the year, with tourism, the state's core driver, leading in job creation. Healthcare and utilities also stood out. Net hiring in finance had slowed due to market instability. The unemployment rate had remained steady below its previous cyclical low, despite a 5% growth in the labor force since its pre-pandemic level. While the housing market had cooled, there were signs of optimism, including a monthly increase in house prices in February. Single-family permit issuance had decreased from the previous year's pace, but the multifamily market was on track for

its strongest year in decades. Florida was expected to continue performing well, but the impact of higher prices and elevated interest rates would likely slow job creation and put pressure on the housing market. The vital tourism industry would provide less support as well. In the long term, Florida's advantageous factors such as low costs, favorable weather, and an improving industrial composition would drive above-average job and income growth.

Historical 29 county service area household, population, and people per household data were used for the Base Case, High Case, and Low Case service area population projections. The DEF service area population was estimated to have grown at an average ten-year compound annual growth rate (CAGR) of 1.56% from 2014-2023 (Schedule 2.1.1 Column 2). The projected DEF service area population growth weakened to a level of 1.20% over the 2024-2033 period due to higher mortality rates among aging baby-boomers. The rate of residential customer growth, which averaged 1.72% per year over the historical ten-year period, is expected to continue at an average of 1.72%. The total number of DEF customers grew from 1.69 million in 2014 to 1.96 million in 2023, an increase of 269,130 or 1.65% annual growth rate. The projected number of additional total customers between 2024 and 2033 is projected to be 320,423 for a 1.67% annual growth rate.

Responses to the pandemic, which changed the patterns of class energy consumption, have reverted to pre-COVID usage characteristics. Remote work in the DEF service area still exists but at a much smaller level than that reached early in the pandemic. These changes imply a decrease in residential energy consumption which can be seen in the projected annual growth rate for average kWh consumption per customer (Schedule 2.1.1 Column 6). The projected ten-year annual growth rate for average kWh consumption per customer is -0.37% vs. a historical rate of -0.21%. Residential use per customer continues to decline due to higher energy prices/inflation, energy efficiency and rooftop solar adoption. In terms of annual residential sales growth, measured in GWh (1.34% projected vs. 1.51% historical), sustained residential customer growth (1.72% projected vs. 1.72% historical) is working to offset the declining use per customer. Labor shortages and the low cost of living in Florida relative to other parts of the U.S. also continue to attract people to the state as per capita income adjusted for cost of living is more favorable in Florida than other parts of the U.S. Florida continues to be a tourist attraction and retirement haven. Given the increase in the retirement population in the U.S. over the near term as the "Baby Boomer"

generation reaches 65 and older, the retirement cohort in Florida should increase significantly over the next five to ten years. Increases in commercial and industrial class energy requirements have returned as well. Commercial sales growth (1.57% projected vs. 0.61% historical) is projected to be driven by the return to normal operating hours, population growth, and consumer spending/tourism. Sales to the industrial class (0.20% projected vs. 0.43% historical) were helped in 2023 by the Nucor Steel plant startup, Mosaic's operations growth, and Trulieve's startup. On the other hand, in November 2023, GP Cellulose shut down its Perry, FL manufacturing site. In February 2024, another major customer announced that they will be installing 6 MW of customer-owned CHP. These two customers accounted for nearly 5% of 2023 Industrial sales. In 2033, several major mining customers will deplete their resources through their operations. This is discussed in further detail under "General Assumptions" page 2-33. Over a nine-year period from 2024-2032, the industrial GWh growth rate was 1.08%. Long-term, total retail sales continue to increase (1.30% projected vs. 1.03% historical) but remain subject to uncertain economic conditions such as increasing rates, unemployment, and energy prices.

From 2014 to 2023, net energy for load (NEL) increased by 0.81% per year (Schedule 2.3.1 Column 4). The average projected ten-year CAGR for NEL is 0.91%. While Sales for Resale experienced an average annual decrease of -26.45% during the forecast period, sustained retail load growth offsets the loss of these contracts. Long term, DEF Sales for Resale energy sales are projected to essentially disappear.

During the 2014 to 2023 historical period the DEF summer net firm demand (Schedule 3.1.1 Column 10) increased from 8,523 MW to 9,352 MW, an average annual ten-year increase of 1.04%. This increase was driven by the ten-year average customer growth of 1.65% per year. The Wholesale summer peak remained relatively flat with a ten-year CAGR of 0.18%. Wholesale load was offset by higher conservation levels and additional residential demand response capability (Schedule 3.1.1.1). Going forward, the projected total DEF summer net firm demand, 2024 – 2033, grows at a slightly lower average annual rate of 0.96% due to declining Sales for Resale. The historical DEF firm winter peak ten-year CAGR was 1.00% per year driven by customer growth. Projected total DEF winter net firm demand remained positive with an average annual rate of 0.42% between 2024 and 2033 due to a reduction in the projected Sales for Resale peak demand

(-8.03% annual average decline), offset by expected ten-year growth in Retail winter peak of 1.06%. Both summer and winter Sales for Resale peak demand are expected to decline significantly towards the end of the ten-year projection.

DEF continues to provide alternate “high” and “low” forecasts for customers, energy, and peak demand, recognizing that the economic future is uncertain due to the tightening of monetary policy or other unknown events. The Fed’s goal has been a “soft landing” where inflation is reigned in to 2% without sending the economy into a recession. Moody’s S1 and S3 (high & low) Florida economic scenarios were used to provide a range of economic variables around the Base Case scenario. These were combined with high and low peak weather scenarios for each season and high and low population growth scenarios from Moody’s.

ENERGY CONSUMPTION AND DEMAND FORECAST SCHEDULES

The below schedules have been provided to represent DEF's expectations for a Base Case as well as reasonable High and Low forecast scenarios for resource planning purposes. (Base-B, High-H and Low-L):

<u>SCHEDULE</u>	<u>DESCRIPTION</u>
2.1, 2.2 and 2.3	History and Forecast of Energy Consumption and Number of Customers by Customer Class (B, H and L)
3.1	History and Forecast of Base Summer Peak Demand (MW) (B, H and L)
3.2	History and Forecast of Base Winter Peak Demand (MW) (B, H and L)
3.3	History and Forecast of Base Annual Net Energy for Load (GWh) (B, H and L)
4	Previous Year Actual and Two-Year Forecast of Peak Demand and Net Energy for Load by Month (B, H and L)

DUKE ENERGY FLORIDA

SCHEDULE 2.1.1

HISTORY AND FORECAST OF ENERGY CONSUMPTION AND

NUMBER OF CUSTOMERS BY CUSTOMER CLASS

BASE CASE FORECAST

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
RURAL AND RESIDENTIAL						COMMERCIAL		
YEAR	DEF POPULATION	MEMBERS PER HOUSEHOLD	GWh	AVERAGE NO. OF CUSTOMERS	AVERAGE KWh CONSUMPTION PER CUSTOMER	GWh	AVERAGE NO. OF CUSTOMERS	AVERAGE KWh CONSUMPTION PER CUSTOMER
HISTORY:								
2014	3,747,160	2.492	19,003	1,503,758	12,637	11,789	167,253	70,485
2015	3,794,138	2.489	19,932	1,524,605	13,074	12,070	169,147	71,359
2016	3,837,436	2.485	20,265	1,543,967	13,126	12,094	170,999	70,724
2017	3,906,975	2.483	19,791	1,573,260	12,579	11,918	173,695	68,612
2018	3,968,241	2.485	20,636	1,597,132	12,920	12,172	175,848	69,216
2019	4,037,435	2.483	20,775	1,626,117	12,776	12,198	178,036	68,514
2020	4,089,498	2.471	21,459	1,655,304	12,964	11,522	179,666	64,129
2021	4,130,929	2.448	21,192	1,687,471	12,558	11,785	182,195	64,686
2022	4,253,325	2.473	21,508	1,719,905	12,505	12,220	184,453	66,248
2023	4,308,553	2.457	21,750	1,753,583	12,403	12,450	186,524	66,749
FORECAST:								
2024	4,338,254	2.439	21,660	1,778,702	12,177	12,031	189,760	63,400
2025	4,383,772	2.420	21,850	1,811,476	12,062	12,232	192,439	63,564
2026	4,431,461	2.403	21,583	1,844,137	11,704	12,268	195,108	62,879
2027	4,481,068	2.388	21,717	1,876,494	11,573	12,383	197,753	62,617
2028	4,534,352	2.375	21,981	1,909,201	11,513	12,599	200,426	62,859
2029	4,591,824	2.364	22,446	1,942,396	11,556	12,849	203,140	63,252
2030	4,651,193	2.354	22,949	1,975,868	11,614	13,097	205,875	63,617
2031	4,711,426	2.345	23,390	2,009,137	11,642	13,322	208,595	63,865
2032	4,772,194	2.337	23,646	2,042,017	11,580	13,568	211,282	64,217
2033	4,830,765	2.329	24,422	2,074,180	11,774	13,847	213,911	64,734

DUKE ENERGY FLORIDA

SCHEDULE 2.1.2

HISTORY AND FORECAST OF ENERGY CONSUMPTION AND

NUMBER OF CUSTOMERS BY CUSTOMER CLASS

HIGH CASE FORECAST

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
RURAL AND RESIDENTIAL					COMMERCIAL			
YEAR	DEF POPULATION	MEMBERS PER HOUSEHOLD	GWh	AVERAGE NO. OF CUSTOMERS	AVERAGE KWh CONSUMPTION PER CUSTOMER	GWh	AVERAGE NO. OF CUSTOMERS	AVERAGE KWh CONSUMPTION PER CUSTOMER
HISTORY:								
2014	3,747,160	2.492	19,003	1,503,758	12,637	11,789	167,253	70,485
2015	3,794,138	2.489	19,932	1,524,605	13,074	12,070	169,147	71,359
2016	3,837,436	2.485	20,265	1,543,967	13,126	12,094	170,999	70,724
2017	3,906,975	2.483	19,791	1,573,260	12,579	11,918	173,695	68,612
2018	3,968,241	2.485	20,636	1,597,132	12,920	12,172	175,848	69,216
2019	4,037,435	2.483	20,775	1,626,117	12,776	12,198	178,036	68,514
2020	4,089,498	2.471	21,459	1,655,304	12,964	11,522	179,666	64,129
2021	4,130,929	2.448	21,192	1,687,471	12,558	11,785	182,195	64,686
2022	4,253,325	2.473	21,508	1,719,905	12,505	12,220	184,453	66,248
2023	4,308,553	2.457	21,750	1,753,583	12,403	12,450	186,524	66,749
FORECAST:								
2024	4,352,608	2.439	24,377	1,784,587	13,660	12,719	190,241	66,858
2025	4,413,787	2.420	24,708	1,823,879	13,547	12,977	193,453	67,080
2026	4,469,921	2.403	24,607	1,860,142	13,228	13,052	196,417	66,452
2027	4,526,156	2.388	24,808	1,895,375	13,088	13,213	199,296	66,301
2028	4,586,538	2.375	25,175	1,931,174	13,036	13,444	202,222	66,484
2029	4,651,704	2.364	25,613	1,967,726	13,017	13,650	205,210	66,516
2030	4,719,116	2.354	26,146	2,004,722	13,042	13,880	208,234	66,658
2031	4,786,708	2.345	26,627	2,041,240	13,045	14,107	211,218	66,790
2032	4,853,400	2.337	26,977	2,076,765	12,990	14,351	214,122	67,024
2033	4,916,610	2.329	27,723	2,111,039	13,133	14,617	216,923	67,382

DUKE ENERGY FLORIDA

SCHEDULE 2.1.3

HISTORY AND FORECAST OF ENERGY CONSUMPTION AND

NUMBER OF CUSTOMERS BY CUSTOMER CLASS

LOW CASE FORECAST

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
RURAL AND RESIDENTIAL						COMMERCIAL		
YEAR	DEF POPULATION	MEMBERS PER HOUSEHOLD	GWh	AVERAGE NO. OF CUSTOMERS	AVERAGE KWh CONSUMPTION PER CUSTOMER	GWh	AVERAGE NO. OF CUSTOMERS	AVERAGE KWh CONSUMPTION PER CUSTOMER
HISTORY:								
2014	3,747,160	2.492	19,003	1,503,758	12,637	11,789	167,253	70,485
2015	3,794,138	2.489	19,932	1,524,605	13,074	12,070	169,147	71,359
2016	3,837,436	2.485	20,265	1,543,967	13,126	12,094	170,999	70,724
2017	3,906,975	2.483	19,791	1,573,260	12,579	11,918	173,695	68,612
2018	3,968,241	2.485	20,636	1,597,132	12,920	12,172	175,848	69,216
2019	4,037,435	2.483	20,775	1,626,117	12,776	12,198	178,036	68,514
2020	4,089,498	2.471	21,459	1,655,304	12,964	11,522	179,666	64,129
2021	4,130,929	2.448	21,192	1,687,471	12,558	11,785	182,195	64,686
2022	4,253,325	2.473	21,508	1,719,905	12,505	12,220	184,453	66,248
2023	4,308,553	2.457	21,750	1,753,583	12,403	12,450	186,524	66,749
FORECAST:								
2024	4,336,457	2.439	19,369	1,777,965	10,894	11,583	189,700	61,060
2025	4,377,461	2.420	19,473	1,808,868	10,765	11,679	192,226	60,757
2026	4,415,587	2.403	19,370	1,837,531	10,541	11,828	194,569	60,792
2027	4,453,353	2.388	19,550	1,864,888	10,483	12,021	196,805	61,082
2028	4,496,433	2.375	19,840	1,893,235	10,479	12,251	199,121	61,527
2029	4,546,275	2.364	20,183	1,923,128	10,495	12,459	201,565	61,811
2030	4,600,010	2.354	20,572	1,954,125	10,528	12,693	204,098	62,191
2031	4,655,643	2.345	20,909	1,985,349	10,532	12,908	206,650	62,464
2032	4,711,960	2.337	21,129	2,016,243	10,479	13,139	209,175	62,812
2033	4,767,593	2.329	21,739	2,047,056	10,620	13,388	211,694	63,242

DUKE ENERGY FLORIDA

SCHEDULE 2.2.1

HISTORY AND FORECAST OF ENERGY CONSUMPTION AND
NUMBER OF CUSTOMERS BY CUSTOMER CLASS

BASE CASE FORECAST

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	INDUSTRIAL						
		AVERAGE	AVERAGE KWh	RAILROADS	STREET &	OTHER SALES	TOTAL SALES
		NO. OF	CONSUMPTION	AND RAILWAYS	HIGHWAY	TO PUBLIC	TO ULTIMATE
YEAR	GWh	CUSTOMERS	PER CUSTOMER	GWh	LIGHTING	AUTHORITIES	CONSUMERS
					GWh	GWh	GWh
HISTORY:							
2014	3,267	2,280	1,432,895	0	25	3,157	37,240
2015	3,293	2,243	1,468,123	0	24	3,234	38,553
2016	3,197	2,178	1,467,860	0	24	3,194	38,774
2017	3,120	2,137	1,459,991	0	24	3,171	38,023
2018	3,107	2,080	1,493,750	0	24	3,206	39,144
2019	2,963	2,025	1,463,210	0	24	3,227	39,187
2020	3,147	1,999	1,574,287	0	23	3,079	39,230
2021	3,292	1,978	1,664,307	0	24	3,158	39,451
2022	3,508	1,868	1,877,916	0	33	3,244	40,512
2023	3,396	1,773	1,915,141	0	31	3,205	40,832
FORECAST:							
2024	3,230	1,786	1,808,343	0	31	3,111	40,063
2025	3,360	1,765	1,903,655	0	31	3,185	40,658
2026	3,423	1,758	1,946,910	0	30	3,185	40,489
2027	3,453	1,756	1,966,388	0	29	3,196	40,777
2028	3,507	1,759	1,993,696	0	29	3,220	41,336
2029	3,500	1,762	1,986,265	0	28	3,234	42,057
2030	3,509	1,764	1,989,180	0	28	3,249	42,832
2031	3,515	1,767	1,989,291	0	27	3,239	43,493
2032	3,523	1,772	1,987,977	0	26	3,232	43,995
2033	3,288	1,776	1,851,436	0	26	3,231	44,815

DUKE ENERGY FLORIDA

SCHEDULE 2.2.2

HISTORY AND FORECAST OF ENERGY CONSUMPTION AND
NUMBER OF CUSTOMERS BY CUSTOMER CLASS

HIGH CASE FORECAST

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
INDUSTRIAL							
YEAR	GWh	AVERAGE NO. OF CUSTOMERS	AVERAGE KWh CONSUMPTION PER CUSTOMER	RAILROADS AND RAILWAYS GWh	STREET & HIGHWAY LIGHTING GWh	OTHER SALES TO PUBLIC AUTHORITIES GWh	TOTAL SALES TO ULTIMATE CONSUMERS GWh
HISTORY:							
2014	3,267	2,280	1,432,895	0	25	3,157	37,240
2015	3,293	2,243	1,468,123	0	24	3,234	38,553
2016	3,197	2,178	1,467,860	0	24	3,194	38,774
2017	3,120	2,137	1,459,991	0	24	3,171	38,023
2018	3,107	2,080	1,493,750	0	24	3,206	39,144
2019	2,963	2,025	1,463,210	0	24	3,227	39,187
2020	3,147	1,999	1,574,287	0	23	3,079	39,230
2021	3,292	1,978	1,664,307	0	24	3,158	39,451
2022	3,508	1,868	1,877,916	0	33	3,244	40,512
2023	3,396	1,773	1,915,141	0	31	3,205	40,832
FORECAST:							
2024	3,266	1,786	1,828,571	0	31	3,177	43,570
2025	3,398	1,765	1,924,953	0	31	3,251	44,363
2026	3,460	1,758	1,967,978	0	30	3,249	44,398
2027	3,489	1,756	1,986,894	0	29	3,254	44,794
2028	3,543	1,759	2,014,133	0	29	3,275	45,465
2029	3,536	1,762	2,006,629	0	28	3,277	46,104
2030	3,545	1,764	2,009,498	0	28	3,284	46,883
2031	3,551	1,767	2,009,524	0	27	3,268	47,580
2032	3,558	1,772	2,008,105	0	26	3,254	48,168
2033	3,324	1,776	1,871,458	0	26	3,246	48,936

DUKE ENERGY FLORIDA

SCHEDULE 2.2.3

HISTORY AND FORECAST OF ENERGY CONSUMPTION AND
NUMBER OF CUSTOMERS BY CUSTOMER CLASS

LOW CASE FORECAST

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
INDUSTRIAL							
YEAR	GWh	AVERAGE NO. OF CUSTOMERS	AVERAGE KWh CONSUMPTION PER CUSTOMER	RAILROADS AND RAILWAYS GWh	STREET & HIGHWAY LIGHTING GWh	OTHER SALES TO PUBLIC AUTHORITIES GWh	TOTAL SALES TO ULTIMATE CONSUMERS GWh
HISTORY:							
2014	3,267	2,280	1,432,895	0	25	3,157	37,240
2015	3,293	2,243	1,468,123	0	24	3,234	38,553
2016	3,197	2,178	1,467,860	0	24	3,194	38,774
2017	3,120	2,137	1,459,991	0	24	3,171	38,023
2018	3,107	2,080	1,493,750	0	24	3,206	39,144
2019	2,963	2,025	1,463,210	0	24	3,227	39,187
2020	3,147	1,999	1,574,287	0	23	3,079	39,230
2021	3,292	1,978	1,664,307	0	24	3,158	39,451
2022	3,508	1,868	1,877,916	0	33	3,244	40,512
2023	3,396	1,773	1,915,141	0	31	3,205	40,832
FORECAST:							
2024	3,202	1,786	1,792,981	0	31	3,030	37,216
2025	3,334	1,765	1,888,814	0	31	3,098	37,615
2026	3,400	1,758	1,934,233	0	30	3,086	37,715
2027	3,432	1,756	1,954,492	0	29	3,089	38,122
2028	3,487	1,759	1,982,346	0	29	3,106	38,712
2029	3,480	1,762	1,974,753	0	28	3,118	39,268
2030	3,488	1,764	1,977,382	0	28	3,134	39,914
2031	3,494	1,767	1,977,407	0	27	3,116	40,454
2032	3,502	1,772	1,976,094	0	26	3,102	40,898
2033	3,267	1,776	1,839,499	0	26	3,094	41,515

DUKE ENERGY FLORIDA

SCHEDULE 2.3.1

HISTORY AND FORECAST OF ENERGY CONSUMPTION AND
NUMBER OF CUSTOMERS BY CUSTOMER CLASS

BASE CASE FORECAST

(1)	(2)	(3)	(4)	(5)	(6)
YEAR	SALES FOR RESALE GWh	UTILITY USE & LOSSES GWh	NET ENERGY FOR LOAD GWh	OTHER CUSTOMERS (AVERAGE NO.)	TOTAL NO. OF CUSTOMERS
-----	-----	-----	-----	-----	-----
HISTORY:					
2014	1,333	2,402	40,975	25,800	1,699,091
2015	1,243	2,484	42,280	25,866	1,721,861
2016	1,803	2,277	42,854	26,005	1,743,149
2017	2,196	2,700	42,919	26,248	1,775,340
2018	2,304	2,776	44,224	26,504	1,801,564
2019	2,910	2,704	44,801	26,707	1,832,885
2020	2,887	2,697	44,814	26,845	1,863,814
2021	3,302	2,311	45,064	27,082	1,898,726
2022	3,673	1,956	46,141	26,834	1,933,060
2023	1,396	1,821	44,049	26,343	1,968,222
FORECAST:					
2024	1,119	2,237	43,418	26,304	1,996,552
2025	904	1,956	43,519	26,402	2,032,082
2026	904	2,190	43,584	26,501	2,067,504
2027	900	2,098	43,775	26,586	2,102,589
2028	889	2,279	44,504	26,680	2,138,066
2029	887	2,177	45,121	26,765	2,174,063
2030	887	2,258	45,977	26,847	2,210,354
2031	70	2,260	45,824	26,926	2,246,425
2032	71	2,536	46,602	27,014	2,282,085
2033	70	2,209	47,094	27,110	2,316,977

DUKE ENERGY FLORIDA

SCHEDULE 2.3.2

HISTORY AND FORECAST OF ENERGY CONSUMPTION AND
NUMBER OF CUSTOMERS BY CUSTOMER CLASS

HIGH CASE FORECAST

(1)	(2)	(3)	(4)	(5)	(6)
YEAR	SALES FOR RESALE GWh	UTILITY USE & LOSSES GWh	NET ENERGY FOR LOAD GWh	OTHER CUSTOMERS (AVERAGE NO.)	TOTAL NO. OF CUSTOMERS
-----	-----	-----	-----	-----	-----
HISTORY:					
2014	1,333	2,402	40,975	25,800	1,699,091
2015	1,243	2,484	42,280	25,866	1,721,861
2016	1,803	2,277	42,854	26,005	1,743,149
2017	2,196	2,700	42,919	26,248	1,775,340
2018	2,304	2,776	44,224	26,504	1,801,564
2019	2,910	2,704	44,801	26,707	1,832,885
2020	2,887	2,697	44,814	26,845	1,863,814
2021	3,302	2,311	45,064	27,082	1,898,726
2022	3,673	1,956	46,141	26,834	1,933,060
2023	1,396	1,821	44,049	26,343	1,968,222
FORECAST:					
2024	1,119	2,799	47,488	26,108	2,002,722
2025	904	2,584	47,852	26,148	2,045,245
2026	904	2,775	48,077	26,243	2,084,560
2027	900	2,731	48,425	26,321	2,122,748
2028	889	2,894	49,248	26,401	2,161,556
2029	887	2,823	49,814	26,432	2,201,130
2030	887	2,902	50,671	26,474	2,241,194
2031	70	2,922	50,572	26,524	2,280,749
2032	71	3,136	51,375	26,570	2,319,229
2033	70	2,905	51,911	26,626	2,356,364

DUKE ENERGY FLORIDA

SCHEDULE 2.3.3

HISTORY AND FORECAST OF ENERGY CONSUMPTION AND
NUMBER OF CUSTOMERS BY CUSTOMER CLASS

LOW CASE FORECAST

(1)	(2)	(3)	(4)	(5)	(6)
YEAR	SALES FOR RESALE GWh	UTILITY USE & LOSSES GWh	NET ENERGY FOR LOAD GWh	OTHER CUSTOMERS (AVERAGE NO.)	TOTAL NO. OF CUSTOMERS
-----	-----	-----	-----	-----	-----
HISTORY:					
2014	1,333	2,402	40,975	25,800	1,699,091
2015	1,243	2,484	42,280	25,866	1,721,861
2016	1,803	2,277	42,854	26,005	1,743,149
2017	2,196	2,700	42,919	26,248	1,775,340
2018	2,304	2,776	44,224	26,504	1,801,564
2019	2,910	2,704	44,801	26,707	1,832,885
2020	2,887	2,697	44,814	26,845	1,863,814
2021	3,302	2,311	45,064	27,082	1,898,726
2022	3,673	1,956	46,141	26,834	1,933,060
2023	1,396	1,821	44,049	26,343	1,968,222
FORECAST:					
2024	1,119	1,760	40,094	26,056	1,995,507
2025	904	1,512	40,031	26,062	2,028,921
2026	904	1,688	40,308	26,038	2,059,896
2027	900	1,640	40,662	26,071	2,089,520
2028	889	1,782	41,383	26,118	2,120,233
2029	887	1,701	41,856	26,217	2,152,672
2030	887	1,762	42,564	26,318	2,186,305
2031	70	1,770	42,294	26,364	2,220,130
2032	71	1,961	42,929	26,405	2,253,595
2033	70	1,732	43,317	26,471	2,286,997

DUKE ENERGY FLORIDA

SCHEDULE 3.1.1

HISTORY AND FORECAST OF SUMMER PEAK DEMAND (MW)

BASE CASE FORECAST

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(OTH)	(10)
					RESIDENTIAL LOAD MANAGEMENT	RESIDENTIAL CONSERVATION	COMM. / IND. LOAD MANAGEMENT	COMM. / IND. CONSERVATION	OTHER DEMAND REDUCTIONS	NET FIRM DEMAND
YEAR	TOTAL	WHOLESALE	RETAIL	INTERRUPTIBLE						
HISTORY:										
2014	10,067	814	9,253	232	355	404	108	313	132	8,523
2015	10,058	772	9,286	303	360	435	124	324	80	8,431
2016	10,530	893	9,637	235	366	466	100	339	80	8,946
2017	10,220	808	9,412	203	342	498	95	349	80	8,653
2018	10,271	812	9,459	257	386	532	83	387	80	8,545
2019	11,029	1021	10,008	230	394	566	86	414	80	9,260
2020	10,765	901	9,864	250	393	599	83	440	80	8,921
2021	10,835	1,010	9,825	375	394	623	85	451	80	8,826
2022	11,012	1,045	9,966	341	361	513	85	441	80	9,190
2023	11,357	827	10,530	476	352	550	88	459	80	9,352
FORECAST:										
2024	10,958	730	10,228	402	358	566	91	461	80	9,000
2025	10,824	451	10,372	402	364	581	94	467	80	8,836
2026	10,805	451	10,354	402	370	593	97	473	80	8,790
2027	10,822	451	10,371	402	376	605	100	477	80	8,781
2028	10,969	451	10,518	402	377	618	103	480	80	8,908
2029	11,174	451	10,723	402	378	630	107	484	80	9,093
2030	11,361	451	10,910	402	379	642	110	488	80	9,260
2031	11,493	401	11,093	402	380	653	113	492	80	9,374
2032	11,733	401	11,332	402	381	663	116	496	80	9,595
2033	11,967	401	11,566	402	382	674	119	499	80	9,811

Historical Values (2014 - 2023):

Col. (2) = recorded peak + implemented load control + residential and commercial/industrial conservation and customer-owned self-service cogeneration.

Cols. (5) - (9) = Represent total cumulative capabilities at peak. Col. (8) includes commercial load management and standby generation.

Col. (OTH) = Customer-owned self-service cogeneration.

Col. (10) = (2) - (5) - (6) - (7) - (8) - (9) - (OTH).

Projected Values (2024 - 2033):

Cols. (2) - (4) = forecasted peak without load control, cumulative conservation, and customer-owned self-service cogeneration.

Cols. (5) - (9) = cumulative conservation and load control capabilities at peak. Col. (8) includes commercial load management and standby generation.

Col. (OTH) = customer-owned self-service cogeneration.

Col. (10) = (2) - (5) - (6) - (7) - (8) - (9) - (OTH).

DUKE ENERGY FLORIDA

SCHEDULE 3.1.2

HISTORY AND FORECAST OF SUMMER PEAK DEMAND (MW)

HIGH CASE FORECAST

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(OTH)	(10)
					RESIDENTIAL LOAD MANAGEMENT	RESIDENTIAL CONSERVATION	COMM. / IND. LOAD MANAGEMENT	COMM. / IND. CONSERVATION	OTHER DEMAND REDUCTIONS	NET FIRM DEMAND
YEAR	TOTAL	WHOLESALE	RETAIL	INTERRUPTIBLE						
HISTORY:										
2014	10,067	814	9,253	232	355	404	108	313	132	8,523
2015	10,058	772	9,286	303	360	435	124	324	80	8,431
2016	10,530	893	9,637	235	366	466	100	339	80	8,946
2017	10,220	808	9,412	203	342	498	95	349	80	8,653
2018	10,271	812	9,459	257	386	532	83	387	80	8,545
2019	11,029	1,021	10,008	230	394	566	86	414	80	9,260
2020	10,765	901	9,864	250	393	599	83	440	80	8,921
2021	10,835	1,010	9,825	375	394	623	85	451	80	8,826
2022	11,012	1,045	9,966	341	361	513	85	441	80	9,190
2023	11,357	827	10,530	476	352	550	88	459	80	9,352
FORECAST:										
2024	11,456	730	10,726	402	358	566	91	461	80	9,498
2025	11,362	451	10,911	402	364	581	94	467	80	9,375
2026	11,371	451	10,920	402	370	593	97	473	80	9,356
2027	11,415	451	10,964	402	376	605	100	477	80	9,375
2028	11,575	451	11,124	402	377	618	103	480	80	9,514
2029	11,751	451	11,300	402	378	630	107	484	80	9,670
2030	11,947	451	11,496	402	379	642	110	488	80	9,847
2031	12,461	401	12,060	402	380	653	113	492	80	10,341
2032	12,314	401	11,913	402	381	663	116	496	80	10,176
2033	12,555	401	12,154	402	382	674	119	499	80	10,399

Historical Values (2014 - 2023):

Col. (2) = recorded peak + implemented load control + residential and commercial/industrial conservation and customer-owned self-service cogeneration.

Cols. (5) - (9) = Represent total cumulative capabilities at peak. Col. (8) includes commercial load management and standby generation.

Col. (OTH) = Customer-owned self-service cogeneration.

Col. (10) = (2) - (5) - (6) - (7) - (8) - (9) - (OTH).

Projected Values (2024 - 2033):

Cols. (2) - (4) = forecasted peak without load control, cumulative conservation, and customer-owned self-service cogeneration.

Cols. (5) - (9) = cumulative conservation and load control capabilities at peak. Col. (8) includes commercial load management and standby generation.

Col. (OTH) = customer-owned self-service cogeneration.

Col. (10) = (2) - (5) - (6) - (7) - (8) - (9) - (OTH).

DUKE ENERGY FLORIDA

SCHEDULE 3.1.3

HISTORY AND FORECAST OF SUMMER PEAK DEMAND (MW)

LOW CASE FORECAST

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(OTH)	(10)
					RESIDENTIAL LOAD MANAGEMENT	RESIDENTIAL CONSERVATION	COMM. / IND. LOAD MANAGEMENT	COMM. / IND. CONSERVATION	OTHER DEMAND REDUCTIONS	NET FIRM DEMAND
YEAR	TOTAL	WHOLESALE	RETAIL	INTERRUPTIBLE						
HISTORY:										
2014	10,067	814	9,253	232	355	404	108	313	132	8,523
2015	10,058	772	9,286	303	360	435	124	324	80	8,431
2016	10,530	893	9,637	235	366	466	100	339	80	8,946
2017	10,220	808	9,412	203	342	498	95	349	80	8,653
2018	10,271	812	9,459	257	386	532	83	387	80	8,545
2019	11,029	1,021	10,008	230	394	566	86	414	80	9,260
2020	10,765	901	9,864	250	393	599	83	440	80	8,921
2021	10,835	1,010	9,825	375	394	623	85	451	80	8,826
2022	11,012	1,045	9,966	341	361	513	85	441	80	9,190
2023	11,357	827	10,530	476	352	550	88	459	80	9,352
FORECAST:										
2024	10,505	730	9,776	402	358	566	91	461	80	8,547
2025	10,360	451	9,909	402	364	581	94	467	80	8,373
2026	10,391	451	9,940	402	370	593	97	473	80	8,376
2027	10,444	451	9,992	402	376	605	100	477	80	8,403
2028	10,592	451	10,141	402	377	618	103	480	80	8,532
2029	10,774	451	10,323	402	378	630	107	484	80	8,693
2030	10,926	451	10,475	402	379	642	110	488	80	8,825
2031	11,407	401	11,006	402	380	653	113	492	80	9,287
2032	11,621	401	11,220	402	381	663	116	496	80	9,483
2033	11,476	401	11,075	402	382	674	119	499	80	9,320

Historical Values (2014 - 2023):

Col. (2) = recorded peak + implemented load control + residential and commercial/industrial conservation and customer-owned self-service cogeneration.

Cols. (5) - (9) = Represent total cumulative capabilities at peak. Col. (8) includes commercial load management and standby generation.

Col. (OTH) = Customer-owned self-service cogeneration.

Col. (10) = (2) - (5) - (6) - (7) - (8) - (9) - (OTH).

Projected Values (2024 - 2033):

Cols. (2) - (4) = forecasted peak without load control, cumulative conservation, and customer-owned self-service cogeneration.

Cols. (5) - (9) = cumulative conservation and load control capabilities at peak. Col. (8) includes commercial load management and standby generation.

Col. (OTH) = customer-owned self-service cogeneration.

Col. (10) = (2) - (5) - (6) - (7) - (8) - (9) - (OTH).

DUKE ENERGY FLORIDA

SCHEDULE 3.2.1

HISTORY AND FORECAST OF WINTER PEAK DEMAND (MW)

BASE CASE FORECAST

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(OTH)	(10)
					RESIDENTIAL LOAD MANAGEMENT	RESIDENTIAL CONSERVATION	COMM. / IND. LOAD MANAGEMENT	COMM. / IND. CONSERVATION	OTHER DEMAND REDUCTIONS	NET FIRM DEMAND
YEAR	TOTAL	WHOLESALE	RETAIL	INTERRUPTIBLE						
HISTORY:										
2013/14	9,467	658	8,809	257	654	785	101	229	219	7,222
2014/15	10,648	1035	9,613	273	658	815	109	236	237	8,319
2015/16	9,678	1275	8,403	207	675	845	131	240	170	7,409
2016/17	8,739	701	8,038	191	695	878	79	243	165	6,489
2017/18	11,559	1071	10,488	244	699	913	79	246	196	9,182
2018/19	8,527	572	7,955	239	711	948	82	251	164	6,132
2019/20	9,725	613	9,112	292	670	982	80	256	177	7,268
2020/21	9,654	679	8,975	319	671	1,006	82	260	175	7,141
2021/22	10,594	1,038	9,556	317	668	1,013	83	261	195	8,056
2022/23	10,474	1,047	9,426	317	638	975	83	262	194	8,005
FORECAST:										
2023/24	11,506	852	10,654	388	646	1,055	87	263	195	8,872
2024/25	11,787	1,052	10,735	388	654	1,081	90	266	196	9,112
2025/26	11,833	1,052	10,781	388	662	1,101	93	268	196	9,124
2026/27	11,908	1,052	10,855	388	670	1,120	96	270	197	9,165
2027/28	11,452	451	11,001	388	671	1,141	100	273	198	8,682
2028/29	11,594	451	11,143	388	672	1,161	103	276	200	8,795
2029/30	11,784	451	11,333	388	673	1,180	106	278	202	8,957
2030/31	11,870	401	11,469	388	674	1,197	109	280	204	9,017
2031/32	12,002	401	11,601	388	675	1,215	112	282	205	9,125
2032/33	12,112	401	11,711	388	676	1,232	115	284	206	9,210

Historical Values (2014 - 2023):

Col. (2) = recorded peak + implemented load control + residential and commercial/industrial conservation and customer-owned self-service cogeneration.

Cols. (5) - (9) = Represent total cumulative capabilities at peak. Col. (8) includes commercial load management and standby generation.

Col. (OTH) = Voltage reduction and customer-owned self-service cogeneration.

Col. (10) = (2) - (5) - (6) - (7) - (8) - (9) - (OTH).

Projected Values (2024 - 2033):

Cols. (2) - (4) = forecasted peak without load control, cumulative conservation, and customer-owned self-service cogeneration.

Cols. (5) - (9) = Represent cumulative conservation and load control capabilities at peak. Col. (8) includes commercial load management and standby generation.

Col. (OTH) = Voltage reduction and customer-owned self-service cogeneration.

Col. (10) = (2) - (5) - (6) - (7) - (8) - (9) - (OTH).

DUKE ENERGY FLORIDA

SCHEDULE 3.2.2

HISTORY AND FORECAST OF WINTER PEAK DEMAND (MW)

HIGH CASE FORECAST

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(OTH)	(10)
					RESIDENTIAL LOAD MANAGEMENT	RESIDENTIAL CONSERVATION	COMM. / IND. LOAD MANAGEMENT	COMM. / IND. CONSERVATION	OTHER DEMAND REDUCTIONS	NET FIRM DEMAND
YEAR	TOTAL	WHOLESALE	RETAIL	INTERRUPTIBLE						
HISTORY:										
2013/14	9,467	658	8,809	257	654	785	101	229	219	7,222
2014/15	10,648	1,035	9,613	273	658	815	109	236	237	8,319
2015/16	9,678	1,275	8,403	207	675	845	131	240	170	7,409
2016/17	8,739	701	8,038	191	695	878	79	243	165	6,489
2017/18	11,559	1,071	10,488	244	699	913	79	246	196	9,182
2018/19	8,527	572	7,955	239	711	948	82	251	164	6,132
2019/20	9,725	613	9,112	292	670	982	80	256	177	7,268
2020/21	9,654	679	8,975	319	671	1,006	82	260	175	7,141
2021/22	10,594	1,038	9,556	317	668	1,013	83	261	195	8,056
2022/23	10,474	1,047	9,426	317	638	975	83	262	194	8,005
FORECAST:										
2023/24	13,301	852	12,449	388	646	1,055	87	263	195	10,667
2024/25	13,680	1,052	12,628	388	654	1,081	90	266	196	11,005
2025/26	13,779	1,052	12,727	388	662	1,101	93	268	196	11,070
2026/27	13,899	1,052	12,847	388	670	1,120	96	270	197	11,157
2027/28	13,491	451	13,039	388	671	1,141	100	273	198	10,720
2028/29	13,641	451	13,190	388	672	1,161	103	276	200	10,842
2029/30	13,836	451	13,385	388	673	1,180	106	278	202	11,009
2030/31	13,938	401	13,538	388	674	1,197	109	280	204	11,086
2031/32	14,083	401	13,682	388	675	1,215	112	282	205	11,205
2032/33	14,209	401	13,808	388	676	1,232	115	284	206	11,307

Historical Values (2014 - 2023):

Col. (2) = recorded peak + implemented load control + residential and commercial/industrial conservation and customer-owned self-service cogeneration.

Cols. (5) - (9) = Represent total cumulative capabilities at peak. Col. (8) includes commercial load management and standby generation.

Col. (OTH) = Voltage reduction and customer-owned self-service cogeneration.

Col. (10) = (2) - (5) - (6) - (7) - (8) - (9) - (OTH).

Projected Values (2024 - 2033):

Cols. (2) - (4) = forecasted peak without load control, cumulative conservation, and customer-owned self-service cogeneration.

Cols. (5) - (9) = Represent cumulative conservation and load control capabilities at peak. Col. (8) includes commercial load management and standby generation.

Col. (OTH) = Voltage reduction and customer-owned self-service cogeneration.

Col. (10) = (2) - (5) - (6) - (7) - (8) - (9) - (OTH).

DUKE ENERGY FLORIDA

SCHEDULE 3.2.3

HISTORY AND FORECAST OF WINTER PEAK DEMAND (MW)

LOW CASE FORECAST

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(OTH)	(10)
					RESIDENTIAL LOAD MANAGEMENT	RESIDENTIAL CONSERVATION	COMM. / IND. LOAD MANAGEMENT	COMM. / IND. CONSERVATION	OTHER DEMAND REDUCTIONS	NET FIRM DEMAND
YEAR	TOTAL	WHOLESALE	RETAIL	INTERRUPTIBLE						
HISTORY:										
2013/14	9,467	658	8,809	257	654	785	101	229	219	7,222
2014/15	10,648	1,035	9,613	273	658	815	109	236	237	8,319
2015/16	9,678	1,275	8,403	207	675	845	131	240	170	7,409
2016/17	8,739	701	8,038	191	695	878	79	243	165	6,489
2017/18	11,559	1,071	10,488	244	699	913	79	246	196	9,182
2018/19	8,527	572	7,955	239	711	948	82	251	164	6,132
2019/20	9,725	613	9,112	292	670	982	80	256	177	7,268
2020/21	9,654	679	8,975	319	671	1,006	82	260	175	7,141
2021/22	10,594	1,038	9,556	317	668	1,013	83	261	195	8,056
2022/23	10,474	1,047	9,426	317	638	975	83	262	194	8,005
FORECAST:										
2023/24	9,330	852	8,478	388	646	1,055	87	263	195	6,696
2024/25	9,493	1,052	8,441	388	654	1,081	90	266	196	6,818
2025/26	9,559	1,052	8,507	388	662	1,101	93	268	196	6,850
2026/27	9,655	1,052	8,603	388	670	1,120	96	270	197	6,913
2027/28	9,187	451	8,736	388	671	1,141	100	273	198	6,416
2028/29	9,291	451	8,840	388	672	1,161	103	276	200	6,492
2029/30	9,423	451	8,972	388	673	1,180	106	278	202	6,596
2030/31	9,472	401	9,071	388	674	1,197	109	280	204	6,619
2031/32	9,567	401	9,166	388	675	1,215	112	282	205	6,689
2032/33	9,645	401	9,245	388	676	1,232	115	284	206	6,744

Historical Values (2014 - 2023):

Col. (2) = recorded peak + implemented load control + residential and commercial/industrial conservation and customer-owned self-service cogeneration.

Cols. (5) - (9) = Represent total cumulative capabilities at peak. Col. (8) includes commercial load management and standby generation.

Col. (OTH) = Voltage reduction and customer-owned self-service cogeneration.

Col. (10) = (2) - (5) - (6) - (7) - (8) - (9) - (OTH).

Projected Values (2024 - 2033):

Cols. (2) - (4) = forecasted peak without load control, cumulative conservation, and customer-owned self-service cogeneration.

Cols. (5) - (9) = Represent cumulative conservation and load control capabilities at peak. Col. (8) includes commercial load management and standby generation.

Col. (OTH) = Voltage reduction and customer-owned self-service cogeneration.

Col. (10) = (2) - (5) - (6) - (7) - (8) - (9) - (OTH).

DUKE ENERGY FLORIDA

SCHEDULE 3.3.1

HISTORY AND FORECAST OF ANNUAL NET ENERGY FOR LOAD (GWh)

BASE CASE FORECAST

(1)	(2)	(3)	(4)	(OTH)	(5)	(6)	(7)	(8)	(9)
YEAR	TOTAL	RESIDENTIAL CONSERVATION	COMM. / IND. CONSERVATION	OTHER ENERGY REDUCTIONS	RETAIL	WHOLESALE	UTILITY USE & LOSSES	NET ENERGY FOR LOAD	LOAD FACTOR (%) *
HISTORY:									
2014	43,443	812	791	864	37,240	1,333	2,402	40,975	50.7
2015	44,552	848	829	595	38,553	1,243	2,484	42,280	50.9
2016	45,200	892	857	596	38,774	1,803	2,277	42,854	50.6
2017	45,318	933	871	595	38,024	2,196	2,699	42,919	52.7
2018	46,729	977	933	595	39,145	2,304	2,775	44,224	48.9
2019	47,385	1,017	972	595	39,187	2,910	2,704	44,801	51.3
2020	47,476	1,050	1,016	596	39,230	2,887	2,697	44,814	52.9
2021	47,786	1,100	1,027	595	39,451	3,302	2,311	45,064	53.1
2022	48,842	1,120	986	595	40,512	3,673	1,956	46,141	52.8
2023	46,805	1,168	996	595	40,832	1,392	1,821	44,046	49.0
FORECAST:									
2024	46,240	1,223	1,004	595	40,063	1,119	2,237	43,418	55.1
2025	46,392	1,259	1,018	596	40,658	904	1,956	43,519	54.4
2026	46,503	1,297	1,028	595	40,489	904	2,190	43,584	54.5
2027	46,743	1,337	1,036	595	40,777	900	2,098	43,775	54.5
2028	47,519	1,376	1,044	595	41,336	889	2,279	44,504	57.0
2029	48,183	1,413	1,053	596	42,057	887	2,177	45,121	56.5
2030	49,081	1,447	1,062	595	42,832	887	2,258	45,977	56.7
2031	48,970	1,481	1,070	595	43,493	70	2,260	45,824	55.8
2032	49,789	1,515	1,077	595	43,995	71	2,536	46,602	55.4
2033	50,322	1,547	1,085	596	44,815	70	2,209	47,094	54.6

* Load Factors for historical years are calculated using the actual and projected annual peak.

DUKE ENERGY FLORIDA

SCHEDULE 3.3.2

HISTORY AND FORECAST OF ANNUAL NET ENERGY FOR LOAD (GWh)

HIGH CASE FORECAST

(1)	(2)	(3)	(4)	(OTH)	(5)	(6)	(7)	(8)	(9)
		RESIDENTIAL	COMM. / IND.	OTHER			UTILITY USE	NET ENERGY	LOAD
YEAR	TOTAL	CONSERVATION	CONSERVATION	ENERGY	RETAIL	WHOLESALE	& LOSSES	FOR LOAD	FACTOR
				REDUCTIONS					(%) *
HISTORY:									
2014	43,443	812	791	864	37,240	1,333	2,402	40,975	50.7
2015	44,552	848	829	595	38,553	1,243	2,484	42,280	50.9
2016	45,200	892	857	596	38,774	1,803	2,277	42,854	50.6
2017	45,318	933	871	595	38,024	2,196	2,699	42,919	52.7
2018	46,729	977	933	595	39,145	2,304	2,775	44,224	48.9
2019	47,385	1,017	972	595	39,187	2,910	2,704	44,801	51.3
2020	47,476	1,050	1,016	596	39,230	2,887	2,697	44,814	52.9
2021	47,786	1,100	1,027	595	39,451	3,302	2,311	45,064	53.1
2022	48,842	1,120	986	595	40,512	3,673	1,956	46,141	52.8
2023	46,805	1,168	996	595	40,832	1,392	1,821	44,046	49.0
FORECAST:									
2024	50,309	1,223	1,004	595	43,570	1,119	2,799	47,488	50.8
2025	50,724	1,259	1,018	595	44,363	904	2,584	47,852	49.6
2026	50,998	1,297	1,028	596	44,398	904	2,775	48,077	49.4
2027	51,392	1,337	1,036	595	44,794	900	2,731	48,425	49.5
2028	52,263	1,376	1,044	595	45,465	889	2,894	49,248	52.4
2029	52,876	1,413	1,053	596	46,104	887	2,823	49,814	52.3
2030	53,776	1,447	1,062	595	46,883	887	2,902	50,671	52.5
2031	53,719	1,481	1,070	595	47,580	70	2,922	50,572	52.1
2032	54,562	1,515	1,077	595	48,168	71	3,136	51,375	52.3
2033	55,139	1,547	1,085	596	48,936	70	2,905	51,911	52.3

* Load Factors for historical years are calculated using the actual and projected annual peak.

DUKE ENERGY FLORIDA

SCHEDULE 3.3.3

HISTORY AND FORECAST OF ANNUAL NET ENERGY FOR LOAD (GWh)

LOW CASE FORECAST

(1)	(2)	(3)	(4)	(OTH)	(5)	(6)	(7)	(8)	(9)
YEAR	TOTAL	RESIDENTIAL CONSERVATION	COMM. / IND. CONSERVATION	OTHER ENERGY REDUCTIONS	RETAIL	WHOLESALE	UTILITY USE & LOSSES	NET ENERGY FOR LOAD	LOAD FACTOR (%) *
HISTORY:									
2014	43,443	812	791	864	37,240	1,333	2,402	40,975	50.7
2015	44,552	848	829	595	38,553	1,243	2,484	42,280	50.9
2016	45,200	892	857	596	38,774	1,803	2,277	42,854	50.6
2017	45,318	933	871	595	38,024	2,196	2,699	42,919	52.7
2018	46,729	977	933	595	39,145	2,304	2,775	44,224	48.9
2019	47,385	1,017	972	595	39,187	2,910	2,704	44,801	51.3
2020	47,476	1,050	1,016	596	39,230	2,887	2,697	44,814	52.9
2021	47,786	1,100	1,027	595	39,451	3,302	2,311	45,064	53.1
2022	48,842	1,120	986	595	40,512	3,673	1,956	46,141	52.8
2023	46,805	1,168	996	595	40,832	1,392	1,821	44,046	49.0
FORECAST:									
2024	42,916	1,223	1,004	595	37,216	1,119	1,760	40,094	53.5
2025	42,904	1,259	1,018	596	37,615	904	1,512	40,031	54.4
2026	43,227	1,297	1,028	595	37,715	904	1,688	40,308	54.9
2027	43,629	1,337	1,036	595	38,122	900	1,640	40,662	55.2
2028	44,398	1,376	1,044	595	38,712	889	1,782	41,383	55.4
2029	44,918	1,413	1,053	596	39,268	887	1,701	41,856	54.8
2030	45,668	1,447	1,062	595	39,914	887	1,762	42,564	55.1
2031	45,441	1,481	1,070	595	40,454	70	1,770	42,294	52.0
2032	46,116	1,515	1,077	595	40,898	71	1,961	42,929	51.7
2033	46,544	1,547	1,085	596	41,515	70	1,732	43,317	52.9

* Load Factors for historical years are calculated using the actual and projected annual peak.

DUKE ENERGY FLORIDA

SCHEDULE 4.1

PREVIOUS YEAR ACTUAL AND TWO-YEAR FORECAST OF PEAK DEMAND
AND NET ENERGY FOR LOAD BY MONTH
BASE CASE FORECAST

(1)	(2)	(3)	(4)	(5)	(6)	(7)
	ACTUAL		FORECAST		FORECAST	
	2023		2024		2025	
MONTH	PEAK DEMAND MW	NEL GWh	PEAK DEMAND MW	NEL GWh	PEAK DEMAND MW	NEL GWh
JANUARY	7,840	3,128	10,109	3,205	10,360	3,239
FEBRUARY	6,657	2,797	7,984	2,772	8,190	2,784
MARCH	7,608	3,320	7,559	3,170	7,694	3,180
APRIL	7,845	3,457	7,963	3,342	7,685	3,360
MAY	8,354	3,781	8,773	3,832	8,532	3,863
JUNE	9,322	4,188	9,099	4,171	8,769	4,138
JULY	9,725	4,767	9,758	4,345	9,448	4,304
AUGUST	10,268	4,978	9,851	4,453	9,696	4,469
SEPTEMBER	9,281	4,152	8,897	3,988	8,685	4,013
OCTOBER	7,859	3,455	8,492	3,715	8,277	3,723
NOVEMBER	6,799	3,010	6,905	3,111	6,735	3,136
<u>DECEMBER</u>	5,936	<u>3,014</u>	7,965	<u>3,314</u>	8,210	<u>3,310</u>
TOTAL		44,046		43,418		43,519

NOTE: Recorded Net Peak demands and NEL include off-system wholesale contracts.
December 2022 is the 2023 winter peak 8110 MW.

DUKE ENERGY FLORIDA

SCHEDULE 4.2

PREVIOUS YEAR ACTUAL AND TWO-YEAR FORECAST OF PEAK DEMAND
AND NET ENERGY FOR LOAD BY MONTH
HIGH CASE FORECAST

(1)	(2)	(3)	(4)	(5)	(6)	(7)
	ACTUAL		FORECAST		FORECAST	
	2023		2024		2025	
MONTH	PEAK DEMAND MW	NEL GWh	PEAK DEMAND MW	NEL GWh	PEAK DEMAND MW	NEL GWh
JANUARY	7,840	3,128	11,904	3,648	12,253	3,713
FEBRUARY	6,657	2,797	9,231	3,210	9,507	3,250
MARCH	7,608	3,320	8,617	3,668	8,806	3,702
APRIL	7,845	3,457	8,545	3,668	8,369	3,707
MAY	8,354	3,781	9,276	4,055	9,078	4,107
JUNE	9,322	4,188	9,625	4,394	9,338	4,382
JULY	9,725	4,767	10,277	4,544	10,014	4,524
AUGUST	10,268	4,978	10,349	4,643	10,235	4,678
SEPTEMBER	9,281	4,152	9,356	4,171	9,180	4,213
OCTOBER	7,859	3,455	9,141	4,049	8,962	4,076
NOVEMBER	6,799	3,010	7,664	3,517	7,569	3,560
<u>DECEMBER</u>	5,936	<u>3,014</u>	9,795	<u>3,921</u>	10,090	<u>3,939</u>
TOTAL		44,046		47,488		47,852

NOTE: Recorded Net Peak demands and NEL include off-system wholesale contracts.
December 2022 is the 2023 winter peak 8110 MW.

SCHEDULE 4.3
PREVIOUS YEAR ACTUAL AND TWO-YEAR FORECAST OF PEAK DEMAND
AND NET ENERGY FOR LOAD BY MONTH
LOW CASE FORECAST

(1)	(2)	(3)	(4)	(5)	(6)	(7)
	ACTUAL		FORECAST		FORECAST	
	-----		-----		-----	
	2023		2024		2025	
	-----		-----		-----	
MONTH	PEAK DEMAND MW	NEL GWh	PEAK DEMAND MW	NEL GWh	PEAK DEMAND MW	NEL GWh
-----	-----	-----	-----	-----	-----	-----
JANUARY	7,840	3,128	7,933	2,860	8,066	2,852
FEBRUARY	6,657	2,797	6,902	2,390	7,046	2,374
MARCH	7,608	3,320	6,761	2,809	6,836	2,790
APRIL	7,845	3,457	7,558	3,119	7,239	3,114
MAY	8,354	3,781	8,402	3,673	8,120	3,684
JUNE	9,322	4,188	8,659	3,977	8,315	3,928
JULY	9,725	4,767	9,307	4,162	8,976	4,111
AUGUST	10,268	4,978	9,398	4,265	9,233	4,277
SEPTEMBER	9,281	4,152	8,469	3,799	8,255	3,824
OCTOBER	7,859	3,455	7,973	3,451	7,761	3,461
NOVEMBER	6,799	3,010	6,321	2,776	6,128	2,802
<u>DECEMBER</u>	5,936	<u>3,014</u>	6,423	<u>2,816</u>	6,706	<u>2,812</u>
TOTAL		44,046		40,094		40,031

NOTE: Recorded Net Peak demands and NEL include off-system wholesale contracts.
December 2022 is the 2023 winter peak 8110 MW.

FUEL REQUIREMENTS AND ENERGY SOURCES

DEF's two-year actual and ten-year projected nuclear, coal, oil, and gas requirements (by fuel unit) are shown in Schedule 5. DEF's two-year actual and ten-year projected energy sources by fuel type are presented in Schedules 6.1 and 6.2, in GWh and percent (%) respectively. Although DEF's fuel mix continues to rely on an increasing amount of natural gas to meet its generation needs, DEF continues to maintain alternate fuel supplies including long term operation of some coal fired facilities, adequate supplies of oil for dual fuel back up and increasing amounts of renewable generation particularly from solar generation. Projections shown in Schedules 5 and 6 reflect the Base Load and Energy Forecasts.

DUKE ENERGY FLORIDA

SCHEDULE 5
FUEL REQUIREMENTS

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
-ACTUAL-															
		<u>FUEL REQUIREMENTS</u>	<u>UNITS</u>	<u>2022</u>	<u>2023</u>	<u>2024</u>	<u>2025</u>	<u>2026</u>	<u>2027</u>	<u>2028</u>	<u>2029</u>	<u>2030</u>	<u>2031</u>	<u>2032</u>	<u>2033</u>
(1)	NUCLEAR		TRILLION BTU	0	0	0	0	0	0	0	0	0	0	0	0
(2)	COAL		1,000 TON	2,117	1,825	1,045	927	815	768	702	695	789	814	768	927
(3)	RESIDUAL	TOTAL	1,000 BBL	0	0	0	0	0	0	0	0	0	0	0	0
(4)		STEAM	1,000 BBL	0	0	0	0	0	0	0	0	0	0	0	0
(5)		CC	1,000 BBL	0	0	0	0	0	0	0	0	0	0	0	0
(6)		CT	1,000 BBL	0	0	0	0	0	0	0	0	0	0	0	0
(7)		DIESEL	1,000 BBL	0	0	0	0	0	0	0	0	0	0	0	0
(8)	DISTILLATE	TOTAL	1,000 BBL	312	124	26	19	16	27	47	36	29	33	36	37
(9)		STEAM	1,000 BBL	48	54	11	9	12	14	10	12	13	9	11	14
(10)		CC	1,000 BBL	123	0	0	0	0	0	0	0	0	0	0	0
(11)		CT	1,000 BBL	141	70	15	10	4	14	37	24	16	24	24	24
(12)		DIESEL	1,000 BBL	0	0	0	0	0	0	0	0	0	0	0	0
(13)	NATURAL GAS	TOTAL	1,000 MCF	271,484	265,288	252,983	255,245	253,111	248,403	247,856	244,586	238,530	229,462	228,043	223,608
(14)		STEAM	1,000 MCF	25,066	21,181	15,119	13,755	10,865	8,764	11,038	13,379	10,949	11,540	12,064	11,894
(15)		CC	1,000 MCF	238,711	234,659	233,195	236,804	237,822	234,218	231,497	225,655	222,892	211,949	209,562	204,652
(16)		CT	1,000 MCF	7,708	9,448	4,670	4,686	4,425	5,421	5,321	5,552	4,689	5,973	6,418	7,062
OTHER (SPECIFY)															
(17)	OTHER, DISTILLATE	ANNUAL FIRM INTERCHANGE	1,000 BBL	N/A	N/A	0	0	0	0	0	0	0	0	0	0
(18)	OTHER, NATURAL GAS	ANNUAL FIRM INTERCHANGE, CC	1,000 MCF	N/A	N/A	0	0	0	0	0	0	0	0	0	0
(18.1)	OTHER, NATURAL GAS	ANNUAL FIRM INTERCHANGE, CT	1,000 MCF	N/A	N/A	2,420	2,650	1,639	601	0	0	0	0	0	0
(19)	OTHER, COAL	ANNUAL FIRM INTERCHANGE, STEAM	1,000 TON	N/A	N/A	0	0	0	0	0	0	0	0	0	0

DUKE ENERGY FLORIDA

SCHEDULE 6.1
ENERGY SOURCES (GWh)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
				-ACTUAL-											
	<u>ENERGY SOURCES</u>		<u>UNITS</u>	<u>2022</u>	<u>2023</u>	<u>2024</u>	<u>2025</u>	<u>2026</u>	<u>2027</u>	<u>2028</u>	<u>2029</u>	<u>2030</u>	<u>2031</u>	<u>2032</u>	<u>2033</u>
(1)	ANNUAL FIRM INTERCHANGE 1/		GWh	1,203	60	237	260	161	60	18	3	6	15	7	2
(2)	NUCLEAR		GWh	0	0	0	0	0	0	0	0	0	0	0	0
(3)	COAL		GWh	4,375	3,829	2,157	1,920	1,639	1,539	1,370	1,395	1,569	1,617	1,519	1,873
(4)	RESIDUAL	TOTAL	GWh	0	0	0	0	0	0	0	0	0	0	0	0
(5)		STEAM	GWh	0	0	0	0	0	0	0	0	0	0	0	0
(6)		CC	GWh	0	0	0	0	0	0	0	0	0	0	0	0
(7)		CT	GWh	0	0	0	0	0	0	0	0	0	0	0	0
(8)		DIESEL	GWh	0	0	0	0	0	0	0	0	0	0	0	0
(9)	DISTILLATE	TOTAL	GWh	146	29	7	5	2	6	17	11	7	10	11	10
(10)		STEAM	GWh	0	0	0	0	0	0	0	0	0	0	0	0
(11)		CC	GWh	91	0	0	0	0	0	0	0	0	0	0	0
(12)		CT	GWh	55	29	7	5	2	6	17	11	7	10	11	10
(13)		DIESEL	GWh	0	0	0	0	0	0	0	0	0	0	0	0
(14)	NATURAL GAS	TOTAL	GWh	36,423	35,526	36,389	37,056	37,034	36,479	36,197	35,521	34,714	33,083	32,668	31,801
(15)		STEAM	GWh	2,249	1,737	1,337	1,205	948	749	942	1,137	916	992	1,032	1,004
(16)		CC	GWh	33,607	32,996	34,577	35,374	35,631	35,193	34,722	33,831	33,331	31,509	31,014	30,123
(17)		CT	GWh	567	792	475	477	456	537	533	553	467	582	622	674
(18)	OTHER 2/														
	QF PURCHASES		GWh	1,769	1,814	818	493	0	0	0	0	0	0	0	0
	RENEWABLES OTHER		GWh	0	0	0	0	0	0	0	0	0	0	0	0
	RENEWABLES MSW		GWh	645	624	556	71	73	73	73	73	72	73	73	71
	RENEWABLES BIOMASS		GWh	0	0	0	0	0	0	0	0	0	0	0	0
	RENEWABLES SOLAR		GWh	1,581	2,165	3,255	3,714	4,674	5,630	6,852	8,161	9,670	11,097	12,401	13,415
	BATTERIES		GWh	0	0	0	0	0	-11	-22	-43	-61	-72	-76	-78
	IMPORT FROM OUT OF STATE		GWh	0	0	0	0	0	0	0	0	0	0	0	0
	EXPORT TO OUT OF STATE		GWh	0	0	0	0	0	0	0	0	0	0	0	0
(19)	NET ENERGY FOR LOAD		GWh	46,141	44,046	43,418	43,519	43,584	43,775	44,504	45,121	45,977	45,824	46,602	47,094

1/ NET ENERGY PURCHASED (+) OR SOLD (-) WITHIN THE FRCC REGION.

2/ NET ENERGY PURCHASED (+) OR SOLD (-).

DUKE ENERGY FLORIDA

SCHEDULE 6.2

ENERGY SOURCES (PERCENT)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
-ACTUAL-															
	ENERGY SOURCES		UNITS	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
(1)	ANNUAL FIRM INTERCHANGE 1/		%	2.6%	0.1%	0.5%	0.6%	0.4%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
(2)	NUCLEAR		%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
(3)	COAL		%	9.5%	8.7%	5.0%	4.4%	3.8%	3.5%	3.1%	3.1%	3.4%	3.5%	3.3%	4.0%
(4)	RESIDUAL	TOTAL	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
(5)		STEAM	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
(6)		CC	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
(7)		CT	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
(8)		DIESEL	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
(9)	DISTILLATE	TOTAL	%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
(10)		STEAM	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
(11)		CC	%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
(12)		CT	%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
(13)		DIESEL	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
(14)	NATURAL GAS	TOTAL	%	78.9%	80.7%	83.8%	85.1%	85.0%	83.3%	81.3%	78.7%	75.5%	72.2%	70.1%	67.5%
(15)		STEAM	%	4.9%	3.9%	3.1%	2.8%	2.2%	1.7%	2.1%	2.5%	2.0%	2.2%	2.2%	2.1%
(16)		CC	%	72.8%	74.9%	79.6%	81.3%	81.8%	80.4%	78.0%	75.0%	72.5%	68.8%	66.6%	64.0%
(17)		CT	%	1.2%	1.8%	1.1%	1.1%	1.0%	1.2%	1.2%	1.2%	1.0%	1.3%	1.3%	1.4%
(18)	OTHER 2/														
	QF PURCHASES		%	3.8%	4.1%	1.9%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	RENEWABLES OTHER		%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	RENEWABLES MSW		%	1.4%	1.4%	1.3%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
	RENEWABLES BIOMASS		%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	RENEWABLES SOLAR		%	3.4%	4.9%	7.5%	8.5%	10.7%	12.9%	15.4%	18.1%	21.0%	24.2%	26.6%	28.5%
	BATTERIES		%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%	-0.1%	-0.2%	-0.2%	-0.2%
	IMPORT FROM OUT OF STATE		%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	EXPORT TO OUT OF STATE		%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
(19)	NET ENERGY FOR LOAD		%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

1/ NET ENERGY PURCHASED (+) OR SOLD (-) WITHIN THE FRCC REGION.

2/ NET ENERGY PURCHASED (+) OR SOLD (-).

FORECASTING METHODS AND PROCEDURES

INTRODUCTION

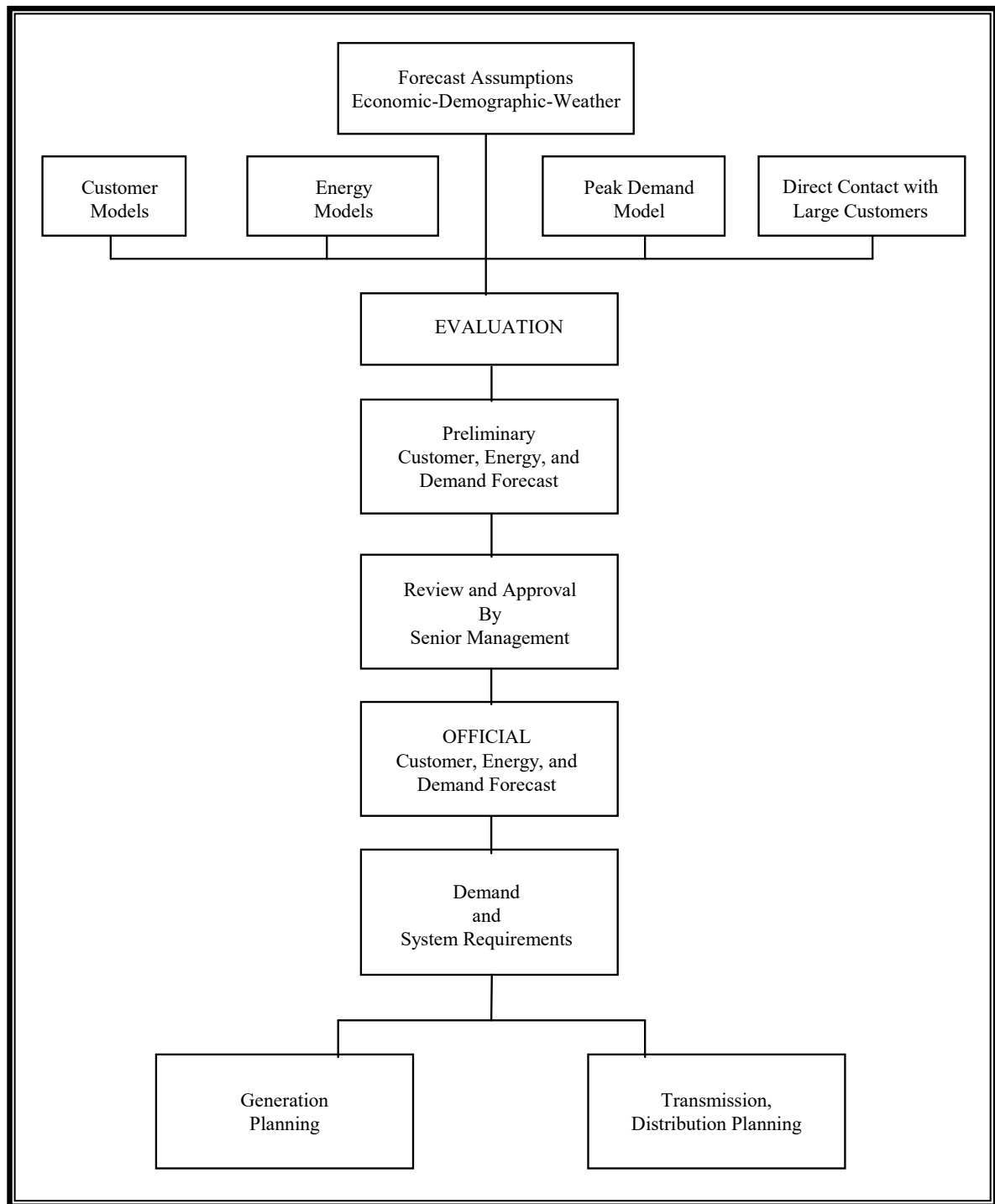
Accurate forecasts of long-range electric energy consumption, customer growth, and peak demand are essential elements in electric utility planning. Accurate projections of a utility's future load growth require a forecasting methodology with the ability to account for a variety of factors influencing electric consumption over the planning horizon. DEF's forecasting framework utilizes a set of econometric models as well as the Itron statistically adjusted end-use (SAE) approach to achieve this end. This section will describe the underlying methodology of the customer, energy, and peak demand forecasts including the principal assumptions incorporated within each. Also included is a description of how DSM impacts the forecast and a review of DEF's DSM programs.

Figure 2.1, entitled "Customer, Energy and Demand Forecast," gives a general description of DEF's forecasting process. Highlighted in the diagram is a disaggregated modeling approach that blends the impacts of average class usage, as well as customer growth, based on a specific set of assumptions for each class. Also accounted for is some direct contact with large customers. These inputs provide the tools needed to frame the most likely scenario of the Company's future demand.

FORECAST ASSUMPTIONS

The first step in any forecasting effort is the development of assumptions upon which the forecast is based. A collaborative internal Company effort develops these assumptions including the research efforts of several external sources. These assumptions specify major factors that influence the level of customers, energy sales, or peak demand over the forecast horizon. The following set of assumptions forms the basis for the forecast presented in this document.

FIGURE 2.1
Customer, Energy, and Demand Forecast



GENERAL ASSUMPTIONS

1. Normal weather conditions for energy sales are assumed over the forecast horizon using a sales-weighted 30-year average of conditions at the St. Petersburg, Orlando, and Tallahassee weather stations. For billed kilowatt-hour (kWh) sales projections, the normal weather calculation begins with a historical 30-year average of calendar and billing cycle weighted monthly heating and cooling degree-days (HDD and CDD). The expected consumption period read dates for each projected billing cycle determines the exact historical dates for developing the 30-year average weather condition each month. Each class displays different weather-sensitive base temperatures from which degree day (DD) values begin to accumulate. Seasonal and monthly peak demand projections are based on a 30-year historical average of system-weighted degree days using the “Itron Rank-Sort Normal” approach which takes annual weather extremes into account as well as the date and hour of occurrence.
2. The DEF customer forecast is based upon Moody’s historical and forecasted population estimates of the 29 counties served by DEF. National and Florida economic projections produced by Moody’s Analytics in their July 2023 forecast, along with Energy Information Administration (EIA) 2023 surveys of residential appliance saturation and average appliance efficiency levels provided the basis for development of the DEF energy forecast.
3. Within the DEF service area, the phosphate mining industry is the dominant sector in the industrial sales class. Two major customers accounted for approximately 39% of the industrial class MWh sales in 2023. These energy-intensive “crop nutrient” producers mine and process phosphate-based fertilizer products for the global marketplace. The supply and demand (price) for their products are dictated by global conditions that include, but are not limited to, foreign competition, national/international agricultural industry conditions, exchange-rate fluctuations, international trade pacts and U.S. environmental regulations. The market price of the raw mined commodity often dictates production levels. Load and energy consumption at the DEF-served mining or chemical processing sites depend heavily on plant operations, which are heavily influenced by these global as well as the local conditions, including environmental regulations. Going forward, global currency fluctuations and global stockpiles of farm commodities will determine the demand for fertilizers. Any increase in self-service generation will act to reduce energy

requirements from DEF. An upside risk to this projection lies in the price of energy, especially low natural gas price, which is a major cost in mining and producing phosphoric fertilizers. DEF has begun to assume a decline in Phosphate sector energy consumption late in the planning horizon as mining product becomes scarce in the areas currently mined.

4. DEF has supplied capacity and energy service to wholesale customers on a “full” and “partial” requirement basis for many years. Many Sales for Resale Customers have moved to other suppliers for their needs or have begun to self-generate. What remains are Partial Requirements (PR) contracted loads with the Reedy Creek Improvement District (RCID) and Seminole Electric Cooperative, Inc. (SECI). The forecast reflects the current contractual obligations based on the nature of the stratified load being requested, plus their ability to receive dispatched energy from power marketers any time it is more economical for them to do so. All contracts are projected to expire in the specific year designated in the respective contracts.
5. This forecast assumes that DEF will successfully renew all future franchise agreements.
6. This forecast incorporates demand and energy reductions expected to be realized through currently FPSC approved DSM goals as stated in Docket No. 20190018-EG.
7. This forecast reflects impacts from both Plug-in Hybrid Electric Vehicle (PHEV) and behind the meter customer-owned renewable generation which is mostly solar photovoltaic (PV) installations on energy and peak demand. PHEV customer penetration levels, which are expected to be a small share of the total DEF service area vehicle stock over the planning horizon, incorporates an EPRI Model view that includes gasoline price expectations. DEF customer PV penetration levels are expected to continue to grow over the planning horizon and the forecast incorporates a view on equipment and electric price impacts on customer use.
8. Expected energy and demand reductions from customer-owned self-service cogeneration facilities are also included in this forecast. DEF will supply the supplemental load of self-service

cogeneration customers. While DEF offers “standby” service to all cogeneration customers, the forecast does not assume an unplanned need for power at time of peak.

This forecast assumes that the regulatory environment and the obligation to serve our retail customers will continue throughout the forecast horizon. Regarding wholesale customers, the forecast does not plan for generation resources unless a long-term contract is in place.

ECONOMIC ASSUMPTIONS

The economic outlook for this forecast was developed in the summer of 2023. As mentioned in the overview, in mid-2023 the U.S. continued to experience strong job growth, rising wages, and low unemployment. Inflation was receding in response to the Federal Reserve’s rate increases. The funds rate was considered sufficient to slow the economy’s growth and succeed in bringing inflation back to the Fed’s target by the fall of 2024. It is with this background that the DEF Customer, Energy and Peak Demand forecast was developed and the environment in which the Moody’s Analytics July 2023 U.S. forecast and Florida forecast was applied. Major assumptions are as follows:

- In Moody’s July 2023 outlook, an additional 25-basis point rate hike to the federal funds rate was incorporated at the July FOMC meeting. This brought the policy rate’s range to 5.25% to 5.5%. The first-rate cut was also pushed back from March to June 2024. The assumption was that the reduction in the Federal Reserve’s balance sheet would remain on autopilot.
- Recent U.S. bank failures were disconcerting to watch, but they were not symptomatic of a serious broader problem in the financial system. Policymakers’ aggressive response ensured the failures did not weaken the system or more than modestly undermine already-weak economic growth.
- Moody’s did not make any adjustments in light of the Supreme Court striking down President Biden’s student loan forgiveness plan. Moreover, the implications of the ruling for near-term growth were minimal. If the Supreme Court had upheld it, debt cancellation would have only boosted the level of real personal consumption expenditures by 0.1%.

- The ten-year U.S. Treasury peaked in the second quarter of 2024 just shy of 4%, as in the prior baseline.
- Moody’s expected strong oil demand growth—headlined by emerging economies and namely China—coupled with OPEC production cuts pushed up oil prices in the second half of the year.
- A full-employment economy is one with an unemployment rate around 3.5%, a 62.5% labor force participation rate, and a prime-age employment-to-population ratio in the range of 80%. The economy was at that level then.

Throughout the ten-year forecast horizon, risks and uncertainties are always recognized and handled on a “highest probability of outcome” basis. General rules of economic theory, namely supply and demand equilibrium, are maintained in the long run. This notion is applied to energy/commodity prices, currency levels, the housing market, wage rates, birth rates, inflation and interest rates. Uncertainty surrounding specific weather anomalies (hurricanes or earthquakes), international crises such as wars or terrorist acts, or future pandemic events, are not explicitly designed into this projection. Thus, any situations of this variety will result in a deviation from this forecast.

FORECAST METHODOLOGY

The DEF forecast of customers, energy sales, and peak demand applies both an econometric and end-use methodology. The residential and commercial energy projections incorporate Itron’s SAE approach while other classes use customer-class specific econometric models. These models are expressly designed to capture class-specific variation over time. Peak demand models are projected on a disaggregated basis as well. This allows for appropriate handling of individual assumptions in the areas of wholesale contracts, demand response, interruptible service, and changes in self-service generation capacity.

ENERGY AND CUSTOMER FORECAST

In the retail jurisdiction, customer class models have been specified showing a historical relationship to weather and economic/demographic indicators using monthly data for sales models and customer models. Sales are regressed against "driver" variables that best explain monthly fluctuations over the historical sample period. Forecasts of these input variables are either derived internally or come from a review of the latest projections made by several independent forecasting concerns. Internal company forecasts are used for projections of electricity price, weather conditions, the length of the billing month and rates of customer owned renewable and electric vehicle adoption. The external sources of data include Moody's Analytics forecasts of changes in population, demographics and economic conditions. The incorporation of residential and commercial "end-use" energy has been modeled as well. Surveys of residential appliance saturation and average efficiency performed by the company's Market Research department and the EIA, along with trended projections of both by Itron capture a significant piece of the changing future environment for electric energy consumption. Specific sectors are modeled as follows:

Residential Sector

Residential kWh usage per customer is modeled using the SAE framework. This approach explicitly introduces trends in appliance saturation and efficiency, dwelling size and thermal efficiency. It allows for an explanation of usage levels and changes in weather-sensitivity over time. The "bundling" of 19 residential appliances into "heating", "cooling" and "other" end uses form the basis of equipment-oriented drivers that interact with typical exogenous factors such as real median household income, average household size, cooling degree-days, heating degree-days, the real price of electricity to the residential class and the average number of billing days in each sales month. This structure captures significant variation in residential usage caused by changing appliance efficiency and saturation levels, economic cycles, weather fluctuations, electric price, and sales month duration. Projections of kWh usage per customer combined with the customer forecast provide the forecast of total residential energy sales. The residential customer forecast is developed by correlating monthly residential customers with county level population projections, provided by Moody's, for counties in which DEF serves residential customers.

Commercial Sector

Commercial MWh energy sales are forecast based on commercial sector (non-agricultural, non-manufacturing and non-governmental) employment, the real price of electricity to the commercial class, the average number of billing days in each sales month, and the heating and cooling degree-day values. As in the residential sector, these variables interact with the commercial end-use equipment (listed below) after trends in equipment efficiency and saturation rates have been projected.

- Heating
- Cooling
- Ventilation
- Water heating
- Cooking
- Refrigeration
- Outdoor Lighting
- Indoor Lighting
- Office Equipment (PCs)
- Miscellaneous

The SAE model contains indices that are based on end-use energy intensity projections developed from EIA's commercial end-use forecast database. Commercial energy intensity is measured in terms of end-use energy use per square foot. End-use energy intensity projections are based on end-use efficiency and saturation estimates that are in turn driven by assumptions in available technology and costs, energy prices, and economic conditions. Energy intensities are calculated from the EIA's Annual Energy Outlook (AEO) commercial database. End-use intensity projections are derived for eleven building types. The energy intensity (EI) is derived by dividing end-use electricity consumption projections by square footage:

$$EI_{bet} = Energy_{bet} / sqft_{bt}$$

Where:

$Energy_{bet}$ = energy consumption for building type b, end-use e, year t

$Sqft_{bt}$ = square footage for building type b in year t

Commercial customers are modeled using the projected level of residential customers.

Industrial Sector

Energy sales to this sector are separated into two sub-sectors. A large portion of industrial energy use is consumed by the phosphate mining industry. Because this one industry is such a large share of the total industrial class, it is separated and modeled apart from the rest of the class. The term "non-phosphate industrial" is used to refer to those customers who comprise the remaining portion of total industrial class sales. Both groups are impacted by changes in economic activity. However, adequately explaining sales levels requires separate explanatory variables. Non-phosphate industrial energy sales are modeled using Florida manufacturing employment, energy prices, and the average number of sales month billing days.

The industrial phosphate mining industry is modeled using customer-specific information with respect to anticipated market conditions. Since this sub-sector is comprised of only three customers, the forecast is dependent upon information received from direct customer contact. DEF Large Account Management employees provide specific phosphate customer information regarding customer production schedules, inventory levels, area mine-out and start-up predictions, and changes in self-service generation or energy supply situations over the forecast horizon. These Florida mining companies compete globally into a global market where farming conditions dictate the need for “crop nutrients”.

The projection of industrial accounts was not expected to decline as rapidly as it has in the previous ten years. The pace of “off-shoring” manufacturing jobs was expected to decline from past levels. Both the Trump and Biden administrations have favored the rebuilding of the American manufacturing sector, with the Biden administration adding a focus on carbon reduction. Also, the rapid increase in Florida population may recalibrate Florida’s competitiveness in “location analysis” studies performed by industry when determining site selection for new operations.

Street Lighting

Electricity sales to the street and highway lighting class are projected to decrease over the forecast period due to increased energy efficiency. The number of accounts has increased due to rate changes from the Public Authority class. A simple time-trend was used to project energy consumption and customer growth in this class.

Public Authorities

Energy sales to public authorities (SPA), comprised of federal, state and local government operated services, are projected to increase within the DEF's service area. This is a result of a growing economy and population representing a larger tax base. The level of government services, and thus energy, can be tied to the population base, as well as the amount of tax revenue collected to pay for these services. Factors affecting population growth will affect the need for additional governmental services (i.e., public schools, city services, etc.) thereby increasing SPA energy consumption. Government employment has been determined to be the best indicator of the level of government services provided. This variable, along with cooling degree-days, energy prices and the sales month billing days, explains most of the variation over the historical sample period. Adjustments are also included in this model to account for the large change in school-related energy use throughout the year. The SPA customer forecast is projected linearly as a function of a time-trend. Recent budget issues have also had an impact on the near-term pace of growth.

Sales for Resale Sector

The Sales for Resale sector encompasses all firm sales to other electric power entities. This includes sales to other utilities (municipal or investor-owned) as well as power agencies (rural electric authority or municipal).

SECI is a wholesale, or Sales for Resale, customer of DEF that contracts for both seasonal and stratified loads over the forecast horizon. The municipal Sales for Resale class includes a number of customers, divergent not only in scope of service (i.e., full or partial requirement), but also in composition of ultimate consumers. Each customer is modeled separately in order to accurately reflect its individual profile. DEF serves partial requirement service (PR) to load serving customers such as Reedy Creek Improvement District. In each case, these customers contract with DEF for a specific level and type of stratified capacity (MW) needed to provide their particular electrical system with an appropriate level of reliability. The energy forecast for each contract is derived using information provided by the purchaser who better understands their needs. Electric energy growth and competitive market prices will dictate the amount of wholesale demand and energy throughout the forecast horizon.

PEAK DEMAND FORECAST

The forecast of peak demand also employs a disaggregated econometric methodology. For seasonal (winter and summer) peak demands, as well as each month of the year, DEF's coincident system peak is separated into five major components. These components consist of total retail load, interruptible and curtailable tariff non-firm load, conservation and demand response program capability, wholesale demand, and company use demand.

Total retail load refers to projections of DEF retail monthly net peak demand before any activation of DEF's General Load Reduction Plan. The historical values of this series are constructed to show the size of DEF's retail net peak demand assuming no utility activated load control had ever taken place. The value of constructing such a "clean" series enables the forecaster to observe and correlate the underlying trend in retail peak demand to retail customer levels and coincident weather conditions at the time of the peak and the amounts of Base-Heating-Cooling load estimated by the monthly Itron models without the impacts of year-to-year variation in utility-sponsored DR programs. Monthly peaks are projected using the Itron SAE generated use patterns for both weather sensitive (cooling & heating) appliances and base load appliances calculated by class in the energy models. Daily and hourly models of applying DEF class-of-business load research survey data lead to class and total retail hourly load profiles when a 30-year normal weather template replaces actual weather. The projections of retail peak are the result of a monthly model driven by the summation of class base, heating and cooling energy interpolated 30-year normal weather pattern-driven load profile. The projection for the months of January (winter) and August (summer) are typically when the seasonal peaks occur. Energy conservation and direct load control estimates consistent with DEF's DSM goals that have been established by the FPSC are applied to the MW forecast. Projections of dispatchable and cumulative non-dispatchable DSM impacts are subtracted from the projection of potential firm retail demand resulting in a projected series of firm retail monthly peak demand figures. The Interruptible and Curtailable service (IS and CS) tariff load projection is developed from historic monthly trends, as well as the incorporation of specific projected information obtained from DEF's large industrial accounts on these tariffs by account executives. Developing this piece of the demand forecast allows for appropriate firm retail demand results in the total retail coincident peak demand projection.

Sales for Resale demand projections represent load supplied by DEF to other electric suppliers such as SECI, RCID, and other electric transmission and distribution entities. For Partial Requirement demand projections, contracted MW levels dictate the level of seasonal demands.

DEF "company use" at the time of system peak is estimated using load research metering studies similar to potential firm retail. It is assumed to remain stable over the forecast horizon as it has historically.

Each of the peak demand components described above is a positive value except for the DSM program MW impacts and IS and CS load. These impacts represent a reduction in peak demand and are assigned a negative value. Total system firm peak demand is then calculated as the arithmetic sum of the five components.

HIGH AND LOW SCENARIOS

DEF has developed high and low scenarios around the base case energy sales and peak demand projections. Both scenarios incorporate historical variation in weather and economic conditions as well as service area population and household growth. Historical variation for economic driver variables selected in the base case energy sales models using the Moody's S1 & S3 (High/Low) scenarios. High and low weather variables were determined for the energy and peak weather variables (HDDs, CDDs, and monthly peak DDs) using actual 30-year weather conditions. Each weather variable used in the modeling process is ranked monthly from "high-to-low" degree days. The high (hottest or coldest) one-fourth of each variable is averaged and becomes a normal "High Case" weather condition. Similarly, the "mildest" one-fourth of each weather variable's 30 observations are averaged and become the normal "Low Case" weather condition. A review of twenty-year historical variation of DEF 29-county population growth based on Moody's high and low customer projections out ten years resulted in the final area of variability around the Load Forecast.

This procedure captures the most influential variables around energy sales and peak demand by estimating high and low cases for economics, demographics, and weather conditions. DEF has

evaluated the load projections generated through this process against projected loads based on extreme temperature events over the last 40 years and concluded that the range of load represented in these cases encompasses the probable outcome of such extreme weather recurrence.

DEMAND SIDE MANAGEMENT

Pursuant to the provisions of Florida Statutes Section 366.82 (the “FEECA Statute”), which requires the FPSC to adopt goals for the FEECA utilities to increase energy efficiency and increase the development of demand-side renewable energy systems and directs the FPSC to review those goals every five years, in 2019, the FPSC conducted its statutorily required review and determined that it was in the public interest to continue with the goals for the 2020-2024 time period established in the 2014 Goals setting proceeding and directed the utilities to file Program Plans designed to achieve these goals (Order No. PSC-2019-0509-FOF-EG). In February 2020, DEF submitted a Plan designed to achieve the 2020-2024 goals which was approved by the Commission (Order No. PSC-2020-0274-PAA-EG) in August of that year. The programs included in this Plan are subject to periodic monitoring and evaluation to ensure that all demand-side resources are acquired in a cost-effective manner and that the program savings are durable. Tables 2.1 and 2.2 reflect the annual Program achievements for the residential and commercial sector compared to the Commission established goals for the 2020-2024 time period.

RESIDENTIAL DEMAND SIDE MANAGEMENT PROGRAMS

TABLE 2.1
Residential DSM MW and GWH Savings

RESIDENTIAL									
YEAR	WINTER PEAK MW REDUCTION			SUMMER PEAK MW REDUCTION			GWH ENERGY REDUCTION		
	TOTAL	COMMISSION		TOTAL	COMMISSION		TOTAL	COMMISSION	
		APPROVED	%		APPROVED	%		APPROVED	%
	ACHIEVED	GOAL	VARIANCE	ACHIEVED	GOAL	VARIANCE	ACHIEVED	GOAL	VARIANCE
2020	31	32	-5%	18	16	13%	35	9	277%
2021	16	28	-42%	10	14	-26%	25	6	311%
2022	25	25	1%	16	12	30%	49	4	1205%
2023	30	22	36%	19	11	70%	50	2	2244%
2024		21			11			1	

The following provides a list of DEF's Residential DSM programs as of December 31, 2023, along with a brief overview of each program:

Home Energy Check – This is DEF's home energy audit program as required by Rule 25-17.003(3)(b), F.A.C. DEF offers a variety of options to customers for home energy audits including walk-through audits, phone assisted audits, and on-line audits. At the completion of the audit, DEF also provides kits that contain energy saving measures that may be easily installed by the customer.

Residential Incentive Program – This program provides incentives on a variety of cost-effective measures designed to provide energy savings. DEF expects to provide incentives to customers for the installation of approximately 75,000 energy saving measures over the 2020 to 2024 time period. These measures primarily include heating and cooling, duct repair, insulation, and energy efficient windows and home energy management systems. The measures and incentive levels included in this program have been updated to reflect the impacts of new codes and standards.

Neighborhood Energy Saver – This program is designed to provide energy saving education and assistance to low-income customers. This program targets neighborhoods that meet certain income eligibility requirements. DEF plans to install energy saving measures in approximately 5,250 homes annually over the 2020 to 2024 time period. Additionally, DEF increased its targeted homes by 5% or 250 homes above the annual projected homes for the calendar years 2022-2024. These measures will be installed at no cost to the customer and include air infiltration measures, water heating measures, lighting, insulation, duct repair, and heat pump and air conditioning tune-ups.

Low Income Weatherization Assistance Program – DEF partners with local agencies to provide funding for energy efficiency and weatherization measures to low-income customers through this program. DEF expects to provide assistance to approximately 500 customers annually through this program.

Residential Load Management a/k/a EnergyWise – This is a voluntary residential demand response program that provides monthly bill credits to customers who allow DEF to reduce peak demand by controlling service to selected electric equipment through various devices and communication options installed on the customer’s premises. These interruptions are at DEF’s option, during specified time periods, and coincident with hours of peak demand. Customers must have a minimum average monthly usage of 600 kWh to be eligible to participate in this program.

The Company is actively replacing 3G load control devices at customer premises and it remains on track for that work to be completed in 2025, as noted in the 2023 Ten-Year Site Plan. DEF will file its plan for incremental capability in the DSM goal setting docket this year and reflect the Commission approved increases in the 2025 Ten-Year Site Plan.

COMMERCIAL/INDUSTRIAL DEMAND SIDE MANAGEMENT PROGRAMS

TABLE 2.2

Commercial/Industrial DSM MW and GWH Savings

COMMERCIAL / INDUSTRIAL									
YEAR	WINTER PEAK MW REDUCTION			SUMMER PEAK MW REDUCTION			GWH ENERGY REDUCTION		
	TOTAL	COMMISSION		TOTAL	COMMISSION		TOTAL	COMMISSION	
		APPROVED	%		APPROVED	%		APPROVED	%
	ACHIEVED	GOAL	VARIANCE	ACHIEVED	GOAL	VARIANCE	ACHIEVED	GOAL	VARIANCE
2020	24	5	354%	46	8	460%	40	6	582%
2021	11	5	124%	24	7	248%	22	4	454%
2022	5	5	1%	5	6	-17%	3	2	25%
2023	30	5	510%	27	6	377%	10	1	654%
2024		5			5			1	

The following provides a list of DEF’s Commercial DSM programs as of December 31, 2023, along with a brief overview of each program:

Business Energy Check – This is a commercial energy audit program that provides commercial customers with an analysis of their energy usage and information about energy-saving practices specific to their business and operations and cost-effective measures that they can implement at their facilities.

Smart Saver Business f/k/a Better Business – This program provides incentives to commercial

customers on a variety of cost-effective energy efficiency measures. These measures are primarily comprised of measures that reduce cooling and heating load.

Smart Saver Custom Incentive f/k/a Florida Custom Incentive – The objective of this program is to encourage customers to make capital investments for the installation of energy efficiency measures which reduce energy and peak demand. This program provides incentives for customized energy efficiency projects and measures that are cost effective but are not otherwise included in DEF's prescriptive commercial programs.

Interruptible Service – This program is available to commercial customers with a minimum billing demand of 500 KW or more who are willing to have their power interrupted at times of capacity shortage during peak or emergency conditions. DEF has remote control access to the switch providing power to the customer's equipment. Customers participating in the Interruptible Service program receive a monthly interruptible demand credit based on their bills.

Curtable Service - This program is an indirect load control program that reduces DEF's energy demand at times of capacity shortage during peak or emergency conditions. The program is available to commercial customers with a minimum of 500KW or more who are willing to curtail their load.

Standby Generation - This program is a demand control program that reduces DEF's demand based upon the control of the customer's back-up generator. The program is a voluntary program available to all commercial and industrial customers who have on-site stand-by generation capacity of at least 50 KW and are willing to allow remote activation of their on-site generation capability in emergencies.

OTHER DSM PROGRAMS

The following provides an overview of other DSM programs:

Technology Development – This program is used to fund research, testing and development of

new energy efficiency and demand response technologies. This program provides the opportunity to investigate and test new technologies and determine their usefulness and feasibility in the support of energy efficiency and demand response programs.

Qualifying Facilities – This program analyzes, forecasts, facilitates, and administers the potential and actual power purchases from Qualifying Facilities (QFs) and the state jurisdictional QF or distributed generator interconnections. The program supports meetings with interested parties or potential QFs, including cogeneration and small power production facilities including renewables interested in providing renewable capacity or energy deliveries within our service territory. Project, interconnection, and avoided cost discussions with renewable and combined heat and power developers who are also exploring distributed generation options continue to remain steady. Most of the interest is coming from companies utilizing solar photovoltaic technology as the price of photovoltaic panels has decreased over time. The cost of this technology continues to decrease, and subsidies remain in place. As of December 31st, 2023, DEF had 69 active solar projects totaling approximately 5,100 MW in its FERC jurisdictional interconnection queue and 19 of those projects included DEF as the project developer. As the technologies advance and the market evolves, the Company's policies will continue to be refined and remain compliant.

CHAPTER 3

*FORECAST OF
FACILITIES REQUIREMENTS*



CHAPTER 3**FORECAST OF FACILITIES REQUIREMENTS****RESOURCE PLANNING FORECAST****OVERVIEW OF CURRENT FORECAST*****Supply-Side Resources***

As of December 31, 2023, DEF had a summer total firm capacity resource of 11,750 MW (see Table 3.1). This capacity resource includes fossil steam generators (2,423 MW), combined cycle plants (5,247 MW), combustion turbines (1,972 MW), solar power plants (648 MW), independent power purchases (1,163 MW), and non-utility purchased power (297 MW). Table 3.2 presents DEF's firm capacity contracts with renewable and cogeneration Facilities.

Demand-Side Programs

In August 2020, the FPSC approved demand-side management programs designed to meet the DSM goals established by the Commission in Order PSC-2019-0509-FOF-EG. Total DSM resources are presented in Schedules 3.1 and 3.2 of Chapter 2. These programs include Non-Dispatchable DSM, Interruptible Load, and Dispatchable Load Control resources.

Capacity and Demand Forecast

DEF's forecasts of capacity and demand for the projected summer and winter peaks can be found in Schedules 7.1 and 7.2, respectively. Demand forecasts shown in these schedules are based on Schedules 3.1.1 and 3.2.1, the base summer and winter forecasts. DEF's forecasts of capacity and demand are based on serving expected growth in retail requirements in its regulated service area and meeting commitments to wholesale power customers who have entered into supply contracts with DEF. In its planning process, DEF balances its supply plan for the needs of retail and wholesale customers and endeavors to ensure that cost-effective resources are available to meet the needs across the customer base.

Base Expansion Plan

DEF's planned supply resource additions and changes are shown in Schedule 8 and are referred to as DEF's Base Expansion Plan. This plan includes a net addition of over 4,700 MW of solar PV generation with an expected equivalent summer firm capacity contribution of approximately 880 MW, 90 MW of firm storage added in 2027 and 430 MW of combustion turbine firm capacity added in years 2032 and 2033. The incorporation of the full firm capacity of the Osprey Energy Center takes place at the end of 2025. Between 2022 and 2027, DEF will add close to 400 MW of combined cycle capacity that results from projects focusing on increasing the fuel efficiency of the combined cycle generating units. DEF continues to consider market supply-side resource alternatives to enhance DEF's resource plan.

DEF recognizes that as solar penetration increases, including both DEF and customer owned PV, the relationship between the solar production and the coincident load peak will change. In this plan, DEF has assigned this DEF owned solar PV generation an equivalent summer capacity value equal to 57% of the nameplate capacity of the planned installations from 2021 to 2024. DEF modeling derives an equivalent summer non-coincident, but on-peak-hour capacity value equal to 25% of the facility's nameplate rating for planned PV installations from 2025 to 2027 and 10% for 2028 and beyond. An annual performance degradation factor of 0.5% has been assigned to the PV installations. DEF will continue to evaluate these assignments over time and may revise these values in future Site Plans based on changes in project designs and the data received from actual operation of these facilities once they are installed. In addition, DEF recognizes that higher penetration of PV resources on the system will result in a need for additional balancing of generation intermittency. The declining capacity value for PV installations late in this decade and beyond could be improved substantially if battery technology advances support economic pairing of PV with energy storage, which could also help to address the need for balancing generation intermittency. DEF's strategy of steady and carefully paced additions of PV to the system will allow continued evaluation of these impacts and the need for additional resources in the future to meet these needs.

In their ongoing efforts to regulate greenhouse gas emissions, on June 19, 2019 the Environmental Protection Agency (EPA) issued the Affordable Clean Energy (ACE) Rule to replace the 2015 Clean Power Plan. However, on January 19, 2021, the U.S. Court of Appeals for the District of

Columbia issued its opinion vacating the ACE Rule and remanding the rule to the EPA. On October 29, 2021, the Supreme Court agreed to hear the appeal of the ACE vacatur. The case was heard at the Supreme Court in February 2022, and on June 30, 2022, the Court issued a decision reversing and remanding the January 19, 2021 D.C. Circuit Court decision. Currently, neither the CPP nor the ACE rule are in effect, as the EPA is working on a replacement rule. On May 23, 2023, EPA proposed five separate actions, which include establishing GHG performance standards for fossil fuel fired EGUs and combustion turbines as well as repealing the ACE rule. The EPA proposal aims to implement more protective GHG emission standards, which are potentially applicable to several DEF coal and natural gas combustion turbine units. DEF will continue to monitor the proposed rule, which is expected to be finalized by May 2024, and the potentially applicable requirements to the DEF emission units.

Duke Energy has set a goal at the enterprise level of achieving at least a 50% reduction in CO₂ emissions from a 2005 baseline by 2030 and net-zero emissions by 2050. DEF has incorporated anticipated tax savings from the 2022 IRA into our resource plan optimization and production cost models. These savings have increased the cost effectiveness of clean energy resources, particularly solar and batteries, enabling further cost-effective progress toward achievement of Duke Energy's enterprise level target.

DEF continues to modernize its generation resources with the retirement and projected retirements of several of the older units in the fleet, particularly combustion turbines at Bayboro, DeBary P2 - P6, and Bartow P1 & P3. Continued operations of the peaking units at Bayboro are planned through the year 2026. The DeBary units P2 - P6 and Bartow units P1 & P3 are projected to retire in 2027. There are many factors which may impact these retirements including environmental regulations and permitting, unit age and maintenance requirements, local operational needs, their relatively small capacity size and system requirement needs. In addition to retirements, DEF anticipates the expiration of several contracts with Qualifying Facilities (QFs) and Independent Power Producers (IPPs) over the plan period. Although the Base Expansion Plan projects expiration of all these contracts, DEF continues to consider options for renewing these contracts in a manner that provides system reliability and cost-effective capacity and energy for our customers.

DEF continues to improve the performance of its generation fleet. Starting in mid-2023 and through the end of 2027, DEF will perform upgrades to the combustion turbines associated with several of the fleet combined cycle units. The goal of these upgrades is to reduce the unit heat rates, improve the fleet fuel efficiency, and reduce DEF CO₂ emissions. These upgrades will also result in the addition of close to 400 MWs of combined cycle capacity.

DEF's Base Expansion Plan projects the need for additional capacity with proposed in-service dates during the ten-year period from 2024 through 2033. The planned capacity additions, together with purchases from QFs, Investor-Owned Utilities (IOUs), and IPPs enable the DEF system to meet the energy requirements of its customer base. The capacity needs identified in this plan may be impacted by DEF's ability to extend or replace existing purchase power, cogeneration and QF contracts and to secure new renewable purchased power resources in their respective projected timeframes. The additions in the Base Expansion Plan depend, in part, on projected load growth, and obtaining all necessary state and federal permits under current schedules. Changes in these or other factors could impact DEF's Base Expansion Plan.

DEF has examined the high and low load scenarios presented in Schedules 3.1 and 3.2. As discussed in Chapter 2, these scenarios were developed to present and test a range of likely outcomes in peak load and energy demand. DEF found that the Base Expansion Plan was robust under the range of conditions examined. Current planned capacity is sufficient to meet the demand including reserve margin in these cases through 2028 allowing DEF sufficient time to plan additional generation capacity either through power purchase or new generation construction as needed if higher than baseline conditions emerge. If lower than baseline conditions emerge, DEF can defer future generation additions.

Status reports and specifications for the planned new generation facilities are included in Schedule 9. Planned transmission lines associated with the DEF Bulk Electric System (BES) are shown in Schedule 10.

TABLE 3.1

DUKE ENERGY FLORIDA

TOTAL CAPACITY RESOURCES OF

POWER PLANTS AND PURCHASED POWER CONTRACTS

AS OF DECEMBER 31, 2023

PLANTS	SUMMER NET DEPENDABLE CAPABILITY (MW)
Fossil Steam	2,423
Combined Cycle	5,247
Combustion Turbine	1,972
Solar	648
Total Net Dependable Generating Capability	10,290
Dependable Purchased Power	1,460
Firm Qualifying Facility Contracts (297 MW)	
Investor Owned Utilities (0 MW)	
Independent Power Producers (1,163 MW)	
TOTAL DEPENDABLE CAPACITY RESOURCES	11,750

TABLE 3.2 DUKE ENERGY FLORIDA FIRM RENEWABLES AND COGENERATION CONTRACTS AS OF DECEMBER 31, 2023	
Facility Name	Firm Capacity (MW)
Mulberry	115
Orange Cogen (CFR-Biogen)	104
Pasco County Resource Recovery	23
Pinellas County Resource Recovery	54.8
TOTAL	296.8

DUKE ENERGY FLORIDA

SCHEDULE 7.1

FORECAST OF CAPACITY, DEMAND AND SCHEDULED MAINTENANCE
AT TIME OF SUMMER PEAK

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	TOTAL	FIRM ^a	FIRM		TOTAL	SYSTEM FIRM					
	INSTALLED	CAPACITY	CAPACITY		CAPACITY	SUMMER PEAK	RESERVE MARGIN		SCHEDULED	RESERVE MARGIN	
	CAPACITY	IMPORT	EXPORT	QF ^b	AVAILABLE	DEMAND	BEFORE MAINTENANCE		MAINTENANCE	AFTER MAINTENANCE	
YEAR	MW	MW	MW	MW	MW	MW	MW	% OF PEAK	MW	MW	% OF PEAK
2024	10,418	874	0	78	11,369	9,000	2,369	26%	0	2,369	26%
2025	10,681	759	0	0	11,440	8,836	2,603	29%	0	2,603	29%
2026	11,319	655	0	0	11,974	8,790	3,184	36%	0	3,184	36%
2027	11,038	0	0	0	11,038	8,781	2,257	26%	0	2,257	26%
2028	11,155	0	0	0	11,155	8,908	2,247	25%	0	2,247	25%
2029	11,242	0	0	0	11,242	9,093	2,149	24%	0	2,149	24%
2030	11,336	0	0	0	11,336	9,260	2,076	22%	0	2,076	22%
2031	11,390	0	0	0	11,390	9,374	2,016	22%	0	2,016	22%
2032	11,873	0	0	0	11,873	9,595	2,279	24%	0	2,279	24%
2033	12,356	0	0	0	12,356	9,811	2,545	26%	0	2,545	26%

Notes:

a. FIRM Capacity Import includes Cogeneration, Utility and Independent Power Producers, and Short Term Purchase Contracts.

b. QF includes Firm Renewables

DUKE ENERGY FLORIDA

SCHEDULE 7.2

FORECAST OF CAPACITY, DEMAND AND SCHEDULED MAINTENANCE

AT TIME OF WINTER PEAK

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	TOTAL	FIRM ^a	FIRM		TOTAL	SYSTEM FIRM					
	INSTALLED	CAPACITY	CAPACITY		CAPACITY	WINTER PEAK	RESERVE MARGIN		SCHEDULED	RESERVE MARGIN	
	CAPACITY	IMPORT	EXPORT	QF ^b	AVAILABLE	DEMAND	BEFORE MAINTENANCE		MAINTENANCE	AFTER MAINTENANCE	
YEAR	MW	MW	MW	MW	MW	MW	MW	% OF PEAK	MW	MW	% OF PEAK
2023/24	10,675	1,442	0	78	12,195	8,872	3,323	37%	0	3,323	37%
2024/25	10,774	803	0	0	11,577	9,112	2,465	27%	0	2,465	27%
2025/26	11,272	699	0	0	11,971	9,124	2,847	31%	0	2,847	31%
2026/27	11,205	699	0	0	11,904	9,165	2,739	30%	0	2,739	30%
2027/28	10,902	0	0	0	10,902	8,682	2,220	26%	0	2,220	26%
2028/29	10,974	0	0	0	10,974	8,795	2,179	25%	0	2,179	25%
2029/30	11,046	0	0	0	11,046	8,957	2,089	23%	0	2,089	23%
2030/31	11,118	0	0	0	11,118	9,017	2,100	23%	0	2,100	23%
2031/32	11,118	0	0	0	11,118	9,125	1,993	22%	0	1,993	22%
2032/33	11,587	0	0	0	11,587	9,210	2,377	26%	0	2,377	26%

Notes:

a. FIRM Capacity Import includes Cogeneration, Utility and Independent Power Producers, and Short Term Purchase Contracts.

b. QF includes Firm Renewables

DUKE ENERGY FLORIDA

SCHEDULE 8

PLANNED AND PROSPECTIVE GENERATING FACILITY ADDITIONS AND CHANGES

AS OF JANUARY 1, 2024 THROUGH DECEMBER 31, 2033

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
												FIRM			
								CONST.	COM'L IN-	EXPECTED	GEN. MAX.	NET CAPABILITY			
	UNIT	LOCATION	UNIT	FUEL	FUEL TRANSPORT			START	SERVICE	RETIREMENT	NAMEPLATE	SUMMER	WINTER		
PLANT NAME	NO.	(COUNTY)	TYPE	PRL	ALT.	PRL	ALT.	MO. / YR	MO. / YR	MO. / YR	KW	MW	MW	STATUS ^a	NOTES ^b
MULE CREEK	1	BAY	PV	SO				04/2023	03/2024		74,900	43	0	P	(1)
WINQUEPIN	1	MADISON	PV	SO				04/2023	03/2024		74,900	43	0	P	(1)
FALMOUTH	1	SUWANNEE	PV	SO				06/2023	08/2024		74,900	43	0	P	(1)
COUNTY LINE	1	GILCHRIST	PV	SO				12/2023	10/2024		74,900	43	0		(1)
P L BARTOW	4	PINELLAS	CC	NG	DFO	PL	TK	09/2024	11/2024			141	99	P	(1) and (5)
SOLAR DEGRADATION	N/A	N/A	N/A	N/A		N/A		N/A	N/A	N/A	N/A	(3)			(2)
SUNDANCE	1	MADISON	PV	SO				04/2024	03/2025		74,900	19	0		(1)
HINES	2	POLK	CC	NG	DFO	PL	TK	03/2025	05/2025			65	65	P	(1) and (5)
OSPREY CC	1	POLK	CC	NG	DFO	PL	TK		10/2025			347	381	P	(3)
HINES	4	POLK	CC	NG	DFO	PL	TK	10/2025	11/2025			52	52	P	(1) and (5)
BAILEY MILL	1	JEFFERSON	PV	SO				04/2025	12/2025		74,900	19	0		(1)
HALF MOON	1	SUMTER	PV	SO				04/2025	12/2025		74,900	19	0		(1)
RATTLER	1	HERNANDO	PV	SO				04/2025	12/2025		74,900	19	0		(1)
SOLAR DEGRADATION	N/A	N/A	N/A	N/A		N/A		N/A	N/A	N/A	N/A	(4)			(2)
TIGER BAY	1	POLK	CC	NG	DFO	PL	TK	02/2026	03/2026			22	22	P	(1) and (5)
HINES	3	POLK	CC	NG	DFO	PL	TK	02/2026	04/2026			65	65	P	(1) and (5)
CITRUS	PB1	CITRUS	CC	NG				02/2026	05/2026			22	22	P	(1) and (5)
CITRUS	PB2	CITRUS	CC	NG				02/2026	05/2026			22	22	P	(1) and (5)
UNKNOWN		UNKNOWN	PV	SO				09/2025	06/2026		224,700	56			(1) and (4)
UNKNOWN		UNKNOWN	PV	SO				03/2026	12/2026		149,800	37	0	P	(1) and (4)
BAYBORO	P1 - P4	PINELLAS	CT	DFO		WA				10/2026		(151)	(198)		
SOLAR DEGRADATION	N/A	N/A	N/A	N/A		N/A		N/A	N/A	N/A	N/A	(4)			(2)
UNKNOWN		UNKNOWN	BA	N/A		N/A		01/2026	01/2027		100,000	90	90	P	(1)
DEBARY	P2 - P6	VOLUSIA	CT	DFO		TK				06/2027		(227)	(292)		
BARTOW	P1, P3	PINELLAS	CT	DFO		WA				06/2027		(82)	(101)		
UNKNOWN		UNKNOWN	PV	SO				09/2026	06/2027		224,700	56			(1) and (4)
UNKNOWN		UNKNOWN	PV	SO				04/2027	12/2027		149,800	37	0	P	(1) and (4)
SOLAR DEGRADATION	N/A	N/A	N/A	N/A		N/A		N/A	N/A	N/A	N/A	(5)			(2)

a. See page v. for Code Identification of Future Generating Unit Status.

b. NOTES

- (1) Planned, Prospective, or Committed project.
- (2) Solar capacity degrades by 0.5% every year
- (3) Osprey CC Acquisition total capacity is available once Transmission Upgrades are in service, total Summer capacity goes up to 592MW and total Winter capacity goes up to 626MW
- (4) Multiple 74.9 MWs units at different sites. For SPS, 40 MW of storage for 74.9 MW of Solar PV.
- (5) Combustion Turbines Heat Rate upgrades for Combined Cycles

DUKE ENERGY FLORIDA

SCHEDULE 8

PLANNED AND PROSPECTIVE GENERATING FACILITY ADDITIONS AND CHANGES

AS OF JANUARY 1, 2024 THROUGH DECEMBER 31, 2033

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
												FIRM			
								CONST.	COM'L IN-	EXPECTED	GEN. MAX.	NET CAPABILITY			
								START	SERVICE	RETIREMENT	NAMEPLATE	SUMMER	WINTER	STATUS ^a	NOTES ^b
PLANT NAME	UNIT NO.	LOCATION (COUNTY)	UNIT TYPE	FUEL PRI	FUEL ALT.	FUEL TRANSPORT PRI	FUEL TRANSPORT ALT.	MO./YR	MO./YR	MO./YR	KW	MW	MW		
UNKNOWN		UNKNOWN	PV	SO				09/2027	07/2028		299,600	30	0	P	(1) and (4)
UNKNOWN		UNKNOWN	SPS	SO				09/2027	07/2028		149,800	55	72	P	(1) and (4)
SOLAR DEGRADATION	N/A	N/A	N/A	N/A		N/A		N/A	N/A	N/A	N/A	(6)			(2)
UNKNOWN		UNKNOWN	PV	SO				09/2028	07/2029		374,500	37	0	P	(1) and (4)
UNKNOWN		UNKNOWN	SPS	SO				09/2028	07/2029		149,800	55	72	P	(1) and (4)
SOLAR DEGRADATION	N/A	N/A	N/A	N/A		N/A		N/A	N/A	N/A	N/A	(6)			(2)
UNKNOWN		UNKNOWN	PV	SO				09/2029	07/2030		449,400	45	0	P	(1) and (4)
UNKNOWN		UNKNOWN	SPS	SO				09/2029	07/2030		149,800	55	72	P	(1) and (4)
SOLAR DEGRADATION	N/A	N/A	N/A	N/A		N/A		N/A	N/A	N/A	N/A	(6)			(2)
UNKNOWN		UNKNOWN	PV	SO				09/2030	07/2031		599,200	60	0	P	(1) and (4)
SOLAR DEGRADATION	N/A	N/A	N/A	N/A		N/A		N/A	N/A	N/A	N/A	(6)			(2)
UNKNOWN	P1 - P2	UNKNOWN	CT	NG	DFO	FL	TK	07/2029	06/2032		455,000	430	466	P	(1)
UNKNOWN		UNKNOWN	PV	SO				09/2032	07/2033		599,200	60	0	P	(1) and (4)
SOLAR DEGRADATION	N/A	N/A	N/A	N/A		N/A		N/A	N/A	N/A	N/A	(7)			(2)
UNKNOWN	P3 - P4	UNKNOWN	CT	NG	DFO	FL	TK	07/2030	06/2033		455,000	430	466	P	(1)
UNKNOWN		UNKNOWN	PV	SO				09/2032	07/2033		599,200	60	0	P	(1) and (4)
SOLAR DEGRADATION	N/A	N/A	N/A	N/A		N/A		N/A	N/A	N/A	N/A	(7)			(2)

a. See page v. for Code Identification of Future Generating Unit Status.

b. NOTES

- (1) Planned, Prospective, or Committed project.
- (2) Solar capacity degrades by 0.5% every year
- (3) Osprey CC Acquisition total capacity is available once Transmission Upgrades are in service, total Summer capacity goes up to 592MW and total Winter capacity goes up to 626MW
- (4) Multiple 74.9 MWs units at different sites. For SPS, 40 MW of storage for 74.9 MW of Solar PV.
- (5) Combustion Turbines Heat Rate upgrades for Combined Cycles

DUKE ENERGY FLORIDA

SCHEDULE 9

STATUS REPORT AND SPECIFICATIONS OF PROPOSED GENERATING FACILITIES
AS OF JANUARY 1, 2024

- | | | | |
|--|--|----------------|--|
| (1) Plant Name and Unit Number: | Mule Creek | | |
| (2) Capacity | | | |
| a. Nameplate (MWac): | 74.9 | | |
| b. Summer Firm (MWac): | 42.7 | | |
| c. Winter Firm (MWac): | - | | |
| (3) Technology Type: | PHOTOVOLTAIC | | |
| (4) Anticipated Construction Timing | | | |
| a. Field construction start date: | 4/2023 | | |
| b. Commercial in-service date: | 3/2024 | (EXPECTED) | |
| (5) Fuel | | | |
| a. Primary fuel: | SOLAR | | |
| b. Alternate fuel: | N/A | | |
| (6) Air Pollution Control Strategy: | N/A | | |
| (7) Cooling Method: | N/A | | |
| (8) Total Site Area: | ~500-600 ACRES
PER SOLAR SITE (74.9 MW) | | |
| (9) Construction Status: | PLANNED | | |
| (10) Certification Status: | | | |
| (11) Status with Federal Agencies: | | | |
| (12) Projected Unit Performance Data | | | |
| a. Planned Outage Factor (POF): | | N/A % | |
| b. Forced Outage Factor (FOF): | | N/A % | |
| c. Equivalent Availability Factor (EAF): | | N/A % | |
| d. Resulting Capacity Factor (%): | | ~28 % | |
| e. Average Net Operating Heat Rate (ANOHR): | | N/A BTU/Kwh | |
| (13) Projected Unit Financial Data | | | |
| a. Book Life (Years): | | 30 | |
| b. Total Installed Cost (In-service year \$/Kw): | | 1,221.86 | |
| c. Direct Construction Cost (\$/Kw ac): | (\$2024) | | |
| d. AFUDC Amount (\$/Kw): | | | |
| e. Escalation (\$/Kw): | | | |
| f. Fixed O&M (\$/Kw dc-yr): | (\$2024) | 17.17 | |
| g. Variable O&M (\$/MWh): | (\$2024) | 0.00 | |
| h. K Factor: | | NO CALCULATION | |

DUKE ENERGY FLORIDA

SCHEDULE 9

STATUS REPORT AND SPECIFICATIONS OF PROPOSED GENERATING FACILITIES
AS OF JANUARY 1, 2024

- | | | | |
|--|--|----------------|--|
| (1) Plant Name and Unit Number: | Winquepin | | |
| (2) Capacity | | | |
| a. Nameplate (MWac): | 74.9 | | |
| b. Summer Firm (MWac): | 42.7 | | |
| c. Winter Firm (MWac): | - | | |
| (3) Technology Type: | PHOTOVOLTAIC | | |
| (4) Anticipated Construction Timing | | | |
| a. Field construction start date: | 4/2023 | | |
| b. Commercial in-service date: | 3/2024 | (EXPECTED) | |
| (5) Fuel | | | |
| a. Primary fuel: | SOLAR | | |
| b. Alternate fuel: | N/A | | |
| (6) Air Pollution Control Strategy: | N/A | | |
| (7) Cooling Method: | N/A | | |
| (8) Total Site Area: | ~500-600 ACRES
PER SOLAR SITE (74.9 MW) | | |
| (9) Construction Status: | PLANNED | | |
| (10) Certification Status: | | | |
| (11) Status with Federal Agencies: | | | |
| (12) Projected Unit Performance Data | | | |
| a. Planned Outage Factor (POF): | | N/A % | |
| b. Forced Outage Factor (FOF): | | N/A % | |
| c. Equivalent Availability Factor (EAF): | | N/A % | |
| d. Resulting Capacity Factor (%): | | ~28 % | |
| e. Average Net Operating Heat Rate (ANOHR): | | N/A BTU/Kwh | |
| (13) Projected Unit Financial Data | | | |
| a. Book Life (Years): | | 30 | |
| b. Total Installed Cost (In-service year \$/Kw): | | 1,221.86 | |
| c. Direct Construction Cost (\$/Kw ac): | (\$2024) | | |
| d. AFUDC Amount (\$/Kw): | | | |
| e. Escalation (\$/Kw): | | | |
| f. Fixed O&M (\$/Kw dc-yr): | (\$2024) | 17.17 | |
| g. Variable O&M (\$/MWh): | (\$2024) | 0.00 | |
| h. K Factor: | | NO CALCULATION | |

DUKE ENERGY FLORIDA

SCHEDULE 9

STATUS REPORT AND SPECIFICATIONS OF PROPOSED GENERATING FACILITIES
AS OF JANUARY 1, 2024

- | | | | |
|--|--|----------------|--|
| (1) Plant Name and Unit Number: | Falmouth | | |
| (2) Capacity | | | |
| a. Nameplate (MWac): | 74.9 | | |
| b. Summer Firm (MWac): | 42.7 | | |
| c. Winter Firm (MWac): | - | | |
| (3) Technology Type: | PHOTOVOLTAIC | | |
| (4) Anticipated Construction Timing | | | |
| a. Field construction start date: | 6/2023 | | |
| b. Commercial in-service date: | 8/2024 | (EXPECTED) | |
| (5) Fuel | | | |
| a. Primary fuel: | SOLAR | | |
| b. Alternate fuel: | N/A | | |
| (6) Air Pollution Control Strategy: | N/A | | |
| (7) Cooling Method: | N/A | | |
| (8) Total Site Area: | ~500-600 ACRES
PER SOLAR SITE (74.9 MW) | | |
| (9) Construction Status: | PLANNED | | |
| (10) Certification Status: | | | |
| (11) Status with Federal Agencies: | | | |
| (12) Projected Unit Performance Data | | | |
| a. Planned Outage Factor (POF): | | N/A % | |
| b. Forced Outage Factor (FOF): | | N/A % | |
| c. Equivalent Availability Factor (EAF): | | N/A % | |
| d. Resulting Capacity Factor (%): | | ~28 % | |
| e. Average Net Operating Heat Rate (ANOHR): | | N/A BTU/Kwh | |
| (13) Projected Unit Financial Data | | | |
| a. Book Life (Years): | | 30 | |
| b. Total Installed Cost (In-service year \$/Kw): | | 1,221.86 | |
| c. Direct Construction Cost (\$/Kw ac): | (\$2024) | | |
| d. AFUDC Amount (\$/Kw): | | | |
| e. Escalation (\$/Kw): | | | |
| f. Fixed O&M (\$/Kw dc-yr): | (\$2024) | 17.17 | |
| g. Variable O&M (\$/MWh): | (\$2024) | 0.00 | |
| h. K Factor: | | NO CALCULATION | |

DUKE ENERGY FLORIDA

SCHEDULE 9

STATUS REPORT AND SPECIFICATIONS OF PROPOSED GENERATING FACILITIES
AS OF JANUARY 1, 2024

(1) Plant Name and Unit Number:	County Line	
(2) Capacity		
a. Nameplate (MWac):	74.9	
b. Summer Firm (MWac):	42.7	
c. Winter Firm (MWac):	-	
(3) Technology Type:	PHOTOVOLTAIC	
(4) Anticipated Construction Timing		
a. Field construction start date:	12/2023	
b. Commercial in-service date:	10/2024	(EXPECTED)
(5) Fuel		
a. Primary fuel:	SOLAR	
b. Alternate fuel:	N/A	
(6) Air Pollution Control Strategy:	N/A	
(7) Cooling Method:	N/A	
(8) Total Site Area:	~500-600 ACRES PER SOLAR SITE (74.9 MW)	
(9) Construction Status:	PLANNED	
(10) Certification Status:		
(11) Status with Federal Agencies:		
(12) Projected Unit Performance Data		
a. Planned Outage Factor (POF):		N/A %
b. Forced Outage Factor (FOF):		N/A %
c. Equivalent Availability Factor (EAF):		N/A %
d. Resulting Capacity Factor (%):		~28 %
e. Average Net Operating Heat Rate (ANOHR):		N/A BTU/Kwh
(13) Projected Unit Financial Data		
a. Book Life (Years):		30
b. Total Installed Cost (In-service year \$/Kw):		1,221.86
c. Direct Construction Cost (\$/Kw ac):	(\$2024)	
d. AFUDC Amount (\$/Kw):		
e. Escalation (\$/Kw):		
f. Fixed O&M (\$/Kw dc-yr):	(\$2024)	17.17
g. Variable O&M (\$/MWh):	(\$2024)	0.00
h. K Factor:	NO CALCULATION	

DUKE ENERGY FLORIDA

SCHEDULE 9

STATUS REPORT AND SPECIFICATIONS OF PROPOSED GENERATING FACILITIES
AS OF JANUARY 1, 2024

- | | | | |
|--|--|----------------|--|
| (1) Plant Name and Unit Number: | Sundance | | |
| (2) Capacity | | | |
| a. Nameplate (MWac): | 74.9 | | |
| b. Summer Firm (MWac): | 18.7 | | |
| c. Winter Firm (MWac): | - | | |
| (3) Technology Type: | PHOTOVOLTAIC | | |
| (4) Anticipated Construction Timing | | | |
| a. Field construction start date: | 4/2024 | | |
| b. Commercial in-service date: | 3/2025 | (EXPECTED) | |
| (5) Fuel | | | |
| a. Primary fuel: | SOLAR | | |
| b. Alternate fuel: | N/A | | |
| (6) Air Pollution Control Strategy: | N/A | | |
| (7) Cooling Method: | N/A | | |
| (8) Total Site Area: | ~500-600 ACRES
PER SOLAR SITE (74.9 MW) | | |
| (9) Construction Status: | PLANNED | | |
| (10) Certification Status: | | | |
| (11) Status with Federal Agencies: | | | |
| (12) Projected Unit Performance Data | | | |
| a. Planned Outage Factor (POF): | | N/A % | |
| b. Forced Outage Factor (FOF): | | N/A % | |
| c. Equivalent Availability Factor (EAF): | | N/A % | |
| d. Resulting Capacity Factor (%): | | ~27 % | |
| e. Average Net Operating Heat Rate (ANOHR): | | N/A BTU/Kwh | |
| (13) Projected Unit Financial Data | | | |
| a. Book Life (Years): | | 30 | |
| b. Total Installed Cost (In-service year \$/Kw): | | 1,415.40 | |
| c. Direct Construction Cost (\$/Kw ac): | (\$2024) | | |
| d. AFUDC Amount (\$/Kw): | | | |
| e. Escalation (\$/Kw): | | | |
| f. Fixed O&M (\$/Kw dc-yr): | (\$2024) | 17.17 | |
| g. Variable O&M (\$/MWh): | (\$2024) | 0.00 | |
| h. K Factor: | | NO CALCULATION | |

DUKE ENERGY FLORIDA

SCHEDULE 9

STATUS REPORT AND SPECIFICATIONS OF PROPOSED GENERATING FACILITIES
AS OF JANUARY 1, 2024

- | | | | |
|--|--|----------------|--|
| (1) Plant Name and Unit Number: | Bailey Mill | | |
| (2) Capacity | | | |
| a. Nameplate (MWac): | 74.9 | | |
| b. Summer Firm (MWac): | 18.7 | | |
| c. Winter Firm (MWac): | - | | |
| (3) Technology Type: | PHOTOVOLTAIC | | |
| (4) Anticipated Construction Timing | | | |
| a. Field construction start date: | 4/2025 | | |
| b. Commercial in-service date: | 12/2025 | (EXPECTED) | |
| (5) Fuel | | | |
| a. Primary fuel: | SOLAR | | |
| b. Alternate fuel: | N/A | | |
| (6) Air Pollution Control Strategy: | N/A | | |
| (7) Cooling Method: | N/A | | |
| (8) Total Site Area: | ~500-600 ACRES
PER SOLAR SITE (74.9 MW) | | |
| (9) Construction Status: | PLANNED | | |
| (10) Certification Status: | | | |
| (11) Status with Federal Agencies: | | | |
| (12) Projected Unit Performance Data | | | |
| a. Planned Outage Factor (POF): | | N/A % | |
| b. Forced Outage Factor (FOF): | | N/A % | |
| c. Equivalent Availability Factor (EAF): | | N/A % | |
| d. Resulting Capacity Factor (%): | | ~27 % | |
| e. Average Net Operating Heat Rate (ANOHR): | | N/A BTU/Kwh | |
| (13) Projected Unit Financial Data | | | |
| a. Book Life (Years): | | 30 | |
| b. Total Installed Cost (In-service year \$/Kw): | | 1,415.40 | |
| c. Direct Construction Cost (\$/Kw ac): | (\$2024) | | |
| d. AFUDC Amount (\$/Kw): | | | |
| e. Escalation (\$/Kw): | | | |
| f. Fixed O&M (\$/Kw dc-yr): | (\$2024) | 17.17 | |
| g. Variable O&M (\$/MWh): | (\$2024) | 0.00 | |
| h. K Factor: | | NO CALCULATION | |

DUKE ENERGY FLORIDA

SCHEDULE 9

STATUS REPORT AND SPECIFICATIONS OF PROPOSED GENERATING FACILITIES
AS OF JANUARY 1, 2024

- | | | |
|--|--|------------|
| (1) Plant Name and Unit Number: | Half Moon | |
| (2) Capacity | | |
| a. Nameplate (MWac): | 74.9 | |
| b. Summer Firm (MWac): | 18.7 | |
| c. Winter Firm (MWac): | - | |
| (3) Technology Type: | PHOTOVOLTAIC | |
| (4) Anticipated Construction Timing | | |
| a. Field construction start date: | 4/2025 | |
| b. Commercial in-service date: | 12/2025 | (EXPECTED) |
| (5) Fuel | | |
| a. Primary fuel: | SOLAR | |
| b. Alternate fuel: | N/A | |
| (6) Air Pollution Control Strategy: | N/A | |
| (7) Cooling Method: | N/A | |
| (8) Total Site Area: | ~500-600 ACRES
PER SOLAR SITE (74.9 MW) | |
| (9) Construction Status: | PLANNED | |
| (10) Certification Status: | | |
| (11) Status with Federal Agencies: | | |
| (12) Projected Unit Performance Data | | |
| a. Planned Outage Factor (POF): | N/A | % |
| b. Forced Outage Factor (FOF): | N/A | % |
| c. Equivalent Availability Factor (EAF): | N/A | % |
| d. Resulting Capacity Factor (%): | ~27 | % |
| e. Average Net Operating Heat Rate (ANOHR): | N/A | BTU/Kwh |
| (13) Projected Unit Financial Data | | |
| a. Book Life (Years): | 30 | |
| b. Total Installed Cost (In-service year \$/Kw): | 1,428.31 | |
| c. Direct Construction Cost (\$/Kw ac): | (\$2024) | |
| d. AFUDC Amount (\$/Kw): | | |
| e. Escalation (\$/Kw): | | |
| f. Fixed O&M (\$/Kw dc-yr): | (\$2024) | 17.17 |
| g. Variable O&M (\$/MWh): | (\$2024) | 0.00 |
| h. K Factor: | NO CALCULATION | |

DUKE ENERGY FLORIDA

SCHEDULE 9

STATUS REPORT AND SPECIFICATIONS OF PROPOSED GENERATING FACILITIES
AS OF JANUARY 1, 2024

- | | | | |
|--|--|------------|--|
| (1) Plant Name and Unit Number: | Rattler | | |
| (2) Capacity | | | |
| a. Nameplate (MWac): | 74.9 | | |
| b. Summer Firm (MWac): | 18.7 | | |
| c. Winter Firm (MWac): | - | | |
| (3) Technology Type: | PHOTOVOLTAIC | | |
| (4) Anticipated Construction Timing | | | |
| a. Field construction start date: | 4/2025 | | |
| b. Commercial in-service date: | 12/2025 | (EXPECTED) | |
| (5) Fuel | | | |
| a. Primary fuel: | SOLAR | | |
| b. Alternate fuel: | N/A | | |
| (6) Air Pollution Control Strategy: | N/A | | |
| (7) Cooling Method: | N/A | | |
| (8) Total Site Area: | ~500-600 ACRES
PER SOLAR SITE (74.9 MW) | | |
| (9) Construction Status: | PLANNED | | |
| (10) Certification Status: | | | |
| (11) Status with Federal Agencies: | | | |
| (12) Projected Unit Performance Data | | | |
| a. Planned Outage Factor (POF): | N/A | % | |
| b. Forced Outage Factor (FOF): | N/A | % | |
| c. Equivalent Availability Factor (EAF): | N/A | % | |
| d. Resulting Capacity Factor (%): | ~27 | % | |
| e. Average Net Operating Heat Rate (ANOHR): | N/A | BTU/Kwh | |
| (13) Projected Unit Financial Data | | | |
| a. Book Life (Years): | 30 | | |
| b. Total Installed Cost (In-service year \$/Kw): | 1,428.31 | | |
| c. Direct Construction Cost (\$/Kw ac): | (\$2024) | | |
| d. AFUDC Amount (\$/Kw): | | | |
| e. Escalation (\$/Kw): | | | |
| f. Fixed O&M (\$/Kw dc-yr): | (\$2024) | 17.17 | |
| g. Variable O&M (\$/MWh): | (\$2024) | 0.00 | |
| h. K Factor: | NO CALCULATION | | |

DUKE ENERGY FLORIDA

SCHEDULE 9

STATUS REPORT AND SPECIFICATIONS OF PROPOSED GENERATING FACILITIES
AS OF JANUARY 1, 2024

- | | | | |
|--|--|----------------|--|
| (1) Plant Name and Unit Number: | TBD | | |
| (2) Capacity | | | |
| a. Nameplate (MWac): | 224.7 | | |
| b. Summer Firm (MWac): | 56.2 | | |
| c. Winter Firm (MWac): | - | | |
| (3) Technology Type: | PHOTOVOLTAIC | | |
| (4) Anticipated Construction Timing | | | |
| a. Field construction start date: | 9/2025 | | |
| b. Commercial in-service date: | 6/2026 | (EXPECTED) | |
| (5) Fuel | | | |
| a. Primary fuel: | SOLAR | | |
| b. Alternate fuel: | N/A | | |
| (6) Air Pollution Control Strategy: | N/A | | |
| (7) Cooling Method: | N/A | | |
| (8) Total Site Area: | ~500-600 ACRES
PER SOLAR SITE (74.9 MW) | | |
| (9) Construction Status: | PLANNED | | |
| (10) Certification Status: | | | |
| (11) Status with Federal Agencies: | | | |
| (12) Projected Unit Performance Data | | | |
| a. Planned Outage Factor (POF): | | N/A % | |
| b. Forced Outage Factor (FOF): | | N/A % | |
| c. Equivalent Availability Factor (EAF): | | N/A % | |
| d. Resulting Capacity Factor (%): | | ~27 % | |
| e. Average Net Operating Heat Rate (ANOHR): | | N/A BTU/Kwh | |
| (13) Projected Unit Financial Data | | | |
| a. Book Life (Years): | | 30 | |
| b. Total Installed Cost (In-service year \$/Kw): | | 1,428.34 | |
| c. Direct Construction Cost (\$/Kw ac): | (\$2024) | | |
| d. AFUDC Amount (\$/Kw): | | | |
| e. Escalation (\$/Kw): | | | |
| f. Fixed O&M (\$/Kw dc-yr): | (\$2024) | 17.17 | |
| g. Variable O&M (\$/MWh): | (\$2024) | 0.00 | |
| h. K Factor: | | NO CALCULATION | |

DUKE ENERGY FLORIDA

SCHEDULE 9

STATUS REPORT AND SPECIFICATIONS OF PROPOSED GENERATING FACILITIES
AS OF JANUARY 1, 2024

- | | | |
|--|--|------------|
| (1) Plant Name and Unit Number: | TBD | |
| (2) Capacity | | |
| a. Nameplate (MWac): | 149.8 | |
| b. Summer Firm (MWac): | 37.5 | |
| c. Winter Firm (MWac): | - | |
| (3) Technology Type: | PHOTOVOLTAIC | |
| (4) Anticipated Construction Timing | | |
| a. Field construction start date: | 4/2026 | |
| b. Commercial in-service date: | 12/2026 | (EXPECTED) |
| (5) Fuel | | |
| a. Primary fuel: | SOLAR | |
| b. Alternate fuel: | N/A | |
| (6) Air Pollution Control Strategy: | N/A | |
| (7) Cooling Method: | N/A | |
| (8) Total Site Area: | ~500-600 ACRES
PER SOLAR SITE (74.9 MW) | |
| (9) Construction Status: | PLANNED | |
| (10) Certification Status: | | |
| (11) Status with Federal Agencies: | | |
| (12) Projected Unit Performance Data | | |
| a. Planned Outage Factor (POF): | N/A | % |
| b. Forced Outage Factor (FOF): | N/A | % |
| c. Equivalent Availability Factor (EAF): | N/A | % |
| d. Resulting Capacity Factor (%): | ~27 | % |
| e. Average Net Operating Heat Rate (ANOHR): | N/A | BTU/Kwh |
| (13) Projected Unit Financial Data | | |
| a. Book Life (Years): | 30 | |
| b. Total Installed Cost (In-service year \$/Kw): | 1,419.08 | |
| c. Direct Construction Cost (\$/Kw ac): | (\$2024) | |
| d. AFUDC Amount (\$/Kw): | | |
| e. Escalation (\$/Kw): | | |
| f. Fixed O&M (\$/Kw dc-yr): | (\$2024) | 17.17 |
| g. Variable O&M (\$/MWh): | (\$2024) | 0.00 |
| h. K Factor: | NO CALCULATION | |

DUKE ENERGY FLORIDA

SCHEDULE 9

STATUS REPORT AND SPECIFICATIONS OF PROPOSED GENERATING FACILITIES
AS OF JANUARY 1, 2024

- | | | | |
|--|-----------------|------------|--|
| (1) Plant Name and Unit Number: | TBD | | |
| (2) Capacity | | | |
| a. Nameplate (MWac): | 100.0 | | |
| b. Summer Firm (MWac): | 90.0 | | |
| c. Winter Firm (MWac): | 90.0 | | |
| (3) Technology Type: | BATTERY STORAGE | | |
| (4) Anticipated Construction Timing | | | |
| a. Field construction start date: | 7/2026 | | |
| b. Commercial in-service date: | 3/2027 | (EXPECTED) | |
| (5) Fuel | | | |
| a. Primary fuel: | N/A | | |
| b. Alternate fuel: | N/A | | |
| (6) Air Pollution Control Strategy: | N/A | | |
| (7) Cooling Method: | N/A | | |
| (8) Total Site Area: | ~1 ACRE / 5 MW | | |
| (9) Construction Status: | PLANNED | | |
| (10) Certification Status: | | | |
| (11) Status with Federal Agencies: | | | |
| (12) Projected Unit Performance Data | | | |
| a. Planned Outage Factor (POF): | N/A | % | |
| b. Forced Outage Factor (FOF): | N/A | % | |
| c. Equivalent Availability Factor (EAF): | N/A | % | |
| d. Resulting Capacity Factor (%): | ~10 | % | |
| e. Average Net Operating Heat Rate (ANOHR): | N/A | BTU/Kwh | |
| (13) Projected Unit Financial Data | | | |
| a. Book Life (Years): | | 15 | |
| b. Total Installed Cost (In-service year \$/Kw): | | 1,650.00 | |
| c. Direct Construction Cost (\$/Kw ac): | (\$2024) | | |
| d. AFUDC Amount (\$/Kw): | | | |
| e. Escalation (\$/Kw): | | | |
| f. Fixed O&M (\$/Kw dc-yr): | (\$2024) | 30.00 | |
| g. Variable O&M (\$/MWh): | (\$2024) | 0.00 | |
| h. K Factor: | NO CALCULATION | | |

DUKE ENERGY FLORIDA

SCHEDULE 9

STATUS REPORT AND SPECIFICATIONS OF PROPOSED GENERATING FACILITIES
AS OF JANUARY 1, 2024

- | | | | |
|--|--|----------------|--|
| (1) Plant Name and Unit Number: | TBD | | |
| (2) Capacity | | | |
| a. Nameplate (MWac): | 224.7 | | |
| b. Summer Firm (MWac): | 56.2 | | |
| c. Winter Firm (MWac): | - | | |
| (3) Technology Type: | PHOTOVOLTAIC | | |
| (4) Anticipated Construction Timing | | | |
| a. Field construction start date: | 9/2026 | | |
| b. Commercial in-service date: | 6/2027 | (EXPECTED) | |
| (5) Fuel | | | |
| a. Primary fuel: | SOLAR | | |
| b. Alternate fuel: | N/A | | |
| (6) Air Pollution Control Strategy: | N/A | | |
| (7) Cooling Method: | N/A | | |
| (8) Total Site Area: | ~500-600 ACRES
PER SOLAR SITE (74.9 MW) | | |
| (9) Construction Status: | PLANNED | | |
| (10) Certification Status: | | | |
| (11) Status with Federal Agencies: | | | |
| (12) Projected Unit Performance Data | | | |
| a. Planned Outage Factor (POF): | | N/A % | |
| b. Forced Outage Factor (FOF): | | N/A % | |
| c. Equivalent Availability Factor (EAF): | | N/A % | |
| d. Resulting Capacity Factor (%): | | ~27 % | |
| e. Average Net Operating Heat Rate (ANOHR): | | N/A BTU/Kwh | |
| (13) Projected Unit Financial Data | | | |
| a. Book Life (Years): | | 30 | |
| b. Total Installed Cost (In-service year \$/Kw): | | 1,409.96 | |
| c. Direct Construction Cost (\$/Kw ac): | (\$2024) | | |
| d. AFUDC Amount (\$/Kw): | | | |
| e. Escalation (\$/Kw): | | | |
| f. Fixed O&M (\$/Kw dc-yr): | (\$2024) | 17.17 | |
| g. Variable O&M (\$/MWh): | (\$2024) | 0.00 | |
| h. K Factor: | | NO CALCULATION | |

DUKE ENERGY FLORIDA

SCHEDULE 9

STATUS REPORT AND SPECIFICATIONS OF PROPOSED GENERATING FACILITIES
AS OF JANUARY 1, 2024

- | | | |
|--|--|-------------|
| (1) Plant Name and Unit Number: | TBD | |
| (2) Capacity | | |
| a. Nameplate (MWac): | 149.8 | |
| b. Summer Firm (MWac): | 37.5 | |
| c. Winter Firm (MWac): | - | |
| (3) Technology Type: | PHOTOVOLTAIC | |
| (4) Anticipated Construction Timing | | |
| a. Field construction start date: | 4/2027 | |
| b. Commercial in-service date: | 12/2027 | (EXPECTED) |
| (5) Fuel | | |
| a. Primary fuel: | SOLAR | |
| b. Alternate fuel: | N/A | |
| (6) Air Pollution Control Strategy: | N/A | |
| (7) Cooling Method: | N/A | |
| (8) Total Site Area: | ~500-600 ACRES
PER SOLAR SITE (74.9 MW) | |
| (9) Construction Status: | PLANNED | |
| (10) Certification Status: | | |
| (11) Status with Federal Agencies: | | |
| (12) Projected Unit Performance Data | | |
| a. Planned Outage Factor (POF): | | N/A % |
| b. Forced Outage Factor (FOF): | | N/A % |
| c. Equivalent Availability Factor (EAF): | | N/A % |
| d. Resulting Capacity Factor (%): | | ~27 % |
| e. Average Net Operating Heat Rate (ANOHR): | | N/A BTU/Kwh |
| (13) Projected Unit Financial Data | | |
| a. Book Life (Years): | | 30 |
| b. Total Installed Cost (In-service year \$/Kw): | | 1,409.96 |
| c. Direct Construction Cost (\$/Kw ac): | (\$2024) | |
| d. AFUDC Amount (\$/Kw): | | |
| e. Escalation (\$/Kw): | | |
| f. Fixed O&M (\$/Kw dc-yr): | (\$2024) | 17.17 |
| g. Variable O&M (\$/MWh): | (\$2024) | 0.00 |
| h. K Factor: | NO CALCULATION | |

DUKE ENERGY FLORIDA

SCHEDULE 9

STATUS REPORT AND SPECIFICATIONS OF PROPOSED GENERATING FACILITIES
AS OF JANUARY 1, 2024

- | | | | |
|--|--|------------|--|
| (1) Plant Name and Unit Number: | TBD | | |
| (2) Capacity | | | |
| a. Nameplate (MWac): | 299.6 | | |
| b. Summer Firm (MWac): | 30.0 | | |
| c. Winter Firm (MWac): | - | | |
| (3) Technology Type: | PHOTOVOLTAIC | | |
| (4) Anticipated Construction Timing | | | |
| a. Field construction start date: | 9/2027 | | |
| b. Commercial in-service date: | 7/2028 | (EXPECTED) | |
| (5) Fuel | | | |
| a. Primary fuel: | SOLAR | | |
| b. Alternate fuel: | N/A | | |
| (6) Air Pollution Control Strategy: | N/A | | |
| (7) Cooling Method: | N/A | | |
| (8) Total Site Area: | ~500-600 ACRES
PER SOLAR SITE (74.9 MW) | | |
| (9) Construction Status: | PLANNED | | |
| (10) Certification Status: | | | |
| (11) Status with Federal Agencies: | | | |
| (12) Projected Unit Performance Data | | | |
| a. Planned Outage Factor (POF): | N/A | % | |
| b. Forced Outage Factor (FOF): | N/A | % | |
| c. Equivalent Availability Factor (EAF): | N/A | % | |
| d. Resulting Capacity Factor (%): | ~27 | % | |
| e. Average Net Operating Heat Rate (ANOHR): | N/A | BTU/Kwh | |
| (13) Projected Unit Financial Data | | | |
| a. Book Life (Years): | 30 | | |
| b. Total Installed Cost (In-service year \$/Kw): | 1,648.99 | | |
| c. Direct Construction Cost (\$/Kw ac): | (\$2024) | | |
| d. AFUDC Amount (\$/Kw): | | | |
| e. Escalation (\$/Kw): | | | |
| f. Fixed O&M (\$/Kw dc-yr): | (\$2024) | | |
| g. Variable O&M (\$/MWh): | (\$2024) | 0.00 | |
| h. K Factor: | NO CALCULATION | | |

DUKE ENERGY FLORIDA

SCHEDULE 9

STATUS REPORT AND SPECIFICATIONS OF PROPOSED GENERATING FACILITIES
AS OF JANUARY 1, 2024

- (1) Plant Name and Unit Number: **TBD**
- (2) Capacity
- | | | |
|------------------------|-------|--|
| a. Nameplate (MWac): | 149.8 | |
| b. Summer Firm (MWac): | 55.0 | |
| c. Winter Firm (MWac): | 72.0 | |
- (3) Technology Type: **PHOTOVOLTAIC WITH BATTERY STORAGE**
- (4) Anticipated Construction Timing
- | | | |
|-----------------------------------|--------|------------|
| a. Field construction start date: | 9/2027 | |
| b. Commercial in-service date: | 7/2028 | (EXPECTED) |
- (5) Fuel
- | | |
|--------------------|-------|
| a. Primary fuel: | SOLAR |
| b. Alternate fuel: | N/A |
- (6) Air Pollution Control Strategy: **N/A**
- (7) Cooling Method: **N/A**
- (8) Total Site Area: **~500-600 ACRES
PER SOLAR SITE (74.9 MW)**
- (9) Construction Status: **PLANNED**
- (10) Certification Status:
- (11) Status with Federal Agencies:
- (12) Projected Unit Performance Data
- | | |
|---|-------------|
| a. Planned Outage Factor (POF): | N/A % |
| b. Forced Outage Factor (FOF): | N/A % |
| c. Equivalent Availability Factor (EAF): | N/A % |
| d. Resulting Capacity Factor (%): | ~34 % |
| e. Average Net Operating Heat Rate (ANOHR): | N/A BTU/Kwh |
- (13) Projected Unit Financial Data
- | | |
|--|----------------|
| a. Book Life (Years): | 30 |
| b. Total Installed Cost (In-service year \$/Kw): | 2,470.83 |
| c. Direct Construction Cost (\$/Kw ac): | (\$2024) |
| d. AFUDC Amount (\$/Kw): | |
| e. Escalation (\$/Kw): | |
| f. Fixed O&M (\$/Kw dc-yr): | (\$2024) |
| g. Variable O&M (\$/MWh): | (\$2024) 0.00 |
| h. K Factor: | NO CALCULATION |

DUKE ENERGY FLORIDA

SCHEDULE 9

STATUS REPORT AND SPECIFICATIONS OF PROPOSED GENERATING FACILITIES
AS OF JANUARY 1, 2024

- | | | | |
|--|--|------------|--|
| (1) Plant Name and Unit Number: | TBD | | |
| (2) Capacity | | | |
| a. Nameplate (MWac): | 374.5 | | |
| b. Summer Firm (MWac): | 37.5 | | |
| c. Winter Firm (MWac): | - | | |
| (3) Technology Type: | PHOTOVOLTAIC | | |
| (4) Anticipated Construction Timing | | | |
| a. Field construction start date: | 9/2028 | | |
| b. Commercial in-service date: | 7/2029 | (EXPECTED) | |
| (5) Fuel | | | |
| a. Primary fuel: | SOLAR | | |
| b. Alternate fuel: | N/A | | |
| (6) Air Pollution Control Strategy: | N/A | | |
| (7) Cooling Method: | N/A | | |
| (8) Total Site Area: | ~500-600 ACRES
PER SOLAR SITE (74.9 MW) | | |
| (9) Construction Status: | PLANNED | | |
| (10) Certification Status: | | | |
| (11) Status with Federal Agencies: | | | |
| (12) Projected Unit Performance Data | | | |
| a. Planned Outage Factor (POF): | N/A | % | |
| b. Forced Outage Factor (FOF): | N/A | % | |
| c. Equivalent Availability Factor (EAF): | N/A | % | |
| d. Resulting Capacity Factor (%): | ~27 | % | |
| e. Average Net Operating Heat Rate (ANOHR): | N/A | BTU/Kwh | |
| (13) Projected Unit Financial Data | | | |
| a. Book Life (Years): | 30 | | |
| b. Total Installed Cost (In-service year \$/Kw): | 1,632.89 | | |
| c. Direct Construction Cost (\$/Kw ac): | (\$2024) | | |
| d. AFUDC Amount (\$/Kw): | | | |
| e. Escalation (\$/Kw): | | | |
| f. Fixed O&M (\$/Kw dc-yr): | (\$2024) | | |
| g. Variable O&M (\$/MWh): | (\$2024) | 0.00 | |
| h. K Factor: | NO CALCULATION | | |

DUKE ENERGY FLORIDA

SCHEDULE 9

STATUS REPORT AND SPECIFICATIONS OF PROPOSED GENERATING FACILITIES
AS OF JANUARY 1, 2024

- (1) Plant Name and Unit Number: **TBD**
- (2) Capacity
- | | | |
|------------------------|-------|--|
| a. Nameplate (MWac): | 149.8 | |
| b. Summer Firm (MWac): | 55.0 | |
| c. Winter Firm (MWac): | 72.0 | |
- (3) Technology Type: **PHOTOVOLTAIC WITH BATTERY STORAGE**
- (4) Anticipated Construction Timing
- | | | |
|-----------------------------------|--------|------------|
| a. Field construction start date: | 9/2028 | |
| b. Commercial in-service date: | 7/2029 | (EXPECTED) |
- (5) Fuel
- | | |
|--------------------|-------|
| a. Primary fuel: | SOLAR |
| b. Alternate fuel: | N/A |
- (6) Air Pollution Control Strategy: **N/A**
- (7) Cooling Method: **N/A**
- (8) Total Site Area: **~500-600 ACRES**
PER SOLAR SITE (74.9 MW)
- (9) Construction Status: **PLANNED**
- (10) Certification Status:
- (11) Status with Federal Agencies:
- (12) Projected Unit Performance Data
- | | |
|---|-------------|
| a. Planned Outage Factor (POF): | N/A % |
| b. Forced Outage Factor (FOF): | N/A % |
| c. Equivalent Availability Factor (EAF): | N/A % |
| d. Resulting Capacity Factor (%): | ~34 % |
| e. Average Net Operating Heat Rate (ANOHR): | N/A BTU/Kwh |
- (13) Projected Unit Financial Data
- | | |
|--|----------------|
| a. Book Life (Years): | 30 |
| b. Total Installed Cost (In-service year \$/Kw): | 2,444.11 |
| c. Direct Construction Cost (\$/Kw ac): | (\$2024) |
| d. AFUDC Amount (\$/Kw): | |
| e. Escalation (\$/Kw): | |
| f. Fixed O&M (\$/Kw dc-yr): | (\$2024) |
| g. Variable O&M (\$/MWh): | (\$2024) 0.00 |
| h. K Factor: | NO CALCULATION |

DUKE ENERGY FLORIDA

SCHEDULE 9

STATUS REPORT AND SPECIFICATIONS OF PROPOSED GENERATING FACILITIES
AS OF JANUARY 1, 2024

- | | | |
|--|--|-------------|
| (1) Plant Name and Unit Number: | TBD | |
| (2) Capacity | | |
| a. Nameplate (MWac): | 449.4 | |
| b. Summer Firm (MWac): | 44.9 | |
| c. Winter Firm (MWac): | - | |
| (3) Technology Type: | PHOTOVOLTAIC | |
| (4) Anticipated Construction Timing | | |
| a. Field construction start date: | 9/2029 | |
| b. Commercial in-service date: | 7/2030 | (EXPECTED) |
| (5) Fuel | | |
| a. Primary fuel: | SOLAR | |
| b. Alternate fuel: | N/A | |
| (6) Air Pollution Control Strategy: | N/A | |
| (7) Cooling Method: | N/A | |
| (8) Total Site Area: | ~500-600 ACRES
PER SOLAR SITE (74.9 MW) | |
| (9) Construction Status: | PLANNED | |
| (10) Certification Status: | | |
| (11) Status with Federal Agencies: | | |
| (12) Projected Unit Performance Data | | |
| a. Planned Outage Factor (POF): | | N/A % |
| b. Forced Outage Factor (FOF): | | N/A % |
| c. Equivalent Availability Factor (EAF): | | N/A % |
| d. Resulting Capacity Factor (%): | | ~27 % |
| e. Average Net Operating Heat Rate (ANOHR): | | N/A BTU/Kwh |
| (13) Projected Unit Financial Data | | |
| a. Book Life (Years): | | 30 |
| b. Total Installed Cost (In-service year \$/Kw): | | 1,617.30 |
| c. Direct Construction Cost (\$/Kw ac): | (\$2024) | |
| d. AFUDC Amount (\$/Kw): | | |
| e. Escalation (\$/Kw): | | |
| f. Fixed O&M (\$/Kw dc-yr): | (\$2024) | |
| g. Variable O&M (\$/MWh): | (\$2024) | 0.00 |
| h. K Factor: | NO CALCULATION | |

DUKE ENERGY FLORIDA

SCHEDULE 9

STATUS REPORT AND SPECIFICATIONS OF PROPOSED GENERATING FACILITIES
AS OF JANUARY 1, 2024

- | | | | |
|--|--|-------------|--|
| (1) Plant Name and Unit Number: | TBD | | |
| (2) Capacity | | | |
| a. Nameplate (MWac): | 149.8 | | |
| b. Summer Firm (MWac): | 55.0 | | |
| c. Winter Firm (MWac): | 72.0 | | |
| (3) Technology Type: | PHOTOVOLTAIC WITH BATTERY STORAGE | | |
| (4) Anticipated Construction Timing | | | |
| a. Field construction start date: | 9/2029 | | |
| b. Commercial in-service date: | 7/2030 | (EXPECTED) | |
| (5) Fuel | | | |
| a. Primary fuel: | SOLAR | | |
| b. Alternate fuel: | N/A | | |
| (6) Air Pollution Control Strategy: | N/A | | |
| (7) Cooling Method: | N/A | | |
| (8) Total Site Area: | ~500-600 ACRES
PER SOLAR SITE (74.9 MW) | | |
| (9) Construction Status: | PLANNED | | |
| (10) Certification Status: | | | |
| (11) Status with Federal Agencies: | | | |
| (12) Projected Unit Performance Data | | | |
| a. Planned Outage Factor (POF): | | N/A % | |
| b. Forced Outage Factor (FOF): | | N/A % | |
| c. Equivalent Availability Factor (EAF): | | N/A % | |
| d. Resulting Capacity Factor (%): | | ~34 % | |
| e. Average Net Operating Heat Rate (ANOHR): | | N/A BTU/Kwh | |
| (13) Projected Unit Financial Data | | | |
| a. Book Life (Years): | | 30 | |
| b. Total Installed Cost (In-service year \$/Kw): | | 2,418.04 | |
| c. Direct Construction Cost (\$/Kw ac): | (\$2024) | | |
| d. AFUDC Amount (\$/Kw): | | | |
| e. Escalation (\$/Kw): | | | |
| f. Fixed O&M (\$/Kw dc-yr): | (\$2024) | | |
| g. Variable O&M (\$/MWh): | (\$2024) | 0.00 | |
| h. K Factor: | NO CALCULATION | | |

DUKE ENERGY FLORIDA

SCHEDULE 9

STATUS REPORT AND SPECIFICATIONS OF PROPOSED GENERATING FACILITIES
AS OF JANUARY 1, 2024

- | | | | |
|--|--|------------|--|
| (1) Plant Name and Unit Number: | TBD | | |
| (2) Capacity | | | |
| a. Nameplate (MWac): | 599.2 | | |
| b. Summer Firm (MWac): | 59.9 | | |
| c. Winter Firm (MWac): | - | | |
| (3) Technology Type: | PHOTOVOLTAIC | | |
| (4) Anticipated Construction Timing | | | |
| a. Field construction start date: | 9/2030 | | |
| b. Commercial in-service date: | 7/2031 | (EXPECTED) | |
| (5) Fuel | | | |
| a. Primary fuel: | SOLAR | | |
| b. Alternate fuel: | N/A | | |
| (6) Air Pollution Control Strategy: | N/A | | |
| (7) Cooling Method: | N/A | | |
| (8) Total Site Area: | ~500-600 ACRES
PER SOLAR SITE (74.9 MW) | | |
| (9) Construction Status: | PLANNED | | |
| (10) Certification Status: | | | |
| (11) Status with Federal Agencies: | | | |
| (12) Projected Unit Performance Data | | | |
| a. Planned Outage Factor (POF): | N/A | % | |
| b. Forced Outage Factor (FOF): | N/A | % | |
| c. Equivalent Availability Factor (EAF): | N/A | % | |
| d. Resulting Capacity Factor (%): | ~27 | % | |
| e. Average Net Operating Heat Rate (ANOHR): | N/A | BTU/Kwh | |
| (13) Projected Unit Financial Data | | | |
| a. Book Life (Years): | 30 | | |
| b. Total Installed Cost (In-service year \$/Kw): | 1,602.23 | | |
| c. Direct Construction Cost (\$/Kw ac): | (\$2024) | | |
| d. AFUDC Amount (\$/Kw): | | | |
| e. Escalation (\$/Kw): | | | |
| f. Fixed O&M (\$/Kw dc-yr): | (\$2024) | | |
| g. Variable O&M (\$/MWh): | (\$2024) | 0.00 | |
| h. K Factor: | NO CALCULATION | | |

DUKE ENERGY FLORIDA

SCHEDULE 9

STATUS REPORT AND SPECIFICATIONS OF PROPOSED GENERATING FACILITIES
AS OF JANUARY 1, 2024

(1) Plant Name and Unit Number:	Undesignated CTs P1-P2	
(2) Capacity		
a. Summer (MWs):	215	
b. Winter (MWs):	235	
(3) Technology Type:	COMBUSTION TURBINE	
(4) Anticipated Construction Timing		
a. Field construction start date:	7/2029	
b. Commercial in-service date:	6/2032	(EXPECTED)
(5) Fuel		
a. Primary fuel:	NATURAL GAS	
b. Alternate fuel:	DISTILLATE FUEL OIL	
(6) Air Pollution Control Strategy:	Dry Low Nox Combustion	
(7) Cooling Method:	N/A	
(8) Total Site Area:	UNKNOWN	
(9) Construction Status:	PLANNED	
(10) Certification Status:	PLANNED	
(11) Status with Federal Agencies:	PLANNED	
(12) Projected Unit Performance Data		
a. Planned Outage Factor (POF):	3.00	%
b. Forced Outage Factor (FOF):	2.00	%
c. Equivalent Availability Factor (EAF):	95.06	
d. Resulting Capacity Factor (%):	1.9	%
e. Average Net Operating Heat Rate (ANOHR):	10,487	BTU/kWh
(13) Projected Unit Financial Data		
a. Book Life (Years):	35	
b. Total Installed Cost (In-service year \$/kW):	1,421.8	
c. Direct Construction Cost (\$/kW): (\$2024)	1,239.7	
d. AFUDC Amount (\$/kW):	180.9	
e. Escalation (\$/kW):	1.2	
f. Fixed O&M (\$/kW-yr): (\$2024)	2.86	
g. Variable O&M (\$/MWh): (\$2024)	9.03	
h. K Factor:	NO CALCULATION	

NOTES

Total Installed Cost includes gas expansion, transmission interconnection and integration

\$/kW values are based on Summer capacity

Fixed O&M cost does not include firm gas transportation costs

DUKE ENERGY FLORIDA

SCHEDULE 9

STATUS REPORT AND SPECIFICATIONS OF PROPOSED GENERATING FACILITIES
AS OF JANUARY 1, 2024

- | | | |
|--|--|------------|
| (1) Plant Name and Unit Number: | TBD | |
| (2) Capacity | | |
| a. Nameplate (MWac): | 599.2 | |
| b. Summer Firm (MWac): | 59.9 | |
| c. Winter Firm (MWac): | - | |
| (3) Technology Type: | PHOTOVOLTAIC | |
| (4) Anticipated Construction Timing | | |
| a. Field construction start date: | 9/2031 | |
| b. Commercial in-service date: | 7/2032 | (EXPECTED) |
| (5) Fuel | | |
| a. Primary fuel: | SOLAR | |
| b. Alternate fuel: | N/A | |
| (6) Air Pollution Control Strategy: | N/A | |
| (7) Cooling Method: | N/A | |
| (8) Total Site Area: | ~500-600 ACRES
PER SOLAR SITE (74.9 MW) | |
| (9) Construction Status: | PLANNED | |
| (10) Certification Status: | | |
| (11) Status with Federal Agencies: | | |
| (12) Projected Unit Performance Data | | |
| a. Planned Outage Factor (POF): | N/A | % |
| b. Forced Outage Factor (FOF): | N/A | % |
| c. Equivalent Availability Factor (EAF): | N/A | % |
| d. Resulting Capacity Factor (%): | ~27 | % |
| e. Average Net Operating Heat Rate (ANOHR): | N/A | BTU/Kwh |
| (13) Projected Unit Financial Data | | |
| a. Book Life (Years): | 30 | |
| b. Total Installed Cost (In-service year \$/Kw): | 1,587.67 | |
| c. Direct Construction Cost (\$/Kw ac): | (\$2024) | |
| d. AFUDC Amount (\$/Kw): | | |
| e. Escalation (\$/Kw): | | |
| f. Fixed O&M (\$/Kw dc-yr): | (\$2024) | |
| g. Variable O&M (\$/MWh): | (\$2024) | 0.00 |
| h. K Factor: | NO CALCULATION | |

DUKE ENERGY FLORIDA

SCHEDULE 9

STATUS REPORT AND SPECIFICATIONS OF PROPOSED GENERATING FACILITIES
AS OF JANUARY 1, 2024

(1) Plant Name and Unit Number:	Undesignated CTs P3-P4		
(2) Capacity			
a. Summer (MWs):	215		
b. Winter (MWs):	235		
(3) Technology Type:	COMBUSTION TURBINE		
(4) Anticipated Construction Timing			
a. Field construction start date:	7/2030		
b. Commercial in-service date:	6/2033	(EXPECTED)	
(5) Fuel			
a. Primary fuel:	NATURAL GAS		
b. Alternate fuel:	DISTILLATE FUEL OIL		
(6) Air Pollution Control Strategy:	Dry Low Nox Combustion		
(7) Cooling Method:	N/A		
(8) Total Site Area:	UNKNOWN		
(9) Construction Status:	PLANNED		
(10) Certification Status:	PLANNED		
(11) Status with Federal Agencies:	PLANNED		
(12) Projected Unit Performance Data			
a. Planned Outage Factor (POF):	3.00	%	
b. Forced Outage Factor (FOF):	2.00	%	
c. Equivalent Availability Factor (EAF):	95.06		
d. Resulting Capacity Factor (%):	1.9	%	
e. Average Net Operating Heat Rate (ANOHR):	10,487	BTU/kWh	
(13) Projected Unit Financial Data			
a. Book Life (Years):	35		
b. Total Installed Cost (In-service year \$/kW):	1,428.6		
c. Direct Construction Cost (\$/kW):	(\$2024)	1,245.5	
d. AFUDC Amount (\$/kW):		181.7	
e. Escalation (\$/kW):		1.4	
f. Fixed O&M (\$/kW-yr):	(\$2024)	2.86	
g. Variable O&M (\$/MWh):	(\$2024)	9.03	
h. K Factor:	NO CALCULATION		

NOTES

Total Installed Cost includes gas expansion, transmission interconnection and integration
 \$/kW values are based on Summer capacity
 Fixed O&M cost does not include firm gas transportation costs

DUKE ENERGY FLORIDA**SCHEDULE 9****STATUS REPORT AND SPECIFICATIONS OF PROPOSED GENERATING FACILITIES
AS OF JANUARY 1, 2024**

- | | | | |
|--|--|----------------|--|
| (1) Plant Name and Unit Number: | TBD | | |
| (2) Capacity | | | |
| a. Nameplate (MWac): | 599.2 | | |
| b. Summer Firm (MWac): | 59.9 | | |
| c. Winter Firm (MWac): | - | | |
| (3) Technology Type: | PHOTOVOLTAIC | | |
| (4) Anticipated Construction Timing | | | |
| a. Field construction start date: | 9/2032 | | |
| b. Commercial in-service date: | 7/2033 | (EXPECTED) | |
| (5) Fuel | | | |
| a. Primary fuel: | SOLAR | | |
| b. Alternate fuel: | N/A | | |
| (6) Air Pollution Control Strategy: | N/A | | |
| (7) Cooling Method: | N/A | | |
| (8) Total Site Area: | ~500-600 ACRES
PER SOLAR SITE (74.9 MW) | | |
| (9) Construction Status: | PLANNED | | |
| (10) Certification Status: | | | |
| (11) Status with Federal Agencies: | | | |
| (12) Projected Unit Performance Data | | | |
| a. Planned Outage Factor (POF): | | N/A % | |
| b. Forced Outage Factor (FOF): | | N/A % | |
| c. Equivalent Availability Factor (EAF): | | N/A % | |
| d. Resulting Capacity Factor (%): | | ~27 % | |
| e. Average Net Operating Heat Rate (ANOHR): | | N/A BTU/Kwh | |
| (13) Projected Unit Financial Data | | | |
| a. Book Life (Years): | | 30 | |
| b. Total Installed Cost (In-service year \$/Kw): | | 1,518.91 | |
| c. Direct Construction Cost (\$/Kw ac): | (\$2024) | | |
| d. AFUDC Amount (\$/Kw): | | | |
| e. Escalation (\$/Kw): | | | |
| f. Fixed O&M (\$/Kw dc-yr): | (\$2024) | | |
| g. Variable O&M (\$/MWh): | (\$2024) | 0.00 | |
| h. K Factor: | | NO CALCULATION | |

DUKE ENERGY FLORIDA

SCHEDULE 10

STATUS REPORT AND SPECIFICATIONS OF PROPOSED DIRECTLY ASSOCIATED TRANSMISSION LINES

MULE CREEK SOLAR

(1) POINT OF ORIGIN AND TERMINATION:	Ladybug Substation
(2) NUMBER OF LINES:	1
(3) RIGHT-OF-WAY:	Existing transmission line right-of-way
(4) LINE LENGTH:	0.1 miles
(5) VOLTAGE:	230 kV
(6) ANTICIPATED CONSTRUCTION TIMING:	1/1/2024
(7) ANTICIPATED CAPITAL INVESTMENT:	\$5,536,000
(8) SUBSTATIONS:	Ladybug Substation
(9) PARTICIPATION WITH OTHER UTILITIES:	N/A

DUKE ENERGY FLORIDA

SCHEDULE 10

STATUS REPORT AND SPECIFICATIONS OF PROPOSED DIRECTLY ASSOCIATED TRANSMISSION LINES

WINQUEPIN SOLAR

(1) POINT OF ORIGIN AND TERMINATION:	Birch Switching Station
(2) NUMBER OF LINES:	1
(3) RIGHT-OF-WAY:	New transmission line right-of-way
(4) LINE LENGTH:	0.1 miles
(5) VOLTAGE:	230 kV
(6) ANTICIPATED CONSTRUCTION TIMING:	4/26/2024
(7) ANTICIPATED CAPITAL INVESTMENT:	\$16,018,213
(8) SUBSTATIONS:	Birch Switching Station
(9) PARTICIPATION WITH OTHER UTILITIES:	N/A

DUKE ENERGY FLORIDA

SCHEDULE 10

STATUS REPORT AND SPECIFICATIONS OF PROPOSED DIRECTLY ASSOCIATED TRANSMISSION LINES

FALMOUTH SOLAR

(1) POINT OF ORIGIN AND TERMINATION:	Suwannee Substation
(2) NUMBER OF LINES:	1
(3) RIGHT-OF-WAY:	New transmission line right-of-way
(4) LINE LENGTH:	0.2 miles
(5) VOLTAGE:	115 kV
(6) ANTICIPATED CONSTRUCTION TIMING:	4/26/2024
(7) ANTICIPATED CAPITAL INVESTMENT:	\$5,190,000
(8) SUBSTATIONS:	Suwannee Substation
(9) PARTICIPATION WITH OTHER UTILITIES:	N/A

DUKE ENERGY FLORIDA**SCHEDULE 10****STATUS REPORT AND SPECIFICATIONS OF PROPOSED DIRECTLY ASSOCIATED TRANSMISSION LINES****COUNTY LINE SOLAR**

(1) POINT OF ORIGIN AND TERMINATION:	Ginnie Substation
(2) NUMBER OF LINES:	1
(3) RIGHT-OF-WAY:	Existing transmission line right-of-way
(4) LINE LENGTH:	0.1 miles
(5) VOLTAGE:	230 kV
(6) ANTICIPATED CONSTRUCTION TIMING:	12/31/2024
(7) ANTICIPATED CAPITAL INVESTMENT:	\$3,532,625
(8) SUBSTATIONS:	Ginnie Substation
(9) PARTICIPATION WITH OTHER UTILITIES:	N/A

DUKE ENERGY FLORIDA**SCHEDULE 10****STATUS REPORT AND SPECIFICATIONS OF PROPOSED DIRECTLY ASSOCIATED TRANSMISSION LINES****SUNDANCE SOLAR**

(1) POINT OF ORIGIN AND TERMINATION:	Birch Switching Station
(2) NUMBER OF LINES:	1
(3) RIGHT-OF-WAY:	New transmission line right-of-way
(4) LINE LENGTH:	0.5 miles
(5) VOLTAGE:	230 kV
(6) ANTICIPATED CONSTRUCTION TIMING:	3/1/2025
(7) ANTICIPATED CAPITAL INVESTMENT:	\$5,540,000
(8) SUBSTATIONS:	Birch Switching Station
(9) PARTICIPATION WITH OTHER UTILITIES:	N/A

DUKE ENERGY FLORIDA

SCHEDULE 10

STATUS REPORT AND SPECIFICATIONS OF PROPOSED DIRECTLY ASSOCIATED TRANSMISSION LINES

BAILEY MILL SOLAR

(1) POINT OF ORIGIN AND TERMINATION:	Waukeelah Substation
(2) NUMBER OF LINES:	1
(3) RIGHT-OF-WAY:	New transmission line right-of-way
(4) LINE LENGTH:	0.1 miles
(5) VOLTAGE:	115 kV
(6) ANTICIPATED CONSTRUCTION TIMING:	7/3/2026
(7) ANTICIPATED CAPITAL INVESTMENT:	\$11,060,000
(8) SUBSTATIONS:	Waukeelah Substation
(9) PARTICIPATION WITH OTHER UTILITIES:	N/A

DUKE ENERGY FLORIDA

SCHEDULE 10

STATUS REPORT AND SPECIFICATIONS OF PROPOSED DIRECTLY ASSOCIATED TRANSMISSION LINES

HALF MOON SOLAR

- | | |
|---|--|
| (1) POINT OF ORIGIN AND TERMINATION: | A new 230 kV Switching Station on the Central Florida to Holder 230 kV line, approximately 18 miles from Holder substation |
| (2) NUMBER OF LINES: | 1 |
| (3) RIGHT-OF-WAY: | Existing transmission line right-of-way |
| (4) LINE LENGTH: | 0.1 miles |
| (5) VOLTAGE: | 230 kV |
| (6) ANTICIPATED CONSTRUCTION TIMING: | 12/1/2025 |
| (7) ANTICIPATED CAPITAL INVESTMENT: | \$28,167,740 |
| (8) SUBSTATIONS: | A new 230 kV Switching Station on the Central Florida to Holder 230 kV line, approximately 18 miles from Holder substation |
| (9) PARTICIPATION WITH OTHER UTILITIES: | N/A |

DUKE ENERGY FLORIDA

SCHEDULE 10

STATUS REPORT AND SPECIFICATIONS OF PROPOSED DIRECTLY ASSOCIATED TRANSMISSION LINES

RATTLER SOLAR

(1) POINT OF ORIGIN AND TERMINATION:	A greenfield four (4) position ring bus substation along the DEF Brooksville to Inverness 69 kV transmission line, proximate to the existing Nobleton Tap
(2) NUMBER OF LINES:	1
(3) RIGHT-OF-WAY:	New transmission line right-of-way
(4) LINE LENGTH:	1 mile
(5) VOLTAGE:	69 kV
(6) ANTICIPATED CONSTRUCTION TIMING:	11/1/2025
(7) ANTICIPATED CAPITAL INVESTMENT:	\$22,337,000
(8) SUBSTATIONS:	A greenfield four (4) position ring bus substation along the DEF Brooksville to Inverness 69 kV transmission line, proximate to the existing Nobleton Tap
(9) PARTICIPATION WITH OTHER UTILITIES:	N/A

DUKE ENERGY FLORIDA**SCHEDULE 10****STATUS REPORT AND SPECIFICATIONS OF PROPOSED DIRECTLY ASSOCIATED TRANSMISSION LINES****OSPREY**

- (1) POINT OF ORIGIN AND TERMINATION: Kathleen - Osprey
- (2) NUMBER OF LINES: 1
- (3) RIGHT-OF-WAY: New transmission line right-of-way
- (4) LINE LENGTH: 26.5 miles
- (5) VOLTAGE: 230 kV
- (6) ANTICIPATED CONSTRUCTION TIMING: 11/1/2024
- (7) ANTICIPATED CAPITAL INVESTMENT: \$150,000,000
- (8) SUBSTATIONS: Kathleen, Osprey
- (9) PARTICIPATION WITH OTHER UTILITIES: N/A

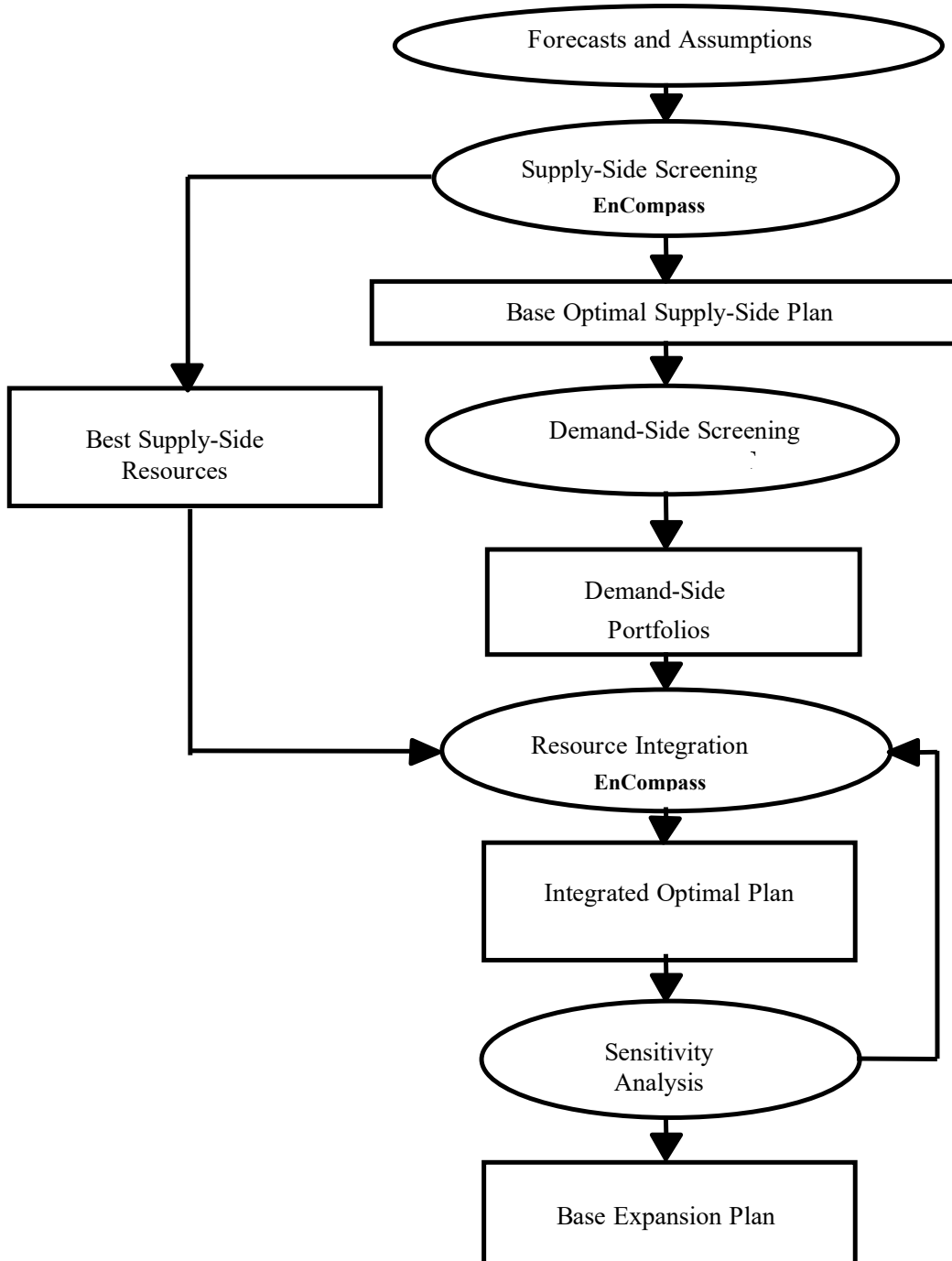
INTEGRATED RESOURCE PLANNING OVERVIEW

DEF employs an Integrated Resource Planning (IRP) process to determine the most cost-effective mix of supply- and demand-side alternatives that will reliably satisfy our customers' future demand and energy needs. DEF's IRP process incorporates state-of-the-art computer models used to evaluate a wide range of future generation alternatives and cost-effective conservation and dispatchable demand-side management programs on a consistent and integrated basis.

An overview of DEF's IRP Process is shown in Figure 3.1. The process begins with the development of various forecasts, including demand and energy, fuel prices, and economic assumptions. Future supply- and demand-side resource alternatives are identified, and extensive cost and operating data are collected to enable these to be modeled in detail. These alternatives are optimized together to determine the most cost-effective plan for DEF to pursue over the next ten years that meets the reliability criteria for our customers. The resulting ten-year plan, the Integrated Optimal Plan, is then tested under different relevant sensitivity scenarios to identify variances, if any, which would warrant reconsideration of any of the base plan assumptions. If the plan is judged robust and works within the corporate framework, it evolves as the Base Expansion Plan. This process is discussed in more detail in the following section titled "The Integrated Resource Planning (IRP) Process".

The IRP provides DEF with substantial guidance in assessing and optimizing the Company's overall resource mix on both the supply side and the demand side. When a decision supporting a significant resource commitment is being developed (e.g., plant construction, power purchase, DSM program implementation), the Company will move forward with directional guidance from the IRP and delve much further into the specific levels of examination required. This more detailed assessment will typically address very specific technical requirements and cost estimates, detailed corporate financial considerations, and the most current dynamics of the business and regulatory environments.

FIGURE 3.1
Integrated Resource Planning (IRP) Process Overview



THE INTEGRATED RESOURCE PLANNING (IRP) PROCESS

Forecasts and Assumptions

The evaluation of possible supply- and demand-side alternatives, and development of the optimal plan, is an integral part of the IRP process. These steps together comprise the integration process that begins with the development of forecasts and collection of input data. Base forecasts that reflect DEF's view of the most likely future scenario are developed. Additional future scenarios along with high and low forecasts may also be developed. Computer models used in the process are brought up to date to reflect this data, along with the latest operating parameters and maintenance schedules for DEF's existing generating units. This establishes a consistent starting point for all further analysis.

Reliability Criteria

Utilities require a margin of generating capacity above the firm demands of their customers in order to provide reliable service. Periodic scheduled outages are required to perform maintenance and inspections of generating plant equipment. At any given time during the year, some capacity may be out of service due to unanticipated equipment failures resulting in forced outages of generation units. Adequate reserve capacity must be available to accommodate these outages and to compensate for higher than projected peak demand due to forecast uncertainty and abnormal weather. In addition, some capacity must be available for operating reserves to maintain the balance between supply and demand on a moment-to-moment basis.

DEF plans its resources in a manner consistent with utility industry planning practices and employs both deterministic and probabilistic reliability criteria in the resource planning process. A Reserve Margin criterion is used as a deterministic measure of DEF's ability to meet its forecasted seasonal peak load with firm capacity. DEF plans its resources to satisfy a minimum 20% Reserve Margin criterion.

Loss of Load Probability (LOLP) is a probabilistic criterion that measures the probability that a company will be unable to meet its load throughout the year. While Reserve Margin considers the peak load and amount of installed resources, LOLP considers generating unit sizes, capacity mix, maintenance scheduling, unit availabilities, and capacity assistance available from other utilities. A

standard probabilistic reliability threshold commonly used in the electric utility industry, and the criterion employed by DEF, is a maximum of one day in ten years loss of load probability.

DEF has based its resource planning on the use of dual reliability criteria since the early 1990s, a practice that has been accepted by the FPSC. DEF's resource portfolio is designed to satisfy the 20% Reserve Margin requirement and probabilistic analyses are periodically conducted to ensure that the one day in ten years LOLP criterion is also satisfied. By using both the Reserve Margin and LOLP planning criteria, DEF's resource portfolio is designed to have sufficient capacity available to meet customer peak demand, and to provide reliable generation service under expected load conditions. DEF has found that resource additions are typically triggered to meet the 20% Reserve Margin thresholds before LOLP becomes a factor.

Supply-Side Screening

Potential supply-side resources are screened to determine those that are the most cost-effective. Data used for the screening analysis is compiled from various industry sources and DEF's experiences. The wide range of resource options is pre-screened to set aside those that do not warrant a detailed cost-effectiveness analysis. Typical screening criteria are costs, fuel source, technology maturity, environmental parameters (e.g., emissions, possible climate impact), and overall resource feasibility.

Economic evaluation of generation alternatives is performed using the Capacity Expansion module of the EnCompass Power Planning Software licensed from Anchor Power Solutions. This optimization tool evaluates revenue requirements for specific resource plans generated from multiple combinations of future resource additions that meet system reliability criteria and other system constraints. Capacity expansion models are used to identify cost-effective system resources. However, additional modeling in a detailed production cost model is necessary to verify the resource selections with respect to cost, reliability, and environmental compliance as well as to conduct an overall assessment of the performance of the portfolio.

Demand-Side Screening

Like supply-side resources, the impacts of potential demand-side resources are also factored into the integrated resource plan. The projected MW and MWH impacts for demand-side management

resources are based on the energy efficiency measures and energy management programs included in DEF's 2015 DSM Plan and meet the goals established by the FPSC in December 2019 (Docket 20190018-EG).

Resource Integration and the Integrated Optimal Plan

The cost-effective generation alternatives can then be optimized together with the demand-side portfolios developed in the screening process to formulate integrated optimal plans. The optimization program considers all possible future combinations of supply- and demand-side alternatives that meet the Company's reliability criteria in each year of the ten-year study period and reports those that provide both flexibility and reasonable revenue requirements (rates) for DEF's customers. Candidate base plans are then evaluated using the production cost module of EnCompass. Production cost models maintain full chronology and load requirements in all hours simulating the hour-to-hour operation of the system. This provides hourly modeling of the portfolio dispatch and provides insights into the detailed energy production cost of a given portfolio, the emissions profile and helps to identify potential issues with unit operation and reliability.

Developing the Base Expansion Plan

The integrated optimized plan that provides the lowest revenue requirements may then be further tested using sensitivity analysis, including High and Low Demand and Energy Forecasts (see Schedules 2 and 3). The economics of the plan may be evaluated under high and low forecast scenarios for fuel, load and financial assumptions, or any other sensitivities which the planner deems relevant. From the sensitivity assessment, the plan that is identified as achieving the best balance of flexibility and cost is then reviewed within the corporate framework to determine how the plan potentially impacts or is impacted by many other factors. If the plan is judged robust under this review, it would then be considered the Base Expansion Plan.

KEY CORPORATE FORECASTS

Load Forecast

The assumptions and methodology used to develop the base case load and energy forecast are described in Chapter 2 of this TYSP. The High and Low forecasts of load and energy were provided to Resource Planning to test the robustness of the base plan.

Fuel Price Forecast

The base case fuel price forecast was developed using short-term and long-term spot market price projections from industry-recognized sources. The base cost for coal is based on the existing contracts and spot market coal prices and transportation arrangements between DEF and its various suppliers. For the longer term, the prices are based on spot market forecasts reflective of expected market conditions. Oil and natural gas prices are estimated based on current and expected contracts and spot purchase arrangements as well as near-term and long-term market forecasts. Oil and natural gas commodity prices are driven primarily by open market forces of supply and demand. Natural gas firm transportation cost is determined primarily by pipeline tariff rates.

Financial Forecast

The key financial assumptions used in DEF's most recent planning studies were 47% debt and 53% equity capital structure, projected cost of debt of 6.0%, and an equity return of 10.1%. The assumptions resulted in a weighted average cost of capital of 8.17% and an after-tax discount rate of 7.45%.

TEN-YEAR SITE PLAN (TYSP) RESOURCE ADDITIONS

DEF's planned supply resource additions and changes are shown in Schedule 8 and are referred to as DEF's Base Expansion Plan. This plan includes a net addition of over 4,700 MW of solar PV generation with an expected equivalent summer firm capacity contribution of approximately 880 MW, 90 MW of firm storage added in 2027 and 430 MW of combustion turbine firm capacity added in years 2032 and 2033. The incorporation of the full firm capacity of the Osprey Energy Center takes place at the end of 2025. Between 2022 and 2027, DEF will add close to 400 MW of combined cycle capacity that results from projects focusing on increasing the fuel efficiency of the combined cycle generating units. DEF continues to consider market supply-side resource alternatives to enhance DEF's resource plan.

The incorporation of the IRA tax credits has helped offset projected cost increases for solar, batteries, and solar plus storage units. In DEF's most recent approved rate settlement (FPSC Docket No. 20210016-EI), DEF anticipates the retirement of the two remaining coal units at Crystal River (Crystal River units 4 and 5) in 2034. Solar PV and a mix of batteries and CTs will

be the cost-effective generation to replace most of that energy in the 2034 timeframe. DEF's plan to construct Solar Plants continues following a steady path, including a total of 1350 MW in the years 2024 through 2027. From 2028 through 2030 two Solar plus Storage units will be added per year. A more aggressive addition of Solar resources will continue from 2028 through 2033, totaling an additional 2,925 MW over those 6 years. This provides a path to meeting this goal through a measured and paced approach to bringing the solar onto the system which recognizes the challenges of building and interconnecting solar projects, helps maintain reliability as solar penetration increases and maintains affordability in customer rates. As with other elements of the plan, DEF will update these projections as decision dates approach. DEF also continues to consider market supply-side resource alternatives to enhance DEF's resource plan.

DEF recognizes that, as solar penetration increases, including both DEF and customer-owned PV, the total dependable solar resource capability is influencing or shifting DEF's reserve planning focus later beyond the on-peak period. DEF is accounting for this planning shift by deriving reduced summer capacity values of planned PV installations starting in 2025. Refer to Page 3-2 for additional solar resource capacity values that are accounting for this change.

DEF's Base Expansion Plan projects the need for additional capacity with estimated in-service dates during the ten-year period from 2024 through 2033. The planned capacity additions, together with purchases from QFs, IOUs, and IPPs help the DEF system meet the energy requirements of its customer base. The capacity needs identified in this plan may be impacted by DEF's ability to extend or replace existing purchase power and QF contracts and to secure new renewable purchased power resources in their respective projected timeframes. The additions in the Base Expansion Plan depend, in part, on projected load growth, and obtaining all necessary state and federal permits under current schedules. Changes in these or other factors could impact DEF's Base Expansion Plan.

Through its ongoing planning process, DEF will continue to evaluate the timetables for all projected resource additions and assess alternatives for the future considering, among other things, projected load growth, fuel prices, lead times in the construction marketplace, project development timelines for new fuels and technologies, and environmental compliance considerations. The

Company will continue to examine the merits of new generation alternatives and adjust its resource plans accordingly to ensure optimal selection of resource additions based on the best information available.

RENEWABLE ENERGY

DEF continues to secure renewable energy from the following facilities listed by fuel type:

Purchases from Municipal Solid Waste Facilities:

Pasco County Resource Recovery (23 MW)
Pinellas County Resource Recovery (54.8 MW)
Dade County Resource Recovery (As Available)
Lake County Resource Recovery (As Available)
Lee County Resource Recovery (As Available)

Purchases from Waste Heat from Exothermic Processes:

PCS Phosphate (As Available)
Citrus World (As Available)

Solar Photovoltaic Facilities

DEF-owned Solar Generation (1185.75 MW)
Osceola Solar Facility 3.8 MW
Perry Solar Facility 5.1 MW
Suwannee Solar Facility 8.8 MW
Hamilton Solar Power Plant 74.9 MW
Trenton Solar Power Plant 74.9 MW
Lake Placid Solar Power Plant 45.0 MW
St. Petersburg Pier Solar Power Plant 0.35 MW
DeBary Solar Power Plant 74.5 MW
Columbia Solar Power Plant 74.9 MW

Twin Rivers Solar Power Plant 74.9 MW
Santa Fe Solar Power Plant 74.9 MW
Duette Solar Power Plant 74.5 MW
Sandy Creek Solar Power Plant 74.9 MW
Fort Green Solar Power Plant 74.9 MW
Charlie Creek Solar Power Plant 74.9 MW
Bay Trail Solar Power Plant 74.9 MW
Bay Ranch Solar Power Plant 74.9 MW
Hardeetown Solar Power Plant 74.9 MW
High Springs Solar Power Plant 74.9 MW
Hildreth Solar Power Plant 74.9 MW

Customer-owned renewable generation under DEF's Net Metering Tariff (about 775 MW as of 12/31/23)

At this time, DEF is reviewing the potential for as-available purchased power contracts with third-party solar companies. In-service dates, however, are generally projected to be beyond 2025. As of December 31, 2023, DEF had over 5,100 MW of FERC jurisdictional solar projects in the DEF grid interconnection queue, representing over 69 active projects and 19 of those projects included DEF as the noted developer. DEF anticipates that additional projects developed by DEF as well as third parties will be added through the decade. Project ownership proportions may change over time based on specific project economics, development details, renewable energy incentives and other factors.

DEF continues to field inquiries from potential renewable suppliers and explore whether these potential QFs can provide project commitments and reliable capacity or energy consistent with FERC Rules and the FPSC Rules, 25-17.080 through 25-17.310. DEF will continue to submit renewable contracts in compliance with all policies as appropriate.

The development, construction, commissioning and initial operation of the solar projects at Perry, Osceola, Suwannee, Hamilton, Lake Placid, Trenton, DeBary, Columbia, Twin Rivers, Santa Fe, Duette, Bay Trail, Sandy Creek, Fort Green, Charlie Creek, the now commercial Bay Ranch, Hildreth, Hardeetown, and High Springs plants and under construction Mule Creek, Winquepin, Falmouth and County Line have provided DEF with valuable experience in siting, community engagement, contracting, constructing, operating, and integrating solar photovoltaic technology facilities on the power grid. DEF has worked with our communities on renewable and solar energy technology education, and our contractors to establish necessary standards for the construction and upkeep of utility grade facilities and to develop standards necessary to ensure the reliability of local distribution systems.

DEF is integrating voltage control in the transmission connected solar projects to enhance operational reliability and local transmission resiliency. In addition, DEF is incorporating the ability to place the solar facilities on Automatic Generation Control (AGC). This capability is preparing DEF for future scenarios where there is an excess of generation on the system and a need to utilize the solar resources to balance generation with demand. DEF is utilizing its operational experience and historic data from these solar resources to optimize the daily economic system dispatch, to quantify additional system flexibility needs to counteract the variability of solar generation and investigate potential fuel diversity contributions. The arrays for the solar plants that went in-service in 2023, Bay Ranch, Hardeetown, High Springs, and Hildreth, are shown in Figures 3.2, 3.3, 3.4, and 3.5 below.

FIGURE 3.2
Bay Ranch Solar Power Plant



FIGURE 3.3
Hardeetown Solar Power Plant



FIGURE 3.4
High Springs Solar Power Plant



FIGURE 3.5
Hildreth Power Plant



DEF's current forecast, supporting the Base Expansion Plan includes over 1,340 MW of DEF-owned solar PV to be under development over the next four years and approximately 4,700 MW over the ten-year planning horizon. As with all forecasts included here, the forecast relies heavily on the forward-looking price for this technology, the value rendered by this technology, and considerations to other emerging and conventional cost-effective alternatives, including the use of emerging battery storage technology.

BATTERY ENERGY STORAGE SYSTEMS

The final energy storage systems from DEF's 50 MW battery storage pilot program (Battery Storage Pilot) were placed in-service in 2023. This portfolio of projects may serve a variety of purposes including, but not limited to substation upgrade deferral, distribution line reconducting deferral, power reliability improvement, frequency regulation, Volt/VAR support, backup power, energy capture, and peak load shaving. The projects, max power output, and guaranteed energy storage for a minimum of ten years are provided in Table 3.3. Going forward, DEF will use the data gathered from the operation of these Pilot Program sites to evaluate the opportunities and uses of future DEF battery development. Integration and information sharing with the Duke Energy enterprise Emerging Technology Office will also allow real-world comparison with alternative technologies that may be available for commercial use in coming years.

Table 3.3
DEF Battery Energy Storage Pilot Program Projects Summary

Name	Max Power Output (MW)	Guaranteed Energy Storage (MWh)
Cape San Blas	5.5	14.3
Trenton	11.0	10.1
Micanopy	8.25	11.7
Jennings	5.5	5.5
John Hopkins Middle School	2.475	18.0
Lake Placid	17.275	34.0

DEF is currently developing a 100 MW / 200 MWH Battery Energy Storage System with a planned in-service date in 2027. The project will utilize lithium-ion energy storage and be located to maximize the Standalone Storage Investment Tax Credit (ITC) passed into law by the current administration. The expected increase of solar energy generation on the system provides a unique opportunity for energy storage assets to assist system integration of these intermittent resources and shift energy from lower system value periods to times with higher system value. This energy arbitrage will allow the cost of energy to be more predictably levelized and potentially partially reduces the need for peaking generation. New technologies and changing economics may allow acceleration of energy storage deployment in the future.

TECHNOLOGY AND INNOVATION

Duke Energy continues to evaluate new technology and innovations for potential application both in and beyond the ten-year plan window. Technologies under evaluation, but not yet included in the base expansion plan may be commercially or economically unproven, but Duke Energy and DEF are active in investigation and development of these technologies. At the Duke Energy enterprise level, engineers and specialists are involved in cooperative work with vendors and industry groups on supply-side technologies including wind generation, advanced battery development, hydrogen generation and combustion, and advanced nuclear. On the demand side, technologies including advanced demand response technologies such as commercial building pre-cooling, two-way water heater control, and smart appliance applications are being explored and evaluated. In addition, the company continues to explore intersections of grid and system operations with alternative generating technologies including distributed solar and storage and microgrid applications.

PLAN CONSIDERATIONS

Load Forecast

In general, higher-than-projected load growth would shift the need for new capacity to an earlier year and lower-than-projected load growth would delay the need for new resources. The Company's resource plan provides the flexibility to shift certain resources to earlier or later in-service dates should a significant change in projected customer demand begin to materialize. A

specific discussion of DEF's review of load growth forecasts higher and lower than the base forecast can be found in the previous sections.

TRANSMISSION PLANNING

DEF's transmission planning assessment practices are developed to test the ability of the planned system to meet the reliability criteria as outlined in the FERC Form No. 715 filing, and to assure the system meets DEF, Florida Reliability Coordinating Council, Inc. (FRCC), and North American Electric Reliability Corporation (NERC) criteria. This involves the use of load flow and transient stability programs to model various contingency situations that may occur, and in determining if the system response meets the reliability criteria. In general, this involves running simulations for the loss of any single line, generator, or transformer. DEF runs this analysis for contingencies that may occur at system peak and off-peak load levels, under both summer and winter conditions. Additional studies are performed to determine the system response to credible, but less probable criteria. These studies include the loss of multiple generators, transmission lines, or combinations of each (some load loss is permissible under the more severe disturbances). These credible, but less probable scenarios are also evaluated at various load levels since some of the more severe situations occur at average or minimum load conditions. In particular, critical fault clearing times are typically the shortest (most severe) at minimum load conditions, with just a few large base load units supplying the system needs. As noted in the DEF reliability criteria, some remedial actions are allowed to reduce system loadings; in particular, sectionalizing is allowed to reduce loading on lower voltage lines for bulk system contingencies, but the risk to load on the sectionalized system must be reasonable (it would not be considered prudent to operate for long periods with a sectionalized system). In addition, the number of remedial action steps and the overall complexity of the scheme are evaluated to determine overall acceptability.

DEF presently uses the following reference documents to calculate and manage Available Transfer Capability (ATC), Total Transfer Capability (TTC) and Transmission Reliability Margin (TRM) for required transmission path postings on the Florida Open Access Same Time Information System (OASIS):

- http://www.oatioasis.com/FPC/FPCdocs/ATCID_Posted_Rev4.pdf
- http://www.oatioasis.com/FPC/FPCdocs/TRMID_4.pdf

DEF uses the following reference document to calculate and manage Capacity Benefit Margin (CBM):

- http://www.oatioasis.com/FPC/FPCdocs/CBMID_rev3.pdf

CHAPTER 4

***ENVIRONMENTAL AND
LAND USE INFORMATION***



CHAPTER 4
ENVIRONMENTAL AND LAND USE INFORMATION

PREFERRED SITES

DEF's 2024 TYSP Preferred Sites include eight solar generations sites: the Mule Creek Solar Site, the Winquepin Solar Site, the Falmouth Solar Site, the County Line Solar Site, the Sundance Solar Site, the Bailey Mill Solar Site, the Half Moon Solar Site, and the Rattler Solar Site. These Preferred Sites are discussed below.

MULE CREEK SOLAR SITE

DEF has identified the Mule Creek Renewable Energy Center, a 74.9 MWac solar single-axis tracking PV project located in Bay County, Florida. Mule Creek is the third project constructed in Bay County. The site was used for pasture lands and is relatively flat with minimal sloping that will allow for the use of a tracking system. The point of interconnection is a new 230 kV breaker in DEF's existing Ladybug Switching Station and is connected via a short generation tie-line. All environmental surveys are complete. Solar is now a permitted use on agriculturally zoned land in a local government comprehensive plan in the State of Florida. Special or Conditional use permits are no longer required. However, a Development Order (Final Site Plan approval) was required from Bay County. An Environmental Resource Permit (ERP) from the Florida Department of Environmental Protection (FDEP) was received in November 2022. There were no wetland impacts on site and there are no impacts to listed species. The project started construction in the spring of 2023. Construction is substantially complete, and the expected in-service date is March 2024.

FIGURE 4.1

Mule Creek Solar Project

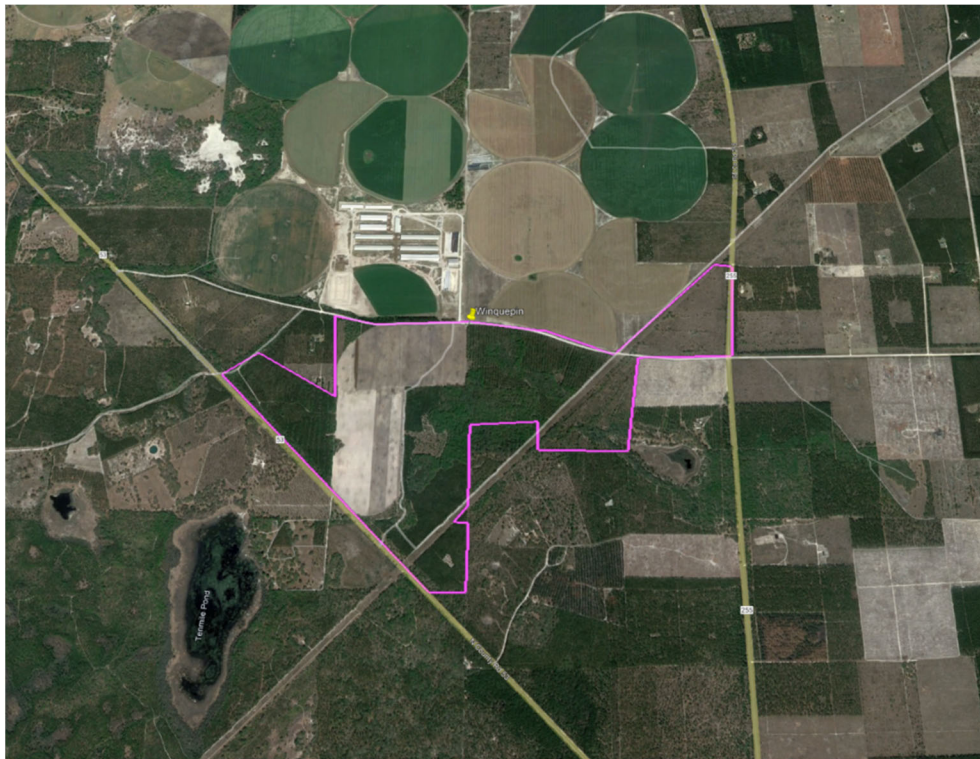


<u>Mule Creek</u>	2500 Sandy Creek Rd
	Panama City, FL 32404

WINQUEPIN SOLAR SITE

DEF has identified the Winquepin Renewable Energy Center, a 74.9 MWac solar single-axis tracking PV project located in Madison County, Florida. The site is located on former agricultural and timber lands and is relatively flat with minimal sloping that will allow for the use of a tracking system. The point of interconnection is a new 230 kV, three terminal, three breaker switching station and is connected via a short generation tie-line. All environmental surveys are complete. Madison County approved the Final Site Plan and an ERP from FDEP was secured. There were no wetland impacts on site. State listed gopher tortoises were present onsite. The appropriate permit (Conservation/Relocation Permit) from the Florida Fish and Wildlife Conservation Commission (FWC) was secured. Tortoises have been relocated from the site. No additional listed species of concern were present. Construction began in the spring of 2023. Construction activities are substantially complete, and the expected in-service date is March 2024.

FIGURE 4.2
Winquepin Solar Project



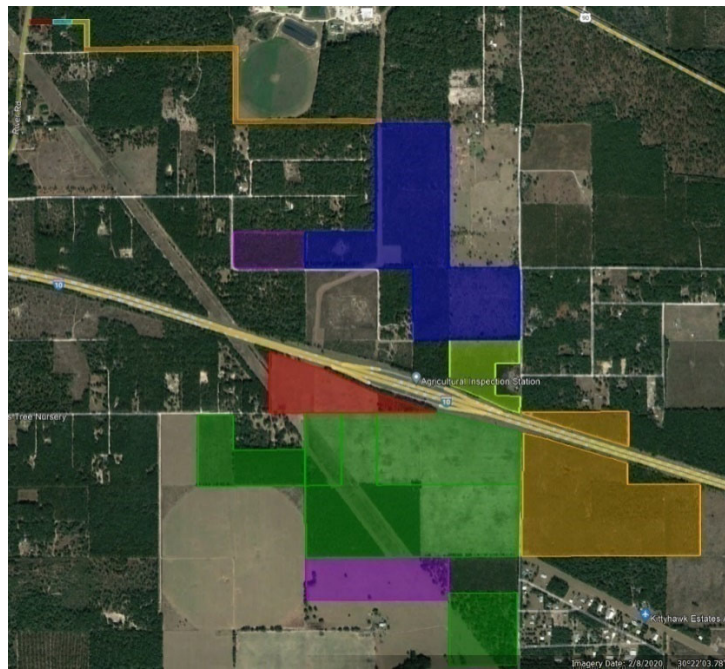
<u>Winquepin</u>	N. County Rd 53
	Madison, FL 32059

FALMOUTH SOLAR SITE

DEF has identified the Falmouth Renewable Energy Center, a 74.9 MWac solar single-axis tracking PV project located in Suwannee County, Florida. Falmouth will be the third project constructed in Suwannee County. The site was historically used as pasture and timber lands and is relatively flat with minimal sloping that will allow for the use of a tracking system. The point of interconnection will be a new 115 kV breaker in DEF's existing Suwannee Switching Station and will be connected via a 1.5-mile generation tie-line. All environmental surveys are complete. Suwannee County has provided Final Site Plan approval. The ERP was issued by FDEP on June 12, 2023. The two small wetlands on site, less than .5 acres total, were avoided thus there were no wetland impacts. The habitat assessment survey and subsequent species-specific surveys confirmed presence for the state-listed Southeastern American kestrel. Gopher tortoises were also present. FWC issued an Incidental Take Permit (ITP) for impacts to Southeastern American kestrel habitat and a Conservation/Relocation permit for gopher tortoises. Construction began in June of 2023. Construction is expected to complete by Q3 2024, with an expected in-service date of August 2024.

FIGURE 4.3

Falmouth Solar Project



<u>Falmouth</u>	4431 River Rd
	Live Oak FL 32060

COUNTY LINE SOLAR SITE

DEF has identified the County Line Renewable Energy Center, a 74.9 MWac solar single-axis tracking PV project located in Gilchrist County, Florida. The site was used for timber and pasture land and is relatively flat with minimal sloping that will allow for the use of a tracking system. The point of interconnection will be a new 230 kV breaker in DEF's existing Ginnie Substation and will be connected via a short generation tie-line. Environmental surveys have been completed and confirmed the presence of state-listed Southeastern American kestrel and state-listed gopher tortoise. There are no wetlands onsite. Final Site Plan approval from Gilchrist County was received on November 14, 2023. FDEP issued the final ERP on July 25, 2023. There are no wetland impacts proposed. FWC issued an ITP for impacts to Southeastern American kestrel habitat and a Conservation/Relocation permit for gopher tortoises. All gopher tortoises have been relocated. Construction began in December 2023. The expected in-service date is October 2024.

FIGURE 4.4
County Line Solar Project

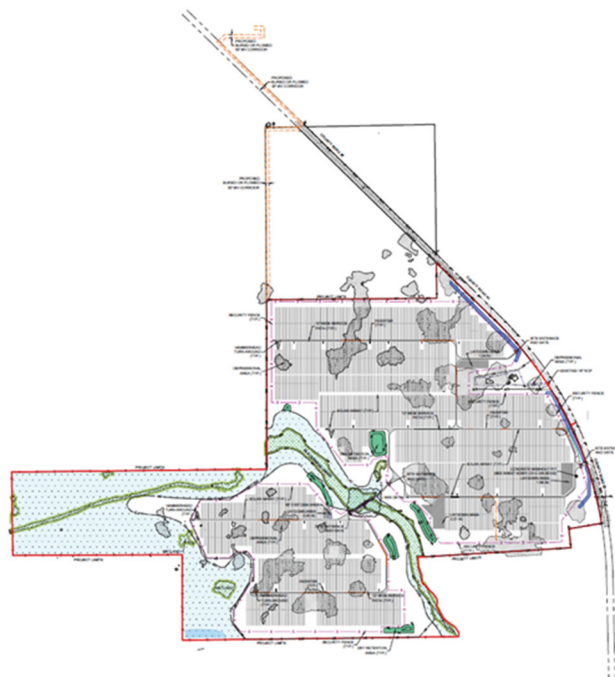


County Line	4960 NE 80th Blvd
	High Springs, FL 32643

SUNDANCE SOLAR SITE

DEF has identified the Sundance Renewable Energy Center, a 74.9 MWac solar single-axis tracking PV project located in Madison County, Florida. The site is located on former agricultural lands and is relatively flat with minimal sloping that will allow for the use of a tracking system. The point of interconnection will be a new breakered terminal in the 230 kV, three Birch switching station and will be connected via a mile generation tie-line. All environmental surveys are complete. Solar is a permitted use on agriculturally zoned land in a local government comprehensive plan in the State of Florida. Special or Conditional use permits are not required. However, a Site Plan approval is required from Madison County. An ERP from FDEP will also be required. DEF has applied for the ERP and expects to receive it early in spring 2024. There are several wetlands on site that will be avoided. State listed gopher tortoises were present onsite. The appropriate Relocation Permit from the FWC will be secured prior to construction. No additional listed species of concern were present. The project is expected to start construction in the spring of 2024, with an expected in-service date of early 2025.

FIGURE 4.5
Sundance Solar Project

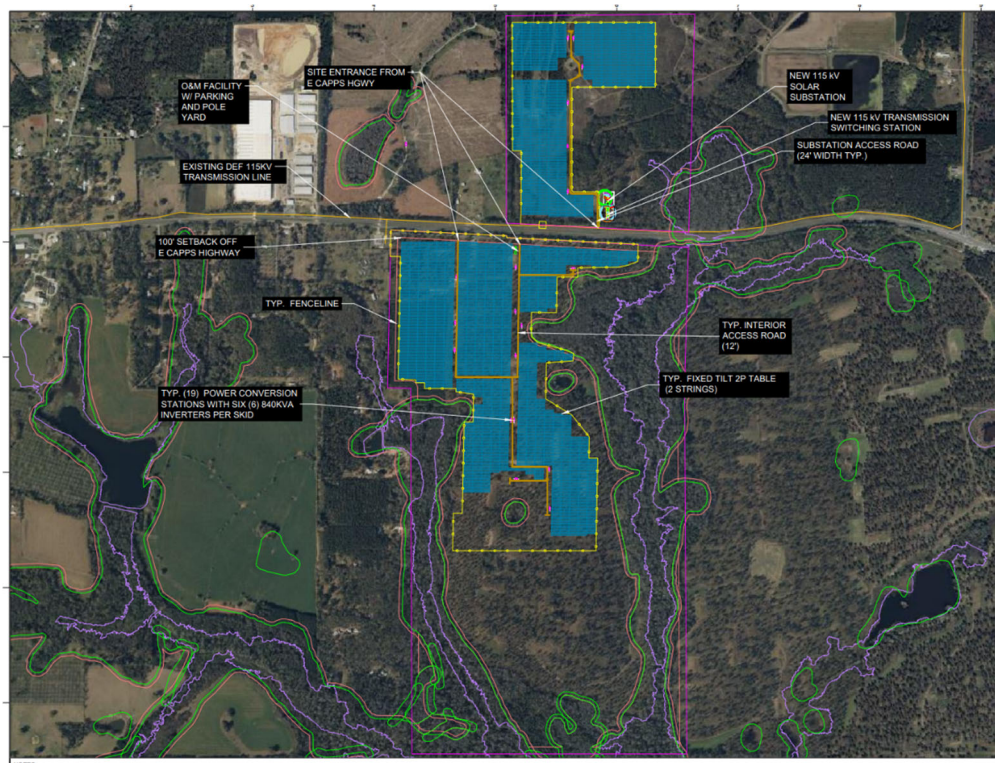


<u>Sundance</u>	16606 County Rd. 53
	Madison, FL 32059

BAILEY MILL SOLAR SITE

DEF has identified the Bailey Mill Renewable Energy Center, a 74.9 MWac solar Fixed tilt PV project located in Jefferson County, Florida. The site is located on timber and agricultural lands with some sloping that limits the use of a tracking system. The point of interconnection will be a new line tap on the Drifton to Waukeenah 115 kV line. All environmental surveys are complete. Solar is a permitted use on agriculturally zoned land in a local government comprehensive plan in the State of Florida. Special or Conditional use permits are not required. However, a Site Plan approval is required from Jefferson County. An ERP from FDEP will also be required. DEF intends to submit the ERP summer of 2024 and expects to receive it in late 2024. There are limited wetlands on site that will be avoided. State listed gopher tortoises were present onsite. The appropriate Relocation Permit from the FWC will be secured prior to construction. No additional listed species of concern were present. The project is expected to start construction in the spring of 2025, with an expected in-service date of December 2025.

FIGURE 4.6
Bailey Mill Solar Project

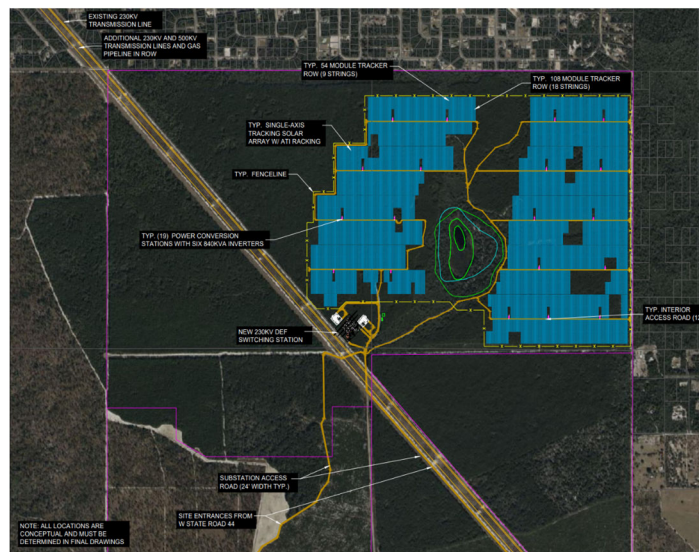


Bailey Mill	Jefferson County
	Zip Code 32344

HALF MOON SOLAR SITE

DEF has identified the Half Moon Renewable Energy Center, a 74.9 MWac solar single-axis tracking PV project located in Sumter County, Florida. The site is located on merchantable timber lands and is relatively flat with minimal sloping that will allow for the use of a tracking system. The point of interconnection will be a new 230 kV, three terminal, three breaker switching station and is connected via a short generation tie-line. All environmental surveys are complete. Solar is a permitted use on agriculturally zoned land in a local government comprehensive plan in the State of Florida. Special or Conditional use permits are not required. However, a Site Plan approval is required from Sumter County. An ERP from FDEP will also be required. DEF intends to submit the ERP summer of 2024 and expects to receive it in late 2024. There are limited wetlands on site that will be avoided. State listed gopher tortoises were present onsite. The appropriate Relocation Permit from the FWC will be secured prior to construction. The Florida Scrub Jay was shown in the area, but not present on site. Consultation with the FWC will be completed prior to the start of construction. The project is expected to start construction in the spring of 2025, with an expected in-service date of December 2025.

FIGURE 4.7
Half Moon Solar Project



<u>Half Moon</u>	County:	Sumter	Latitude:	28.955619	Longitude:	-82.159585
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RATTLER SOLAR SITE

DEF has identified the Rattler Renewable Energy Center, a 74.9 MWac solar single-axis tracking PV project located in Hernando County, Florida. The site is located on agricultural lands and is relatively flat with minimal sloping that will allow for the use of a tracking system. The point of interconnection will be a new 69 kV, four breaker switching station and is connected via a ~2-mile generation tie-line. All environmental surveys are complete. Solar is a permitted use on agriculturally zoned land in a local government comprehensive plan in the State of Florida. Special or Conditional use permits are not required. However, a Site Plan approval is required from Hernando County. An ERP from FDEP will also be required. DEF intends to submit the ERP summer of 2024 and expects to receive it in late 2024. There are limited wetlands on site that will be avoided. State listed gopher tortoises were present onsite. The appropriate permit Relocation Permit from the FWC will be secured prior to construction. The project is expected to start construction in the spring of 2025, with an expected in-service date of December 2025.

FIGURE 4.8
Rattler Solar Project

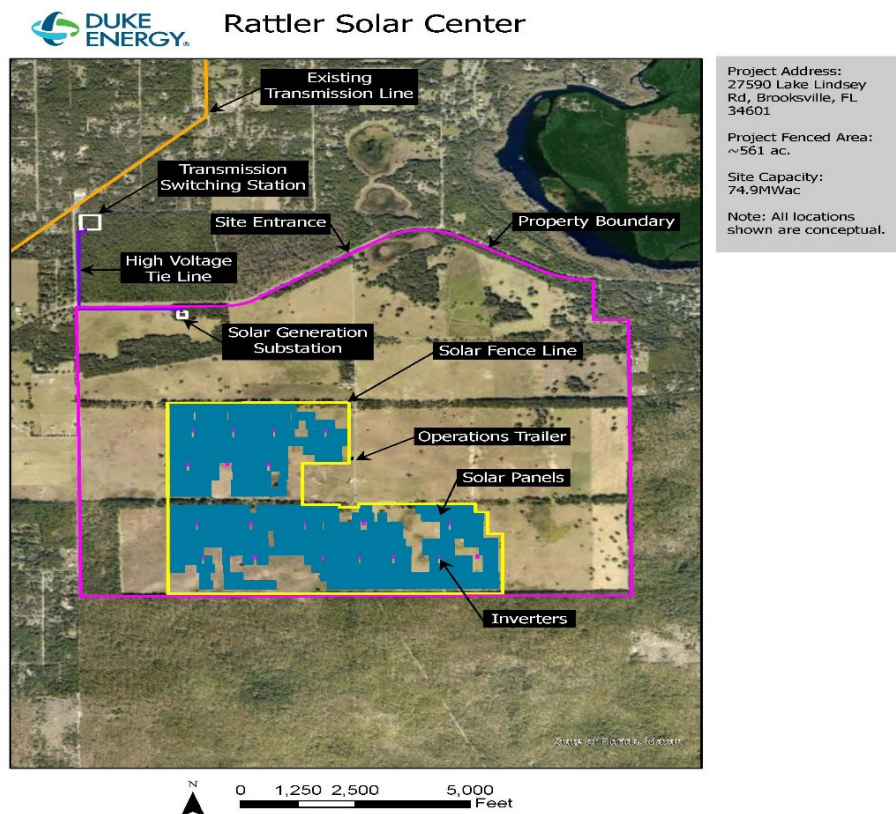


Exhibit RA-4:
2020 Crystal River North Retirement Study

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Petition for rate increase by Duke
Energy Florida, LLC.

Docket No. 20240025-EI

Dated: May 3, 2024

**DUKE ENERGY FLORIDA, LLC'S RESPONSE TO SIERRA CLUB'S FIRST
REQUEST FOR PRODUCTION OF DOCUMENTS (NOS. 1-13)**

Duke Energy Florida, LLC ("DEF"), responds to Sierra Club's First Request for Production of Documents (Nos. 1-13), as follows:

DOCUMENTS REQUESTED

1. Please provide all responses issued by DEF in response to data requests from any other party to this proceeding, including all attachments.

Response:

Sierra Club will have access to the non-confidential discovery responses served by DEF to other parties. Sierra Club may receive confidential responses only after execution of a non-disclosure agreement.

2. Please provide all work papers and schedules supporting DEF's application and supporting testimony (in electronic, machine-readable format).

Response:

Please refer to DEF's response to OPC POD 1-7 and LULAC POD 1-2.

3. Please refer to Sierra Club Interrogatory No. 1. For Crystal River units 4 and 5, please provide unredacted, in native format with all formulas intact, all analyses or assessments that study the value of continued operation (e.g., all retirement studies, unit condition assessments, deactivation assessments, or net present value of retirement analyses) conducted since 2018. This request includes, but is not limited to, all studies, presentations, reports, or other assessments conducted to determine how to comply with existing or potential environmental regulations.

Response:

Please see response to Sierra Club POD 1 - Q4.

4. Please refer to Sierra Club Interrogatory No. 2. Provide all underlying workbooks with formulas intact that were used to develop model input assumptions, in relation to each retirement study or unit condition assessment provided in response to Sierra Club Interrogatory No. 2 and Sierra Club Document Production Request No. 3.
 - a. Produce all analyses or assessments of the impact that retirement of each unit would have on capacity adequacy, transmission grid stability, transmission grid support, voltage support, or transmission system reliability.
 - b. Provide all modeled inputs for each unit and scenario.
 - c. Provide all modeling outputs by unit and scenario.
 - d. Provide all post-processing workbooks with formulas intact that were used to analyze study results outside the model.

Response:

Please see attachment bearing Bates numbers 20240025-SIERRACLUBPOD1-00000001 through 20240025-SIERRACLUBPPOD1-0000105. It includes the list of all the files that support the CRN retirement studies that were presented to Sierra Club in year 2020.

5. Please provide internal analyses, studies, or reports describing maintenance plans for Crystal River units 4 and 5 from now through 2034. Include information about expected timeline and cost for individual projects.

Response:

DEF completes cycle maintenance to keep the units reliable; new parts or material are incorporated as needed to sustain unit life. The Company is not adding new technology to the Crystal River units.

6. Please provide workpapers demonstrating the calculation of the quadratic heat rate formula for Crystal River units 4 and 5.

Response:

Crystal River North Retirement Study - Preliminary

December 15, 2020



Information in This Presentation is Prepared for DEF – Sierra Club Discussion
and is Confidential Subject to 2017 NDA



- Objective: Study Options for cost effective retirement of Crystal River 4 & 5 in a range of years beginning in 2025.
- Criteria: CPVRR through 2042 (current book retirement date)
- Replacement Options:
 - Conventional Generation – NGCC, CT, ZELFR (SMR)
 - Renewable Generation – Utility Scale PV
 - Capacity Replacement – CT, Battery Storage

- Baseline Modeling Assumptions:
 - Load Forecast
 - Fuel Forecast
 - CO2 Assumptions: Emission Price Consistent with DE Climate Goals
 - Solar & Battery Pricing
 - Projected Unit Maintenance Schedule (CRN)

20240025-SIERRACLUBPOD1-00000069

- CRN Current book life presumes a retirement date of 2042.
 - Base Case: Retire 2042
 - Alternates:

CRN Retirement Year	Replacement Alternatives			
2042	ZELFR			
2034	NGCC			Solar & Battery
2029	NGCC	Solar & CT	CTs Only	Solar & Battery
2025	NGCC			

<u>CPVRR Through Year 2042 2020\$M</u>	Early Retirement - CRN Ret 2042						
	CRN Ret 2034 Savings	CRN Ret 2034 Replaced with Solar and Batteries Savings	CRN Ret 2029 Savings	CRN Ret 2029 CTs only Savings	CRN Ret 2029 Replaced with Solar Savings	CRN Ret 2029 Replaced with Solar and Batteries Savings	CRN Ret 2025 Savings
Fuel Cost	(48)	(520)	(91)	346	(511)	(766)	(125)
Variable Costs	7	(4)	7	131	22	(5)	17
Environmental Costs without Carbon	(14)	(16)	(29)	(29)	(40)	(40)	(39)
Total Variable Savings before CO2 Costs	(56)	(539)	(113)	448	(528)	(811)	(148)
CO2 Cost	(398)	(687)	(610)	(371)	(787)	(949)	(678)
Total Variable Savings including CO2 Costs	(454)	(1,226)	(723)	77	(1,316)	(1,759)	(826)
Additional Solar and Batteries (Capital / FOM)	-	1,669	-	-	1,254	2,833	-
Conventional Generation (Capital / FOM / Gas Reserv.)	788	(141)	1,376	991	846	(135)	1,723
Fixed Costs associated with CRN and Ancloze	(360)	(360)	(481)	(481)	(481)	(481)	(708)
Total CPVRR Savings	(25)	(57)	172	586	303	457	190
	Retiring CRN in 2034 is the most economic option						
Total CPVRR Savings Without CO2 Costs	372	630	782	957	1,090	1,406	867
	Retiring CRN in 2042 is the most economic option						

20240025-SIERRACLUBPOD1-00000071
Negative = Savings

20240025-SIERRACLUBPOD1-00000072

CRN Retirement Year	Replacement Alternatives		
2042	ZELFR		
2034	NGCC	Solar 1500 MW and Battery 1300 MW	Solar 3000 MW and Battery 1300 MW
2029	NGCC	Solar 1500 MW and Battery 1300 MW	Solar 3000 MW and Battery 1300 MW
CR4 2026 - CR5 2029		Solar 1500 MW and Battery 1300 MW	Solar 3000 MW and Battery 1300 MW

Sensitivities

- DEF Reference Assumptions
- High Fuel Prices
- NREL ATB “Advanced” Unit Capital Prices and FOM
- Higher Demand Response Potential

UO Solar	Capacity MWs
Solar Units before SoBra	18
SoBra Solar Units	700
CEC Solar Units	750
2025 and beyond Solar Units	1,292
	2,760

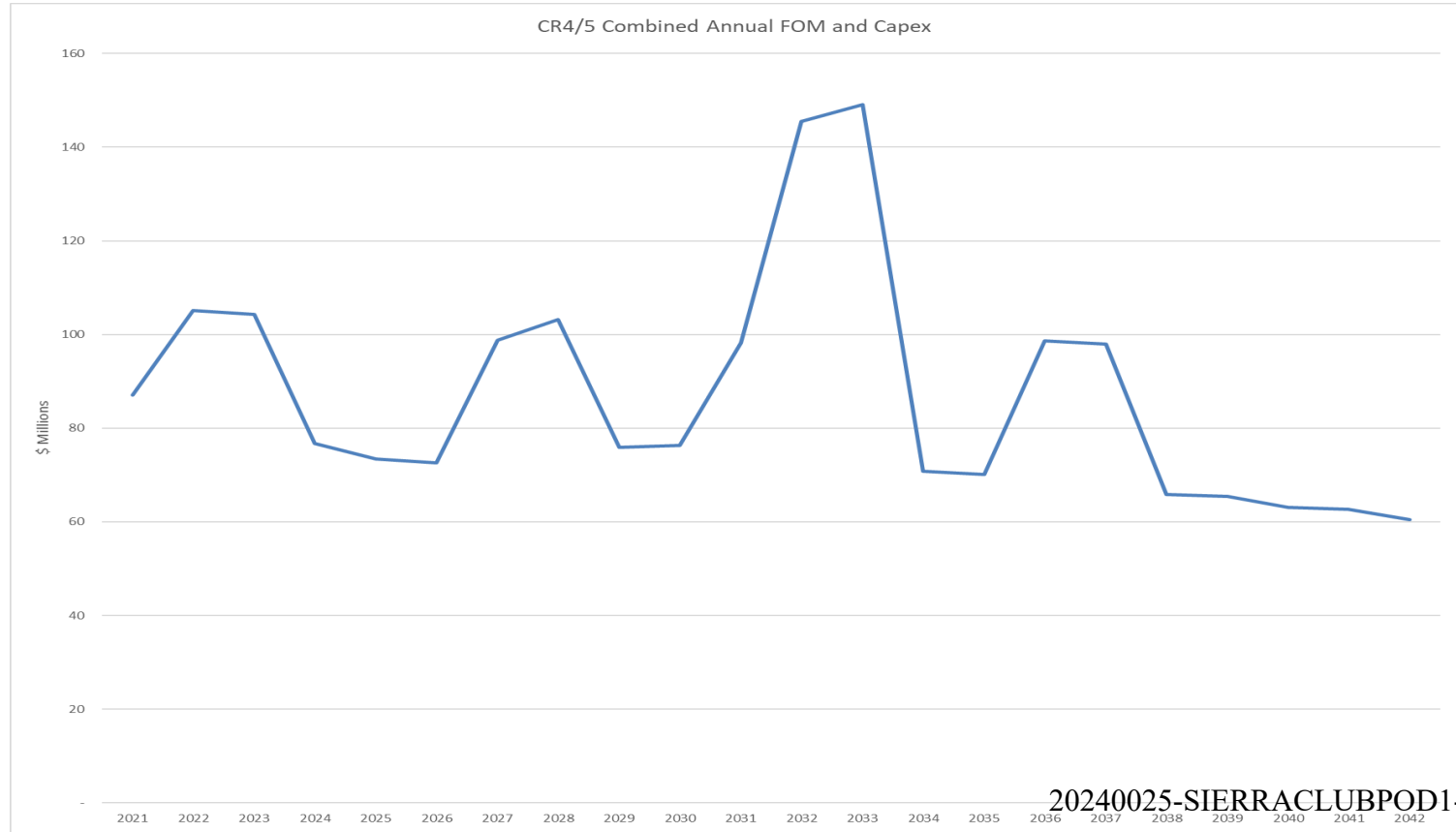
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Capital and OM Price Source:	DEF Reference				Capital and OM Price Source:	Sierra Club		
Fuel Price:	Reference				Fuel Price:	Reference		
DSM (Demand Response):	Base				DSM (Demand Response):	Base		
Retirement Year	Primary Replacement for CRN	Incremental Solar	Incremental Solar MW/Yr		Retirement Year	Primary Replacement for CRN	Incremental Solar	Incremental Solar MW/Yr
2042	ZELFR	None	N/A		2042	ZELFR	None	N/A
2034	NGCC	None	N/A		2034	NGCC	None	N/A
2034	Solar/Storage	1500	300		2034	Solar/Storage	1500	300
2034	Solar/Storage	3000	600		2034	Solar/Storage	3000	600
2029	NGCC	None	N/A		2029	NGCC	None	N/A
2029	Solar/Storage	1500	300		2029	Solar/Storage	1500	300
2029	Solar/Storage	3000	600		2029	Solar/Storage	3000	600
CR4 2026/CR5 2029	Solar/Storage	1500	300		CR4 2026/CR5 2029	Solar/Storage	1500	300
CR4 2026/CR5 2029	Solar/Storage	3000	600		CR4 2026/CR5 2029	Solar/Storage	3000	600
Capital and OM Price Source:	DEF Reference				Capital and OM Price Source:	Sierra Club		
Fuel Price:	High				Fuel Price:	High		
DSM (Demand Response):	Base				DSM (Demand Response):	Base		
Retirement Year	Primary Replacement for CRN	Incremental Solar	Incremental Solar MW/Yr		Retirement Year	Primary Replacement for CRN	Incremental Solar	Incremental Solar MW/Yr
2042	ZELFR	None	N/A		2042	ZELFR	None	N/A
2034	NGCC	None	N/A		2034	NGCC	None	N/A
2034	Solar/Storage	1500	300		2034	Solar/Storage	1500	300
2034	Solar/Storage	3000	600		2034	Solar/Storage	3000	600
2029	NGCC	None	N/A		2029	NGCC	None	N/A
2029	Solar/Storage	1500	300		2029	Solar/Storage	1500	300
2029	Solar/Storage	3000	600		2029	Solar/Storage	3000	600
CR4 2026/CR5 2029	Solar/Storage	1500	300		CR4 2026/CR5 2029	Solar/Storage	1500	300
CR4 2026/CR5 2029	Solar/Storage	3000	600		CR4 2026/CR5 2029	Solar/Storage	3000	600

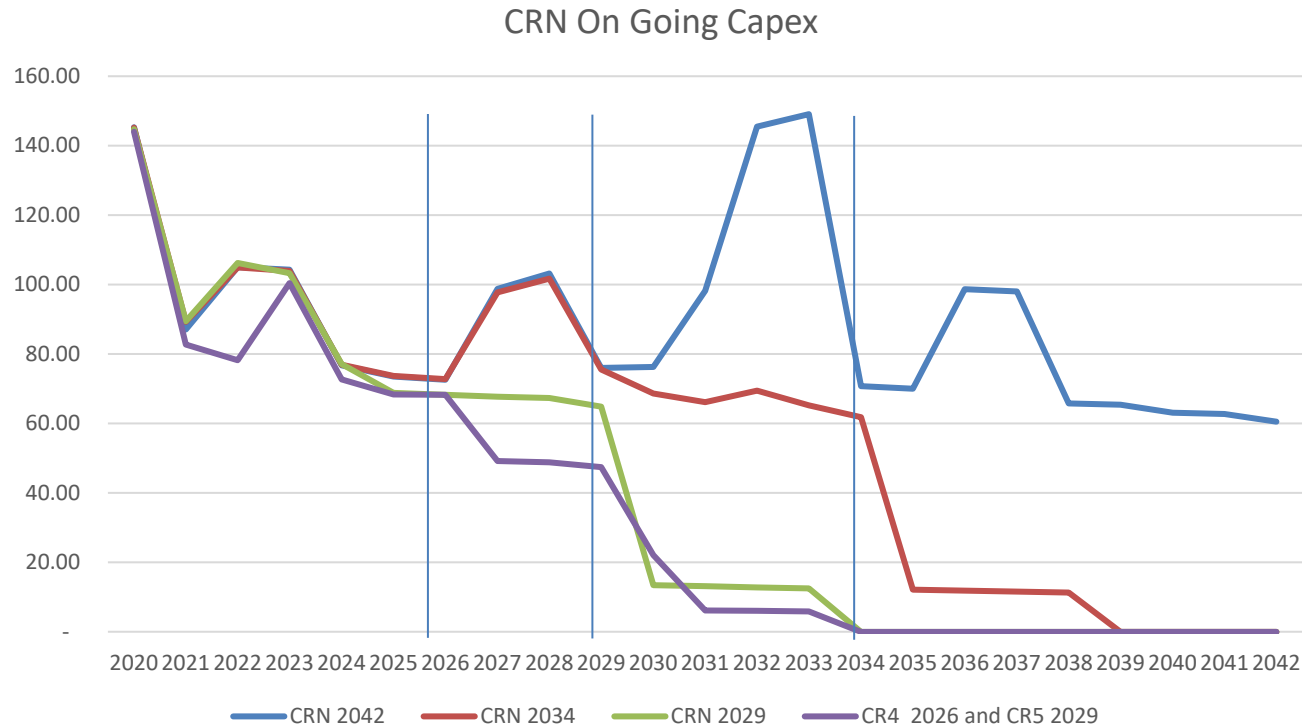
Capital and OM Price Source:	DEF Reference		
Fuel Price:	Reference		
DSM (Demand Response):	High		
Retirement Year	Primary Replacement for CRN	Incremental Solar	Incremental Solar MW/Yr
2042	ZELFR	None	N/A
2034	Solar/Storage	1500	300
2034	Solar/Storage	3000	600
2029	Solar/Storage	1500	300
2029	Solar/Storage	3000	600
CR4 2026/CR5 2029	Solar/Storage	1500	300
CR4 2026/CR5 2029	Solar/Storage	3000	600

<u>Capacity</u>	<u>Summer MWs</u>	<u>Firm MWs</u>
CRN	1,422.0	1,422.0
CT	214.3	214.3
CC	1,191.0	1,191.0
Nuclear	684.0	684.0
Solar	74.9	6.0
Storage	50.0	50.0

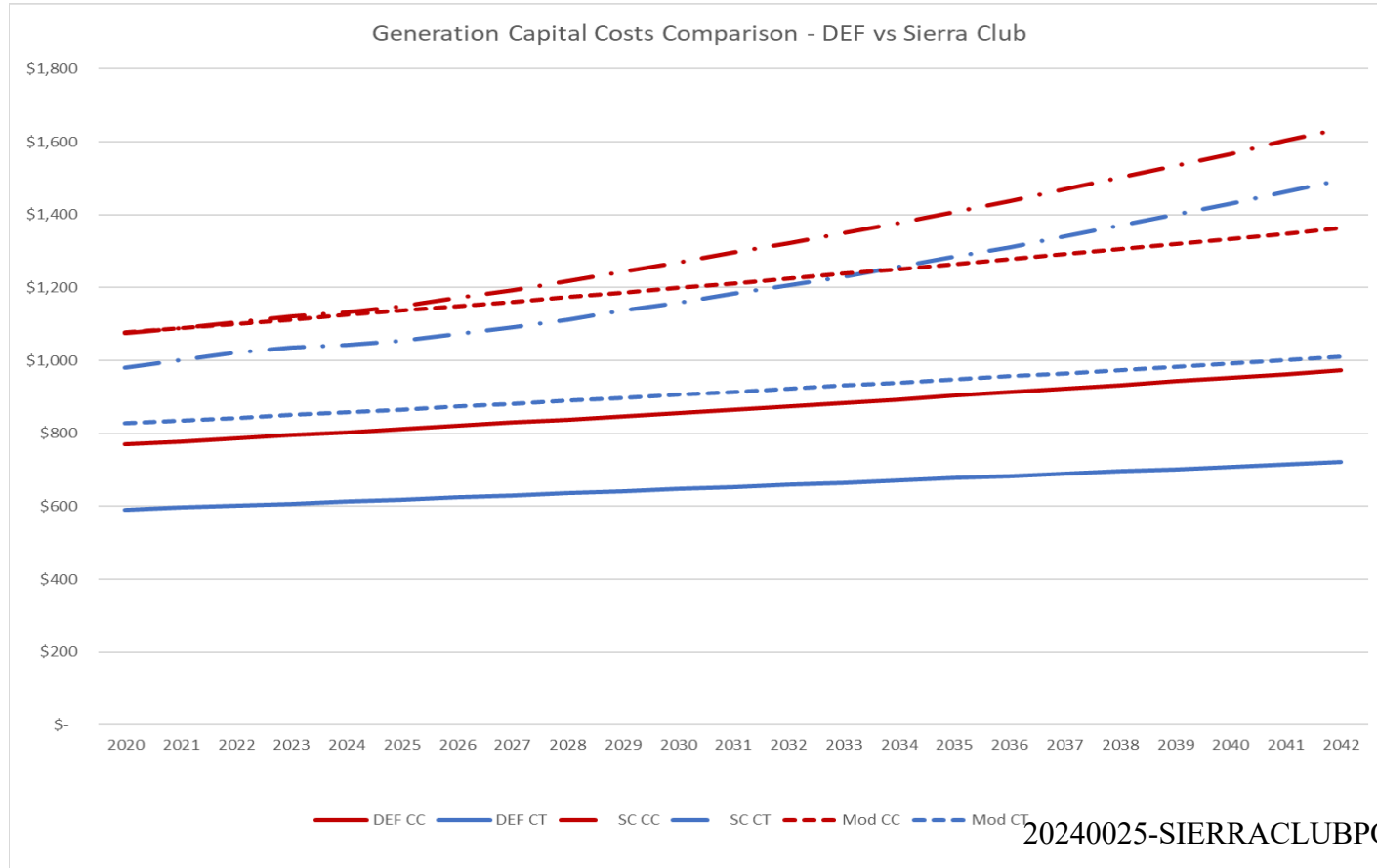
<u>Replacement Options</u>	<u>CC</u>	<u>CT</u>	<u>Nuclear</u>	<u>Solar</u>	<u>Storage</u>	<u>Total</u>	<u>CRN</u>	<u>Difference</u>
Conventional Generation	1,191.0	214.3				1,405.3	1,422.0	(17)
Solar + Storage				119.84	1,300.0	1,419.8	1,422.0	(2)
Nuclear + CTs		214.3	1,368.0			1,582.3	1,422.0	160



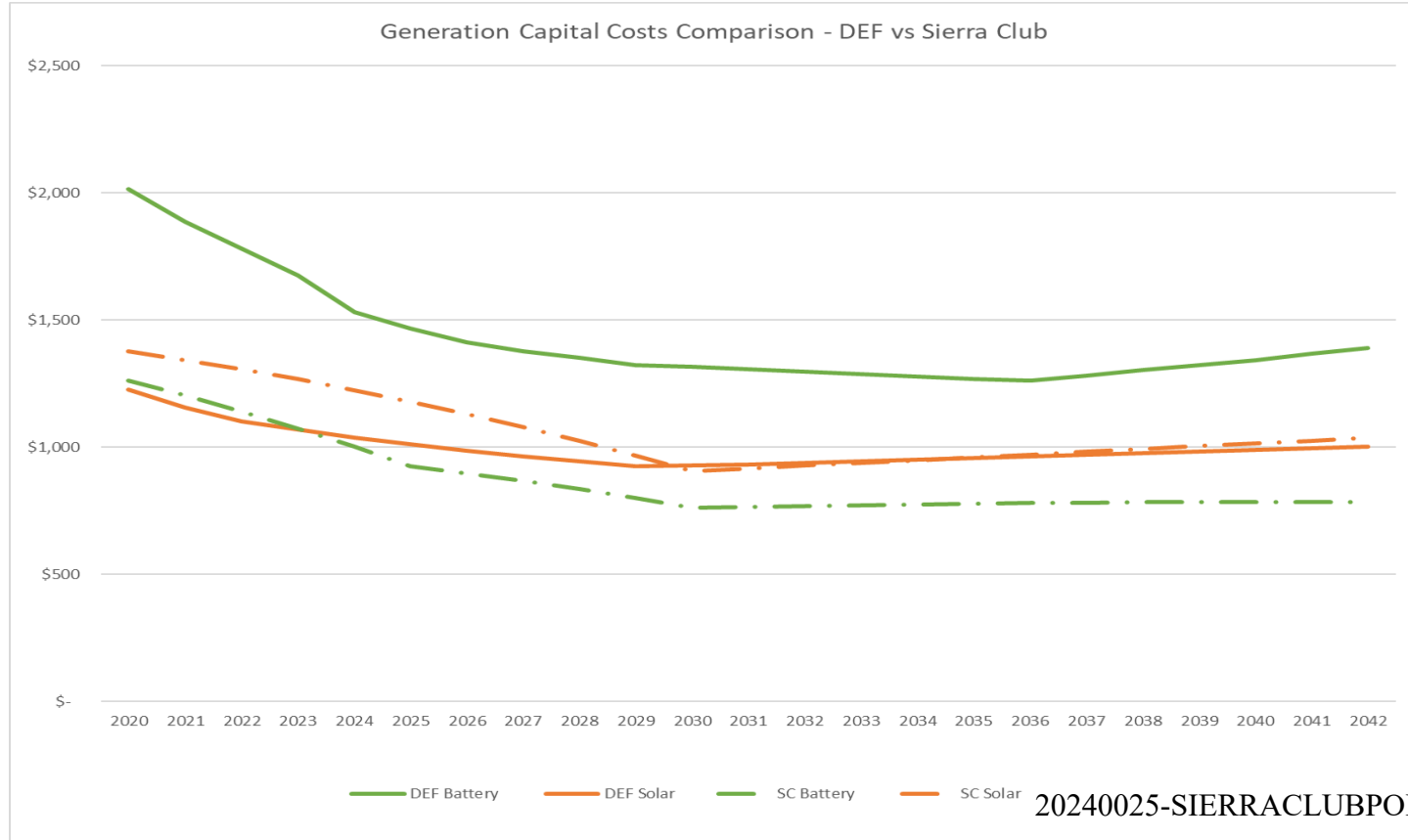
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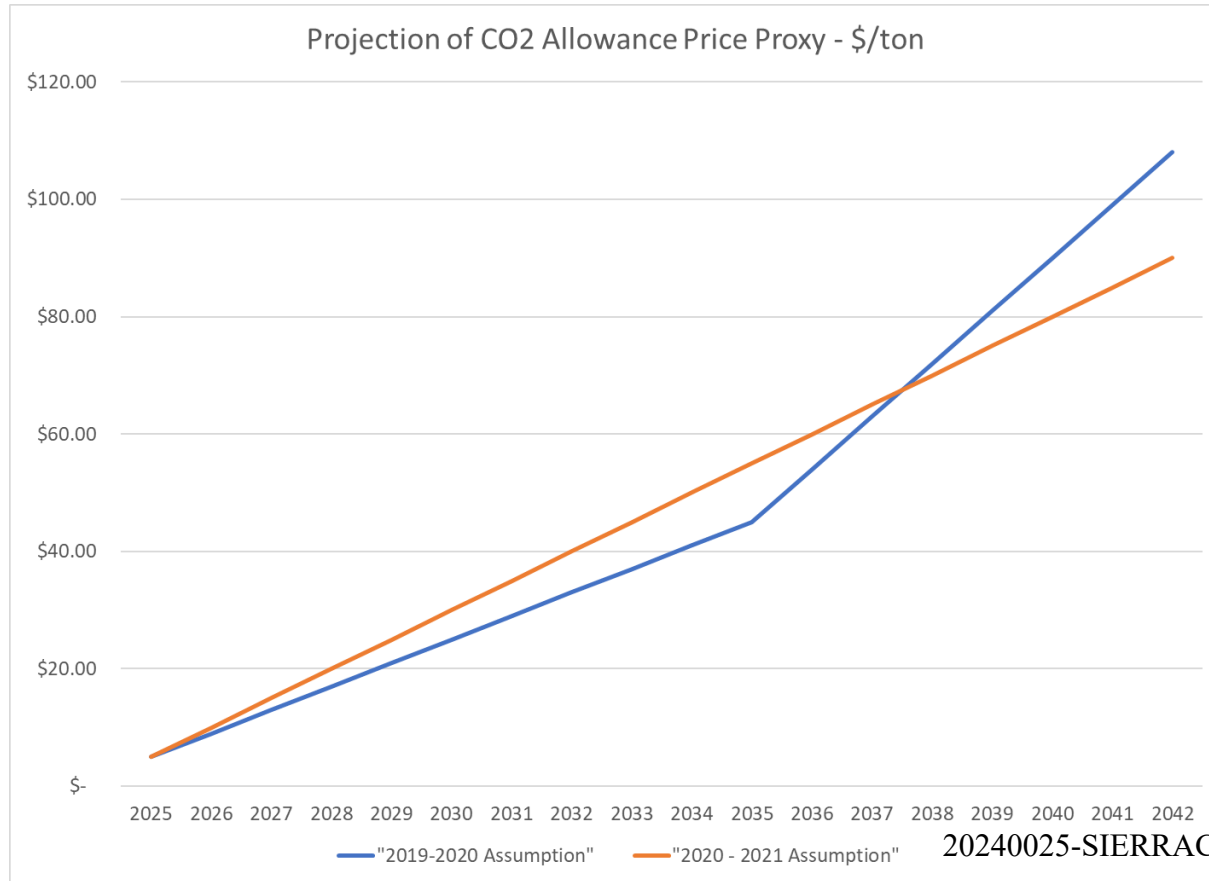
<u>Nominal Dollars</u>	<u>DEF \$/kw</u>		<u>Proposed by Sierra Club \$/kw</u>		<u>Sierra vs DEF \$/kw</u>		<u>Modeled \$/kw</u>		<u>Modeled vs Sierra \$/KW</u>	
<u>Overnight Costs</u>	<u>2029</u>	<u>2034</u>	<u>2029</u>	<u>2034</u>	<u>2029</u>	<u>2034</u>	<u>2029</u>	<u>2034</u>	<u>2029</u>	<u>2034</u>
NG CC	\$ 711	\$ 750	\$ 1,213	\$ 1,344	71%	79%	\$ 996	\$ 1,051	-18%	-22%
CT	\$ 641	\$ 671	\$ 1,109	\$ 1,226	73%	83%	\$ 898	\$ 939	-19%	-23%
Battery	\$ 1,351	\$ 1,280	\$ 800	\$ 776	-41%	-39%	\$ 800	\$ 776	0%	0%
Solar PV	\$ 925	\$ 956	\$ 967	\$ 950	4%	-1%	\$ 925	\$ 956	-4%	1%



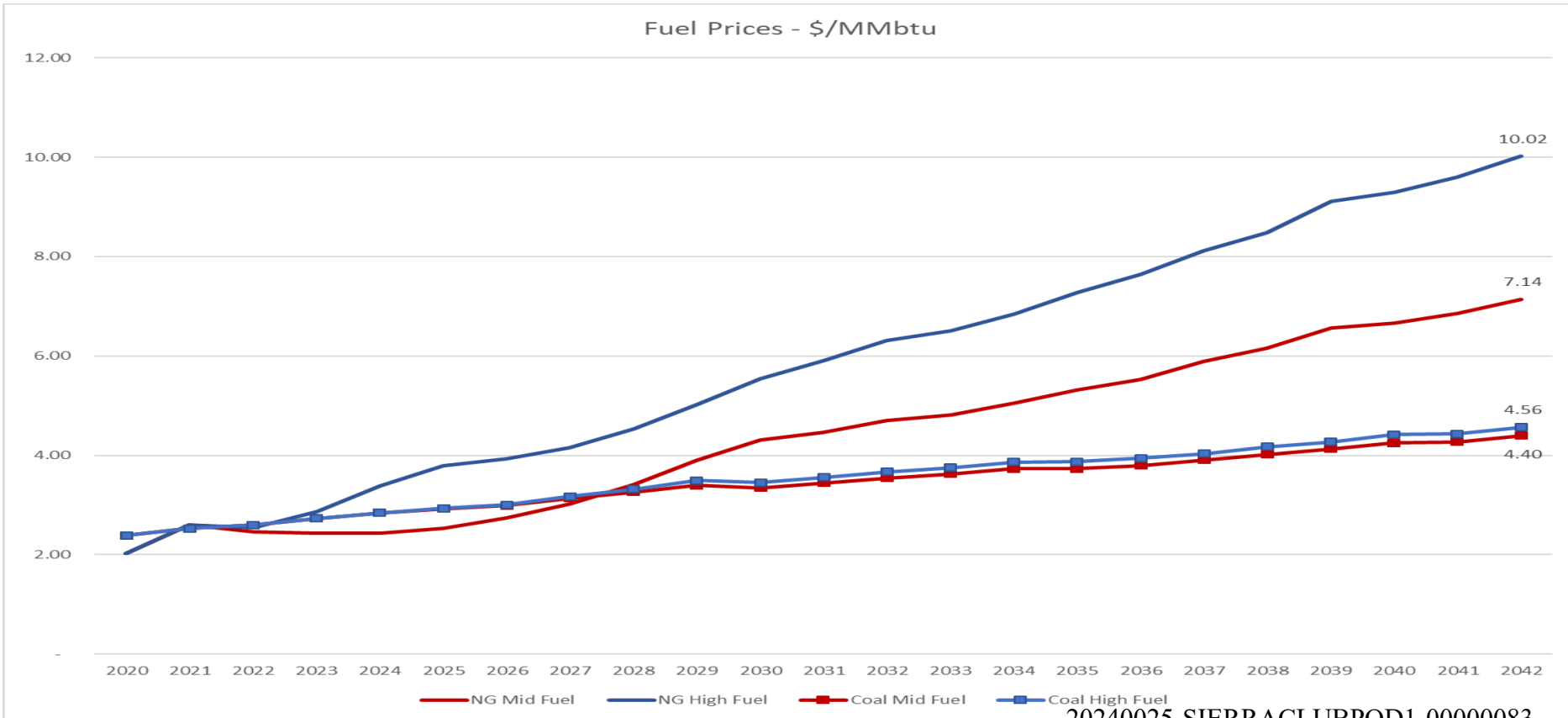
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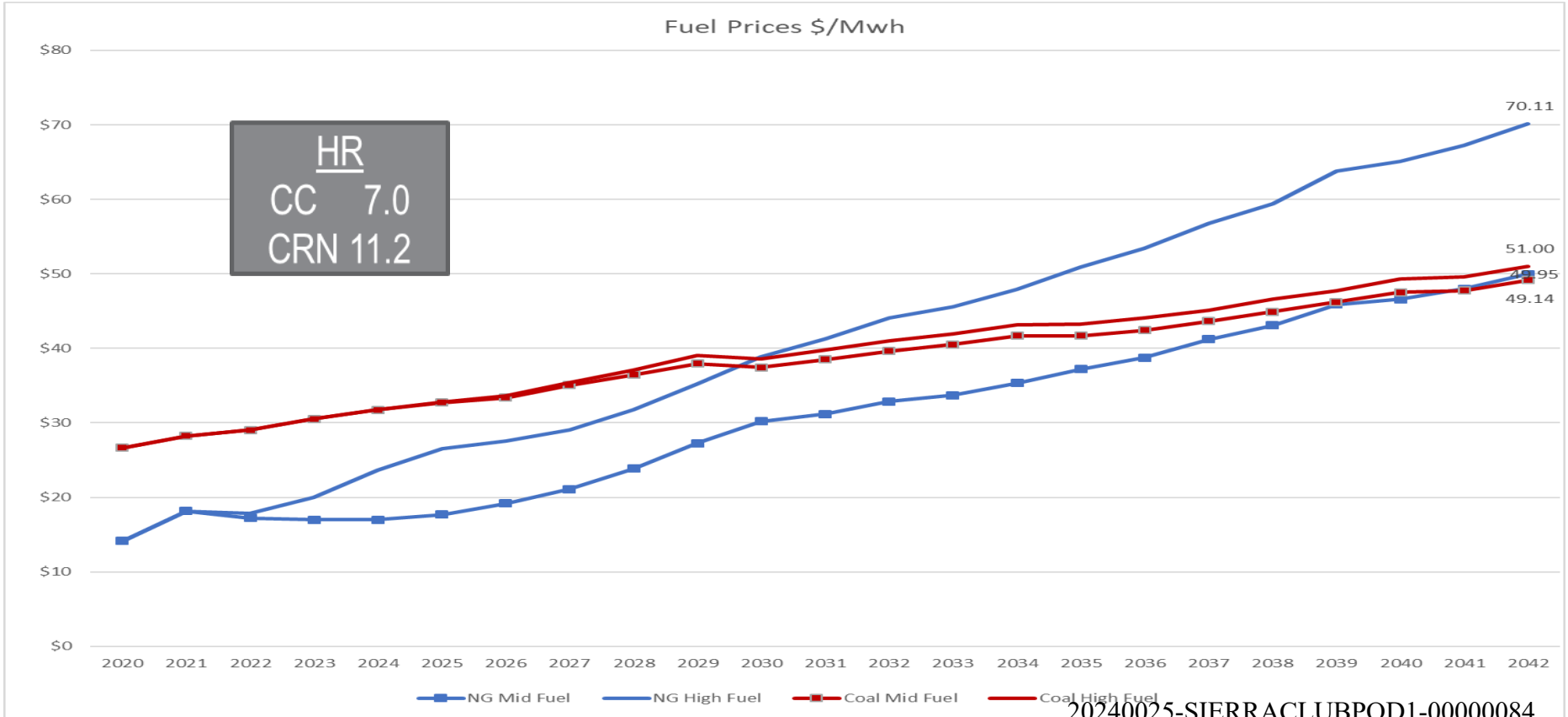


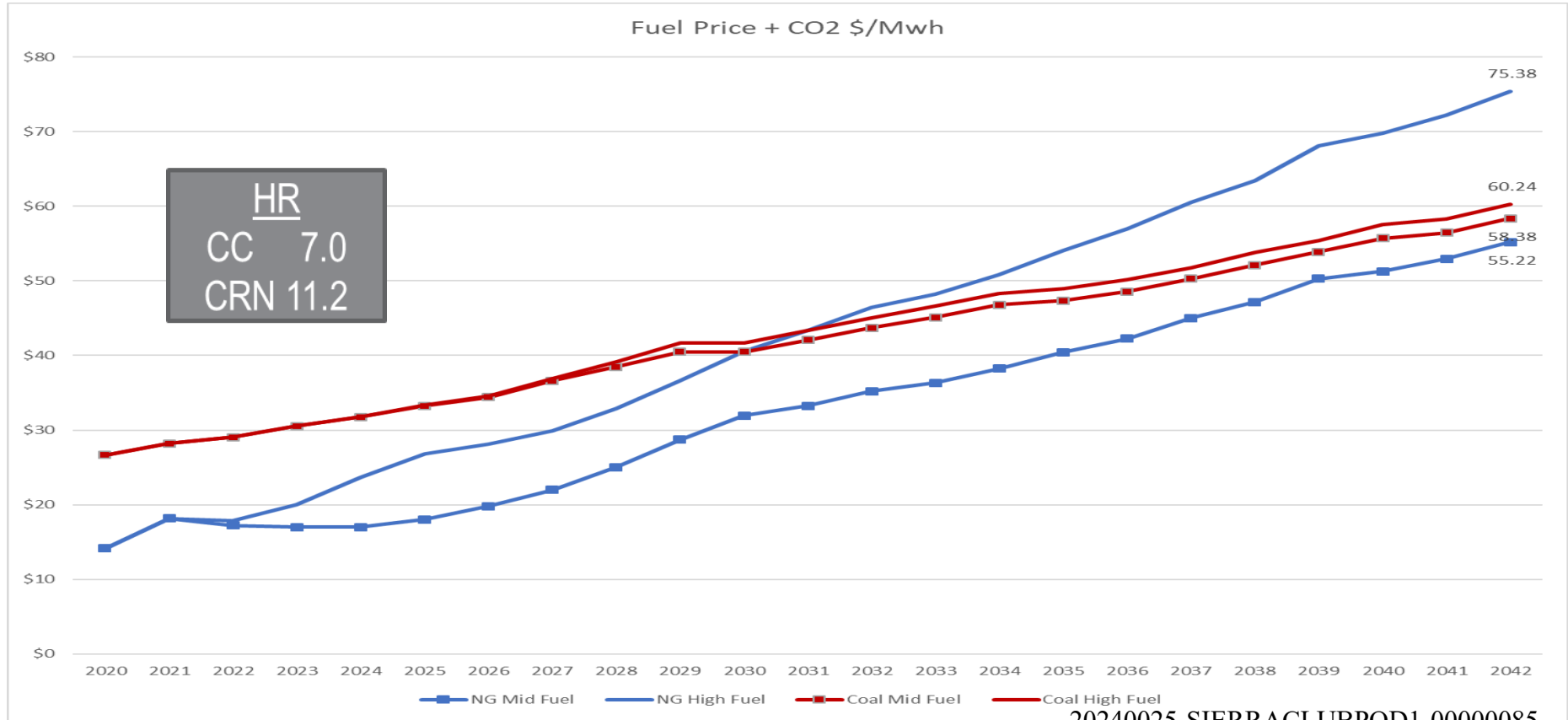
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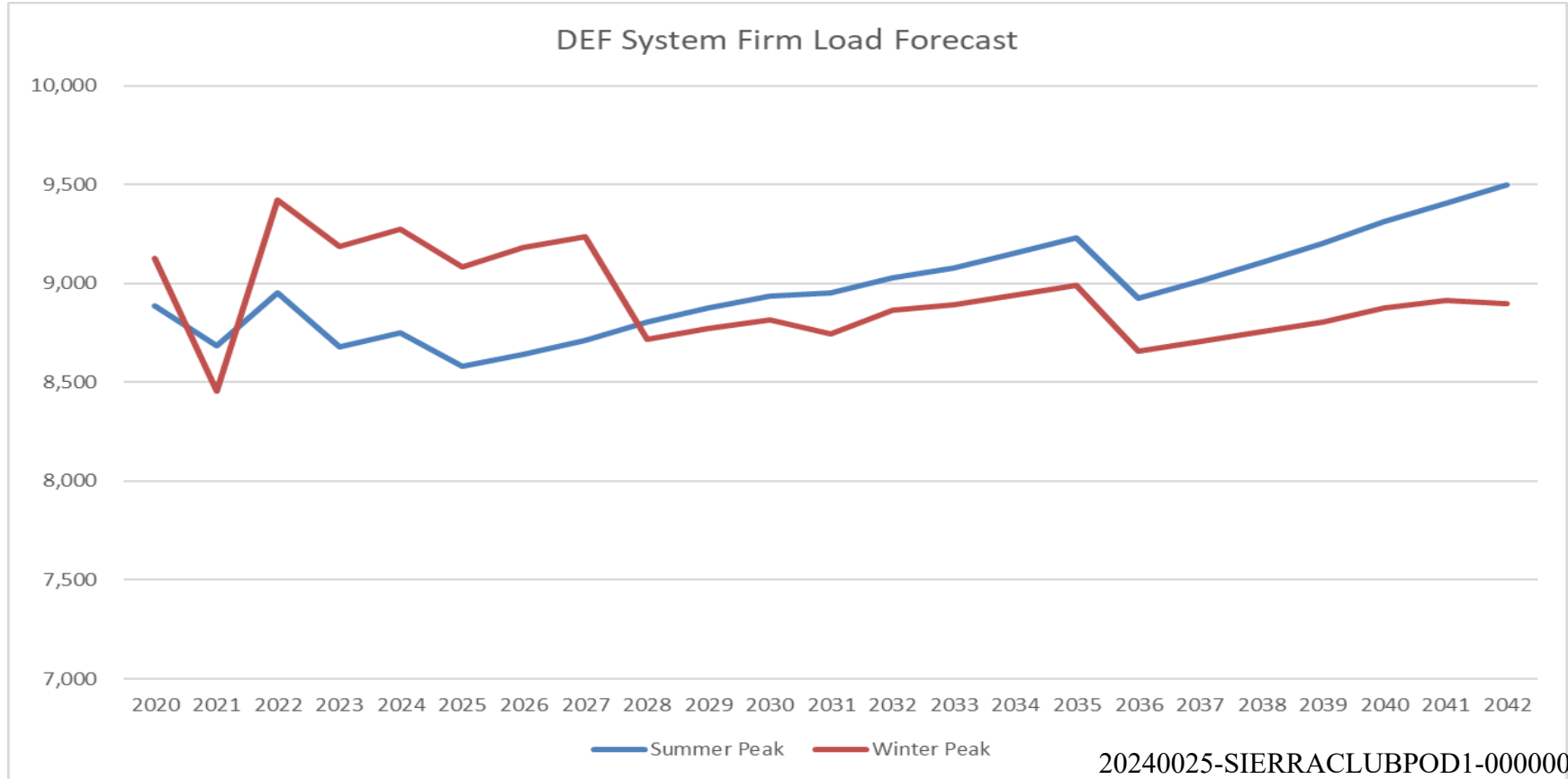


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HR
CC 7.0
CRN 11.2







20240025-SIERRACLUBPOD1-00000086

Forecast Increased by 25%	Increased by 10%	Not modified
Residential Pool Pump	Interruptible Service /	Stand by Generation
Residential Water Heater	Curtable Service	Voltage Reduction
Residential Heating/Ventilation/Air Conditioning		

Winter	Base DR	High DR	Increment	Increment
2021	1,173	1,372	199	17%
2022	1,182	1,381	199	17%
2023	1,193	1,393	200	17%
2024	1,202	1,403	201	17%
2025	1,207	1,408	201	17%
2026	1,212	1,413	201	17%
2027	1,218	1,419	201	17%
2028	1,223	1,424	202	16%
2029	1,228	1,430	202	16%
2030	1,233	1,435	202	16%
2031	1,202	1,401	199	17%
2032	1,207	1,406	199	16%
2033	1,212	1,411	199	16%
2034	1,217	1,417	199	16%
2035	1,222	1,422	200	16%
2036	1,228	1,428	200	16%
2037	1,233	1,433	200	16%
2038	1,238	1,438	200	16%
2039	1,243	1,444	201	16%
2040	1,249	1,450	201	16%
2041	1,254	1,455	201	16%

Summer	Base DR	High DR	Increment	Increment
2021	842	976	134	16%
2022	850	985	135	16%
2023	860	996	136	16%
2024	868	1,005	137	16%
2025	872	1,009	137	16%
2026	877	1,014	137	16%
2027	881	1,018	137	16%
2028	885	1,023	138	16%
2029	889	1,027	138	16%
2030	893	1,031	138	15%
2031	856	990	134	16%
2032	860	995	134	16%
2033	865	999	135	16%
2034	869	1,004	135	16%
2035	873	1,008	135	15%
2036	877	1,013	135	15%
2037	881	1,017	136	15%
2038	886	1,021	136	15%
2039	890	1,026	136	15%
2040	894	1,030	136	15%
2041	898	1,035	137	15%

20240025-SIERRACLUBPOD1-00000088

Capital and OM Price Source:	DEF Reference	DEF Reference	Sierra Club	Sierra Club	DEF Reference
Fuel Price:	Reference	High	Reference	High	Reference
DSM (Demand Response):	Base	Base	Base	Base	High
CPVRR Through Year 2042 2020\$M	CRN Ret 2042				
<u>Production Variable Costs</u>					
Fuel Cost	15,160	18,894	15,160	18,894	15,155
Variable Costs	1,812	1,823	1,812	1,823	1,807
Environmental Costs without Carbon	72	97	72	97	73
Total Variable Savings before CO2 Costs	17,044	20,813	17,044	20,813	17,035
<u>Fixed Costs</u>					
Additional Solar and Batteries (Capital / FOM)	-	-	-	-	-
Conventional Generation (Capital / FOM / Gas Reserv.)	5,507	5,507	5,605	5,605	5,429
Fixed Costs associated with CRN	1,162	1,162	1,162	1,162	1,162
Fixed Costs Savings	6,669	6,669	6,767	6,767	6,590
Total CPVRR Savings Without CO2 Costs	23,713	27,482	23,811	27,580	23,625
CO2 Cost	6,235	6,398	6,235	6,398	6,246
Total CPVRR Savings With CO2 Costs	29,948	33,880	29,946	33,978	29,871

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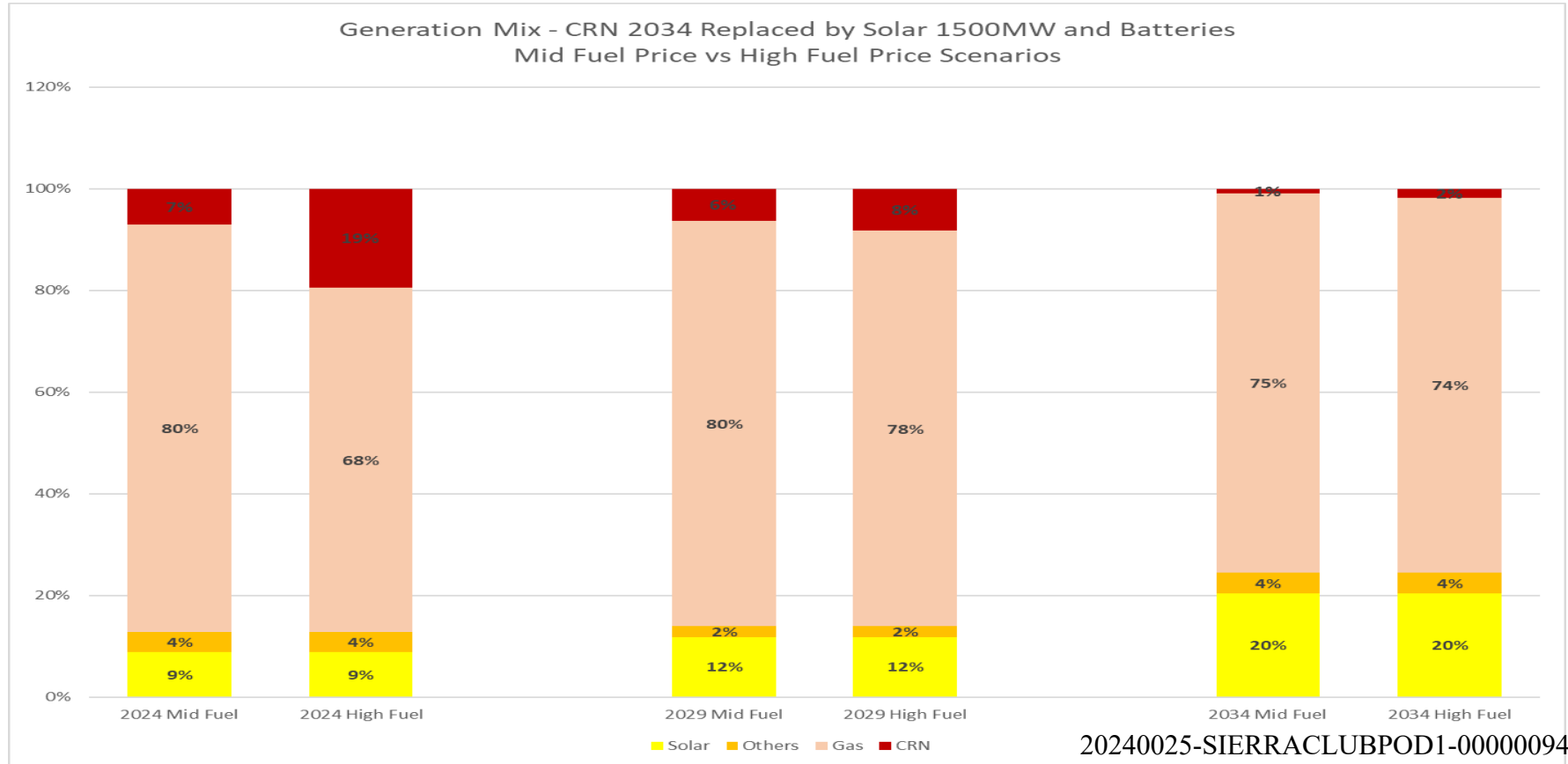
CRN Ret 2042 - Base			CRN 2034			CRN 2029		
Year	Unit	Capacity	Year	Unit	Capacity	Year	Unit	Capacity
2027	Vandolah Extension	640	2027	Vandolah Extension	640	2027	Vandolah Extension	640
2028			2028			2028		
2029			2029			2029	New 2x1 CC J Duct	128
2029			2029			2029	New 2x1 CC J	1,063
2030			2030			2030		
2031			2031			2031	New CT	214
2032			2032			2032		
2033			2033			2033	New CT	214
2034	New CT	643	2034	New CT	643	2034	New CT	429
2034			2034	New CT	214	2034		
2034			2034	New 2x1 CC J	1063	2034		
2034			2034	New 2x1 CC J Duct	128	2034		
2035	New CT	214	2035	New CT	214	2035	New CT	214
2036			2036			2036		
2037			2037					
2038	New CT	429	2038	New CT	429	2038	New CT	429
2039	New CT	214	2039	New CT	214	2039	New CT	214
2040	New CT	214	2040	New CT	214	2040	New CT	214
2041			2041			2041		
2042	New CT	429	2042	New CT	429	2042	New CT	429
2042	New Nuclear SMR	2,052	2042	New Nuclear SMR	684	2042	New Nuclear SMR	684
		4,195			4,232			4,232
10	CT	2,143	11	CT	2,357	11	CT	2,357
-	CC		1	CC	1,191	1	CC	1,191
3	Nuclear	2,052	1	Nuclear	684	1	Nuclear	684
		4,195			4,232			4,232
					37			37

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CPVRR Through Year 2042 2020\$M	DEF Assumptions		DEF Assumptions High Fuel		Sierra Club Assumptions		Sierra Club Assumptions High Fuel	
<u>Production Variable Costs</u>	CRN Ret 2034 Savings	CRN Ret 2029 Savings	CRN Ret 2034 Savings	CRN Ret 2029 Savings	CRN Ret 2034 Savings	CRN Ret 2029 Savings	CRN Ret 2034 Savings	CRN Ret 2029 Savings
Fuel Cost	(97)	(209)	142	127	(97)	(209)	142	127
Variable Costs	1	(2)	14	15	1	(2)	14	15
Environmental Costs without Carbon	(13)	(26)	(19)	(34)	(13)	(26)	(19)	(34)
Total Variable Savings before CO2 Costs	(109)	(236)	137	108	(109)	(236)	137	108
<u>Fixed Costs</u>								
Additional Solar and Batteries (Capital / FOM)	-	-	-	-	-	-	-	-
Conventional Generation (Capital / FOM / Gas Reserv.)	689	1,269	689	1,269	835	1,511	835	1,511
Fixed Costs associated with CRN	(259)	(455)	(259)	(455)	(259)	(455)	(259)	(455)
Fixed Costs Savings	430	814	430	814	576	1,055	576	1,055
Total CPVRR Savings Without CO2 Costs	321	578	567	921	467	819	713	1,163
CO2 Cost	(360)	(593)	(458)	(727)	(360)	(593)	(458)	(727)
Total CPVRR Savings With CO2 Costs	(39)	(15)	109	194	106	226	254	436

CRN and Anclole Ret 2042 - Base			CRN 2034 replaced with Solar 1500 and Batteries			CRN 2034 replaced with Solar 3000 and Batteries		
Year	Unit	Capacity	Year	Unit	Capacity	Year	Unit	Capacity
2027	Vandolah Extension	640	2027	Vandolah Extension	640	2027	Vandolah Extension	640
2028			2028			2028		
2029			2029			2029		
2030			2030	Solar 4 * 74.9	24	2030	Solar 8 * 74.9	48
2031			2031	Solar 4 * 74.9	24	2031	Solar 8 * 74.9	48
2032			2032	Solar 4 * 74.9	24	2032	Solar 8 * 74.9	48
2033			2033	Solar 4 * 74.9	24	2033	Solar 8 * 74.9	48
2034			2034	Solar 4 * 74.9	24	2034	Solar 8 * 74.9	48
2034	New CT	643	2034	New CT	643	2034	New CT	643
2034			2034	Batteries	1,300	2034	Batteries	1,300
2035	New CT	214	2035	New CT	214	2035		
2036			2036			2036		
2037			2037			2037	New CT	214
2038	New CT	429	2038	New CT	429	2038	New CT	429
2039	New CT	214	2039	New CT	214	2039		
2040	New CT	214	2040	New CT	214	2040	New CT	214
2041			2041			2041	New CT	214
2042	New CT	429	2042	New CT	429	2042	New CT	429
2042	New Nuclear SMR	2,052	2042	New Nuclear SMR	684	2042	New Nuclear SMR	684
		4,195			4,247			4,367
10	CT	2,143	10	CT	2,143	10	CT	2,143
-	CC		-	CC	-	-	CC	-
3	Nuclear	2,052	1	Nuclear	684	1	Nuclear	684
-	Add Solar	-	20	Add Solar	120	40	Add Solar	240
	Add Batteries	-	26	Add Batteries	1,300	26	Add Batteries	1,300
		4,195			4,247	20240025 SIERRA CLUB		4,367
				Confidential – Subject to 2017 NDA	52			172

CPVRR Through Year 2042 2020\$M	DEF Assumptions			DEF Assumptions High Fuel			Sierra Club Assumptions			Sierra Club Assumptions High Fuel		
<u>Production Variable Costs</u>	CRN Ret 2034 Replaced with Solar 1500 and Batteries Savings	CRN Ret 2034 Replaced with Solar 3000 and Batteries Savings	Benefit of Adding Solar 1500MW	CRN Ret 2034 Replaced with Solar 1500 and Batteries Savings	CRN Ret 2034 Replaced with Solar 3000 and Batteries Savings	Benefit of Adding Solar 1500MW	CRN Ret 2034 Replaced with Solar 1500 and Batteries Savings	CRN Ret 2034 Replaced with Solar 3000 and Batteries Savings	Benefit of Adding Solar 1500MW	CRN Ret 2034 Replaced with Solar 1500 and Batteries Savings	CRN Ret 2034 Replaced with Solar 3000 and Batteries Savings	Benefit of Adding Solar 1500MW
Fuel Cost	(581)	(1,136)	(555)	(508)	(1,252)	(744)	(581)	(1,136)	(555)	(508)	(1,252)	(744)
Variable Costs	(1)	(41)	(40)	11	(24)	(35)	(1)	(41)	(40)	11	(24)	(35)
Environmental Costs without Carbon	(14)	(14)	(1)	(20)	(21)	(1)	(14)	(14)	(1)	(20)	(21)	(1)
Total Variable Savings before CO2 Costs	(596)	(1,191)	(595)	(517)	(1,297)	(779)	(596)	(1,191)	(595)	(517)	(1,297)	(779)
<u>Fixed Costs</u>												
Additional Solar and Batteries (Capital / FOM)	1,667	2,453	786	1,667	2,453	786	1,410	2,196	786	1,410	2,196	786
Conventional Generation (Capital / FOM / Gas Reserv.)	(226)	(279)	(53)	(226)	(279)	(53)	(226)	(288)	(61)	(226)	(288)	(61)
Fixed Costs associated with CRN	(259)	(259)	-	(259)	(259)	-	(259)	(259)	-	(259)	(259)	-
Fixed Costs Savings	1,182	1,915	734	1,182	1,915	734	925	1,650	725	925	1,650	725
Total CPVRR Savings Without CO2 Costs	585	724	138	664	618	(46)	329	458	130	407	353	(54)
CO2 Cost	(662)	(981)	(319)	(765)	(1,085)	(320)	(662)	(981)	(319)	(765)	(1,085)	(320)
Total CPVRR Savings With CO2 Costs	(77)	(257)	(180)	(101)	(466)	(365)	(333)	(522)	(189)	(358)	(732)	(374)



20240025-SIERRACLUBPOD1-00000094

Preliminary Results – Resource Plans – CRN 2042 - Base vs. High Demand Response

CRN and Ancote Ret 2042 - Base			CRN and Ancote Ret 2042 - Base - High DSM		
Year	Unit	Capacity	Year	Unit	Capacity
2027	Vandolah Extension	640	2027	Vandolah Extension	640
2028			2028		
2029			2029		
2030			2030		
2031			2031		
2032			2032		
2033			2033		
2034			2034		
2034	New CT	643	2034	New CT	643
2034			2034		
2035	New CT	214	2035		
2036			2036		
2037			2037		
2038	New CT	429	2038	New CT	643
2039	New CT	214	2039		
2040	New CT	214	2040	New CT	214
2041			2041		
2042	New CT	429	2042	New CT	643
2042	New Nuclear SMR	2,052	2042	New Nuclear SMR	2,052
		4,195			4,195
10	CT	2,143	10	CT	2,143
-	CC		-	CC	
3	Nuclear	2,052	3	Nuclear	2,052
-	Add Solar	-	-	Add Solar	-
	Add Batteries	-		Add Batteries	-
		4,195			4,195

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Preliminary Results – Resource Plans – CRN 2034 Solar and Batteries - Base vs High Demand Response

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CRN 2034 replaced with Solar 1500 and Batteries			CRN 2034 replaced with Solar 1500 and Batteries High DSM		
Year	Unit	Capacity	Year	Unit	Capacity
2027	Vandolah Extension	640	2027	Vandolah Extension	640
2028			2028		
2029			2029		
2030	Solar 4 * 74.9	24	2030	Solar 4 * 74.9	24
2031	Solar 4 * 74.9	24	2031	Solar 4 * 74.9	24
2032	Solar 4 * 74.9	24	2032	Solar 4 * 74.9	24
2033	Solar 4 * 74.9	24	2033	Solar 4 * 74.9	24
2034	Solar 4 * 74.9	24	2034	Solar 4 * 74.9	24
2034	New CT	643	2034	New CT	643
2034	Batteries	1,300	2034	Batteries	1,300
2035	New CT	214	2035		
2036			2036		
2037			2037	New CT	214
2038	New CT	429	2038	New CT	429
2039	New CT	214	2039		
2040	New CT	214	2040	New CT	214
2041			2041		
2042	New CT	429	2042	New CT	429
2042	New Nuclear SMR	684	2042	New Nuclear SMR	684
		4,247			4,033
10	CT	2,143	9	CT	1,929
-	CC	-	-	CC	-
1	Nuclear	684	1	Nuclear	684
20	Add Solar	120	20	Add Solar	120
26	Add Batteries	1,300	26	Add Batteries	1,300
		4,247			

20240025-SFERRACLUBPOD1-00000096
(214)

CPVRR Through Year 2042 2020\$M	DEF Assumptions					
<u>Production Variable Costs</u>	CRN Ret 2034 Replaced with Solar 1500 and Batteries Savings	CRN Ret 2034 Replaced with Solar 1500 and Batteries - High DSM Savings	Savings from having High DSM	CRN Ret 2034 Replaced with Solar 3000 and Batteries Savings	CRN Ret 2034 Replaced with Solar 3000 and Batteries - High DSM Savings	Savings from having High DSM
Fuel Cost	(578)	(573)	6	(1,136)	(1,127)	9
Variable Costs	(1)	(0)	1	(41)	(38)	3
Environmental Costs without Carbon	(14)	(14)	(1)	(14)	(15)	(1)
Total Variable Savings before CO2 Costs	(593)	(587)	6	(1,191)	(1,180)	11
<u>Fixed Costs</u>						
Additional Solar and Batteries (Capital / FOM)	1,667	1,667	-	2,453	2,453	-
Conventional Generation (Capital / FOM / Gas Reserv.)	(226)	(220)	6	(279)	(265)	14
Fixed Costs associated with CRN	(259)	(259)	-	(259)	(259)	-
Fixed Costs Savings	1,182	1,188	6	1,915	1,929	14
Total CPVRR Savings Without CO2 Costs	588	600	12	724	749	25
CO2 Cost	(661)	(672)	(11)	(981)	(991)	(10)
Total CPVRR Savings With CO2 Costs	(73)	(72)	1	(257)	(242)	15

CRN and Ancote Ret 2042 - Base			CRN 2029 replaced with Solar 1500 and Batteries			CRN 2029 replaced with Solar 3000 and Batteries		
Year	Unit	Capacity	Year	Unit	Capacity	Year	Unit	Capacity
2025			2025	Solar 4 * 74.9	24	2025	Solar 8 * 74.9	48
2026			2026	Solar 4 * 74.9	24	2026	Solar 8 * 74.9	48
2027			2027	Solar 4 * 74.9	24	2027	Solar 8 * 74.9	48
2027	Vandolah Extension	640	2027	Vandolah Extension	640	2027	Vandolah Extension	640
2028			2028	Solar 4 * 74.9	24	2028	Solar 8 * 74.9	48
2029			2029	Solar 4 * 74.9	24	2029	Solar 4 * 74.9	48
2029			2029	Batteries	1,300	2029	Batteries	1,300
2030			2030			2030		
2031			2031			2031		
2032			2032			2032		
2033			2033			2033		
2034	New CT	643	2034	New CT	643	2034	New CT	643
2035	New CT	214	2035	New CT	214	2035		
2036			2036			2036		
2037						2037	New CT	214
2038	New CT	429	2038	New CT	429	2038	New CT	429
2039	New CT	214	2039	New CT	214	2039		
2040	New CT	214	2040	New CT	214	2040	New CT	214
2041			2041			2041	New CT	214
2042	New CT	429	2042	New CT	429	2042	New CT	429
2042	New Nuclear SMR	2,052	2042	New Nuclear SMR	684	2042	New Nuclear SMR	684
		4,195			4,175			4,223
10	CT	2,143	10	CT	2,143	10	CT	2,143
-	CC		-	CC	-	-	CC	-
3	Nuclear	2,052	1	Nuclear	684	1	Nuclear	684
-	Add Solar	-	2	Add Solar	120	3	Add Solar	240
	Add Batteries	-	26	Add Batteries	1,300	26	Add Batteries	1,300
		4,195			4,247			4,367
								172

CPVRR Through Year 2042 2020\$M	DEF Assumptions			DEF Assumptions High Fuel			Sierra Club Assumptions			Sierra Club Assumptions High Fuel		
<u>Production Variable Costs</u>	CRN Ret 2029 Replaced with Solar 1500 and Batteries Savings	CRN Ret 2029 Replaced with Solar 3000 and Batteries Savings	Benefit of Adding Solar 1500MW	CRN Ret 2029 Replaced with Solar 1500 and Batteries Savings	CRN Ret 2029 Replaced with Solar 3000 and Batteries Savings	Benefit of Adding Solar 1500MW	CRN Ret 2029 Replaced with Solar 1500 and Batteries Savings	CRN Ret 2029 Replaced with Solar 3000 and Batteries Savings	Benefit of Adding Solar 1500MW	CRN Ret 2029 Replaced with Solar 1500 and Batteries Savings	CRN Ret 2029 Replaced with Solar 3000 and Batteries Savings	Benefit of Adding Solar 1500MW
Fuel Cost	(906)	(1,749)	(843)	(803)	(1,920)	(1,117)	(906)	(1,749)	(843)	(803)	(1,920)	(1,117)
Variable Costs	(5)	(57)	(52)	9	(36)	(45)	(5)	(57)	(52)	9	(36)	(45)
Environmental Costs without Carbon	(27)	(28)	(1)	(36)	(37)	(1)	(27)	(28)	(1)	(36)	(37)	(1)
Total Variable Savings before CO2 Costs	(938)	(1,834)	(896)	(830)	(1,993)	(1,162)	(938)	(1,834)	(896)	(830)	(1,993)	(1,162)
<u>Fixed Costs</u>												
Additional Solar and Batteries (Capital / FOM)	2,829	4,083	1,254	2,829	4,083	1,254	2,340	3,594	1,254	2,340	3,594	1,254
Conventional Generation (Capital / FOM / Gas Reserv.)	(226)	(279)	(53)	(226)	(279)	(53)	(226)	(288)	(61)	(226)	(288)	(61)
Fixed Costs associated with CRN	(455)	(455)	-	(455)	(455)	-	(455)	(455)	-	(455)	(455)	-
Fixed Costs Savings	2,147	3,348	1,201	2,147	3,348	1,201	1,659	2,851	1,192	1,659	2,851	1,192
Total CPVRR Savings Without CO2 Costs	1,209	1,514	305	1,317	1,355	39	721	1,017	296	828	858	30
CO2 Cost	(958)	(1,371)	(413)	(1,096)	(1,510)	(414)	(958)	(1,371)	(413)	(1,096)	(1,510)	(414)
Total CPVRR Savings With CO2 Costs	251	144	(108)	221	(154)	(375)	(237)	(354)	(116)	(268)	(650)	(384)

Preliminary Results – Resource Plans – CR4 2026 CR5 2029 Replaced with Batteries and Solar

CRN and Anclote Ret 2042 - Base			CR4 2026 CR5 2029 replaced with Solar 1500 and Batteries			CR4 2026 CR5 2029 replaced with Solar 3000 and Batteries		
Year	Unit	Capacity	Year	Unit	Capacity	Year	Unit	Capacity
2025			2025	Solar 4 * 74.9	24	2025	Solar 8 * 74.9	48
2026			2026	Solar 4 * 74.9	24	2026	Solar 8 * 74.9	48
2027			2027	Solar 4 * 74.9	24	2027	Solar 8 * 74.9	48
2027	Vandolah Extension	640	2027	Vandolah Extension	640	2027	Vandolah Extension	640
2028			2028	Solar 4 * 74.9	24	2028	Solar 8 * 74.9	48
2029			2029	Solar 4 * 74.9	24	2029	Solar 4 * 74.9	48
2029			2029	Batteries	1,300	2029	Batteries	1,300
2030			2030			2030		
2031			2031			2031		
2032			2032			2032		
2033			2033			2033		
2034	New CT	643	2034	New CT	643	2034	New CT	643
2035	New CT	214	2035	New CT	214	2035		
2036			2036			2036		
2037			2037			2037	New CT	214
2038	New CT	429	2038	New CT	429	2038	New CT	429
2039	New CT	214	2039	New CT	214	2039		
2040	New CT	214	2040	New CT	214	2040	New CT	214
2041			2041			2041	New CT	214
2042	New CT	429	2042	New CT	429	2042	New CT	429
2042	New Nuclear SMR	2,052	2042	New Nuclear SMR	684	2042	New Nuclear SMR	684
		4,835			4,887			5,007
			10	CT	2,143	10	CT	2,143
			-	CC	-	-	CC	-
			1	Nuclear	684	1	Nuclear	684
			2	Add Solar	120	3	Add Solar	240
			26	Add Batteries	1,300	26	Add Batteries	1,300
					4,247			4,367
					5,212			172

CPVRR Through Year 2042 2020\$M	DEF Assumptions			DEF Assumptions High Fuel			Sierra Club Assumptions			Sierra Club Assumptions High Fuel		
<u>Production Variable Costs</u>	CR4/CR5 Ret 2026/2029 Replaced with Solar 1500 and Batteries Savings	CR4/CR5 Ret 2026/2029 Replaced with Solar 3000 and Batteries Savings	Benefit of Adding Solar 1500MW	CR4/CR5 Ret 2026/2029 Replaced with Solar 1500 and Batteries Savings	CR4/CR5 Ret 2026/2029 Replaced with Solar 3000 and Batteries Savings	Benefit of Adding Solar 1500MW	CR4/CR5 Ret 2026/2029 Replaced with Solar 1500 and Batteries Savings	CR4/CR5 Ret 2026/2029 Replaced with Solar 3000 and Batteries Savings	Benefit of Adding Solar 1500MW	CR4/CR5 Ret 2026/2029 Replaced with Solar 1500 and Batteries Savings	CR4/CR5 Ret 2026/2029 Replaced with Solar 3000 and Batteries Savings	Benefit of Adding Solar 1500MW
Fuel Cost	(888)	(1,739)	(852)	(761)	(1,889)	(1,128)	(888)	(1,739)	(852)	(761)	(1,889)	(1,128)
Variable Costs	(2)	(53)	(51)	17	(27)	(44)	(2)	(53)	(51)	17	(27)	(44)
Environmental Costs without Carbon	(30)	(31)	(1)	(41)	(42)	(1)	(30)	(31)	(1)	(41)	(42)	(1)
Total Variable Savings before CO2 Costs	(920)	(1,823)	(903)	(785)	(1,958)	(1,173)	(920)	(1,823)	(903)	(785)	(1,958)	(1,173)
<u>Fixed Costs</u>												
Additional Solar and Batteries (Capital / FOM)	2,829	4,083	1,254	2,829	4,083	1,254	2,340	3,594	1,254	2,340	3,594	1,254
Conventional Generation (Capital / FOM / Gas Reserv.)	(226)	(279)	(53)	(226)	(279)	(53)	(226)	(288)	(61)	(226)	(288)	(61)
Fixed Costs associated with CRN	(546)	(546)	-	(546)	(546)	-	(546)	(546)	-	(546)	(546)	-
Fixed Costs Savings	2,056	3,257	1,201	2,056	3,257	1,201	1,568	2,760	1,192	1,568	2,760	1,192
Total CPVRR Savings Without CO2 Costs	1,136	1,434	298	1,271	1,299	28	648	937	289	783	802	19
CO2 Cost	(979)	(1,391)	(412)	(1,127)	(1,541)	(414)	(979)	(1,391)	(412)	(1,127)	(1,541)	(414)
Total CPVRR Savings With CO2 Costs	157	42	(115)	144	(242)	(386)	(331)	(455)	(123)	(344)	(739)	(395)

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<u>Production Variable Costs</u>	CRN Ret 2029 Replaced with Solar 1500 and Batteries Savings	CR4/CR5 Ret 2026/2029 Replaced with Solar 1500 and Batteries Savings	Benefit of Accelerating CR4 Retirement to 2026
Fuel Cost	(906)	(888)	18
Variable Costs	(5)	(2)	3
Environmental Costs without Carbon	(27)	(30)	(3)
Total Variable Savings before CO2 Costs	(938)	(920)	18
<u>Fixed Costs</u>			
Additional Solar and Batteries (Capital / FOM)	2,829	2,829	-
Conventional Generation (Capital / FOM / Gas Reserv.)	(226)	(226)	-
Fixed Costs associated with CRN	(455)	(546)	(91)
Fixed Costs Savings	2,147	2,056	(91)
Total CPVRR Savings Without CO2 Costs	1,209	1,136	(73)
CO2 Cost	(958)	(979)	(21)
Total CPVRR Savings With CO2 Costs	251	157	(94)
Coal being cheaper than Gas before 2029 reduces the fuel benefits of the earlier CR4 retirement.			
New CTs, Solar, and Battery additions are the same in both cases. The only difference is the acceleration of the CR4 retirement from 2029 to 2026.			
The Vandolah Contract extension benefits the CR4 2026-CR5 2029 case. Having Vandolah avoids the addition of new units to replace CR4 between 2026 and 2028. Only a small seasonal purchase was included in year 2028 to avoid the addition of a CT.			

20240025-SIERRA CLUB POD1-00000102

CPVRR Through Year 2042 2020\$M	DEF Assumptions		DEF Assumptions High Fuel		Sierra Club Assumptions		Sierra Club Assumptions High	
<u>Production Variable Costs</u>	CRN Ret 2034 Replaced with Solar 1500 and Batteries Savings	CRN Ret 2029 Replaced with Solar 1500 and Batteries Savings	CRN Ret 2034 Replaced with Solar 1500 and Batteries Savings	CRN Ret 2029 Replaced with Solar 1500 and Batteries Savings	CRN Ret 2034 Replaced with Solar 1500 and Batteries Savings	CRN Ret 2029 Replaced with Solar 1500 and Batteries Savings	CRN Ret 2034 Replaced with Solar 1500 and Batteries Savings	CRN Ret 2029 Replaced with Solar 1500 and Batteries Savings
Fuel Cost	(581)	(906)	(508)	(803)	(581)	(906)	(508)	(803)
Variable Costs	(1)	(5)	11	9	(1)	(5)	11	9
Environmental Costs without Carbon	(14)	(27)	(20)	(36)	(14)	(27)	(20)	(36)
Total Variable Savings before CO2 Costs	(596)	(938)	(517)	(830)	(596)	(938)	(517)	(830)
<u>Fixed Costs</u>								
Additional Solar and Batteries (Capital / FOM)	1,667	2,829	1,667	2,829	1,410	2,340	1,410	2,340
Conventional Generation (Capital / FOM / Gas Reserv.)	(226)	(226)	(226)	(226)	(226)	(226)	(226)	(226)
Fixed Costs associated with CRN	(259)	(455)	(259)	(455)	(259)	(455)	(259)	(455)
Fixed Costs Savings	1,182	2,147	1,182	2,147	925	1,659	925	1,659
Total CPVRR Savings Without CO2 Costs	585	1,209	664	1,317	329	721	407	828
CO2 Cost	(662)	(958)	(765)	(1,096)	(662)	(958)	(765)	(1,096)
Total CPVRR Savings With CO2 Costs	(77)	251	(101)	221	(333)	(237)	(358)	(268)

CPVRR Through Year 2042 2020\$M	DEF Assumptions		DEF Assumptions High Fuel		Sierra Club Assumptions		Sierra Club Assumptions High	
<u>Production Variable Costs</u>	CRN Ret 2034 Replaced with Solar 3000 and Batteries Savings	CRN Ret 2029 Replaced with Solar 3000 and Batteries Savings	CRN Ret 2034 Replaced with Solar 3000 and Batteries Savings	CRN Ret 2029 Replaced with Solar 3000 and Batteries Savings	CRN Ret 2034 Replaced with Solar 3000 and Batteries Savings	CRN Ret 2029 Replaced with Solar 3000 and Batteries Savings	CRN Ret 2034 Replaced with Solar 3000 and Batteries Savings	CRN Ret 2029 Replaced with Solar 3000 and Batteries Savings
Fuel Cost	(1,136)	(1,749)	(1,252)	(1,920)	(1,136)	(1,749)	(1,252)	(1,920)
Variable Costs	(41)	(57)	(24)	(36)	(41)	(57)	(24)	(36)
Environmental Costs without Carbon	(14)	(28)	(21)	(37)	(14)	(28)	(21)	(37)
Total Variable Savings before CO2 Costs	(1,191)	(1,834)	(1,297)	(1,993)	(1,191)	(1,834)	(1,297)	(1,993)
<u>Fixed Costs</u>								
Additional Solar and Batteries (Capital / FOM)	2,453	4,083	2,453	4,083	2,196	3,594	2,196	3,594
Conventional Generation (Capital / FOM / Gas Reserv.)	(279)	(279)	(279)	(279)	(288)	(288)	(288)	(288)
Fixed Costs associated with CRN	(259)	(455)	(259)	(455)	(259)	(455)	(259)	(455)
Fixed Costs Savings	1,915	3,348	1,915	3,348	1,650	2,851	1,650	2,851
Total CPVRR Savings Without CO2 Costs	724	1,514	618	1,355	458	1,017	353	858
CO2 Cost	(981)	(1,371)	(1,085)	(1,510)	(981)	(1,371)	(1,085)	(1,510)
Total CPVRR Savings With CO2 Costs	(257)	144	(466)	(154)	(522)	(354)	(732)	(651)

20240025-SIERRACLUBPOD1-00000104



Exhibit RA-5:

**Duke Energy Florida's Response to Off. of Pub.
Counsel ("OPC") POD 1-7 attach. "B-13 CWIP –
REDACTED.xlsx" tab "UI – Additions"**

DOCKET NO. 20240025-EI

RA-5, 1

[illegible]

Supporting Schedules:

DOCKET NO. 20240025-EI

RA-5, 3

[illegible]

Supporting Schedules

RA-5, 5

RA-5, 6

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Planning Entry	PLNT/CMP Name	CMP ID	Main Project Group	CMP ID	Main Project Group	CMP ID	Main Project Group	CMP ID	Main Project Group	CMP ID	Main Project Group	CMP ID	Main Project Group	CMP ID	Main Project Group	CMP ID	Main Project Group
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Supporting Schedules:

Recap Schedule: 8-1
303.60037, 06/20/04, 00004331

DOCKET NO. 20240025-EI

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[illegible]

Recap Schedule: 8-2
02-60025-CPCFO01-00004223

Recap Schedule: B-2
20240025-CPCPO01-00004223

DOCKET NO. 20240025-EI

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[illegible]

Recap Schedule: B-1
20240025-CPCC01-00004221

Supporting Schedules:

Recap Schedule: 8-3
20240025-OPCPO01-00004223

Exhibit RA-6:
Benjamin Borsch Deposition Transcript
(Excerpted)

1 BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

2

3 IN RE: PETITION FOR RATE
4 INCREASE BY DUKE ENERGY
5 FLORIDA, LLC.

6

DOCKET NO. 20240025-EI

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VOLUME II

12

(Pages 70 through 185)

13

VIDEO-TELECONFERENCE

14

DEPOSITION OF BENJAMIN BORSCH

15

(Taken on behalf of the Office of Public Counsel)

16

DATE TAKEN: May 30, 2024

17

TIME: 8:30 a.m. - 6:03 p.m.

18

PLACE: Zoom

19

20

21

22

23

Examination of the witness taken before:

24

JESSICA RENCHEN, Court Reporter

25

On Behalf of

26

For The Record Reporting

27

28

29

30

1 APPEARANCES OF COUNSEL:

2 MARY A. WESSLING, ESQ.
3 AUSTIN WATROUS, ESQ.
4 Office of Public Counsel
5 C/o The Florida Legislature
6 111 West Madison Street, Suite 812
7 Tallahassee, FL 32399
8 E-mail: Wessling.mary@leg.state.fl.us

9 DIANNE M. TRIPLETT, ESQ.
10 Duke Energy Florida, LLC
11 299 First Avenue North
12 St. Petersburg, FL 33701
13 E-mail: Dianne.Triplett@duke-energy.com

14 MAJOR THOMPSON, ESQ.
15 SHAW STILLER, ESQ.
16 Florida Public Service Commission
17 Office of General Counsel
18 2540 Shumard Oak Blvd.
19 Tallahassee, FL 32399-0850
20 E-mail: Mthompso@psc.state.fl.us
21 E-mail: Sstiller@psc.state.fl.us
22 E-mail: Discovery-gcl@psc.state.fl.us

23 ROBERT PICKELS, ESQ.
24 Duke Energy Florida, LLC
25 106 East College Avenue, Suite 800
Tallahassee, FL 32301-7740
E-mail: Robert.Pickels@duke-energy.com

17 JAMES W. BREW, ESQ.
18 Stone Mattheis Xenopoulos & Brew
19 1025 Thomas Jefferson St. NW
20 Suite 800 West
21 Washington, DC 20007-5201
22 E-mail: Jbrew@smxblaw.com

23 MELISSA O. NEW, ESQ.
24 Troutman Pepper, LLC
25 600 Peachtree Street NE, Suite 3000
Atlanta, GA 30308
E-mail: Melissa.butler@troutman.com

23 BRADLEY MARSHALL, ESQ.
24 JORDAN LUEBKEMANN, ESQ.
25 Earthjustice
111 S. Martin Luther King Jr. Blvd.
Tallahassee, Florida 32301

1 E-mail: Bmarshall@earthjustice.org
E-mail: Jluebkmann@Earthjustice.Org

2
SARI AMIEL, ESQ.
3 Sierra Club
50 F St. NW, Eighth Floor
4 Washington, DC 20001
E-mail: Sari.amiel@sierraclub.org

5
ROBERT SCHEFFEL WRIGHT, ESQ.
6 Gardner Bist Law Firm
1300 Thomaswood Drive
7 Tallahassee, FL 32308
E-mail: Schef@gbwlegal.com

8
WILLIAM C. GARNER, ESQ.
9 Law Office of William C. Garner, PLLC
3425 Bannerman Road
10 Unit 105, No. 414
Tallahassee, FL 32312
11 E-mail: Bgarner@wcglawoffice.com

12 Also Present:

13 Charles Rehwinkel
14 Bart Fletcher

15

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1 INDEX OF WITNESS

2

3 WITNESS PAGE

4 BENJAMIN BORSCH

Continued Examination by Ms. Wessling 74

5 Examination by Mr. Thompson 133

Examination by Ms. Amiel 144

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3 Revised Schedule 8 102

10 4 Update of Schedule F6 130

5 Update of Schedule F7 131

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CERTIFICATE OF OATH 182

13 REPORTER'S PAGE 183

READ & SIGN LETTER 184

14 ERRATA SHEET 185

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1 think you do this. There we go. Okay.

2 THE WITNESS: Oh, yes. Okay.

3 MS. AMIEL: Great. Thank you.

4 BY MS. AMIEL:

5 Q. If you can look at page 5, the spreadsheet.
6 Just let me know when you're ready?

7 A. Okay. One second. Page 5. Is there a
8 section that you're particularly wanting? I'm just
9 hunting here. Three, four, six. I'm sorry. Five.
10 Okay. Yes. Okay. Go ahead.

11 Q. Okay. This spreadsheet does not assign any
12 capacity value to solar resources in the winter; is
13 that correct?

14 A. That is correct.

15 Q. So do solar resources provide some capacity
16 in the winter during the peak time?

17 A. As I mentioned earlier, the peak hour in the
18 wintertime is considered to be the hour between 7:00
19 and 8:00 a.m. Typically -- and that's in January,
20 mind you. So typically that is the hour during which
21 the sun is rising in January.

22 Consequently, there is a percentage or two of
23 contribution from the solar. But we believe that it
24 was reasonable and conservative for the purposes of
25 our planning to assume that that number was zero.

1 Q. What about the secondary peak in the
2 afternoon that you referred to earlier?

3 A. Well, we are not really planning for that
4 peak because it's smaller than the one in the morning.
5 So we're planning for it, but in the sense that it's
6 not driving our planning decisions.

7 Q. Okay.

8 A. The winter peak is defined to be that one in
9 the morning.

10 Q. So at that time in the morning, is there --
11 I'm just looking back at what we said earlier, but
12 okay, so the peak is about 7:00 to 8:00 a.m. Is there
13 ever -- there's never sun that's risen at that point?

14 There isn't -- Do you have any document that
15 shows what the capacity part of the solar units are
16 around that time?

17 A. We have performance data presumably. But the
18 -- again, what we know both from history and also from
19 the analysis of the performance projections is that
20 that number is quite small. It's less than 5%. It's
21 probably 2 or 3%. It does vary quite a bit across,
22 say, that period around from say Christmas to
23 Valentine's Day because you're moving through time.

24 So again, as I say, the conservative
25 assumption to maintain reliability was to assume that

1 2% equals zero.

2 Q. Is it possible that it's as high as 5%?

3 A. Not consistently, especially if you look at
4 the very beginning of January, the end of December
5 you're talking about periods where it's quite dark at
6 that time of day.

7 Q. Okay. So you're saying it's around 2% to 3%
8 in average?

9 A. I don't want to stick to that number, but
10 it's in the general vicinity of significantly less
11 than 5%.

12 Q. Okay. But Duke has not done any analysis
13 showing that the firm capacity value for solar in the
14 winter is zero, correct?

15 A. We have not done a specific analysis on that
16 note, that is an assumption, which is we believe is
17 close enough to accurate. Again, our planning process
18 is naturally conservative because we have to serve
19 load.

20 Q. Okay. So if it's naturally conservative,
21 would the 25% summary value, could that possibly also
22 be an underestimate?

23 A. Again, yes, that's a conservative response to
24 the number that we have, the data that we have and
25 we're not -- we're trying to be as close to accurate

Exhibit RA-7:
Reginald Anderson Deposition Transcript
(Excerpted)

1 BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

2 DOCKET NO.: 20240025-EI

3 In re: Petition for Rate Increase FILED May 15, 2024
4 by Duke Energy, Florida, LLC.
5 _____ /

6
7 VOLUME II (Pages 110-236)

8 DEPOSITION OF REGINALD ANDERSON

9 Taken on Behalf of:

10 CITIZENS OF THE STATE OF FLORIDA

11
12 DATE: Friday, May 24, 2024

13 TIME: 8:30 a.m. - 3:52 p.m.

14 PLACE: Via Zoom Video-Conference

15 Stenographically Reported Remotely by:

16 Deborah Alff, RPR

17 For the Record Reporting, Inc.
18 1500 Mahan Drive, Suite 140
19 Tallahassee, Florida 32308
20
21
22
23
24
25

1 APPEARANCES OF COUNSEL (Via Zoom Video Conference):

2 On behalf of DUKE ENERGY FLORIDA, LLC:

3 DIANNE MARIE TRIPLETT, ESQUIRE
4 Duke Energy Florida, LLC
5 299 First Avenue North
6 St. Petersburg, Florida 33701
7 E-mail: Diane.Triplett@duke-energy.com

8 ROBERT L. PICKELS, ESQUIRE
9 MATTHEW R. BERNIER, ESQUIRE
10 Duke Energy Florida, LLC
11 106 East College Avenue, Suite 800
12 Tallahassee, Florida 32301
13 E-mails: Robert.Pickels@duke-energy.com;

14 MELISSA MINDY MCGRATH, ESQ.
15 Troutman Pepper, LLC
16 301 South College Street, 34th Floor
17 Charlotte, North Carolina 28202
18 E-mail: Mindy.McGrath@troutman.com

19 On behalf of CITIZENS OF THE STATE OF FLORIDA:

20 CHARLES J. REHWINKEL, ESQUIRE
21 MARY A. WESSLING, ESQUIRE
22 AUSTIN A. WATROUS, ESQUIRE
23 WALTER L. TRIERWEILER, ESQUIRE
24 Office of Public Counsel
25 c/o The Florida Legislature
111 West Madison Street, Suite 812
Tallahassee, Florida 32399
E-mail: Rehwinkel.Charles@leg.state.fl.us

On behalf of the FLORIDA RETAIL FEDERATION:

ROBERT SCHEFFEL WRIGHT, ESQUIRE
Gardner Bist Law Firm
1300 Thomaswood Drive
Tallahassee, Florida 32308
E-mail: Schef@gbwlegal.com

1 APPEARANCES CONTINUED:

2 On behalf of SIERRA CLUB:

3 ANTHONY MENDOZA, ESQUIRE
4 PATRICK WOOLSEY, ESQUIRE
5 Sierra Club
6 2101 Webster Street, Suite 1300
7 Oakland, California 94612
8 E-mail: Patrick.Woolsey@sierraclub.org

9 On behalf of FLORIDA RISING and the LEAGUE OF UNITED
10 LATIN AMERICAN CITIZENS OF FLORIDA:

11 BRADLEY MARSHALL, ESQUIRE
12 JORDAN LUEBKEMANN, ESQUIRE
13 Earthjustice
14 111 South Martin Luther King Jr. Boulevard
15 Tallahassee, Florida 32301
16 E-mail: BMarshall@earthjustice.org

17 On behalf of WHITE SPRINGS AGRICULTURAL CHEMICALS:

18 JAMES BREW, ESQUIRE
19 Stone Mattheis Xenopoulos & Brew
20 1025 Thomas Jefferson Street NW, Suite 800 West
21 Washington, D.C. 20007
22 E-mail: Jbrew@smxblaw.com

23 On behalf of SOUTHERN ALLIANCE FOR CLEAN ENERGY:

24 WILLIAM C. GARNER, ESQUIRE
25 Law Office of William C. Garner, PLLC
3425 Bannerman Road, Unity 105, No. 414
Tallahassee, Florida 32312
E-mail: BGarner@wcglawoffice.com

On behalf of FLORIDA PUBLIC SERVICE COMMISSION STAFF:

MAJOR RYAN THOMPSON, ESQUIRE
SHAW PHILIP STILLER, ESQUIRE
Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, Florida 32399-7019
E-mail: Major.Thompson@psc.state.fl.us

1 APPEARANCES CONTINUED:

2 Also Present:

3 Anthony Salvarezza
4 Mark Fletcher
5 Monique Hampton
6 Bernadette Howard
7 Julia Kitt
8 Tina Lopez
9 Sarah Lewis
10 James Dauphinais
11
12
13
14
15
16
17
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1 Q. Okay. So you don't know whether there's any
2 other planned solar capacity additions by 2034 that are
3 not reflected in this chart, in the attachment?

4 A. That's correct.

5 Q. Okay. Could you please turn to page five of
6 that attachment? And let me know when you're there.
7 And that has Bates number ending in 33.

8 A. Okay. Yeah, I think I'm there.

9 Q. So this shows solar resources in the winter
10 among other things, correct?

11 A. Oops. Just a second here. Winter load
12 resources, yeah. Yes.

13 Q. So this table doesn't assign any capacity
14 value to solar resources in the winter, correct, we just
15 see null values for that section of the table?

16 A. Yes.

17 Q. Why is that? Don't Duke's solar resources
18 provide any capacity in the winter?

19 A. That would be a question for Ben Borsch and
20 the forecasting team.

21 Q. Okay. So you don't, you don't know the answer
22 to that one?

23 A. No. I don't know why it's shown this way, no.

24 Q. Okay. So I'll ask Mr. Borsch that question.

25 Staying in this attachment, if we go back to

Exhibit RA-8:
EPA, Final Carbon Pollution Standards to Reduce
Greenhouse Gas Emissions from Power Plants
(April 5, 2024)



Final Carbon Pollution Standards to Reduce Greenhouse Gas Emissions from Power Plants

April 25, 2024



Outline

- Overview
- Details about the Final Rules
 - New Source Performance Standards (NSPS)
 - Emission Guidelines
 - State Plan Development
 - Other Elements
- Summary of Benefits, Costs, and Economic Impacts
- Environmental Justice
- Support for Reliability



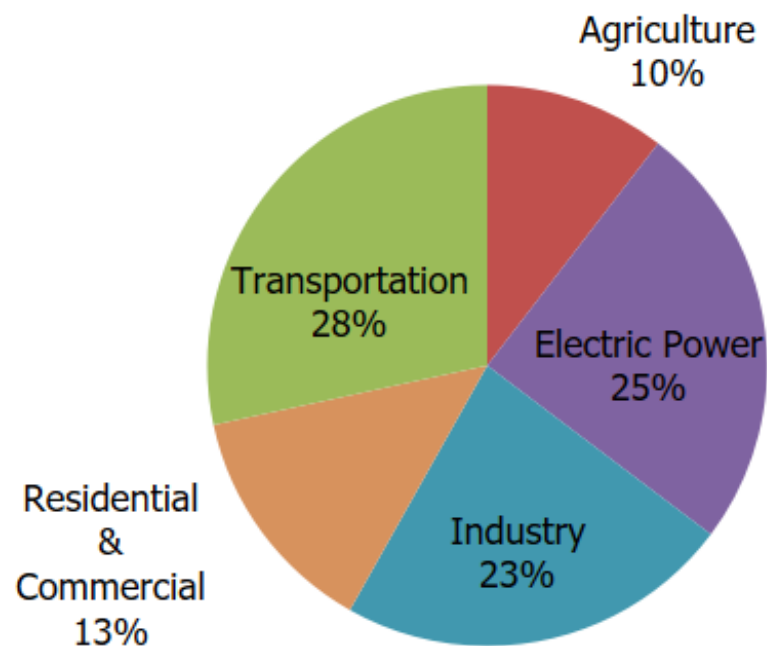
Overview

On April 25, EPA issued final carbon pollution standards for power plants that will protect public health and reduce harmful pollutants.

The **power sector is the largest stationary source of greenhouse gases (GHGs)**. In 2022, the sector emitted 25 percent of the overall domestic emissions.

The rules address climate pollution from **existing coal-fired power plants**, which continue to be the largest source of greenhouse gas emissions from the power sector, and ensure that **new combustion turbines**, some of the largest new sources of CO₂ being built today, are constructed to minimize GHG emissions.

Total U.S. Greenhouse Gas Emissions by Economic Sector in 2022



EPA (2024). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2022 U.S. Environmental Protection Agency, EPA 430R-24004. <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2022>.



Overview

Types of fossil fuel-fired power plants covered by this final rule

- New, modified, and reconstructed sources – Covered under 111(b)
 - New and reconstructed gas-fired combustion turbines
 - Modified coal-fired steam generating units
- Existing sources – Covered under 111(d)
 - Coal-, oil-, and gas-fired steam generating units

Technology-based standards

- Consistent with EPA's traditional approach to establishing pollution standards under the Clean Air Act, the final limits and emission guidelines are based on proven control technology.
- Emission guidelines for the longest-running existing coal units and standards for heavily-utilized new gas units are based on carbon capture and sequestration/storage (CCS) – an available and cost-effective control technology that can be applied directly to power plants to significantly limit carbon dioxide (CO₂) emissions.

Reduces climate and other health-harming pollution

- The climate and health benefits of this rule significantly outweigh the compliance costs.
- Between 2024 and 2047, the regulatory impact analysis projects net climate and health benefits systemwide of \$370 billion, which is an annualized net benefit of \$20 billion.
- Expected to avoid up to 1.38 billion metric tons of CO₂ systemwide through 2047



Overview

Builds on decades of technology advancements and momentum from recent changes in the sector created by the Inflation Reduction Act and the Bipartisan Infrastructure law

- Leverages the clean energy incentives and opportunities provided in the Inflation Reduction Act

Provides utilities options for meeting these standards as well as the time needed to plan and invest for compliance and continue to support a reliable supply of affordable electricity.

Compliance date is January 1, 2032, for the longest-running existing coal-fired steam generating units and heavily utilized new combustion turbines

- Includes two optional reliability-related instruments that states can consider including in their state plans

Through the state planning process, communities will have an opportunity to be heard about the future of individual plants in their neighborhoods.

- States, in developing plans for existing coal sources, will need to describe their meaningful engagement with affected stakeholders
- Includes communities disproportionately burdened by pollution and climate change impacts, as well the energy communities and workers who have powered our nation for generations



Summary of Final Standards and Guidelines

- **New gas-fired combustion turbines:**
 - Base load turbines (>40% capacity factor): initial "phase one" standard based on efficient operation of combined cycle turbine; "phase two" standard based on 90% capture of CO₂ with a compliance deadline of Jan. 1, 2032
 - Intermediate turbines (between 20% and 40% capacity factor): standard based on efficient operation of simple cycle turbine
 - Low load turbine (less than 20% capacity factor): standard based on low-emitting fuel
- **Existing coal-fired steam EGUs:**
 - "Long-term" units (plan to operate on or after Jan. 1, 2039): standard based on 90% capture of CO₂ with a compliance deadline of Jan. 1, 2032
 - "Medium-term" units (plan to operate on or after Jan. 1, 2032, with a commitment to cease operation before Jan. 1, 2039): standard based on 40% co-firing with natural gas with a compliance deadline of Jan. 1, 2030
 - Units that commit to cease operation by Jan. 1, 2032 are not subject to the rule
- **Existing oil and natural gas-fired steam EGUs:**
 - Standards based on routine operation and maintenance, with different levels of stringency for base load, intermediate, and low load units

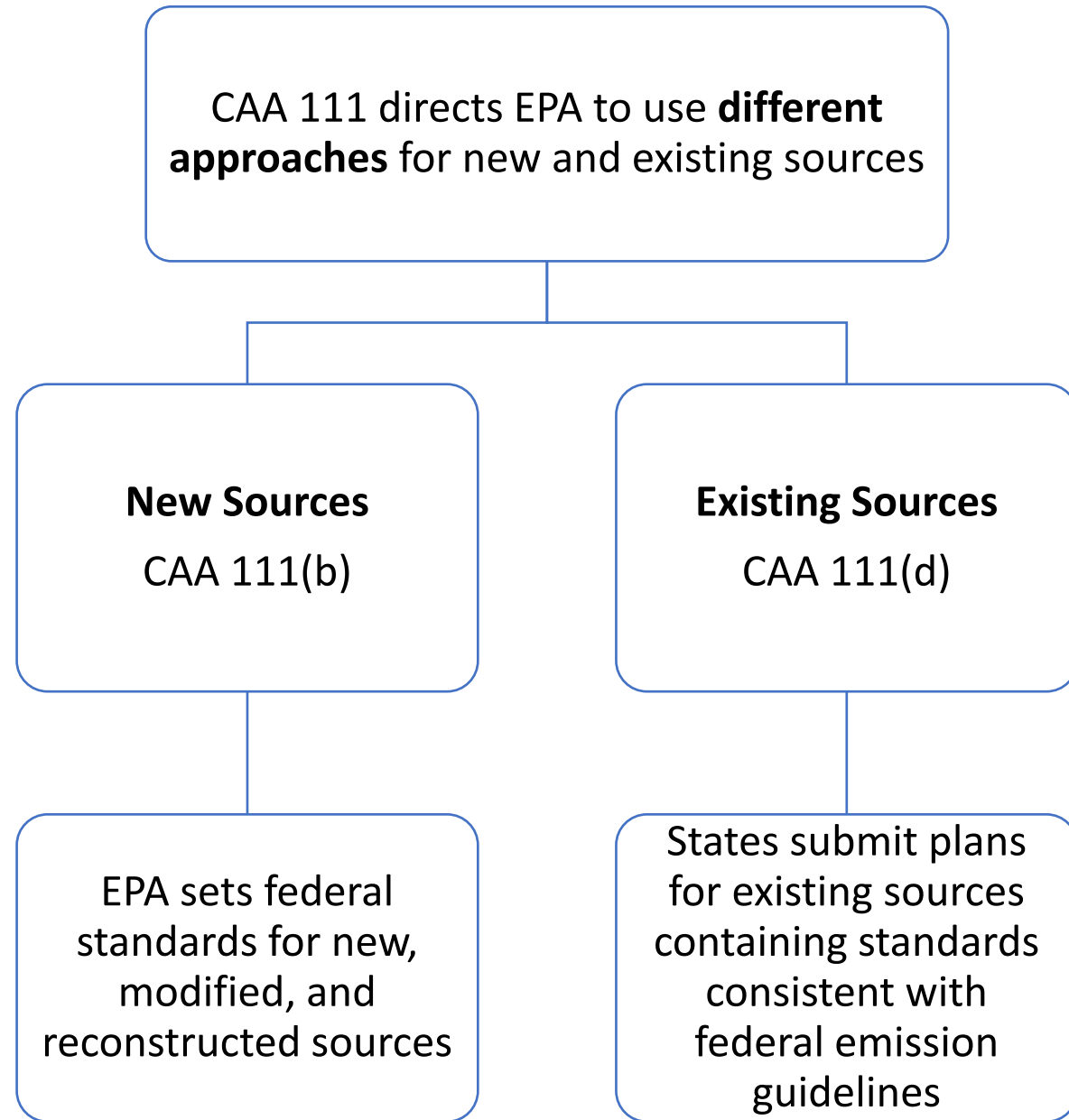


Key Changes Since Proposal

- Existing coal-fired steam generating units
 - Two subcategories for existing coal-fired steam generating units – instead of four as proposed
 - “Long-term” units – plan to operate on or after Jan. 1, 2039
 - “Medium-term” units – plan to operate on or after Jan. 1, 2032 and permanently cease operation before Jan. 1, 2039
 - Providing an applicability exemption for units that plan to permanently cease operation by January 1, 2032
 - Extending the compliance date from January 1, 2030, to January 1, 2032, for existing coal-fired steam generating units to meet a standard of performance based on implementation of 90% CCS
- New combustion turbines
 - Have expanded applicability of most stringent “base load” standard to units operating above 40% capacity factor
 - Have moved compliance deadline for CCS-based standard for base load units to 2032 (was 2035 at proposal)
 - Have removed low-GHG hydrogen co-firing as a BSER pathway for base load and intermediate units
 - Minor changes to “phase one” efficiency-based standards for base load and intermediate units
- Adjustments for reliability
 - Revised subcategories, longer compliance timeframe for CCS installation, a suite of compliance options
 - Addition of two reliability-related instruments as an additional layer of safeguard to support power companies, grid operators, and states in maintaining the reliability of the electric grid during the implementation of these final rules.
- EPA is not finalizing proposed requirements for existing fossil fuel-fired stationary combustion turbines.



Clean Air Act Section 111





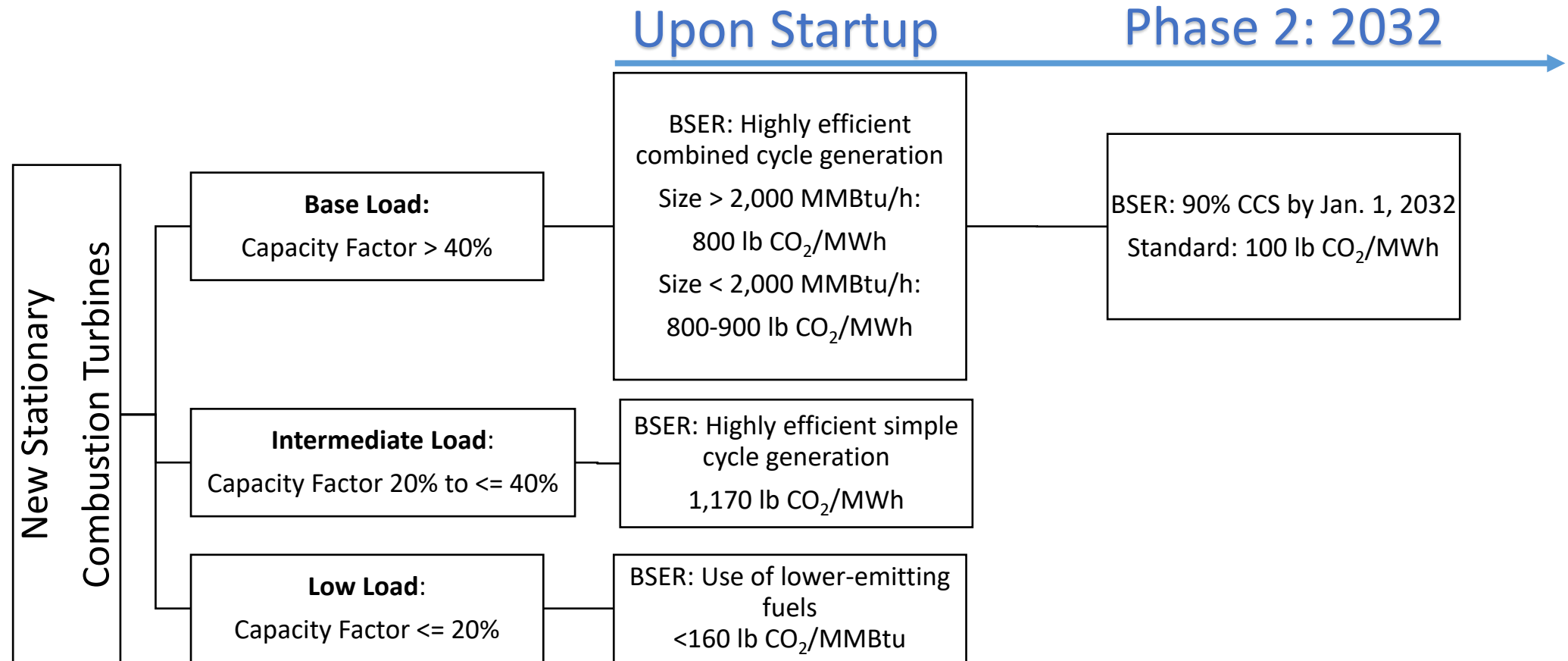
Final Standards for New Stationary Combustion Turbines

- Clean Air Act Section 111(b)
- For source categories that cause or contribute significantly to air pollution which may reasonably be anticipated to endanger public health or welfare, CAA section 111 requires EPA to establish standards of performance for new sources
- Standards must be set based on what is achievable through the application of the best system of emission reduction (BSER)
 - Cost (must not be “exorbitant,” “greater than the industry can bear,” or “unreasonable”)
 - Non-air quality health and environmental impacts
 - Energy requirements
 - Control measures that have been adequately demonstrated



Final Standards for New Stationary Combustion Turbines

- Standards effective from date of proposal publication (May 23, 2023)
- Three subcategories: base load, intermediate load, low load
- Standards are technology neutral, affected sources may comply with it by co-firing hydrogen





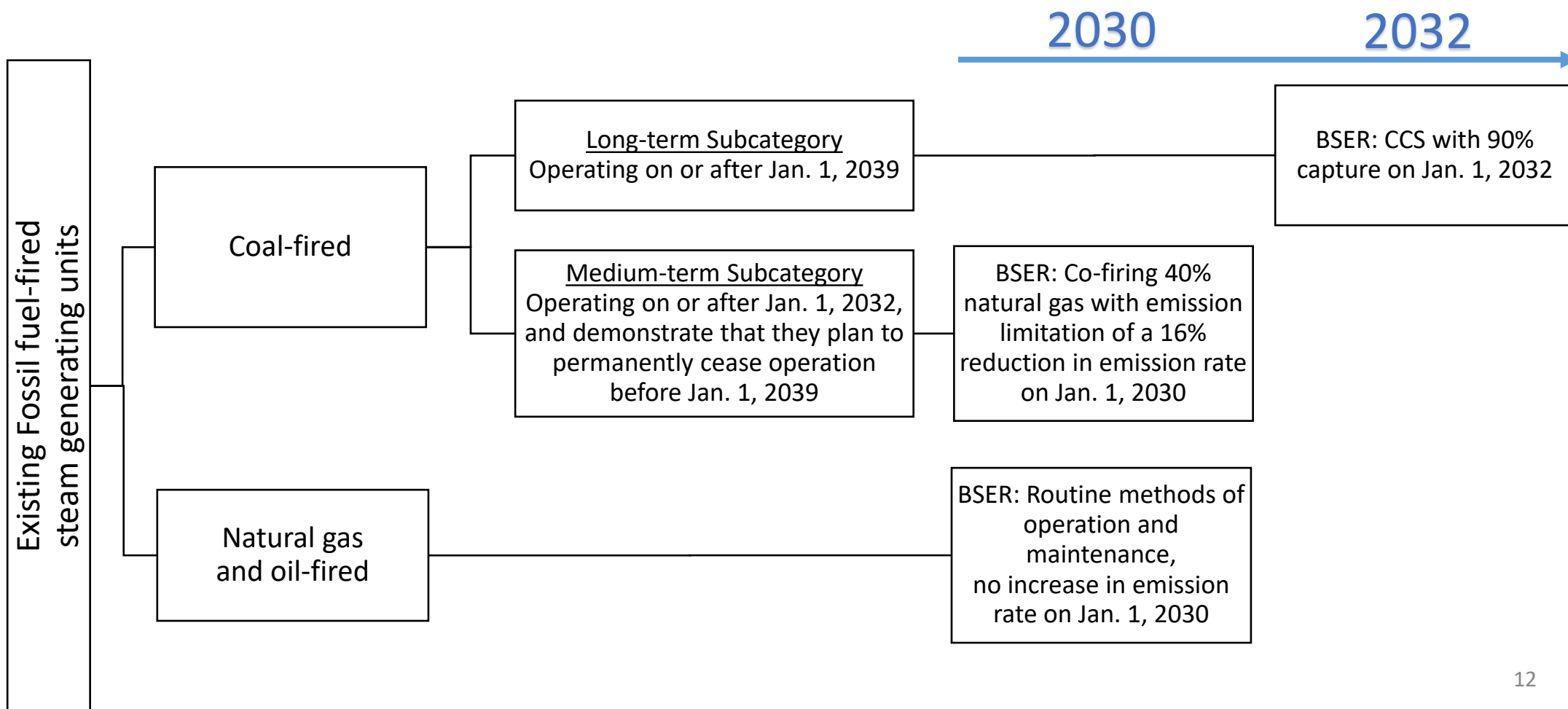
Final Emission Guidelines for Existing Fossil Fuel-Fired Sources

- Clean Air Act Section 111(d)
- Required in certain circumstances once EPA issues New Source Performance Standards for new, modified and reconstructed sources.
- Do not impose requirements directly on sources.
- Inform states as they develop, submit and implement required plans that set standards for existing sources.
- Emission standards must be set based on what is achievable through the application of the best system of emission reduction (BSER)



Final Emission Guidelines for Existing Steam Generating Units

- Two subcategories for existing coal-fired units, depending on operating horizon: (1) Units operating on or after Jan. 1, 2039 and (2) Units that are operating on or after Jan. 1, 2032, and demonstrate they plan to permanently cease operation before Jan. 1, 2039
- Units that demonstrate they plan to permanently cease operations before Jan. 1, 2032 are not subject to these standards





State Plans for FINAL Emission Guidelines

State Plan Submission Deadline

- Submission within 24 months after publication of the final emissions guidelines

State Plan Components

- Requirements specific to these emission guidelines to ensure transparency, including a website hosted by EGU owners/operators to publish documentation and information related to compliance with the state plan

Compliance Deadlines

- January 1, 2030, or January 1, 2032, depending on subcategory
- Compliance must be demonstrated annually
- States may include a mechanism in their plans to extend the compliance date by up to one year for affected EGUs installing a control technology that experience and subsequently provide documentation of a delay entirely outside of the owner/operator's control (e.g., permitting- or construction-related) that makes it impossible to commence compliance by the compliance deadline

Meaningful Engagement

- General implementing regulations (Subpart Ba) apply, and require states to describe their meaningful engagement with pertinent stakeholders, including communities that are most affected by and vulnerable to emissions from these EGUs, and reliability authorities
- Helps ensure that the priorities, concerns and perspectives of these communities are heard during the planning process



State Plans for Final Emission Guidelines

Presumptive Standards of Performance

- For each subcategory, EPA has determined a BSER and degree of emission limitation and is providing a corresponding methodology for establishing presumptively approvable standards of performance
- Expressed as rate-based emission limitations (i.e., limitations on the amount of a regulated pollutant that can be emitted per unit of output, per unit of energy or material input, or per unit of time)

Remaining Useful Life and Other Factors (RULOF)

- As provided in subpart Ba, under certain circumstances, states may apply a less stringent standard to a particular source based on that source's remaining useful life and other factors
- RULOF is intended as a limited variance from the EPA's determinations to address unusual circumstances at particular facilities

Increments of Progress (IoPs) and Reporting Obligations

- Will serve as clear, transparent, and enforceable implementation checkpoints between state plan submittal and the compliance dates. Similarly, reporting obligations for affected EGUs that have demonstrated they plan to permanently cease operating provide transparency to stakeholders
- States may generally choose the calendar dates for their IoPs



State Plans for Final Emission Guidelines

Compliance Flexibilities

- States may incorporate compliance flexibilities, such as emission averaging, trading, and unit-specific mass-based compliance, into their state plans, subject to parameters laid out by EPA in the emission guidelines, including:
 - For mass-based compliance flexibilities, EPA is requiring the use of a backstop emission limitation applied to individual sources
 - EPA is providing a presumptively approvable methodology for unit-specific mass-based compliance for affected EGUs in the long-term coal-fired subcategory
- If a state chooses to incorporate compliance flexibilities into their state plans, the state must demonstrate that the plan achieves a level of emission reduction equivalent to each source individually achieving their rate-based standard of performance, and the state must document and justify any assumptions underlying the calculation of the aggregate standard of performance or mass limit/budget
- EPA believes that the use of compliance flexibilities, within the parameters specified in the emission guidelines, can create an incentive for overperformance and may also provide some additional operational flexibility to states and affected EGUs in achieving the required level of emission reduction



Other Elements

- EPA is also simultaneously taking other actions, including
 - finalizing revisions to the NSPS for GHG emissions from fossil fuel-fired steam generating units that undertake a large modification, based upon the eight-year review required by the Clean Air Act;
 - repealing the “Affordable Clean Energy (ACE) rule” that was finalized in 2019 under the previous Administration; and
 - withdrawing the changes proposed to the NSPS for coal in 2018 under the previous Administration.
- EPA is not taking final action on the May 2023 proposed emission guidelines for existing combustion turbines. We are working to design a broader, more environmentally-protective approach to GHG regulation of the entire fleet of existing combustion turbines. EPA is taking this step as part of the comprehensive approach to regulation of climate, toxic and criteria air pollution from combustion turbines. As part of a robust stakeholder outreach effort, we issued framing questions and are gathering input through a non-regulatory docket that is open through May 28, 2024. Details are available at [Nonregulatory Public Docket: Reducing Greenhouse Gas Emissions from Existing Gas Turbines at Power Plants](#).



Emissions changes, benefits, and costs

- EPA evaluated the national emissions changes, benefits and costs in a Regulatory Impact Analysis (RIA). The RIA presents systemwide information.
- Estimates are presented two ways – as present values (PV) and equivalent annualized values (EAV). The PV is the costs or benefits over the timeframe from 2024 to 2047. The EAV represents the value for each year of the analysis.
- Over the years from 2024 to 2047, EPA estimates net benefits of **\$370 billion**. This includes:
 - **\$270 billion** in climate benefits
 - **\$120 billion** in health benefits (PM and ozone)
 - **\$19 billion** in compliance costs
- For a single year, the net benefits are **\$20 billion**. This includes:
 - **\$14 billion** in climate benefits
 - **\$6.3 billion** in health benefits (PM and ozone)
 - **\$0.98 billion** in compliance costs



Emissions changes

Aggregate emission cuts from 2028-2047

- The Regulatory Impact Analysis projects reductions of 1.38 billion metric tons of CO₂ systemwide over the 2028 to 2047 timeframe along with tens of thousands of tons of PM_{2.5}, SO₂, and NO_x – harmful air pollutants that are known to endanger public health.

Snapshot of emissions changes

- In 2035, the power sector systemwide would emit
- 123 million metric tons less CO₂
- 49,000 tons less annual NO_x
- 19,000 tons less ozone season NO_x
- 90,000 tons less SO₂
- 1,000 tons less direct PM_{2.5}
- About 200 pounds less mercury



Benefits and Costs – Snapshot Years

	2028	2030	2035	2040	2045
Climate Benefit	\$8.4 billion	\$11 billion	\$30 billion	\$14 billion	\$12 billion
PM2.5 and O3-related Health Benefits	Up to \$5.8 billion	Up to \$4.0 billion	Up to \$15 billion	Up to -\$0.14 billion	Up to \$8.2 billion
Total Benefits	\$11 billion to \$14 billion	\$13 billion to \$15 billion	\$37 billion to \$45 billion	\$14 billion to \$14 billion	\$16 billion to \$20 billion
Costs	-\$1.3 billion	-\$0.22 billion	\$1.3 billion	\$0.59 billion	\$3.3 billion
Net Benefits	\$12 billion to \$15 billion	\$13 billion to \$16 billion	\$36 billion to \$44 billion	\$13 billion to \$13 billion	\$12 billion to \$17 billion



Environmental Justice

- EPA engaged on multiple occasions with environmental justice organizations and representatives of communities that are affected by fossil fuel-fired EGUs, several of whom raised significant concerns about raised significant concerns about the potential health, environmental, and safety impacts of CCS. The EPA takes these concerns seriously, agrees that CCS must be deployed in a manner that protects public health, safety and the environment, and has carefully considered these concerns as it finalized its determinations of the BSERs for these rules.
- Overall, EPA modeling found that the final rule will result in large reductions of both GHGs and other emissions that will have significant positive benefits. While baseline ozone and PM2.5 concentration will decline substantially relative to today's levels in virtually all areas of the country, there is the potential for some localized increases in emissions.
- However, a robust regulatory framework exists to reduce the risks of localized emissions increases and facilitate the safe transport of CO2
 - The EPA plans to review and update as needed its guidance on NSR permitting, specifically with respect to BACT determinations for GHG emissions and consideration of co-pollutant increases from sources installing CCS
 - PHMSA is currently undertaking rulemaking to amend and enhance CO2 pipeline safety regulations
- Further, the EPA will continue to prioritize engagement with stakeholders throughout this process and is committed to engaging with all stakeholders on opportunities to ensure that deployment of CCS is done in a responsible manner.
- Each state will ultimately be responsible for determining the future operation of existing fossil fuel-fired EGUs located within its jurisdiction, and EPA's meaningful engagement requirements ensure that all interested stakeholders will have an opportunity to have their concerns heard in the state planning process.

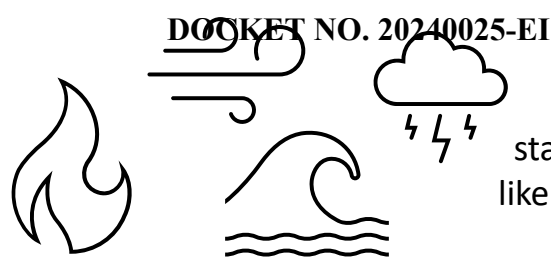


Support for Reliability

EPA developed a four-point plan to address reliability throughout the implementation period.

- 1) **Rule Structure**. EPA adjusted the compliance timeframe by 2 additional years for coal-fired units, to provide more time to install CCS, and streamlined the subcategories. The EPA is not regulating existing natural gas fired turbines at this time, which creates more time for a comprehensive approach, including for reliability.
- 2) **RULOF Provisions**. EPA articulated how states can use the Remaining Useful Life and Other Factors (RULOF) provisions to address reliability in state plans, as well as in state plan revisions, should circumstances change.
- 3) **Compliance Flexibilities**. Several important flexibilities are included: a flexible annual average compliance period, emissions trading/averaging, and mass-based compliance equivalency are allowed in circumstances that uphold the environmental integrity of the rule, and a 1-year compliance extension is available for new and existing units for implementation delays outside of the control the owner/operator.
- 4) **Reliability Mechanisms**. The final rule adds two optional reliability-related instruments as an additional layer of safeguards. A short-term mechanism to provide flexibility for units responding to grid emergencies and a reliability assurance mechanism for units with retirement dates with a documented and verified reliability need.

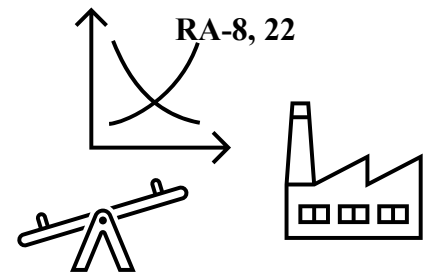
EPA completed analyses of the reliability and resource adequacy implications of these final rules, including high growth and combined regulation sensitivity analyses, that show these final rules can be implemented without adverse consequences for grid reliability. EPA will continue to engage extensively with all reliability related authorities.



DOCKET NO. 20240025-EI

Two Additional, Optional Mechanisms to Support Reliability

EPA’s approach to supporting reliability is multifaceted, as it has always been. We listened to stakeholders and included adjustments to key provisions that will support planning and reliability -- like subcategories and time to meet the standards. We also added two reliability-related mechanisms that are voluntary for states to include in state plans for existing sources.



Short Term Mechanism		Reliability Assurance Mechanism
New or existing units during certain specified grid emergencies, like extreme weather events which can include hurricanes, wildfires, and winter storms.	Who	Existing units with cease operations dates.
Units responding to emergencies have access to greater compliance flexibility for those time periods.	What	Extensions can be granted extensions where there is a documented reliability need but is insufficient time for a state plan revision.
Short-lasting, mostly occurring over a few hours and in some rare instances can last for a few days.	When	Units have access to up to a 1-year extension – but no longer than what is substantiated through documentation.
A unit must submit documentation, for annual compliance purposes, demonstrating the hours in which it operated out of schedule due to a qualified grid emergency.	How	A unit must substantiate that is needed to maintain reliability and have fulfilled all reporting requirements.
Grid emergencies that qualify for flexibility under this mechanism are energy emergency alerts (EEA) as defined by the North American Reliability Corporation. EEA levels 2 and 3 qualify for flexibility under this mechanism	More Details	Extensions exceeding 1 year in duration must be addressed through a state plan revision. EPA will seek the advice of Federal Energy Regulatory Commission (FERC) for extensions longer than 6 months.



For More Information

- Fact sheets and a copy of the final rule, RIA, and supporting documents are available at [Greenhouse Gas Standards and Guidelines for Fossil Fuel-Fired Power Plants](#)



THANK YOU

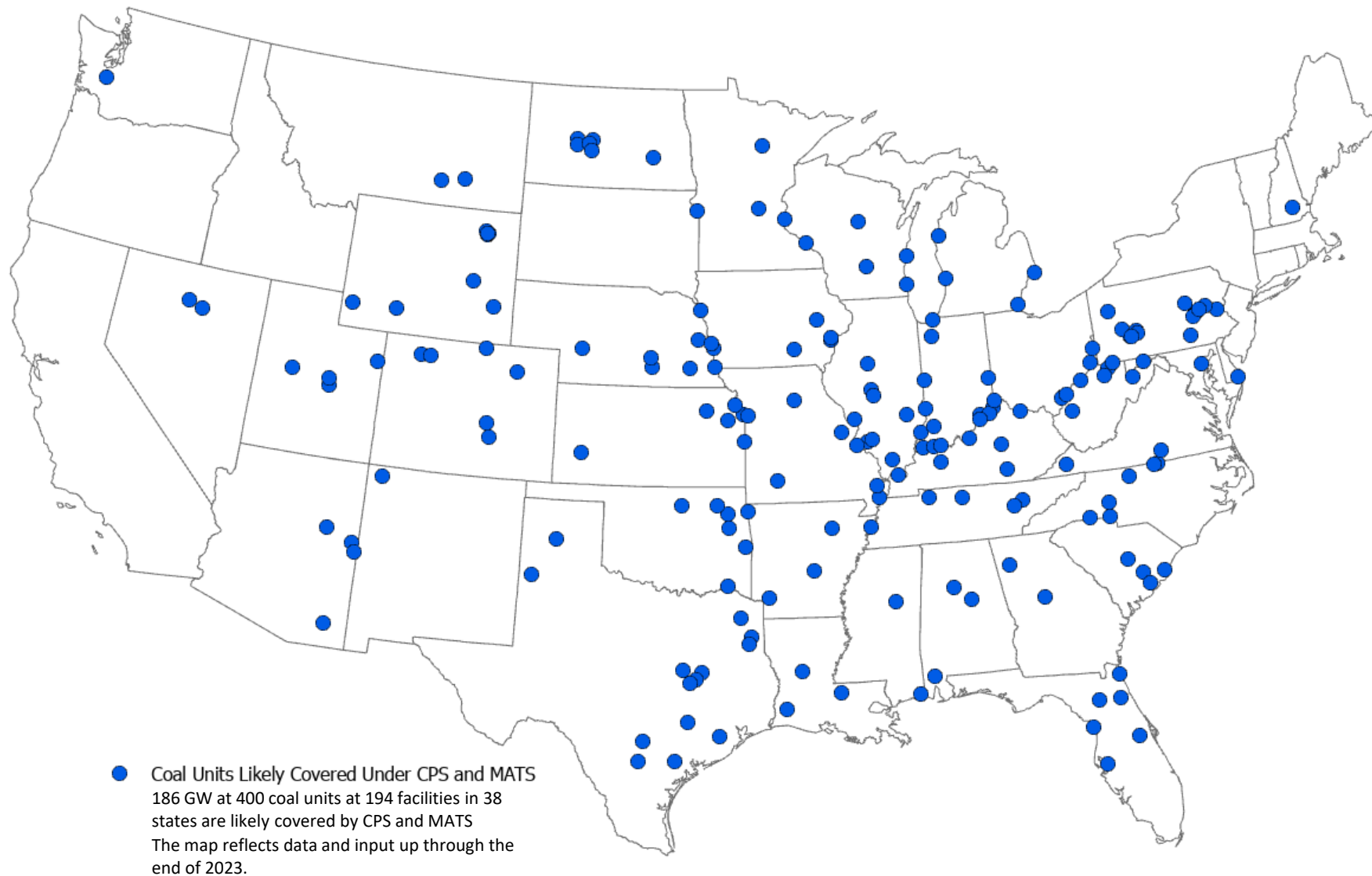


Appendix - Maps



Potentially Covered Coal-Fired Units: 2023

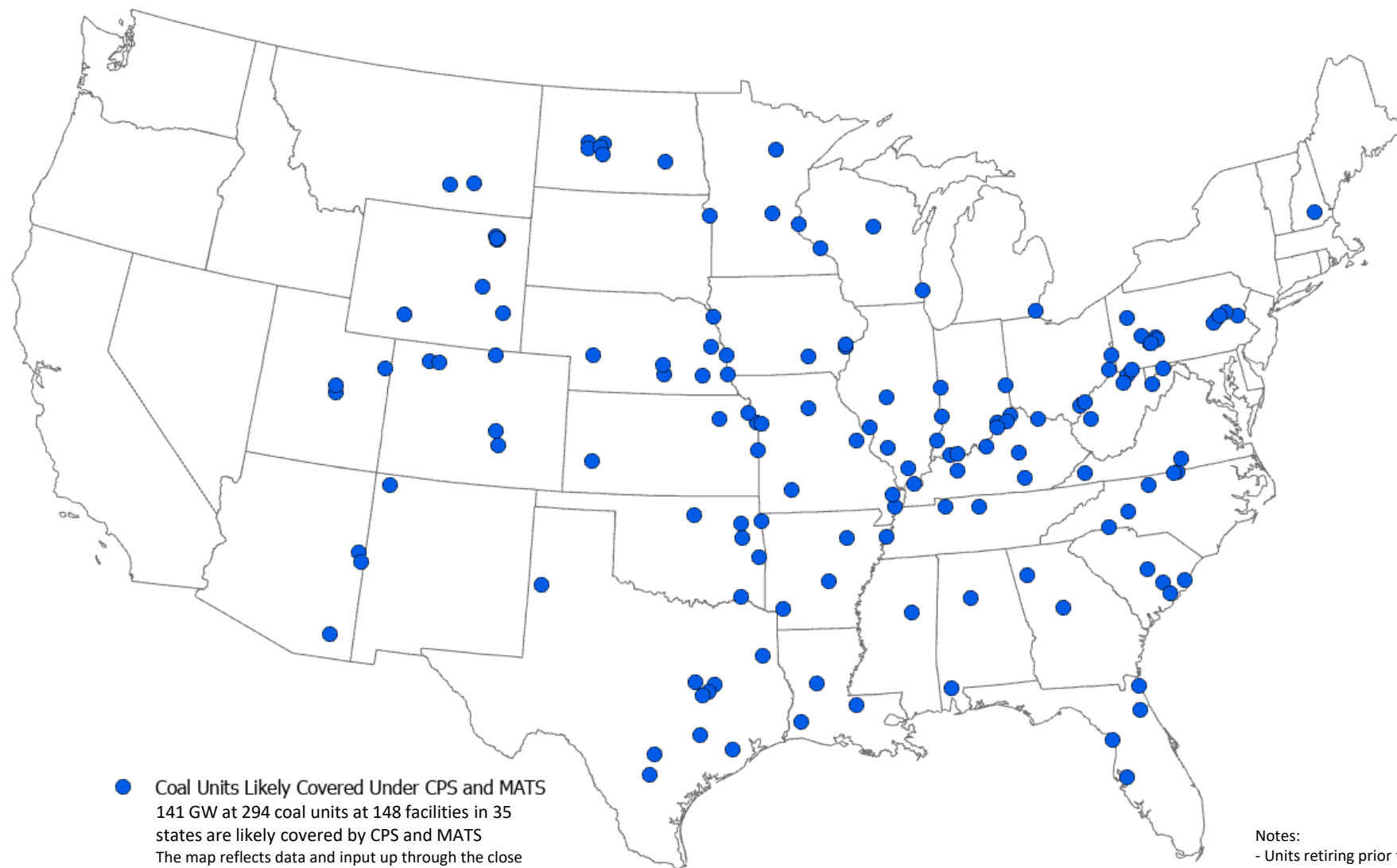
- Today, about 186 GW of coal-fired power plants are operating nationwide, this is 38% less than 10 years ago.
- Many of these have announced plans to retire or convert to natural gas (see following maps)





Potentially Covered Coal-Fired Units: 2029

- This map shows units for which EPA is not aware of plans to retire or switch to natural gas by 2029.
- Over the next 5 years, EPA is aware of 45 GW that have announced plans to retire or convert to natural gas, leaving a coal-fired fleet of 141 GW.
- These plans to retire or change fuel are among the many factors states and power plant owners can consider as they make decisions about CPS subcategories and/or controls for these units.
- The units on this map may be likely to be in the medium-term or long-term CPS subcategories.

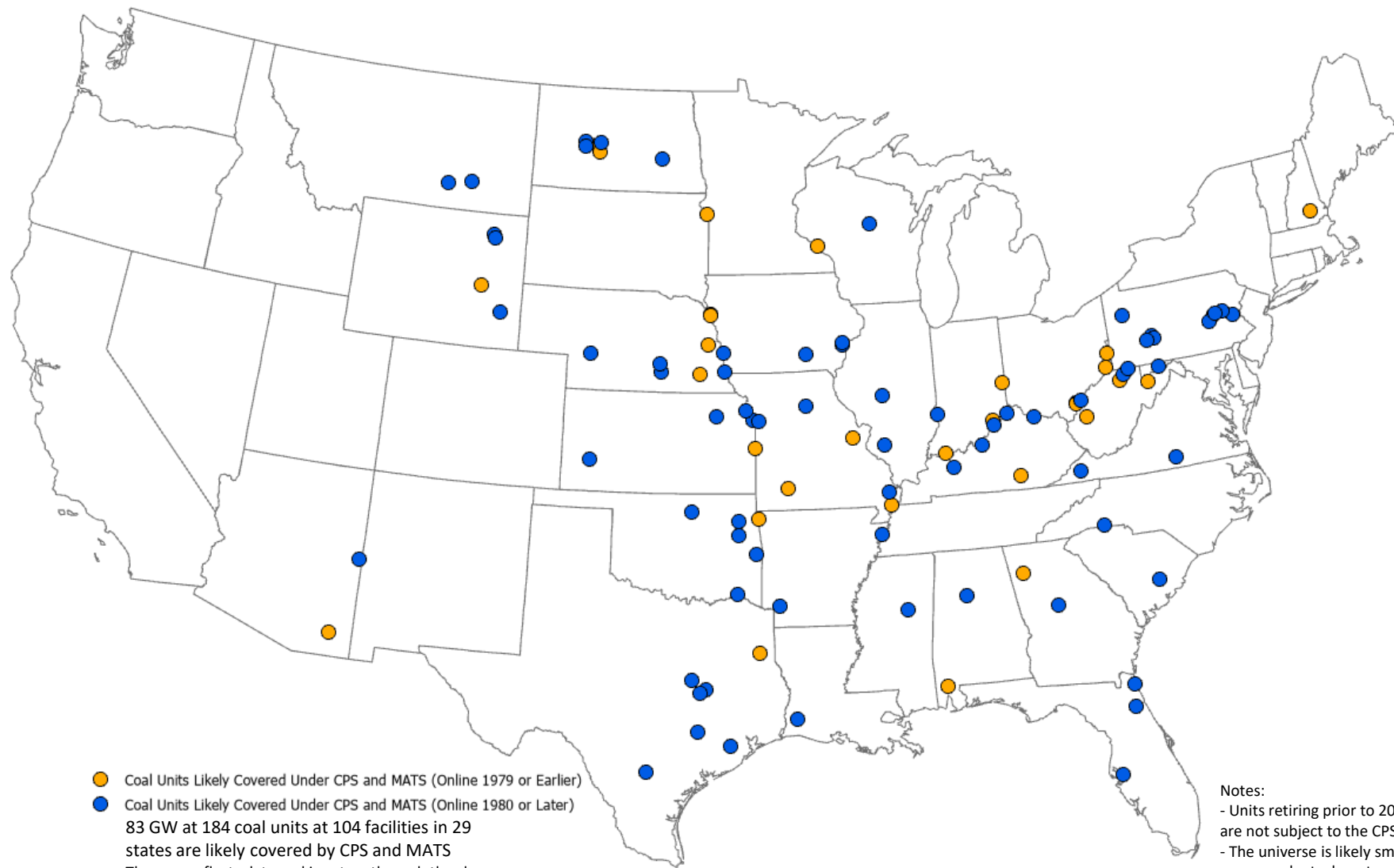
**Notes:**

- Units retiring prior to 2032 are not subject to the CPS rule
- The universe is likely smaller, as many plants do not announce retirement plans this far in advance



Potentially Covered Coal-Fired Units: 2039

- This map shows units for which EPA is not aware of plans to retire or switch to natural gas by 2039.
- Over the next 15 years, EPA is aware of 103 GW that have announced plans to retire or convert to natural gas, leaving a coal-fired fleet of 83 GW.
- Of the remaining coal-fired fleet, 36 GW will be over 60 years old by 2039.
- The units on this map may be even more likely to be in the medium-term or long-term CPS subcategories.



● Coal Units Likely Covered Under CPS and MATS (Online 1979 or Earlier)
● Coal Units Likely Covered Under CPS and MATS (Online 1980 or Later)
83 GW at 184 coal units at 104 facilities in 29 states are likely covered by CPS and MATS
The map reflects data and input up through the close of comment period (August 8, 2023) but may not reflect more recent announcements.

Notes:
- Units retiring prior to 2032 are not subject to the CPS rule
- The universe is likely smaller, as many plants do not announce retirement plans this far in advance

Exhibit RA-9:
Florida Reliability Coordinating Council, 2022 Load
& Resource Reliability Assessment Report,
FRCC-MS-PL-397



FRCC

2022 Load & Resource Reliability Assessment Report

FRCC-MS-PL-397

Version: 1

3001 North Rocky Point Drive East, Suite 410
Tampa, Florida 33607-8410
(813) 289-5644 - Phone
(813) 289-5646 - Fax
www.frcc.com

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		Version 1

The original signatures are maintained on file.

TITLE	NAME	DATE
Version Author	Andrew Whitley (FPL) Navid Nowakhtar (FMPA) Christina Rau (FRCC)	07/07/2022
Document Review Authority	Resource Subcommittee Load Forecast Working Group Fuel Reliability Working Group Transmission Technical Subcommittee	07/14/2022
Document Owner/Approval Authority	Planning Committee	07/22/2022

Document Subject Matter Expert: Planning Technical Specialist

Original Author: Andrew Whitley (FPL), Navid Nowakhtar (FMPA), Christina Rau (FRCC)

Responsible Department: Planning

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Classification: Public

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1.0 Purpose

A key responsibility of the Florida Reliability Coordinating Council (FRCC) is to assess the planned reserve margin and resulting reliability of the Bulk Power System in the FRCC Region¹ to ensure resource adequacy as required by the Florida Public Service Commission (FPSC)².

As part of this annual assessment, the FRCC aggregates, and reviews forecasted load and resource data and identifies any expected planning reserve or reliability issues over the next ten years. The FRCC receives data annually from its members to develop the Regional Load & Resource Plan (RLRP). Based on the information contained in the RLRP as well as other FRCC reliability assessment processes, this Load & Resource Reliability Assessment Report (Reliability Assessment Report) is developed and submitted to the FPSC along with the RLRP.

The Reliability Assessment Report evaluates the projected reliability for the FRCC Region by analyzing Planned Reserve Margins, Loss of Load Probability (LOLP), Availability Factors (AF), and Forced Outage Rates (FOR). In addition, this report incorporates any potential reliability issues that may be encountered with varying system conditions (off peak) such as solar generation levels in Florida. This assessment may include insight from studies performed by the Resource Subcommittee (RS), Load Forecast Working Group (LFWG), Transmission Technical Subcommittee (TTS), Fuel Reliability Working Group (FRWG) and other operations planning groups.

2.0 Terms and Definitions

Terms are defined within the document.

3.0 Responsibilities

3.1 Resource Subcommittee (RS)

The RS is responsible for reviewing this document.

3.2 Load Forecast Working Group (LFWG)

The LFWG is responsible for reviewing this document.

3.3 Fuel Reliability Working Group (FRWG)

The FRWG is responsible for reviewing this document.

3.4 Transmission Technical Subcommittee (TTS)

The TTS is responsible for reviewing this document.

3.5 Planning Committee (PC)

The PC is responsible for the final approval of this document.

¹ As of January 1, 2022, the FRCC Region includes Gulf Power Company.

² FAC 25-6.035: Adequacy of Resources (<https://www.flrules.org/gateway/ruleno.asp?id=25-6.035>)

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4.0 Executive Summary/Conclusion

In summary, the findings of the 2022 Reliability Assessment Report of the FRCC Region are:

- Electric service is projected to be reliable from³ a resource adequacy perspective throughout the ten-year planning horizon, consistent with the following:
 - Reserve margins, including the use of Demand Side Management (DSM), for the FRCC Region for the summer and winter peak hours are projected to meet or exceed 20% for each year in the ten-year period, which is above the FRCC's minimum Reserve Margin Planning Criterion of 15%.
 - Reserve margin without DSM is declining over time, and this decline is coincident with an increase in intermittent and duration-limited resources. The region is increasingly dependent upon DSM and intermittent/duration-limited resources in the later years of the study period.
 - The results of the most recent (2022) Loss-Of-Load-Probability (LOLP) analysis of the period 2022-2026 reflect the expectation that the FRCC region will not exceed an LOLP level of 0.1 days per year during that timeframe, under the assumption that duration-limited resources perform as modeled under typical meteorological year weather conditions; an LOLP level of 0.1 days per year is commonly used in the power industry as a reliability criterion.
 - Projected low Forced Outage Rate (FOR) and high Availability Factor (AF) are largely due to the utilities' modernization and maintenance efforts.
 - Measuring traditional reserve margins over a seasonal peak hour, while highly beneficial, is anticipated to be subject to reduced applicability in the context of resource adequacy as the amount of intermittent and duration-limited generation synced to the FRCC system increases. Additional adequacy measurements that account for capacity and energy sufficiency across all hours of the day are being reviewed to better capture and communicate the long-term adequacy position of the FRCC as a whole. FRCC Members and staff continue to work on defining and evolving the standard practice for such calculations.
 - Specifically, the FRCC Board has directed the Resource Subcommittee and Load Forecast Working Group to coordinate across a wide range of expertise to better capture risks related to these emerging issues in the future. One current Resource Subcommittee effort is evaluating resource availability across two 24-hour periods around the summer and winter peak to evaluate the potential impacts on system peak hour and energy adequacy in the future as renewable resource installations continue to grow
 - The possibility of extreme weather events, the integration of increasing amounts of renewables and time duration limited storage onto the grid, the impacts of gradual electrification of transportation on future load, as well as the potential for natural gas supply disruptions are emerging issues that are being reviewed in terms of the broader resource adequacy discussions.

³ Effective January 1, 2022, Gulf Power was merged into FPL for ratemaking purposes. All projected information presented for the years 2022 through 2031 is for the single integrated system (FPL), moving Gulf's capacity, demand, and energy into the FRCC section. These transitional impacts have been specifically identified where practical. Historical data prior to 2022 excludes the Gulf system.

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- The load forecast that results from the amalgamation of independent, individually derived Member projections is reasonable, and reflects moderate growth over ten years.
 - The average annual growth rate for Net Energy for Load (NEL) is expected to be 0.93% per year, which is higher than the previous forecast.
 - Firm summer peak demand is expected to grow by 1.09% per year, which is lower than the previous forecast.
 - Firm winter peak demand is expected to grow by approximately 1.06% per year, which is lower than the previous forecast.

The following table summarizes additional net Utility-Owned Generation Capacity including additional capacity being added in the Gulf area.

Additional Utility-Owned Generation Capacity (MW)

<i>Combined Cycle</i>	3,400
<i>Combustion Turbine Capacity</i>	2,500
<i>Plant Uprates</i>	500
<i>Plant Retirements</i>	<u>(2,300)</u>
Net Non-Renewable Generation	4,100
Firm Solar Capacity	4,900
Firm Battery Storage Capacity⁴	<u>2,400</u>
Net Total (Summer)	11,400

- Natural Gas is expected to remain the primary fuel source for the region with all proposed new thermal generation expected to use natural gas as their primary fuel.
 - Natural gas is projected to provide approximately 65% of the electrical energy (GWh) in peninsular Florida by the end of the ten-year planning horizon. The existing and planned pipeline capacity supporting the Region are adequate to meet projected peak day gas requirements (summer and winter) through 2031, with the assumption that any short-term capacity shortfall can be met with member backup fuel capabilities or market solutions. However, a growth in natural gas use sensitivity scenario indicated some possible additional natural gas pipeline capacity could be needed in the 2031-time frame (by the end of the planning period).
 - In the event of a short-term failure of key elements of natural gas delivery infrastructure, use of dual fuel capability (between 57% – 61% of available natural gas capacity over the planning horizon) will be required to meet projected demand. It should be noted that additional fuel management coordination would also be required in the event of a long-term failure of key elements of natural gas delivery infrastructure.

⁴ Limited Duration Energy.

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- Renewables in the FRCC Region are expected to grow from:
 - 3,591 MW in 2022 (5.9%) to 7,754 MW in 2031 (11.8%) in terms of nameplate generation capacity and
 - 12,013 GWh in 2022 (4.9%) to 50,547 GWh in 2031 (18.3%) in terms of energy served.

This growth is projected to come from solar generation. Members continue to leverage operating experience with these resources to better forecast future contributions to capacity, energy and how they impact system peaks. The FRCC will continue to monitor and evaluate the effects of increased penetration levels of renewable generation on the system.

- Battery storage contributions to capacity are included in reserve margins consistent with members' TYSP filings. The region currently has approximately 496 MW of firm summer capacity from battery storage and 2,400 MW of additional firm summer capacity from battery storage facilities are planned through 2031. As FRCC members continue to gain experience with operating battery storage, members will be better able to develop methodologies and protocols to properly account for battery contributions toward capacity, energy sufficiency and operational support.
- COVID-19 and Recent Fuel Price Increase Impact on Load Forecasts
 - Although the amounts vary by member, COVID-19 impacts have gradually receded back to pre-pandemic load levels.
 - The LFWG is actively engaged in monitoring the potential impact of recent high natural gas prices and other geopolitical conditions that have increased inflationary pressures on electric customers. Any price elasticity impact associated with such risks would only improve reliability metrics presented herein, all else equal.
- FRCC members continue to learn from recent electrical system events that have occurred across the Country. Specifically, in 2021, US consumers endured two significant extreme weather events in California and the south-central area of the country which resulted in firm load shedding in order to preserve broader system reliability. The second event stretched over Texas, Arkansas, and Louisiana in February of 2021 and was an historic cold weather event that forced generating units offline, reduced natural gas supplies, and pushed electric heat demand to very high levels. The Texas event resulted in significant societal impacts and an ongoing Regulatory focus on preparations for extreme weather.
 - As a result, NERC and FERC developed numerous recommendations issued in a joint report, FERC, NERC and Regional Entity Staff Report, November 2021⁵ including recommendation "9a" which recommends that utilities in southern states adjust load forecasts to reflect actual historic peak loads. These events and ensuing analyses continue to be reviewed by FRCC member companies for applicability to their systems.
 - The FRCC initiated a broad-based review plan to identify contributing causes, relevance to FRCC, and address any applicable near-term actions as well as longer term activities to identify any FRCC analysis or process improvement opportunities in load forecasting, extreme weather response and mitigation, resource adequacy methodologies as well as internal and external

⁵ Report: *The February 2021 Cold Weather Outages in Texas and the South-Central United States* / FERC, NERC, and Regional Entity Staff Report <https://www.ferc.gov/media/february-2021-cold-weather-outages-texas-and-south-central-united-states-ferc-nerc-and>

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communications processes.

- FRCC member utilities continue to perform internal as well as FRCC wide reviews to better understand the potential loads that could be experienced based on actual historical weather events. Initial reviews of aggregate load forecasts based on winter 1989 and 2010 actual weather conditions identified the potential for customer load curtailments (rotating load shedding) to preserve the reliability of the FRCC systems during cold morning peaks should conditions similar to 1989 be experienced over the study horizon.
- The FRCC RS has been working to prepare a detailed 2 x 24 (hourly) evaluation of the sufficiency of resources to serve aggregated FRCC load across all hours of the peak summer and winter day. As of the writing of this assessment, the evaluation is not yet at a level of maturity from which to draw conclusions.

5.0 FRCC Reserve Margin Review

In February 2021, impacts from Winter Storm Uri caused multiple consecutive days with extremely low temperatures in Texas and elsewhere in the middle of the country which resulted in millions of customers being without power for days. In addition to the hardship these customers endured, the negative economic consequences for businesses in the affected areas and the state were significant. As a result, NERC and FERC developed numerous recommendations issued in a joint report, FERC, NERC and Regional Entity Staff Report, November 2021. One recommendation is that utilities (by Winter 2023-2024) “that forecast load within southern states should adjust their 50/50 forecasts to reflect actual historic peak loads that occurred during severe cold weather events in their footprints and reflect the potential for exponential load increase due to the resistive heating used in southern states”. As a result, FRCC member utilities continue to perform internal as well as FRCC wide reviews to better understand the potential loads that could be experienced based on actual historical weather events.

FPL, whose load centers include the most southern part of Florida, estimated the largest increase in forecast load from its 50/50 forecast of any Florida utility when considering actual historical severe cold weather. This result is intuitive since the more northern parts of the state more frequently experience cold weather and that is then statistically captured in their “normalized” weather. As a result, FPL has developed a “Recommended” resource plan as well as “Business as Usual” resource plan, as part of their “Ten Year Power Plant Site Plan 2022-2031” filing to the FPSC. The aggregate FRCC L&RP compilation includes FPL's traditional P50 load forecast along with the resources and fuel diversification improvements that were identified as part of their “Recommended” resource plan. **Unless otherwise noted, the tables and charts in this reliability assessment include the P50 load forecast and the Recommended FPL resource plan.** For reference, the impacts on aggregate calculations have been annotated where practical. FPL has recently withdrawn its Recommended Plan from PSC consideration. However, one lesson learned from the 2021 Winter Storm Uri, is that a single calculation of reserve margin based on a 50/50 load forecast does not provide a complete picture of the probability of being able to serve load in extreme weather events.

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The FRCC has a reliability criterion of a 15% minimum Total Reserve Margin based on firm load. FRCC Reserve Margin calculations include merchant plant capacity that is under firm contract to load-serving entities. The FRCC assesses the upcoming ten-year projected summer and winter peak hour loads, generating resources, and DSM resources on an annual basis to ensure that the Total Reserve Margin requirement is projected to be satisfied. The three Investor-Owned Utilities, Florida Power & Light Company (FPL), Duke Energy Florida (DEF), and Tampa Electric Company (TEC), are utilizing, along with other reliability criteria, a 20% minimum Total Reserve Margin planning criterion consistent with a voluntary stipulation agreed to by the FPSC⁶. Other utilities employ a 15% minimum Total Reserve Margin planning criterion.

If projections had shown a forecasted peak period for which the Total Reserve Margin requirement would not be met, such a projection would be researched and reflected in the annual Reliability Assessment Report. There are no such projections for the next ten years.

The information contained in the Figures and Tables in this report are consistent with information presented in the individual utilities' 2022 Ten-Year Site Plans (TYSP). These TYSPs present information from the utilities' latest resource planning work. As noted above, the calculations and aggregations this year include FPL's Recommended plan resource data paired with FPL's traditional P50 load forecast data as was provided to the FRCC through this year's regional load and resource plan data collection effort. Although this Recommended Plan was recently withdrawn from consideration by FPL, the FRCC Reserve Margin for winter is still above the 15% minimum criterion, using the P50 load forecast, without the additional capacity in FPL's Recommended Plan, as shown in *Figure 3*.

All reserve margin projections include both the projected firm impact of existing and projected solar resources as well as the firm impact of energy storage resources projected to come online over the planning horizon. The firm capacity value of solar, which varies by utility as some percentage of nameplate capacity for summer and is generally zero for winter, is discussed in more detail in Section 10.0 of this document. The firm capacity value of solar coupled to energy storage will continue to be evaluated as member utilities add more storage to their resource projections. Currently, each member utility assigns a firm capacity value to the energy storage projected in their resource plans, and those firm capacities are used in the calculation of the FRCC's Reserve Margin values.

Figure 1 below shows that the projected summer Total Reserve Margins, including the use of DSM, from the 2022 *Regional Load & Resource Plan*⁷ continue to be above the FRCC's minimum 15% Total Reserve Margin criterion. In fact, the 2022 projected summer Total Reserve Margins exceed 20% for every year in the ten-year forecast period. **Figure 1** also includes historical trends from the 2019, 2020, and 2021 LRP. Reserve Margins are generally comparable to those forecasted in 2021 with minor differences driven from timing and planned generation.

⁶ Docket No. 981890-EU Generic investigation into the aggregate electric utility reserve margins planned for Peninsular Florida, Order No. PSC-99-2507-S-EU, issued December 22, 1999 (<http://www.floridapsc.com/library/filings/1999/15628-1999/15628-1999.pdf#search=99-2507-S-EU>)

⁷ [2022 Regional Load & Resource Plan](#)

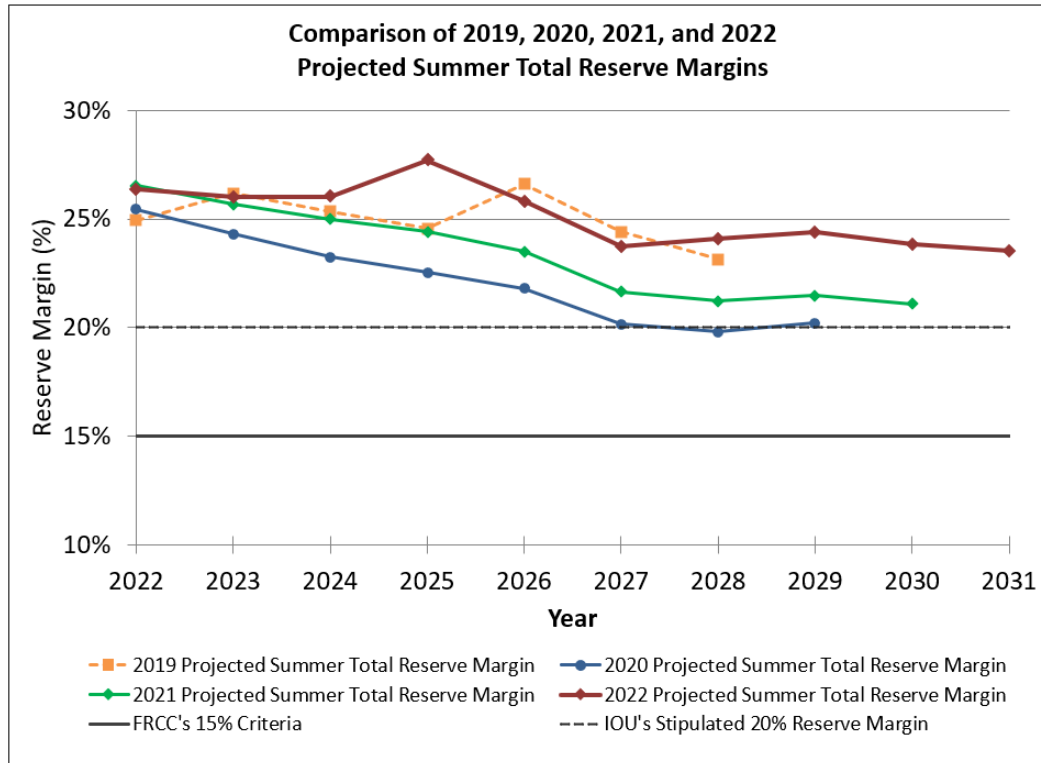
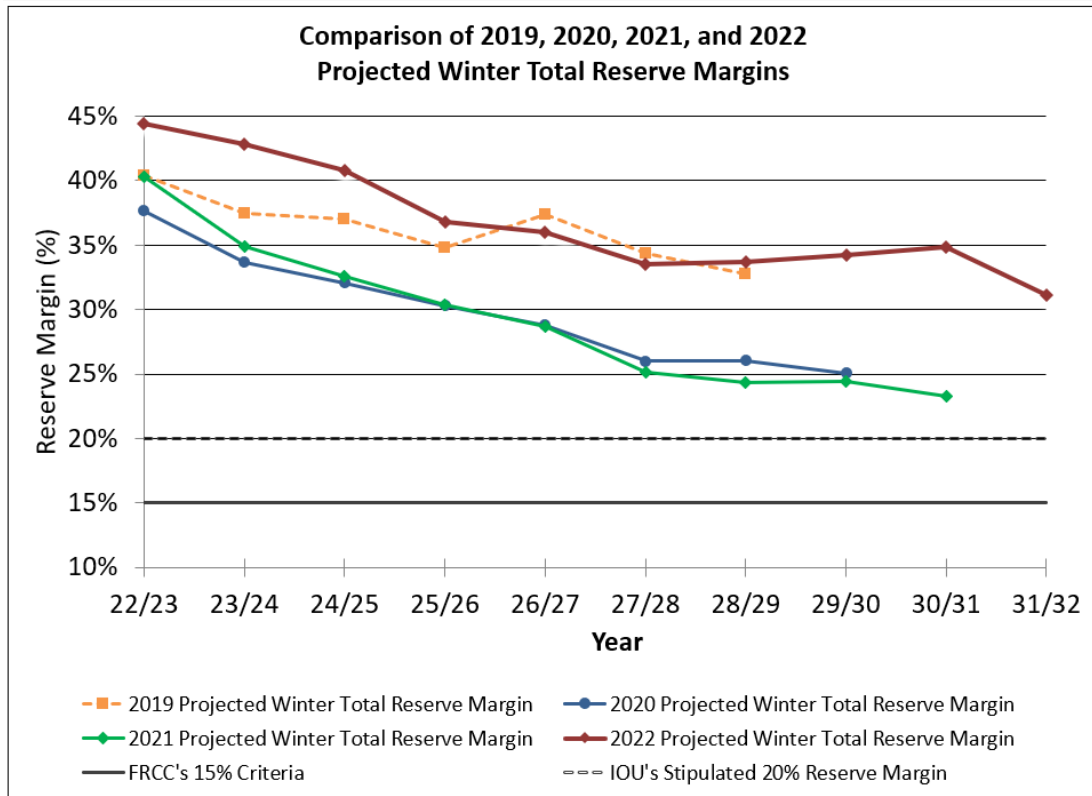


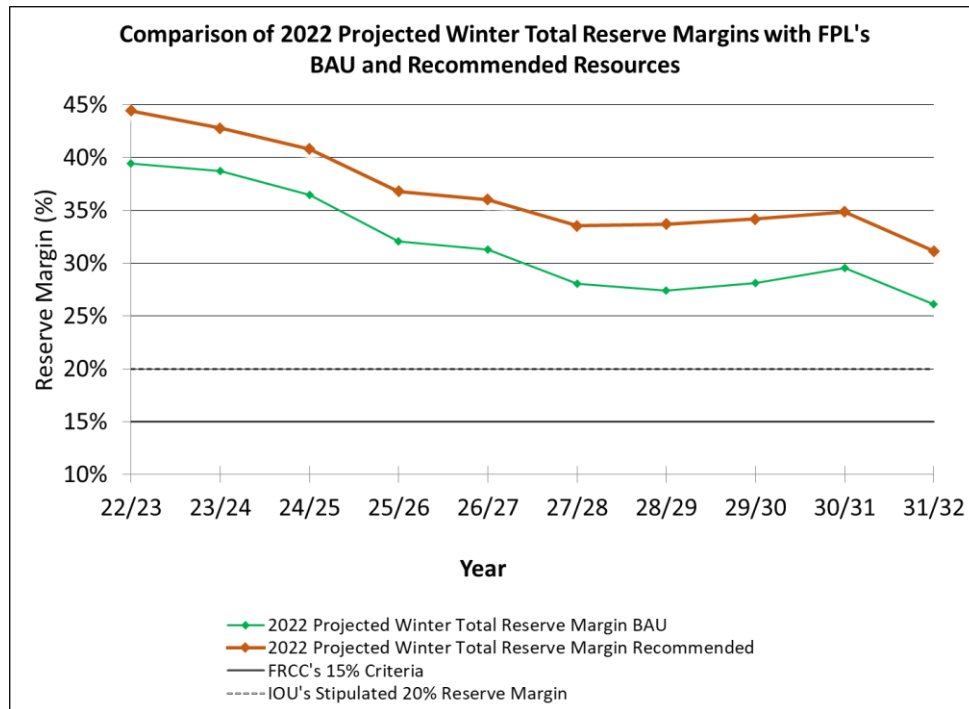
Figure 1
Trends in Projected Summer Total Reserve Margins

In a similar manner, **Figure 2** below shows the projected winter Total Reserve Margins, including the use of DSM, from the 2022 *Regional Load & Resource Plan*. The 2022 projected winter Total Reserve Margins are also over 20% for every year in the ten-year forecast period. 2022 projected winter reserve margins are generally comparable with 2021 projections. In the latter years of the planning horizon, winter reserve margins increased from 2021 projections due in part to the additional winter capacity included from FPL's Recommended TYSP. Figure 2 also includes historical trends from the 2019, 2020, and 2021 LRP.

**Figure 2⁸*****Trends in Projected Winter Total Reserve Margins***

Specifically, and based on previous extreme events, FPL developed a new load forecasting approach that lies outside the traditional resource planning norms in order to clearly identify the potential risks and uncertainty associated with future extreme weather events and take incremental resource steps to mitigate those risks. As a result, FPL submitted two Ten-Year Site Plans to the FPSC. One in which FPL switched from using a P50 load forecast for all 12 months to a hybrid-type forecast that projects a P50 peak load for 11 months, with an extreme Winter peak load for the month of January (only) identified as their Recommended resource plan, and the other utilizing their traditional P50 load forecast identified as their Business as Usual (BAU) resource plan. Although the core FRCC LRDB included FPL's Recommended resource plan, FRCC has included **Figure 3** below as a point of reference to help identify the impacts to aggregate FRCC planned reserve margin using either plan. **Figure 3** shows the forecasted Winter Total Reserve Margin differences for the FRCC Region between aggregating FPL's Recommended Plan resources and FPL's BAU Plan resources. Both calculations assume all FRCC entities' P50 load forecast, and not FPL's extreme winter load forecast, which continues to be a highly debated topic across the industry and Regulating community.

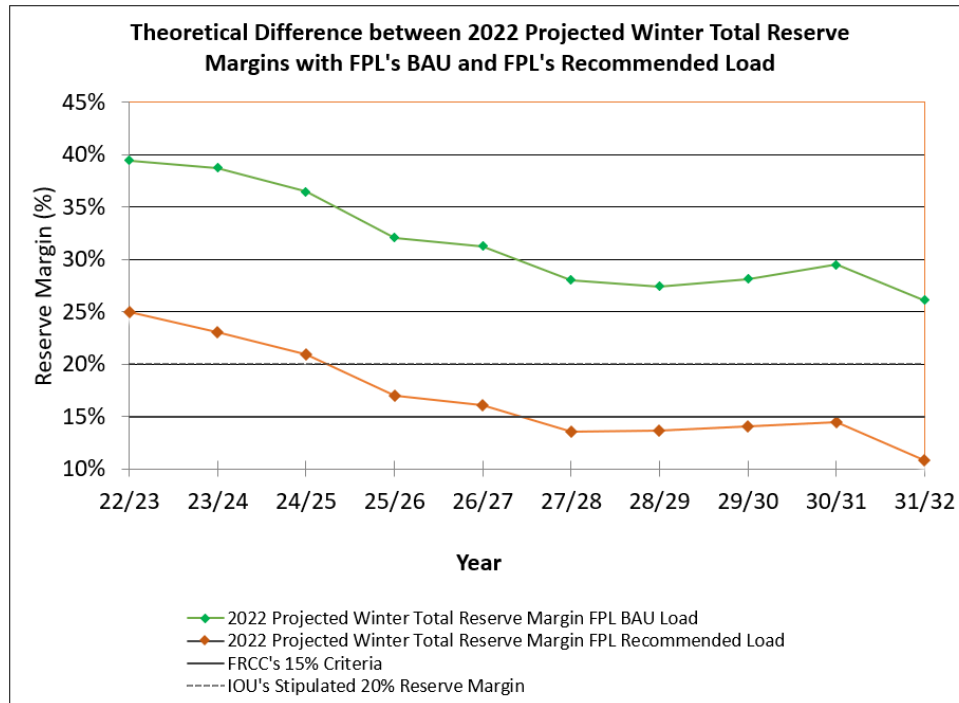
⁹ The winter season spans from the 4th quarter of one year through the 1st quarter of the next year. For example, the year 21/22 refers to the winter season spanning from the 4th quarter of 2021 through the 1st quarter of 2022.

*Figure 3*

Comparison of 2022 FRCC Regional Projected Winter Total Reserve Margins between FPL's BAU and Recommended Resources

Planning Reserve Margins generally project demand based on a 50/50 forecast. When NERC discusses a 15% Reserve Margin for predominantly thermal systems (in Florida 15% and 20% reference Reserve Margins), those Reserve Margins are associated with a 50/50 forecast. Therefore, a Reserve Margin calculation with a higher forecast load is not comparable to a reference Reserve Margin. Even though the results are not directly comparable, in **Figure 4** below the green line of the chart uses a 50/50 forecast for all Florida entities. The orange line uses a 50/50 forecast for all Florida entities except FPL. For FPL an extreme Winter peak load is utilized (from FPL's Recommended Plan).

Figure 4 shows a theoretical forecasted Winter Total Reserve Margin difference for the FRCC Region between aggregating FPL's Recommended Plan load and FPL's BAU Plan load. Note: The resources assumed in Figure 4 are the same as in Figure 3 (FRCC total resources with FPL's Recommended Plan). Only the total FRCC load differs in the orange line calculation, with the 50/50 forecast load being used for all Florida entities except FPL, combined with FPL's extreme Winter peak load.

**Figure 4**

Theoretical Difference between 2022 FRCC Regional Projected Winter Total Reserve Margins between with FPL's BAU and FPL's Recommended Load

6.0 FRCC Resource Adequacy Criteria Review

Introduction

Loss-Of-Load-Probability (LOLP) projections are developed in analyses that are conducted every other year. In addition, projections of generator Forced Outage Rate (FOR) and Availability Factor (AF) are developed annually. The results of these analyses are utilized, in combination with the above-described Total Reserve Margin review, to determine if the planned resources for the FRCC Region are adequate to meet FRCC and FPSC requirements.

LOLP Analysis

The FRCC has historically used an LOLP analysis to support the adequacy of reserve levels for the FRCC Region. The LOLP analysis utilizes probabilistic analysis methods to quantify the ability of the generation system resources to reliably meet expected demand, incorporating the uncertainties associated with generation reliability including unit forced outage rates, maintenance schedules, load uncertainty, and demand response capabilities that vary on a seasonal basis. In response to the increasing penetration of utility-scale solar and other energy-limited resources as well as the drive to model the region as accurately as possible, the FRCC has updated their modeling approach for these resources. For the 2022 LOLP analysis, the RS collected projected hourly solar output and energy storage charging and discharging profiles for all utility-scale units and treated them as a modifier to the load in order to further improvement the assessment model. The purpose is to verify that the projected LOLP for the system does not exceed the maximum target LOLP of 0.1 day in a given year. In addition

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to maintaining this LOLP level, the FRCC established an additional Regional Reserve Margin Planning Criterion (also known as a Resource Adequacy Criteria) of a minimum 15% Total Reserve Margin for both summer and winter versus firm load.

The most recent LOLP analysis was conducted in 2022. “Base” LOLP projections were obtained for the FRCC Region for the years 2022 through 2026 using updated assumptions and forecasts that correspond with the Florida utilities’ 2022 TYSPs. Beyond the base or “reference” case values for LOLP, projected LOLP values for a variety of scenarios were considered, including: (i) no availability of firm imports, (ii) no availability of load management/demand response (DR) types of DSM programs, and (iii) a high load case.

Results indicate that the FRCC Region is projected to be reliable from an LOLP perspective through 2026. In other words, the FRCC Region’s electric system is projected not to exceed the planning maximum LOLP criterion of 0.1 days per year with all transmission facilities in service for the reference case and the scenario cases. The projected LOLP values are shown in *Table 1* below.

Year	Base Case	No Availability of Firm Imports	No Availability of Demand Response	High Case
	LOLP (Days/Year)	LOLP (Days/Year)	LOLP (Days/Year)	LOLP (Days/Year)
2022	0.000003	0.000957	0.015117	0.000008
2023	0.000003	0.000441	0.015003	0.000008
2024	0.000002	0.000652	0.014572	0.000009
2025	0.000004	0.000688	0.010994	0.000011
2026	0.000002	0.000597	0.008826	0.000009

Table 1
2022 LOLP Results¹⁰

Forced Outage Rates (FOR) and Availability Factors (AF)

Generating unit reliability is a primary driver of LOLP results. The FRCC Resource Subcommittee tracks and monitors capacity (MW)-weighted FOR and AF measures for individual utility systems and the FRCC Region as a whole. This assessment was again conducted as part of the 2022 Load and Resource Reliability Assessment. The individual utility system information is aggregated to develop MW-weighted FRCC Regional FOR and AF values. Actual and forecasted FOR and AF values are then compared to historical values. Projections of these annual measures for individual utilities and the region, plus projected changes from year-to-year, are implicit indicators of system reliability from an LOLP perspective.

In the current analysis, both yearly capacity weighted FOR and AF projected values for each utility system were calculated. The calculations were based on each utility's latest planning assumptions and historic forced outage information as presented in each utility's 2022 TYSP. These 2022 projections for FOR and AF values were compared to the values projected in 2019, 2020, and 2021.

As seen in *Figure 5* below, the 2022 projection of FOR values remain generally in-line with projected values from the last several years. The current projected FOR values are in a relatively narrow range and continue to decline. This trend is also consistent with projections from the prior years. The projected FOR values are one

¹⁰ The 2022 LOLP results are based on: (i) a load variation model and (ii) a manual approach to generator maintenance inputs which typically results in higher LOLP values than would result if using an automatic maintenance approach.

driver of the projected low LOLP base case values from the 2022 LOLP analyses presented above in *Table 1*. This consistency in FOR projections¹¹ further supports the finding that the FRCC Region is projected to remain resource adequate and maintain its reliability from 2021 through 2031. In addition to the low projected FOR values, low projected LOLP values presented above are likely driven by the updated modeling approach for utility-scale solar and energy limited resources. The updated modeling approach more accurately represents the real-time output of these units at time of peak which was understated in the previous approach.

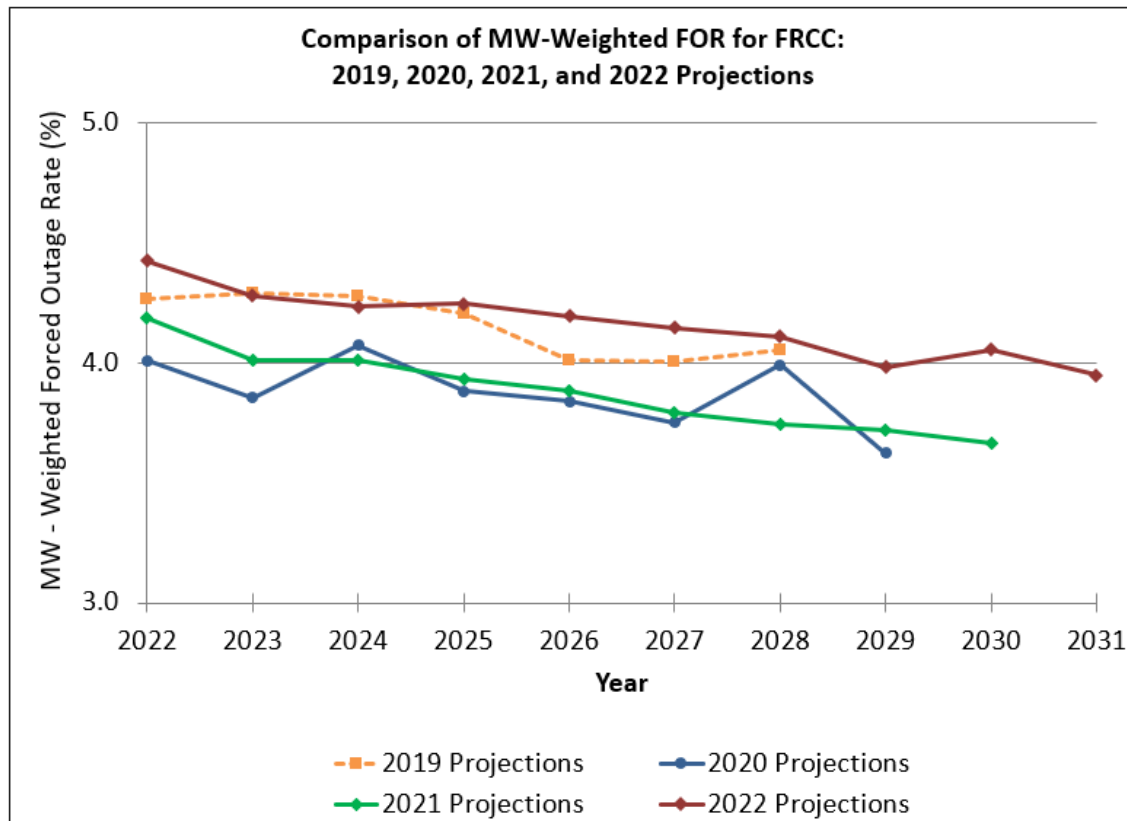


Figure 5
Trends in Projected Forced Outage Rates (FOR)

Though unit AF is not an input to LOLP calculations, it is often used as an indicator that generally correlates well with reliability data. The projections from resource planning work conducted in the previous four years remain consistent in a narrow range from approximately 85% to 90%. For 2022 projections of MW-weighted AF, the dip in 2024 is due to individual unit retirements as seen in *Figure 6* below.

¹¹ For some FRCC members, solar is currently modeled in the process using typical weather year shapes.

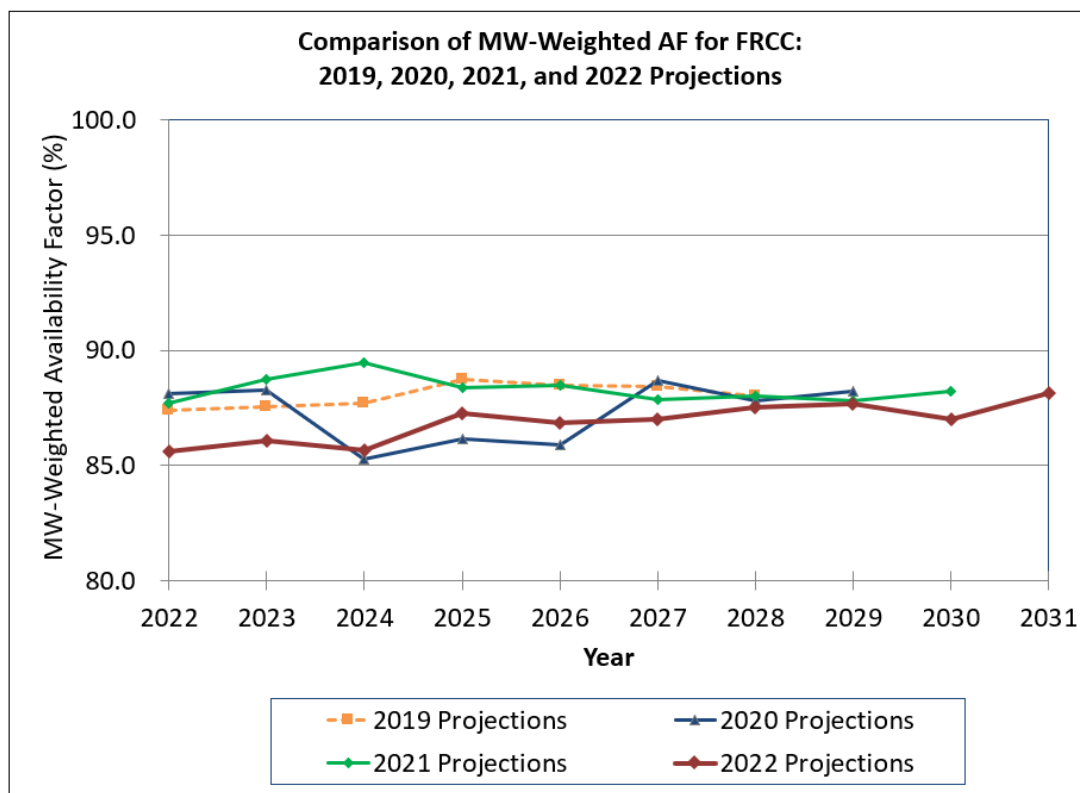


Figure 6
Trends in Projected Availability Factors (AF)

The results of the AF analyses, combined with the results of the FOR analyses depicted in **Figure 6**, the very low projected LOLP base case results for 2022 – 2026, and the projections of Total Reserve Margins for all years that are above the FRCC’s minimum Total Reserve Margin Planning Criterion of 15% (as presented in the 2022 *Regional Load & Resource Plan* document and presented in the previous section in **Figure 1** and **Figure 2**), support a conclusion that the FRCC Region is projected to continue to be reliable throughout the ten-year period addressed in this document.

Additional Resource Adequacy Reviews and Metrics

Generation Only Reserve Margin (GRM)

In addition to the Deterministic Reserve Margin, LOLP, and FOR/AF analyses, the RS examines the extent to which the system’s projected Total Reserve Margin values rely upon DSM to meet and maintain the FRCC’s 15% Total Reserve Margin Planning Criterion. Historically, FPL adopted a minimum 10% generation-only reserve margin (GRM) as a third reliability criterion in its Integrated Resource Planning (IRP) process. The GRM criterion supplements FPL’s other two reliability criterion, a 20% minimum total reserve margin for summer and winter and a maximum LOLP of 0.1 day per year. FPL’s GRM criterion is similar in concept to the supply-side reserve margin reliability criterion that TEC has used in its IRP process for more than a decade. Both criteria are essentially designed to ensure that there is an adequate generation component as the utilities meet their 20% total reserve margin criterion.

To examine the extent to which the FRCC Region’s system is dependent upon DSM, and whether the system is projected to become more dependent upon DSM over time, a projection of annual “generation-only” Reserve

Margin¹² values are analyzed by the RS each year. The generation-only Reserve Margin analysis includes aggregating the utilities' 2022 TYSP projections in which incremental and cumulative load management, incremental utility program energy conservation/energy efficiency and other demand reduction contributions, are excluded. The resulting generation-only Reserve Margin projection, presented in **Figure 7** below, shows the projected future Reserve Margins when considering only generating unit contributions (existing and future thermal resources and assumed typical weather performance of solar generation) compared against the Reserve Margins with contributions of incremental and cumulative load management, incremental utility program energy conservation/energy efficiency, and other demand reduction contributions.

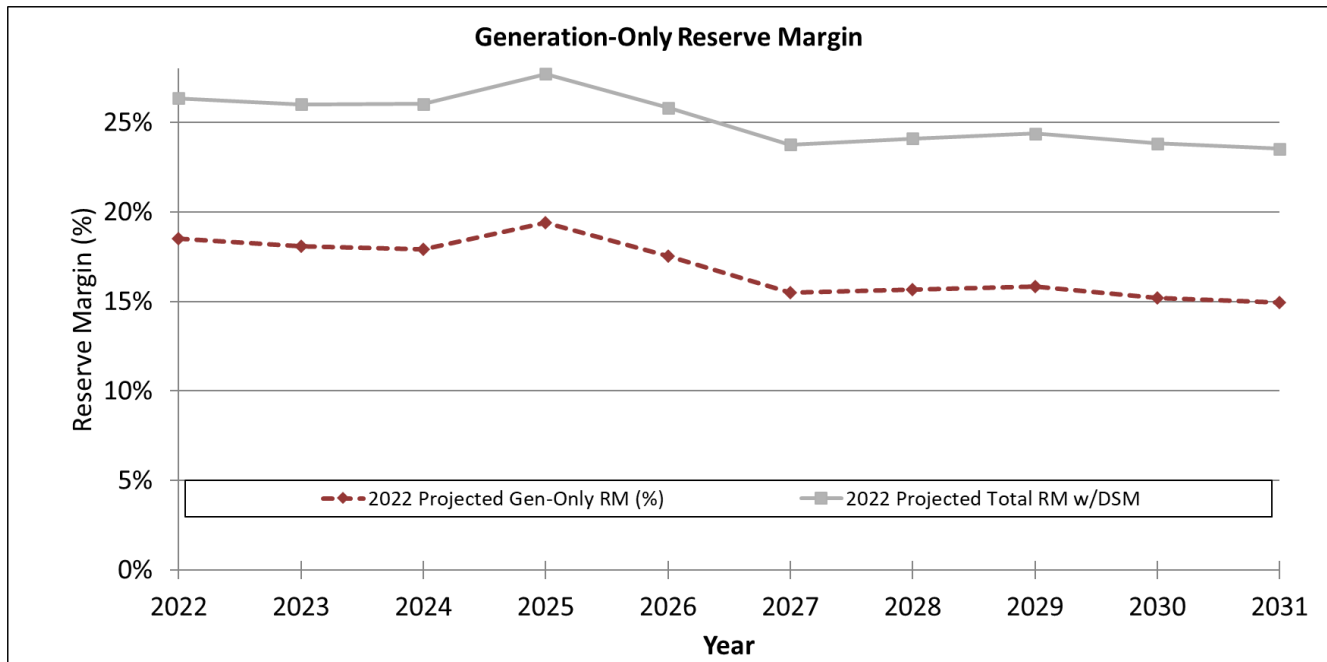


Figure 7
Projected Generation-Only Reserve Margin

As shown in **Figure 7**, the generation-only Reserve Margin does not fall below the FRCC's 15% Total Reserve Margin Planning Criterion. In previous years, FRCC was increasingly reliant upon firm DSM towards the end of the planning horizon. In this year's planning horizon, additional resources have been added beginning in 2026, resulting in FRCC maintaining at least a 15% GRM through 2031. Increased reliance on DSM versus the near term remains, as the gen-only reserve margin declines from 2022 levels by 2031. The FRCC and individual utilities continue to evaluate generation-only Reserve Margin projections and their potential implications for system reliability.

As the integration of intermittent renewable resources (particularly solar and energy storage) continues to increase in penetration at FRCC member utilities, the historical adequacy assertions will be challenged and will require additional analyses and metrics to accurately factor in the dispatchability challenges posed by these resources. Recognizing that solar is expected to contribute to traditional peak hours, times of day with high or persistent cooling load without sunlight, must be carefully examined to ensure sufficient firm capacity in such hours over the longer-term planning horizon. The operational combination of energy storage and solar must also

¹² For purposes of calculating projected 'generation-only reserve margin' values, the following formula was used: (total capacity - load forecast) / load forecast, in which the following DSM components have been removed from the calculation: existing load management capability, projected new incremental load management capability, and projected new energy efficiency/energy conservation utility program additions.

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be analyzed with more depth to understand the extent to which future solar output shapes can be optimized to support reliability.

Fuel Deliverability

Natural gas is the predominant source of fuel for electric generation in the FRCC Reliability Area. This is expected to continue over the coming years. While utilities continue to install natural gas generation, the percentage of electric energy generated by natural gas is expected to drop from approximately 68% to approximately 65% of total net energy for load by 2031. This drop correlates to a projected increase in electric energy generated by Renewable energy sources from approximately 5% of net energy for load in Florida in 2022 to approximately 18% of net energy for load in 2031.

The state has no native natural gas production and currently relies primarily on three existing interstate natural gas pipelines: Gulfstream Natural Gas System (Gulfstream), Florida Gas Transmission Company (FGT), and Sabal Trail Transmission (Sabal Trail). Florida also utilizes the Central Florida Hub, a location near Orlando where Sabal Trail has a bi-directional interconnection with wheeling capability to FGT and Gulfstream. A relatively small amount of gas is also transported into FRCC via Southern Natural's Cypress and South Georgia pipeline systems. Gulf South Pipeline Company (Gulf South) also has a minimal delivery capability directly into peninsular Florida. FRCC-Member contracted capacity for delivery to Florida markets is currently approximately 0.03 Bcf/day on Gulf South.

The FRCC Planning Committee performs a biennial assessment of gas infrastructure and compares the utilities' expected peak day gas burn to available gas infrastructure to identify any near-term infrastructure deficiencies. The most recent assessment found that in aggregate FRCC members hold the vast majority of contracted firm transportation pipeline capacity delivering into the State of Florida and that pipeline capacity and member resources are adequate to meet projected peak day gas requirements (summer and winter) through 2029, with the assumption that any short-term capacity shortfall can be met with member backup fuel capabilities or market solutions.

In terms of ensuring the reliability of Florida's natural gas supply, utilities have added additional "upstream pipeline transportation capacity" to access onshore production, shale gas reserves as well as natural gas storage facilities. This upstream capacity allows Florida's utilities to diversify natural gas supply away from the Gulf of Mexico and to tap the abundant shale gas reserves in Texas, Louisiana, Oklahoma, and other states. However, efforts by utilities in managing gas transportation risks, decreasing costs, and increasing supply diversity is limited by the existing access provided by the current pipeline delivery infrastructure. The FRCC, via the FRWG, performs periodic studies to assess and evaluate potential natural gas delivery capacity losses that can occur as a result of such pipeline outages and further evaluates contingency planning in the event of such outages. Finally, via the RS, the FRCC continues to evaluate the long-term adequacy of pipeline delivery infrastructure to meet the projected natural gas requirements of electric generation assets in the region during the ten-year planning horizon. The most recent study results projected that the Natural Gas pipeline capacity in the region will be sufficient to meet the projected electric generation needs and did not indicate a need for incremental pipeline capacity. Further flexibility to support gas supply adequacy is available in the form of redispatch that leverages alternative thermal resources. Additionally, a long-term interruption of any of the primary pipelines serving the state could significantly impact the adequacy of resources within the FRCC to serve customer loads during the period required to repair the affected pipeline.

Environmental Compliance

At this time, the RS believes that current environmental requirements imposed by Federal, State, and local

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authorities that may impact the capability and operation of generation resources are appropriately addressed within the individual utility resource planning processes. However, FRCC Members are monitoring recent developments with potential legislation surrounding the “CLEAN Future Act” and associated variants being proposed in Congress and will provide updates on potential implications to FRCC reliability in subsequent cycles.

7.0 Load Forecast Evaluation

In aggregate, customer growth was .99% in 2021, 0.8% higher than what had been projected. FRCC Region’s average per-customer consumption decreased for the Rural & Residential and increased for the Industrial Class and the Commercial Class from 2020.

Net Energy sales are projected to grow at a higher rate, relative to what was previously forecasted, with an average annual growth rate of 0.96%¹. The projected average annual growth rate for customers is 1.22%¹. In general, higher than normal temperatures experienced over the past several years are playing a noticeable role in the somewhat higher than projected average consumption per customer. These forecasts continued to project that Florida’s economy would continue to see steady growth, but weather is more of a factor in higher than projected sales and average consumption than growth in the economy as it relates to short-term fluctuations in energy and peak demand. Impacts of conservation and energy efficiency, including the impacts of higher energy efficiency building codes and appliance standards, continue to contribute to the weather-normalized declines in per-customer consumption both on an actual and projected basis. While a decline in state-level vacancy rates in the residential sector could result in some short-term boosts to average residential usage, this is in part offset by declines in smaller-sized commercial customer accounts as the retail sector continues to be challenged by online commerce and associated supply-chain disruptions.

Electric vehicles and private Photovoltaic factors were included in the aggregate forecasted totals for both energy and demand as applicable, for the various utility systems that comprise FRCC. Penetration in the Florida market of private dependable AC solar capacity during peak periods and electric vehicles is still relatively low but expected to grow steadily. FRCC’s Load Forecast Working Group (LFWG) will continue to monitor trends in solar uptake and electric vehicle penetration and will coordinate with the FRCC RS on best practices for determination of dependable AC solar capacity during peak periods as well as the impact of electric vehicle charging on system peak demand, as applicable.

The impacts on load growth from the *Energy Policy Act of 2005*¹³ and the *Energy Independence and Security Act of 2007*¹⁴ were reviewed. Most utilities incorporate these mandated energy efficiency impacts in their load forecasts. Other utilities capture these embedded efficiency trends that have been taking place historically through their econometric models.

The FRCC aggregates the individual peak demand forecast of each of its member utilities by summing these forecasts to develop the FRCC Region forecast. FRCC has pursued this avenue using the logical assumption that each utility is most familiar with its own service territory and the behavior patterns of its customer base. The load forecast evaluation process undertaken by FRCC is designed to understand which forecasting models are used, and, to a certain degree, seek consistency of assumptions across all utilities. FRCC’s LFWG reviewed each utility’s forecast methodology, input assumptions and sources, and output of forecast results. Reasonability

¹³ Energy Policy Act of 2005 (<https://www.energy.gov/sites/prod/files/edg/media/HR6PP%281%29.pdf>)

¹⁴ Energy Independence and Security Act of 2007 (<https://www.govinfo.gov/content/pkg/BILLS-110hr6enr/pdf/BILLS-110hr6enr.pdf>)

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checks were performed comparing the historical past with the projected load growth, use per customer, weather-normalized assumptions, and load factors.

Although a significant amount of advancement has been achieved in forecasting and statistical modeling, there remains an amount of risk (in the form of forecast variance) associated with the uncertainties embedded in the primary factors that determine the demand for electricity. The uncertainties that are most noticeable are departures from historical weather patterns, recent population growth, performance of the local and national economy, size of homes and number of homes being built, inflation, interest rates, price of electricity, changing electric end-use technology, appliance efficiency standards, and changes in consumption patterns. In the short-run, weather deviations from normal conditions tends to be the most important factor. However, population growth, economic performance, price of electricity, changing technology, changing consumption patterns, and more-efficient building codes and standards also play crucial roles in explaining the growth in demand for electricity over the long-run. The load forecast should provide an unbiased estimate of the future load after accounting for these uncontrollable factors using a theoretically sound and transparent modeling framework. The projections of load should not consistently under- or over-forecast the actual loads. Additionally, it is desirable that the forecasting processes used by the member utilities of FRCC exhibit continuous improvement in the theoretical bases utilized to develop forecast equations and a high level of scrutiny for the sensibility of parameters and relationships that are then leveraged to simulate future conditions. While it can be attractive to focus on short-term weather-normalized forecast variance, a poorly specified series of models (containing spurious correlation or various other econometric problems) could still show limited forecast variance by happenstance. Such a model would have limited variance decomposition capabilities and would not be appropriate to support long-term resource or financial decisions.

Methodology

The FRCC's evaluation process of each individual member's load forecast and forecasting methodologies is described in the following sections.

Models

The LFWG reviews the properties and theoretical specifications of the forecasting models utilized to develop the individual utility's forecast without recommending or endorsing a particular type of model. There is an evident preference for econometric models over end-use modeling by utilities in the state of Florida. However, more and more utilities are finding it advantageous to combine econometric models with other types of forecasting models (which were basically hybrids of end-use and econometric models).

The LFWG was attentive as to the forecasting results and cannot categorically endorse one type of model over the other based upon the results obtained. The LFWG does not consider it prudent to standardize the types of forecasting models to be used in Florida because each service territory is different and certain types of models seem to yield better results under specific conditions. It is customary that all utilities update and refine their models with each additional year of actual data, which ensures that the most recent correlations and associations embedded in the data are captured and that the models are calibrated accordingly. Furthermore, this ensures that the starting point of each forecast series is adjusted to the latest historical value for load or customer growth.

Inputs

The input assumptions that feed the forecasting models used to project load, as well as the sources of these inputs, were assessed. The primary inputs that were examined included: Florida population and customers, the price of

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electricity, normal weather assumptions, an economic outlook for income and employment levels and saturations/efficiencies of electrical appliances in those models that combine end-use technology with econometric modeling. The source data for Florida's population was the *Florida Legislature's Office of Economic and Demographic Research (EDR)*, which works in conjunction with the *Bureau of Economic and Business Research from the University of Florida*¹⁵. *Moody's Economy.com*¹⁶, *Global Insight*¹⁷, and *Woods and Poole Economics, Inc.*¹⁸, all reputable forecasting organizations, were additionally utilized for historical and projected economic data. The price of electricity was derived internally by each utility and consisted of base rates and all "pass-through" clauses filed with the FPSC. The National Oceanographic and Atmospheric Administration (NOAA) provided historical weather data used in model estimation and calibration.

Because each utility's service territory has its own characteristics, different time horizons were used to determine the values for normal weather that best fits their territory. As such, some utilities employed the average weather over the last 20 years, others the last 10 or 30 years, and some used longer time periods to define what was considered as "normal" weather. Some utilities employed a Monte-Carlo simulation while others chose a rolling average or rolling median. There is no prescribed correct measure of "normal" weather and utilities will rely on the definition that best portrays the observed weather patterns in their service territory. This member-defined definition of "normal" weather is then employed throughout the forecast horizon by all utilities.

The economic outlook of the local and national economy was obtained from several reputable economic forecasting firms such as *Global Insight*, *Woods and Poole*, and *Moody's Economy.com*. The utilities across the State are nearly divided evenly among the three. All three firms are highly regarded in the industry. By using more than one firm, the risks of producing flawed results were minimized because somewhat different economic perspectives were relied upon by each entity.

Outputs

The current forecast was compared to the prior forecast developed last year (see **Table 2** below). The 2022 NEL is forecasted to be higher than the actual 2021 NEL. The current compound annual growth rate (CAGR) for NEL is 0.93% for the forecast period. The 2022 firm winter peak demands are forecasted to be lower than the 2021 actual winter peak demands. For the firm winter peak demand, the CAGR is expected to be approximately 1.06% for the forecast period. For the summer peak demand, the CAGR is expected to be 1.09% for the forecast period¹⁹.

Load Factor

Several other ad-hoc measures were examined to assist in the determination of the reasonableness of the load forecast. The load factor, which is the relationship between the average load and the peak load, was examined comparing projected and historical values for this parameter. The resulting confirmation that historical and projected load factors were aligned helped to provide an increased level of assurance that no given component of the load forecast was unreasonable. While historical load factor figures can be influenced by extreme temperatures in the hour of the annual peak, all member utilities exhibited reasonable load factors when comparing these values in the historical and projected periods. In aggregate, the implied load factor trend for the

¹⁵ Bureau of Economic and Business Research (<https://www.bibr.ufl.edu/>)

¹⁶ Moody's Economy.com (<http://www.economy.com>)

¹⁷ Global Insight (<http://www.globalinsight.com>)

¹⁸ Woods and Poole (<http://www.woodsandpoole.com>)

¹⁹ These CAGR values are reflective of firm peak demand values which incorporate the impacts of Demand-Side Management programs while **Table 2** does not include these impacts; therefore, the growth rates will not be congruent between the two.

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FRCC continues to decrease, as energy is projected to grow at a slower rate than net firm winter and summer peaks over the forecast horizon.

Results

The comparison between the 2021 and 2022 forecasts for summer and winter peaks are shown in *Table 2*.

Summer Peak					Winter Peak				
Year	Forecast		Difference		Year	Forecast		Difference	
	2021	2022	MW	%		2021	2022	MW	%
2022	51,071	51,205	134	0.3%	2022/23	47,151	47,350	199	0.4%
2023	51,779	51,986	207	0.4%	2023/24	47,759	47,563	-196	-0.4%
2024	52,443	52,305	-138	-0.3%	2024/25	48,310	47,984	-326	-0.7%
2025	53,044	52,827	-217	-0.4%	2025/26	48,909	48,881	-28	-0.1%
2026	53,552	53,391	-161	-0.3%	2026/27	49,412	49,330	-82	-0.2%
2027	54,111	53,947	-164	-0.3%	2027/28	49,869	49,822	-47	-0.1%
2028	54,611	54,427	-184	-0.3%	2028/29	50,470	50,404	-66	-0.1%
2029	55,341	55,140	-201	-0.4%	2029/30	51,023	50,948	-75	-0.1%
2030	56,145	55,823	-322	-0.6%	2030/31	51,563	51,145	-418	-0.8%

Values are non-coincident peaks

*Reflects the integration of Gulf Power Company Load Forecast into the FPL Load Forecast (effective 1/1/2022)

Table 2
Comparison of 2021 and 2022 Forecasts

For the first forecast year (2022 Summer, 2022/23 Winter) shown above in *Table 2*, the 2022 forecast of the summer period peak demand of the integrated FRCC system is projected to be higher than expected when compared to the 2021 forecast for the last overlapping forecast year by approximately 134 MW (0.3%). Also, the 2022 forecast of the winter peak demand is projected to be higher when compared to the 2021 forecast by approximately 199 MW (0.4%).

For the last forecast year (2030 Summer, 2030/31 Winter) shown above in *Table 2*, the 2022 forecast of the summer period peak demand of the integrated FRCC system is projected to be lower than expected when compared to the 2021 forecast for the last overlapping forecast year by approximately 322 MW (0.6%). Also, the 2022 forecast of the winter peak demand is projected to be lower when compared to the 2021 forecast by approximately 418 MW (0.8%).

Over the last ten years of actuals, the FRCC Region had a CAGR of 0.99%²⁰ for summer peak demand. The current study period (2022-2031) projection has a CAGR of 0.93%**Error! Bookmark not defined..**

The confidence level that can be placed on these forecasts can be deduced by examining the historical performance of the aggregate forecasts. The summer peak analysis of the forecasted peaks versus the actual peaks, shown in *Table 3*, indicates that since 2012, there has been a tendency to over-forecast the summer peak demand in the FRCC aggregate ten-year load forecast. This is in large part a function of the 2007-2009 recession, and the tendency of economic providers to over-forecast the pace of the economic recovery.

The first column in *Table 3*, labeled “Actual Summer Peak (MW)”, corresponds to the actual non-coincident summer peak. The next ten columns show the forecast as it was presented in the Regional Load & Resource Plan

²⁰ This CAGR is significantly impacted by the deep and prolonged recession that originated approximately 12 years ago (“Great Recession”) and consequently, the forecast period reflects the expectation of a gradual, protracted recovery from said economic contraction.

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for each of the ten years listed from 2012 to 2021. The bottom table is the percent forecast variance, derived by comparing actual to forecast demands. A positive variance means that the “actual” was larger than the forecasted value for the corresponding year, meaning an under-forecast. A negative forecast variance means an over-forecast.

COMPARISON OF SUMMER PEAK FORECASTS TO ACTUAL PEAKS
(MW)

Year	Actual Summer Peak (MW)	Forecasted Summer Peaks									
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
2012	43,946	45,613									
2013	44,549	46,270	45,668								
2014	45,794	46,857	46,338	45,759							
2015	45,716	47,758	47,053	46,719	46,452						
2016	47,660	48,594	47,650	47,615	47,304	47,654					
2017	46,471	49,244	48,285	48,501	48,097	48,125	47,508				
2018	45,327	49,643	48,881	49,147	48,784	48,648	48,042	47,505			
2019	48,432	50,356	49,603	49,852	49,498	49,266	48,587	48,264	47,670		
2020	46,638	52,186	50,356	49,603	49,852	49,498	49,266	48,587	48,264	48,334	
2021	46,306	53,083	51,191	50,336	50,554	50,133	49,873	48,947	48,739	48,710	48,334

FORECAST VARIANCE
(PERCENT)

Year	Actual Summer Peak (MW)	Forecasted Summer Peaks									
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
2012	43,946	-3.7%									
2013	44,549	-3.7%	-2.5%								
2014	45,794	-2.3%	-1.2%	0.1%							
2015	45,716	-4.3%	-2.8%	-2.1%	-1.6%						
2016	47,660	-1.9%	0.0%	0.1%	0.8%	0.0%					
2017	46,471	-5.6%	-3.8%	-4.2%	-3.4%	-3.4%	-2.2%				
2018	45,327	-8.7%	-7.3%	-7.8%	-7.1%	-6.8%	-5.7%	-4.6%			
2019	48,432	-3.8%	-2.4%	-2.8%	-2.2%	-1.7%	-0.3%	0.3%	1.6%		
2020	46,638	-10.6%	-7.4%	-6.0%	-6.4%	-5.8%	-5.3%	-4.0%	-3.4%	-3.5%	
2021	46,306	-12.8%	-9.5%	-8.0%	-8.4%	-7.6%	-7.2%	-5.4%	-5.0%	-4.9%	-4%

Values are non-coincident peaks

Table 3
Comparison of Summer Peak Forecasts to Actual Peaks and Forecast Variance

Over the short-term, customer growth and economic conditions can differ from the long-term assumptions used to develop a particular vintage of a load forecast. The utility forecasts do not attempt to capture short-term deviations to customer growth and economic conditions but seek to deliver as objective an outcome as possible in terms of projected load for the state of Florida over the next ten years. Since the FRCC level forecast is merely an aggregation of individual entity forecasts, there is no incremental improvement or retrenchment in sensibility resulting from the FRCC amalgamation process.

The analysis for winter peaks is shown on **Table 4**. A perfunctory review noting the negative values would suggest a tendency to over-forecast given the predominance of projected peaks higher than the observed “actuals”. Weather and temperature variations typically differ from the “normalized” weather assumptions used to develop the individual utility electric forecasts. In Florida, this is much more pronounced for the winter months compared to the summer months. Therefore, this weather volatility caused a significantly larger number of over-forecast occurrences.

Florida does not experience a cold winter very often. Nevertheless, each utility in its resource plan considers the

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eventuality of a severe winter peak. The winter of 1989 turned out to be the coldest winter on record (or very close) in many areas of the FRCC Region. Utilities utilized several load management/demand response programs to serve their firm load throughout the peak load period.

**COMPARISON OF WINTER PEAK FORECASTS TO ACTUAL PEAKS
(MW)**

Year	Actual Winter Peak (MW)	Forecasted Winter Peaks									
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
2012/13	36,733	46,864									
2013/14	38,842	46,367	46,456								
2014/15	42,597	47,568	47,161	44,636							
2015/16	37,881	48,172	47,722	45,668	45,600						
2016/17	36,309	48,797	48,251	46,415	46,019	45,521					
2017/18	42,877	49,298	48,773	47,165	46,412	45,962	44,836				
2018/19	36,008	49,908	49,377	47,692	46,912	46,546	45,350	44,190			
2019/20	39,192	50,570	49,989	48,241	47,381	47,035	45,769	44,667	44,737		
2020/21	37,171	51,218	50,612	48,769	47,794	47,525	46,270	45,292	47,314	44,737	
2021/22	42,413	51,921	51,249	49,323	48,199	47,993	46,659	45,781	47,780	47,314	46,467

**FORECAST VARIANCE
(PERCENT)**

Year	Actual Winter Peak (MW)	Forecasted Winter Peaks									
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
2012/13	36,733	-21.6%									
2013/14	38,842	-16.2%	-16.4%								
2014/15	42,597	-10.5%	-9.7%	-4.6%							
2015/16	37,881	-21.4%	-20.6%	-17.1%	-16.9%						
2016/17	36,309	-25.6%	-24.7%	-21.8%	-21.1%	-20.2%					
2017/18	42,877	-13.0%	-12.1%	-9.1%	-7.6%	-6.7%	-4.4%				
2018/19	36,008	-27.9%	-27.1%	-24.5%	-23.2%	-22.6%	-20.6%	-18.5%			
2019/20	39,192	-22.5%	-21.6%	-18.8%	-17.3%	-16.7%	-14.4%	-12.3%	-12.4%		
2020/21	37,171	-27.4%	-26.6%	-23.8%	-22.2%	-21.8%	-19.7%	-17.9%	-21.4%	-16.9%	
2021/22	42,413	-18.3%	-17.2%	-14.0%	-12.0%	-11.6%	-9.1%	-7.4%	-11.2%	-10.4%	-8.7%

Values are non-coincident peaks

Table 4
Comparison of Winter Peak Forecasts to Actual Peaks and Forecast Variance

Finally, **Table 5** shows a comparison between the historical load factors (for 2012 through 2021), and the projected load factors (for 2022 through 2031), based on the summer peak. The summer peak was chosen for this calculation because it is less volatile than the winter peak, which fluctuates widely over the historical years because cold winters have occurred only sporadically. Both historical and forecasted load factors are similar in magnitude. Projected load factors are slightly lower than what has been reported historically, due to peak demand growing slightly faster than NEL⁴.

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FRCC LOAD FACTORS (Based on Summer Peak)			
Historical Year	Load Factor	Forecasted Year	Load Factor
2012	0.574	2022	0.561
2013	0.568	2023	0.559
2014	0.560	2024	0.559
2015	0.585	2025	0.560
2016	0.557	2026	0.558
2017	0.567	2027	0.557
2018	0.593	2028	0.557
2019	0.569	2029	0.555
2020	0.598	2030	0.554
2021	0.595	2031	0.553

Table 5
FRCC Load Factors

Forecasting models and methodologies used for developing energy sales and peak demand forecasts are delivering current projections that appear reasonable based on historical data and recent forecasts. The inputs and assumptions were also reasonable and appropriate given current trends. As a result of this evaluation, the FRCC LFWG concludes that the load forecast is suitable and reasonable for use in reliability assessment analyses.

8.0 FRCC Transmission

FRCC members and FRCC staff perform various annual transmission planning studies addressing the NERC TPL-001-4 (and its soon-to-be-effective revision, TPL-001-5) Transmission Planning Reliability Standard. These studies include near-term (years one through five), and longer-term (years six through ten) forecasted peak load conditions and certain additional system sensitivity conditions (e.g., extreme weather, off-peak conditions, spare equipment strategies). The studies include existing and planned Facilities within the FRCC Region, though the assumptions for the longer-term are more tenuous given the uncertainty of generation and transmission expansion plans that are still under review and the location and timing of the projected loads.

The most recent studies of the Bulk Electric System (BES) transmission system demonstrate the adequacy of the BES within the FRCC Region under Planning and Extreme events in NERC Reliability Standard TPL-001-4/5. The studies concluded that potential steady-state thermal and voltage performance violations can be resolved by operator intervention to meet the NERC TPL Standard after planned system adjustments and Corrective Action Plans are implemented as planned by FRCC members. The studies also found that Corrective Action Plans of FRCC members will resolve all short-circuit breaker duty screening exceptions. Finally, the studies show that the system is expected to perform within all TPL Standard stability performance criteria. Thus, based on the current study assumptions, there is no need for new regional infrastructure to support reliability other than the infrastructure that FRCC members already have planned.

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9.0 FRCC Fuel Reliability

Long-term adequacy reviews consider the potential of natural gas supply or delivery disruptions on the long-term adequacy of FRCC resources to meet customer load. The FRCC has undertaken initiatives to increase coordination among natural gas pipeline operators and generators within the FRCC Area. The FRCC, through its Fuel Reliability Working Group (FRWG), provides the administrative oversight of a regional fuel reliability forum that assesses the interdependencies of fuel availability and electric reliability in the near-term.

Results of the most recent analysis indicate that risk to the reliability of the power system within the FRCC related to projected shorter-term gas delivery disruptions for normal winter peak loads can be mitigated through use of dual fuel units and increased fuel management coordination. Extreme winter loads could challenge generating capacity as well as the level of shorter-term gas delivery disruption mitigation available.

The *FRCC Generating Capacity Shortage Plan* distinguishes between generating capacity shortages caused by (1) abnormally high system loads or unavailable generating facilities or (2) inadequate fuel supply. The two types have distinct initiating events and require unique responses to ensure optimal state-wide communication and coordination to minimize impacts of shortages on the people of Florida. The procedure provides the FRCC Operating Committee (OC) a process to allow for proper communication and coordination between the FRCC Reliability Coordinator (RC) and the natural gas pipeline operators as necessary. In addition, the FRCC Operating Reliability Subcommittee (ORS), through its FRWG continues to periodically review and assess various aspects of the current fuel supply infrastructure in terms of reliability for generating capacity.

For capacity constraints due to inadequate fuel supply, the FRCC State Capacity Emergency Coordinator (SCEC), along with the FRCC RC, can assess FRCC RC Area fuel supply status by initiating Fuel Data Status reporting by FRCC Operating Entities (OEs). This process requires the FRCC OEs to report their actual and projected fuel availability, along with alternate fuel capabilities, to serve their projected system loads. This is typically provided by type of fuel and expressed in terms relative to forecast loads or generic terms of unit output, depending on the event initiating the reporting process. Data is aggregated at the FRCC level and is provided from an FRCC RC Area perspective to the RC, SCEC and governmental agencies as requested. Fuel Data Status reporting is typically performed when threats to FRCC RC Area fuel availability have been identified and the results of the reporting are quickly integrated into an enhanced FRCC daily capacity assessment process along with various other coordination protocols. These processes help improve the accuracy of the reliability assessments of the Region and ensure coordination to minimize impacts of FRCC RC Area fuel supply issues and/or disruptions to facilities and customers.

Currently, the expected percentage of generation capacity (MW) whose primary fuel is natural gas is projected to reach 65.3% by 2031. A similar long-term forecast projects coal-fired generation to account for 2.14% of capacity, nuclear generation for 10.85% and oil-fired generation for 2.9% of generation resources. About 18.2% of capacity generation will be from Renewables (Solar, Municipal Solid Waste, Landfill Gas, etc.), Inter-Regional interchange, and miscellaneous fuels.

Regarding the percentage of total electrical energy (GWh) provided by natural gas, the use of natural gas is currently projected to remain high through the next ten years with the projected percentage being 65% in 2031.

Currently, with no natural gas production or storage within Florida, three major pipelines deliver more than 90% of the natural gas to the FRCC RC Area. Existing and planned pipeline capacity within the Region supports the increasing gas generation requirements driven from new gas-fired generators being constructed over the next 10 years. In the event of a short-term failure of key elements of natural gas delivery infrastructure, there is sufficient

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back-up fuel capability to meet projected demand on a short-term basis. However, additional coordination would be required in the event of a long-term failure of natural gas pipeline infrastructure.

FRCC OEs continue to utilize mitigation strategies to minimize the effects of short-term supply interruptions due to extreme weather during peak load conditions. These strategies include fuel storage, fuel supply and transportation diversity as well as alternate fuel capabilities. Absent long-term transportation outages, and based on current fuel diversity, alternate fuel capability and on-going coordination efforts, the FRCC does not anticipate any fuel transportation issues that will affect electric reliability during peak periods in the near-term.

10.0 FRCC Renewable Energy Resources

Nationally, the definition of renewable energy resources varies from state to state. While almost all states treat solar and wind as renewable resources, many states differ on the applicability of other forms of renewable resources such as municipal solid waste (MSW) facilities and some types of hydroelectric and waste heat from cogeneration facilities. The State of Florida has defined the term “Renewable Energy” in Florida Statute 366.91 as “electrical energy produced from a method that uses one or more of the following fuels or energy sources: hydrogen produced from sources other than fossil fuels, biomass, solar energy, geothermal energy, wind energy, ocean energy, and hydroelectric power. The term includes the alternative energy resource, waste heat from sulfuric acid manufacturing operations, and electrical energy produced using pipeline-quality synthetic gas produced from waste petroleum coke with carbon capture and sequestration.” Furthermore, the term “Biomass” is defined as “a power source that is comprised of, but not limited to, combustible residues or gases from forest products manufacturing, waste, byproducts or products from agricultural and orchard crops, waste and co-products from livestock and poultry operations, waste and byproducts from food processing, urban wood waste, municipal solid waste (MSW), municipal liquid waste treatment operations, and landfill gas.”

Twenty-seven States, Washington, D.C., and two territories have adopted a Renewable Portfolio Standard (RPS) and three states, and one territory have set renewable energy goals as of August 2021²¹. Although the State of Florida does not have a Renewable Portfolio Standard (or a Clean Energy Standard), a portion of its energy is derived from renewable resources and a significant amount of energy, approximately 12%, is produced by emissions-free nuclear resources.

Total Renewable energy generation in 2021 for the FRCC Reliability Area was 10,208 GWh. Solar (84.2%), Biomass (5.8%), municipal solid waste (6.0%), and Landfill Gas (2.2%) provided the bulk of this 2021 renewable generation, as seen in **Figure 7** below.

Based on the utilities’ TYSPs, renewable energy generation in the FRCC Reliability Area is projected to grow from 10,208 GWh in 2021 to 50,545 GWh by 2031 (4.1% of total NEL in 2021 to 18.3% of the NEL in 2031). Perhaps even more important is the increase in the contribution from solar: from 8,595 GWh in 2021 to 48,017 GWh in 2031 (2.5% of total NEL in 2021 to 14.4% of total NEL in 2031). **Figure 8** provides the projected values for 2031. FRCC and individual entities continue to monitor and evaluate penetration levels of renewable resources to ensure resource adequacy and system reliability.

One particular concern around the growth of utility-scale PV solar will be how it contributes to the firm peak calculation used in both reserve margin and LOLP analyses. Solar is typically given some percentage of its nameplate rating as a contribution to summer peaks; for summer, the amount varies and is determined by the individual utilities. This value varies from utility to utility as factors such as geographic location, technology

²¹ <https://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx>

type and expected time of system peak can affect the firm capacity value; for winter, solar typically receives no firm capacity value. This firm capacity contribution from solar will continue to be monitored as solar becomes a larger and larger part of FRCC member company's resource mix and utilities continue to integrate largescale battery storage. Importantly, while solar is expected to contribute to traditional peak hours, times of day with high or persistent cooling load without sunlight must be carefully examined to ensure sufficient firm capacity in such hours over the longer-term planning horizon. The operational combination of energy storage and solar must also be analyzed with more depth to understand the extent to which future solar output shapes can be optimized to support reliability.

Renewable energy resources and their contribution to overall FRCC Reserve Margin continues to be evaluated as penetration of these resources increases year to year. Measuring traditional reserve margins over a seasonal peak hour, while highly beneficial, is anticipated to be subject to reduced applicability in the context of resource adequacy as the amount of intermittent generation synched to the FRCC system increases. Energy sufficiency across all hours of the day, among other resource adequacy metrics, must be developed to better capture and communicate the long-term adequacy position of the FRCC. FRCC Members and staff continue to work on defining and evolving the standard of practice for such calculations, beginning with a focus on readily available data.

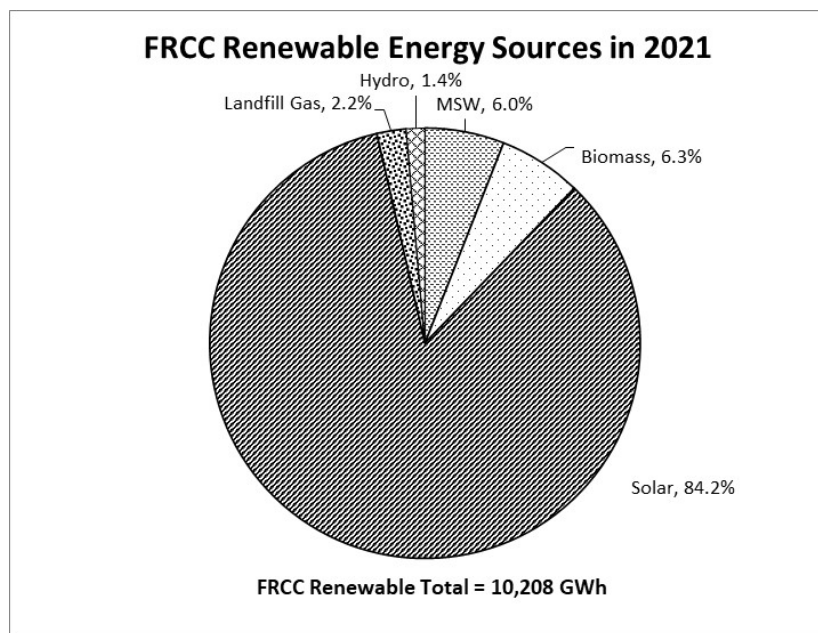


Figure 8
FRCC Renewable Energy Sources in 2021²²

²² This data is reflective of utility-scale installations and does not include the impacts of Distributed Energy Resources.

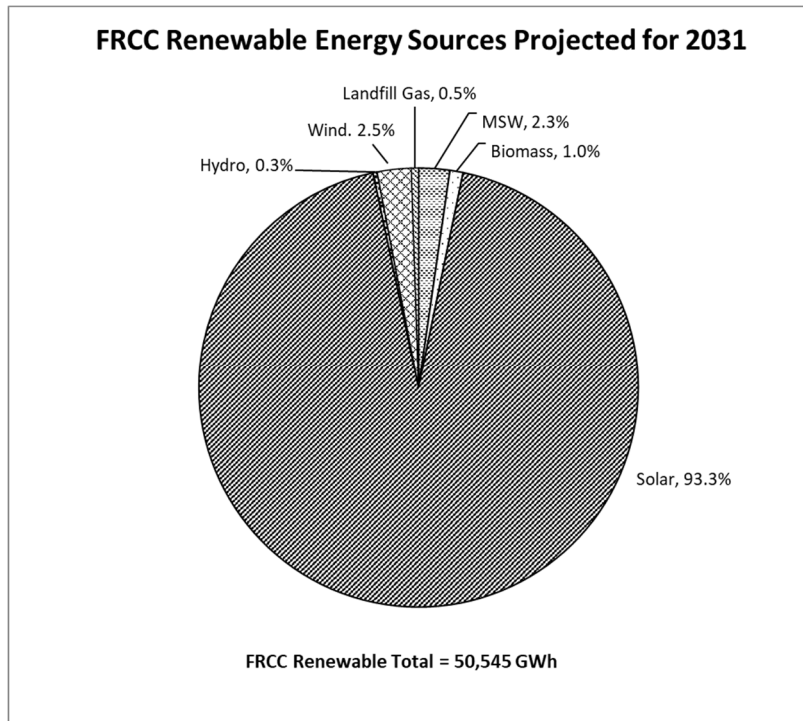


Figure 9
FRCC Renewable Energy Sources Projected for 2031

11.0 Battery Energy Storage in the FRCC Region

FRCC members continue to analyze additional opportunities to utilize battery storage systems as part of their resource portfolios. This includes combining battery storage with new or existing PV facilities or for other types of specific system support. FRCC members are considering batteries for a variety of purposes including, but not limited to contributing towards capacity, substation upgrade deferral, distribution line reconductoring deferral, power reliability improvement, frequency regulation, Volt/VAR support, backup power, energy capture, and peak load shaving.

FRCC members continue to gain experience with batteries and share experiences so that they will be better able to develop methodologies and protocols to properly account for battery contributions toward capacity, energy sufficiency and operational support as additional energy reliability assessments are performed in the future.

The FRCC Region currently has approximately 496 MW of firm summer capacity from battery storage and an additional 2,400 MW of firm summer capacity from battery storage facilities are planned through 2031. The FRCC Resource Subcommittee (RS) continues to analyze battery storage and its effect on resource planning.

12.0 References

12.1 2022 Regional Load & Resource Plan

13.0 Review and Modification History

Review and Modification Log			
Date	Version Number	Description of Review or Modification	Sections Affected
06/04/2022	1	New document	All

14.0 Disclaimer

The information, analysis, requirements and/or procedures described herein are not intended to be fully inclusive of all activities that may support compliance to a specific NERC Reliability Standard referenced or implied within the document. Nevertheless, it is the FRCC entities' and other users' responsibility to ensure the most recent version of this document is being used in conjunction with other applicable procedures, including, but not limited to, the applicable NERC Reliability Standards as they may be revised from time to time.

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Exhibit RA-10:

**Duke Energy Carolinas and Duke Energy Progress
Effective Load Carrying Capability (ELCC) Study,
Astrapé Consulting (April 25, 2022)**



Duke Energy Carolinas and Duke Energy Progress Effective Load Carrying Capability (ELCC) Study

4/25/2022

PREPARED FOR

Duke Energy

PREPARED BY

Nick Wintermantel
Cole Benson
Astrapé Consulting

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I. Summary of Methodology and Results

This study was requested by Duke Energy Carolinas (DEC) and Duke Energy Progress (DEP) to analyze the capacity value of solar, storage, and wind within each system. Capacity value is the reliability contribution of a generating resource and is the fraction of the rated capacity considered to be firm. Average seasonal capacity values are used for reserve margin calculation purposes and seasonal marginal values can be used for expansion planning. Both Companies are winter planning due to winter peak loads and the amount of solar on the systems. As more solar is added, Loss of Load Expectation (LOLE) is shifted to the winter when solar provides less reliability contribution. Because of this winter planning, the winter capacity values were the focus of the study which can then be used for reserve margin accounting and expansion planning purposes.¹

Because solar and wind are intermittent resources, a solar or wind facility's ability to provide reliable capacity when it is needed is different from that of a fully dispatchable resource such as a gas-fired turbine, which can be called upon in any hour to produce energy, notwithstanding unit outages. Similarly, battery systems have limited energy storage capability and must be recharged, either from the grid or a dedicated generation resource. A battery's ability to reliably provide capacity when it is needed will also differ from that of a fully dispatchable resource. The study results provide the winter capacity value for solar, storage, and wind which are used in the Companies' Carbon Plan and Integrated Resource Plans.

¹ The Appendix includes one set of summer ELCC values for solar and wind for purposes of calculating DEC and DEP summer reserve margins. For determining marginal resources, the summer capacity values have no impact on plans because capacity needs are driven by the winter and resource adequacy risk is in the winter season given the level of solar being included in the plans.

A. Methodology

Astrapé performed this Effective Load Carrying Capacity (ELCC) study using the Strategic Energy Risk Valuation Model (SERVM) which is the same model used for DEC and DEP's past Resource Adequacy and ELCC Studies. The terms capacity value and ELCC are often used interchangeably for the purposes of this report. Additional details of the model setup and assumptions are included in the Technical Modeling Appendix of this report.

The Effective Load Carrying Capacity (ELCC) methodology was used to calculate the capacity value of the resource being studied. A "base" case of the system with no solar or storage was developed that resulted in the DEC and DEP systems achieving the 1 day in 10-year industry standard of 0.1 Loss of Load Expectation (LOLE). This is a common industry standard and ensures that these resources are being evaluated within a reliable system. Once the "base" case is established, battery, solar, and/or wind resources are added to the system. The additional resources improve LOLE to less than 0.1. Next, load is increased by adding a negative resource until the LOLE is returned to the same seasonal reliability as seen in the Base Case.² The ratio of the additional load to the additional resource being added is the reliability contribution or ELCC of the battery or renewable resource. For example, if 100 MW of battery is added and achieves the same Base Case seasonal LOLE after adding 90 MW of load, the ELCC is 90% (90 MW divided by 100 MW).

² Because it is difficult to return cases back to the exact seasonal reliability, several load levels were analyzed for each setup and interpolation was performed to determine the amount of load added to return to the Base Case seasonal LOLE.

As part of the 2020 IRP filed by the Companies, the Public Service Commission of South Carolina required the Companies to make several adjustments to its solar and storage ELCC studies.³ For the Companies' Carbon Plan the following items have been taken into account in this study.

1. Perform Surface ELCCs for Solar and Storage –

To accommodate the surface ELCC, Astrapé performed solar only ELCC analyses, storage only ELCC analyses, and storage and solar aggregated ELCC analysis to ensure any synergistic benefits were included. As laid out in the report, this analysis was performed over a broad range of capacity and storage durations. Previously, in the 2020 Storage ELCC Study, the storage ELCC analysis was performed with significant solar on the system, so all synergistic value was given to storage. Similar surface analysis was performed for wind and solar.

2. Use of 2035 Load Forecasts in the Analysis-

Utilizing the 2035 load forecast captures a larger system and provides these resources more capacity value as the penetration increases.⁴

3. Use higher capacity factor solar resources –

All future solar additions were modeled as bifacial, single-axis tracking resources.

4. Incorporate the Company's Winter Peak Demand Reduction Potential Assessment-

The Winter Peak Study, which included additional demand response programs, adds demand response capacity in both winter and summer.⁵

³ South Carolina Docket Nos. 2019-224-E and 2019-225-E, Order No. 2021-447, June 28, 2021, at 87.

⁴ Given this assumption, ELCCs could potentially be overstated prior to 2035.

⁵ The 2020 Winter Peak Demand Reduction Potential Assessment (also referred to as the Winter Peak Study) was prepared for Duke Energy by Dunskey Energy Consulting in partnership with Tierra Resource Consultants. The objective of the study was to identify the potential for new demand response programs and measures to reduce the

B. Solar and Storage Scope

Astrapé calculated the average ELCC of solar and battery energy storage systems as shown in Tables 1 and 2 for both Companies. These tables show the surface that was analyzed across solar and storage resources for each Company. The highlighted blue cells were simulated representing only solar, only storage, and aggregated solar and storage scenarios. Each of the matrices were duplicated for 2-hour, 4-hour, 6-hour, 8-hour, and 12-hour storage systems. The surface methodology allows modelers to understand the benefit of each resource alone and together to determine any synergistic values the resources may have with one another. There is synergistic benefit between solar and storage resources because the resources work together to increase their value from a resource adequacy perspective. After adding a fixed solar profile, the net peak load (gross load minus solar) is typically narrower allowing for short duration storage to better serve the new net load peak.

winter peak demand in each of the DEC and DEP systems. The Winter Peak Study reports were filed with the NCUC in Docket No. E-100, Sub 165.

Table 1. DEC Solar Storage Surface Matrix⁶

		Solar MW						
Battery MW	DEC	-	2,000	3,000	4,000	6,000	8,000	8,000
	-							
	300							
	600							
	1,200							
	2,400							
	3,200							

Table 2. DEP Solar Storage Surface Matrix

		Solar MW						
Battery MW	DEP	-	3,000	4,500	6,000	7,500	9,000	12,000
	-							
	450							
	900							
	1,800							
	3,600							
	4,800							

C. Battery and Solar Modeling

For this study, battery resources were modeled in economic arbitrage mode. The objective of economic arbitrage mode is to maximize the economic value of the battery. In this mode, SERVUM schedules the battery to charge at times when system energy costs are low, and to discharge when system energy costs are high. This type of dispatch aligns well with resource adequacy risks, meaning the battery will be available to discharge during peak net load conditions when loss of load events are most likely to occur. In this mode, SERVUM offers recourse options during a

⁶ The black highlighted areas were not simulated. If it became necessary, these values could be interpolated based on the simulated values.

reliability event. In other words, SERVVM allows the schedule of the battery to be adjusted in real time, and discharge if its state of charge is greater than zero to avoid firm load shed. This method also assumes the utility has full control of the battery and best represents how batteries are expected to be operated on the DEC and DEP systems. Batteries were assumed to have no limits on ramping capability or constraints on number of cycles per day outside of the ability to charge the battery. Batteries were given an equivalent forced outage rate (“EFOR”) of 2.4% compared to the negative resource (modeled as load) that was given a 4% outage rate.⁷ By modeling resources with their unit specific EFOR values, all resources are captured on a level playing field. Solar was modeled with hourly profiles as described in the Technical Appendix, and a 2.7% outage rate. All new solar was based on bifacial single-axis tracking profiles.

D. Storage/Solar Surface Winter Results

Tables 3 and 4 show the average winter ELCC for battery without any solar included in the setup, solar without any battery included in the setup, and the synergistic ELCC’s when both are included. For DEC, battery levels were modeled from 0 to 3,200 MW and solar resources from 0 to 8,000 MW. The synergistic values are higher than the single resource values especially as penetrations increase.

⁷ The 4% outage rate represents the high end of new thermal resources such as new combined cycle or combustion turbine resources.

Table 3. DEC Winter Solar and Storage Results⁸

Solar MW	Battery MW	Duration Hours	Average Battery Capacity Value (no solar included)	Average Solar Capacity Value (no battery included)	Average Battery Capacity Value including any synergistic value	Average Solar Capacity Value including any synergistic value
2,000	200	2	99.2%	6.1%	100.0%	6.5%
3,000	400	2	97.8%	5.0%	100.0%	5.0%
4,000	600	2	96.4%	4.1%	98.7%	4.1%
5,000	800	2	95.1%	3.4%	95.7%	3.8%
2,000	300	4	99.5%	6.1%	99.9%	6.1%
3,000	600	4	99.8%	5.0%	99.8%	5.1%
4,000	1,200	4	98.5%	4.1%	98.8%	4.3%
5,000	2,400	4	87.3%	3.4%	94.0%	3.7%
6,000	3,200	4	73.5%	2.9%	88.4%	3.3%
8,000	3,200	4	73.5%	2.4%	88.6%	3.0%
2,000	300	6	99.8%	6.1%	100.0%	6.1%
3,000	600	6	99.4%	5.0%	100.0%	5.0%
4,000	1,200	6	97.4%	4.1%	99.3%	4.3%
5,000	2,400	6	88.7%	3.4%	95.6%	3.7%
6,000	3,200	6	79.2%	2.9%	91.7%	3.3%
8,000	3,200	6	79.2%	2.4%	91.8%	2.8%
2,000	300	8	99.6%	6.1%	99.6%	6.1%
3,000	600	8	99.6%	5.0%	99.6%	5.1%
4,000	1,200	8	98.1%	4.1%	98.3%	4.3%
5,000	2,400	8	89.6%	3.4%	94.7%	3.6%
6,000	3,200	8	79.8%	2.9%	91.0%	3.2%
8,000	3,200	8	79.8%	2.4%	92.6%	2.8%
2,000	300	12	99.8%	6.1%	100.0%	6.1%
3,000	600	12	99.5%	5.0%	99.8%	5.1%
4,000	1,200	12	97.7%	4.1%	98.3%	4.2%
5,000	2,400	12	90.2%	3.4%	94.8%	3.6%
6,000	3,200	12	82.1%	2.9%	92.1%	3.1%
8,000	3,200	12	82.1%	2.4%	92.7%	2.8%

⁸ All values have been curve fitted to reflect smooth curves across the solar and storage penetrations resulting in minor adjustments for reporting purposes.

The same results are shown for DEP. The solar was simulated up to 12,000 MW and battery was simulated up to 4,800 MW.

Table 4. DEP Winter Solar and Storage Results⁹

Solar MW	Battery MW	Duration Hours	Average Battery Capacity Value (no solar included)	Average Stand-Alone Solar Capacity Value (no battery included)	Average Battery Capacity Value including any synergistic value	Average Solar Capacity Value including any synergistic value
3,000	300	2	97.7%	7.7%	100.0%	8.2%
4,500	600	2	91.2%	6.3%	96.2%	6.4%
6,000	900	2	84.8%	5.2%	90.4%	5.3%
7,500	1,200	2	78.4%	4.4%	83.3%	4.8%
3,000	450	4	100.0%	7.7%	100.0%	7.8%
4,500	900	4	95.8%	6.3%	96.6%	6.5%
6,000	1,800	4	86.9%	5.2%	88.4%	5.5%
7,500	3,600	4	68.3%	4.4%	73.4%	4.7%
9,000	4,800	4	55.3%	3.8%	64.5%	4.2%
12,000	4,800	4	55.3%	3.3%	64.5%	3.9%
3,000	450	6	100.0%	7.7%	100.0%	7.7%
4,500	900	6	97.5%	6.3%	98.3%	6.5%
6,000	1,800	6	93.5%	5.2%	94.5%	5.5%
7,500	3,600	6	78.2%	4.4%	84.1%	4.8%
9,000	4,800	6	62.5%	3.8%	75.1%	4.3%
12,000	4,800	6	62.5%	3.3%	75.1%	4.0%
3,000	450	8	100.0%	7.7%	100.0%	7.7%
4,500	900	8	97.8%	6.3%	98.8%	6.4%
6,000	1,800	8	95.0%	5.2%	96.4%	5.5%
7,500	3,600	8	81.6%	4.4%	87.3%	4.7%
9,000	4,800	8	66.9%	3.8%	78.0%	4.2%
12,000	4,800	8	66.9%	3.3%	78.0%	3.9%
3,000	450	12	100.0%	7.7%	100.0%	7.8%

⁹ At the low battery capacity levels (450-900 MW), additional Monte Carlo outage iterations are likely required to understand any clear differences between battery durations which are showing capacity values all near 100%. For reporting purposes, minor adjustments were made. For example, if the 450 MW 8 hour was interpolated at 99% it was adjusted to 100% since the 6-hour showed 100% for 450 MW. All values have been curve fitted to reflect smooth curves across the solar and storage penetrations resulting in minor adjustments for reporting purposes.

4,500	900	12	97.8%	6.3%	98.8%	6.4%
6,000	1,800	12	95.6%	5.2%	96.5%	5.4%
7,500	3,600	12	85.2%	4.4%	88.8%	4.6%
9,000	4,800	12	71.1%	3.8%	79.3%	4.1%
12,000	4,800	12	71.1%	3.3%	79.3%	4.0%

Tables 5 and 6 show the same ELCC results but calculated as the marginal ELCC. These include any synergistic value between the solar and storage. The marginal values were developed by curve fitting the average results to a polynomial and taking the first derivative. A single set of solar winter values were reported since all the values were similar across all the battery durations. The marginal ELCC represents the next MW at each point in the penetration. For example, the 2401st MW of 4-hour storage is worth 79.4%.

Table 5. DEC Winter Marginal Values

Solar	Battery	Duration	Marginal Battery including any synergistic values	Marginal Solar including any synergistic values
2,000	200	2	100.0%	
3,000	400	2	98.0%	
4,000	600	2	93.9%	
5,000	800	2	89.8%	
2,000	300	4	100.0%	3.1%
3,000	600	4	100.0%	2.4%
4,000	1,200	4	94.9%	1.8%
5,000	2,400	4	79.4%	1.2%
6,000	3,200	4	69.0%	1.1%
2,000	300	6	100.0%	
3,000	600	6	100.0%	
4,000	1,200	6	96.2%	
5,000	2,400	6	85.2%	
6,000	3,200	6	77.9%	
2,000	300	8	100.0%	
3,000	600	8	99.3%	
4,000	1,200	8	95.0%	
5,000	2,400	8	86.5%	
6,000	3,200	8	80.8%	

2,000	300	12	100.0%	
3,000	600	12	98.7%	
4,000	1,200	12	95.0%	
5,000	2,400	12	87.6%	
6,000	3,200	12	82.7%	

Table 6 shows the same information for DEP. At some point, batteries will flatten the net load shape, removing the arbitrage opportunity, making the value of the next MW of short duration storage much less valuable.

Table 6. DEP Winter Marginal Values

Solar	Battery	Duration	Marginal Battery including any synergistic values	Marginal Solar including any synergistic values
3,000	300	2	100.0%	
4,500	600	2	85.1%	
6,000	900	2	70.2%	
7,500	1,200	2	55.4%	
3,000	450	4	93.7%	4.7%
4,500	900	4	86.8%	3.2%
6,000	1,800	4	73.1%	1.7%
7,500	3,600	4	45.8%	1.7%
9,000	4,800	4	27.5%	1.6%
3,000	450	6	100.0%	
4,500	900	6	97.9%	
6,000	1,800	6	84.9%	
7,500	3,600	6	59.0%	
9,000	4,800	6	41.6%	
3,000	450	8	100.0%	
4,500	900	8	100.0%	
6,000	1,800	8	88.5%	
7,500	3,600	8	62.2%	
9,000	4,800	8	44.7%	
3,000	450	12	100.0%	
4,500	900	12	100.0%	
6,000	1,800	12	90.4%	
7,500	3,600	12	64.2%	
9,000	4,800	12	46.7%	

In addition to standalone solar and standalone storage resources, the Companies also include storage that is “DC coupled” with solar in their capacity expansion model. While not explicitly analyzed in this study, it is reasonable to assume that the ELCC of the solar resource and the ELCC of the storage resource are additive. As an example, a 100 MW solar facility that is DC-coupled with a 50 MW, 4-hour storage facility in DEP should have a firm capacity rating of approximately 52 MW (100 MW solar * 4.7% + 50 MW, 4-hour storage * 93.7%).

E. Sensitivity – 6-Hour Standalone Winter Battery Capacity Values Beyond 4-Hour Values

Additional surface analysis was performed to understand how 6-hour storage performed after significant 4-hour storage had already been added to the system. For these runs, storage and solar were added together as in the previous analysis to capture the synergistic value. The results are listed in Tables 7 and 8.

Table 7. DEC Winter 6-Hour after 4-Hour Battery

Solar	Battery	Duration	Average Battery Capacity Value (including any synergistic value)	Marginal Battery Capacity Value (including any synergistic value)
2,000	300	4	100%	100%
3,000	600	4	100%	100%
4,000	1,200	4	99%	95%
5,000	2,400	4	94%	79%
6,000	3,200	4	88%	69%
8,000	4,000	6	81%	51%
8,000	5,000	6	74%	38%

Table 8. DEP Winter 6-Hour after 4-Hour Battery

Solar	Battery	Duration	Average Battery Capacity Value (including any synergistic value)	Marginal Battery Capacity Value (including any synergistic value)
3,000	450	4	100%	94%
4,500	900	4	97%	87%
6,000	1,800	4	88%	73%
7,500	2,300	6	90%	85%
7,500	2,800	6	87%	68%

One last sensitivity was performed for DEC evaluating the existing Bad Creek Pump Hydro Facility. DEC's existing Bad Creek (BC1) is modeled with 19 hours of storage and 1,640 MW of capacity. Because of its long duration, existing pump storage on the system was assumed to provide nearly 100% capacity value. DEC is evaluating adding a second powerhouse (Bad Creek 2 or BC2) at the existing Bad Creek 1 facility. In that case, Bad Creek 1 is reduced to 12 hours and an incremental 1,680 MW of 12-hour duration storage capacity is added. To assess the impact of reduced duration of Bad Creek 1 on the incremental 12-hour storage created by the addition of Bad Creek 2, the 12-hour surface analysis was rerun assuming a lower duration BC1. This analysis, depicted in Table 9, determined that the capacity value of incremental 12-hour storage decreases slightly with a reduction in BC1 storage duration.

Table 9. DEC Winter 12-Hour Bad Creek 2 Sensitivity

Solar	Battery	Duration	Average Battery Capacity Value BC1 @ 19 hours including any synergistic value	Marginal Battery Capacity Value BC1 @ 19 storage including any synergistic value	Average Battery Capacity Value BC1@ 12 hours including any synergistic value	Marginal Battery Capacity Value BC1@ 12 hours including any synergistic value
2,000	300	12	100.0%	100.0%	100.5%	100.0%
3,000	600	12	99.8%	98.7%	99.6%	98.3%
4,000	1,200	12	98.3%	95.0%	97.7%	93.6%
5,000	2,400	12	94.8%	87.6%	93.5%	84.1%
6,000	3,200	12	92.1%	82.7%	90.2%	77.8%

F. Wind Resources

Wind resources were modeled as hourly profiles provided by the Companies. The Technical Appendix provides more information surrounding these shapes. Wind profiles were provided assuming a 2.6% outage rate compared to the negative resource that was assumed to have a 4% outage rate.

G. Wind/Solar Surface Scope

Astrapé calculated the average ELCC of wind and solar as laid out in Tables 10 and 11 for both Companies. The highlighted blue cells were simulated representing only wind, only solar, and aggregated solar and wind scenarios. Each of the matrices were duplicated for offshore and onshore wind for both Companies.

Table 10. DEC Solar/Wind Surface Matrix

		Solar MW				
		DEC	-	2,000	4,000	6,000
Wind MW	-					
	1,000					
	2,000					
	3,000					

Table 11. DEP Solar/Wind Surface Matrix

		Solar MW				
		DEP	-	3,000	6,000	9,000
Wind MW	-					
	1,000					
	2,000					
	3,000					

H. Winter Wind/Solar Surface Results

Tables 12 and 13 show the average winter ELCC for wind without any solar included in the setup, solar without any wind included in the setup, and the ELCC's when both are included to capture any synergistic value the resources have. There was very little synergistic value seen in the onshore wind and solar analysis but a higher amount in the offshore wind and solar analysis. DEC was modeled with solar from 0 to 6,000 MW and wind from 0 to 3,000 MW. DEP was modeled with solar from 0 to 9,000 MW and wind from 0 to 3,000 MW. The profiles provided by the Company showed substantial output during cold winter mornings in the offshore wind profiles.¹⁰ Even for winter values, to see ELCC's of this magnitude for offshore wind, particularly in DEC, is not intuitive and it is recommended that the Companies continue to understand offshore wind profiles especially during extreme cold periods.

Table 12. DEC Winter Wind Results

Solar MW	Wind MW	Offshore/ Onshore	Average Wind Capacity Value (no solar included)	Average Solar Capacity Value (no wind included)	Average Wind Capacity Value (including any synergistic value)	Average Solar Capacity Value (including any synergistic value)	Marginal Wind Capacity Value (including any synergistic value)
2,000	1,000	Onshore	39.9%	6.1%	40.7%	6.6%	29.1%
4,000	2,000	Onshore	36.9%	4.1%	36.9%	3.9%	32.0%
6,000	3,000	Onshore	35.8%	2.9%	34.9%	3.0%	35.0%
2,000	1,000	Offshore	89.5%	6.1%	94.9%	6.9%	86.6%
4,000	2,000	Offshore	84.2%	4.2%	89.3%	4.3%	80.7%
6,000	3,000	Offshore	76.4%	2.9%	85.5%	3.4%	74.8%

¹⁰ Profiles are based on "ERA5" climate and weather data from the European Centre for Medium-Range Weather Forecasts. More information can be found at: <https://cds.climate.copernicus.eu/cdsapp#!/dataset/reanalysis-era5-single-levels?tab=overview>

Table 13. DEP Winter Wind Results

Solar MW	Wind MW	Offshore/ Onshore	Average Wind Capacity Value (no solar included)	Average Solar Capacity Value (no wind included)	Average Wind Capacity Value (including any synergistic value)	Average Solar Capacity Value (including any synergistic value)	Marginal Wind Capacity Value (including any synergistic value)
3000	1000	Onshore	44.3%	7.7%	43.2%	7.8%	42.1%
6000	2000	Onshore	40.9%	5.2%	41.9%	5.4%	39.2%
9000	3000	Onshore	39.1%	3.8%	40.5%	4.1%	36.3%
3000	1000	Offshore	72.8%	7.7%	81.8%	6.9%	69.7%
6000	2000	Offshore	71.4%	5.2%	74.4%	5.5%	64.3%
9000	3000	Offshore	67.6%	3.8%	70.1%	4.1%	58.9%

I. Winter ELCC Conclusions

Winter ELCC's are a driver in resource plans for the Companies. Astrapé has taken an approach to recognize the synergistic value of combinations of resources. The winter storage ELCC's are at or near 100% for the first couple of battery tranches, but eventually these values will drop dramatically given winter load shapes can remain high across the day. Once enough storage is on the system, the net loads flatten to the point storage is needed in both the evening and morning peaks with limited reserve capacity available throughout the night to recharge the batteries. Solar values remain low during the winter as the risk of load shed is mostly during the early morning hours. The ELCC of onshore wind is in the 30-40% range while the ELCC of offshore wind was calculated to be north of 60%. This is driven by the ERA-5 shapes provided by the Company which show extremely high wind output during the coldest winter mornings. The average winter values should be used for reserve margin accounting and the marginal winter values should be used for marginal resource decision making since the needs of the Companies are in the winter.

II. Technical Modeling Appendix

The following sections include a discussion on the setup and assumptions used to perform the ELCC study. The Study utilized the framework from the 2020 Resource Adequacy study and updated the following inputs.

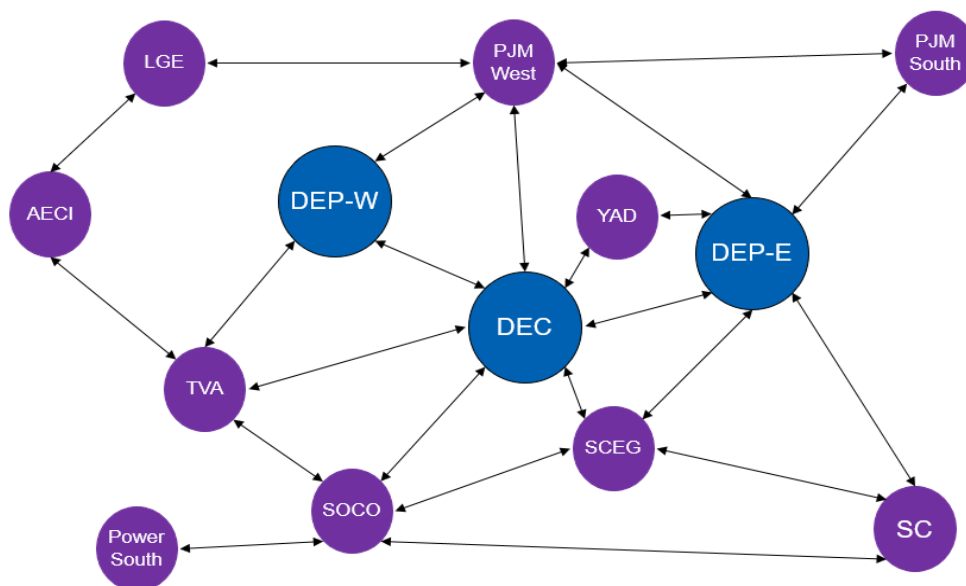
A. SERVM Framework and Cases

The study uses the same framework as the Base Case 2020 Resource Adequacy Study but was updated to model study year 2026 and included forty-one weather years (1980 – 2020), five load forecast error multipliers, and Monte Carlo generator outages.

B. Study Topology

The 2020 Resource Adequacy study was updated to include the additional SEEM entities Louisiana Gas and Electric (LGE), Associated Electric Cooperative Incorporated (AECI), and Power South. The study topology is shown below in Figure 1.

Figure 1. Study Topology



In order to reduce the simulation time for the ELCC analysis, the neighbors were tuned to 0.1 reliability in a calibration study. Purchases were derived from this calibration study to simulate the benefit received from the market. This allowed DEC and DEP to be simulated as islands for all the ELCC analyses.

C. Load Modeling

The load modeling was updated to model forty-one historical weather years (1980- 2020). The same methods used in the 2020 Resource Adequacy Study were used for this update. Based on the last five years of historical weather and load, a neural network program was used to develop relationships between weather observations and load. The historical weather consisted of hourly temperatures from weather stations across the DEC and DEP service territories. Other inputs into the neural net model consisted of hour of week, eight hour rolling average temperatures, twenty-four hour rolling average temperatures, and forty-eight hour rolling average temperatures. Different weather to load relationships were built for the summer, winter, and shoulder seasons. These relationships were then applied to the last forty-one years of weather to develop forty-one synthetic load shapes for 2026. Extreme peaks were corrected based on regression analysis examining extreme peak periods for both winter and summer. Equal probabilities were given to each of the forty-one load shapes in the simulation. The synthetic load shapes were scaled to align the normal summer and winter peaks to the Company's projected thirty-year weather normal load forecast for 2026.

D. Economic Load Forecast Error

Economic load forecast error multipliers from the 2020 Resource Adequacy were updated to reflect additional historical data. The updated values are shown in Table 14. Because the system is driven to 0.1 before the analysis begins, these assumptions don't drive the ELCC analysis significantly.

Table 14. Load Forecast Error

Load Forecast Error Multipliers	Probability %
0.96	10.4%
0.98	23.3%
1.00	32.5%
1.02	23.3%
1.04	10.4%

E. Conventional Resource Modeling

The resource mixes for DEC, DEP-E, and DEP-W were all updated to reflect any changes in the fleets since the 2020 Resource Adequacy Study was performed. Additionally, all modeled outage rates for the thermal fleet were updated to reflect the five most recent years of GADS data.

F. Renewable Resource Modeling

The solar units were modeled with updated forty-one solar shapes that represent forty-one years of weather data. The solar shapes were developed by Astrapé from data downloaded from the National Renewable Energy Laboratory (NREL) National Solar Radiation Database (NSRDB) Data Viewer. The data was then input into NREL's System Advisor Model (SAM) for each year and county to generate hourly profiles for both fixed and tracking solar profiles. Figure 2 below

shows the county locations that were used and then Figure 3 shows the average August output for different fixed-tilt and single-axis-tracking inverter loading ratios.

Figure 2. Solar Location Map

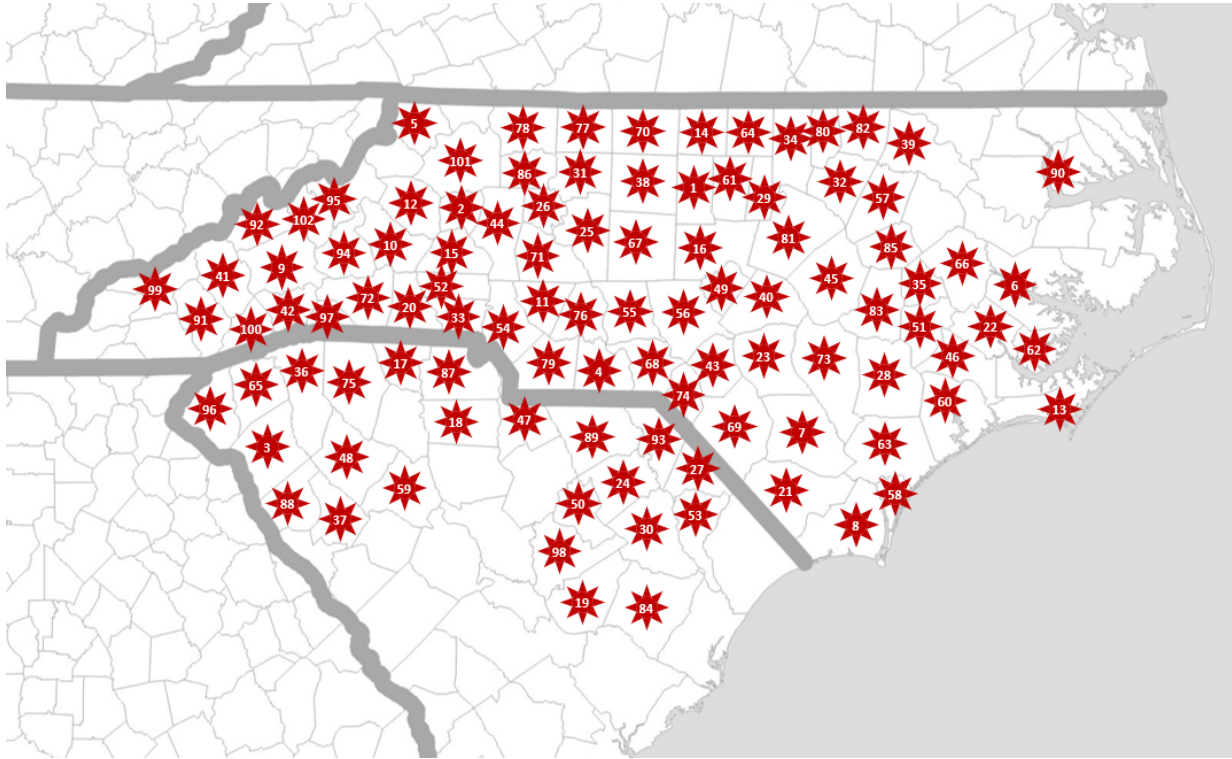
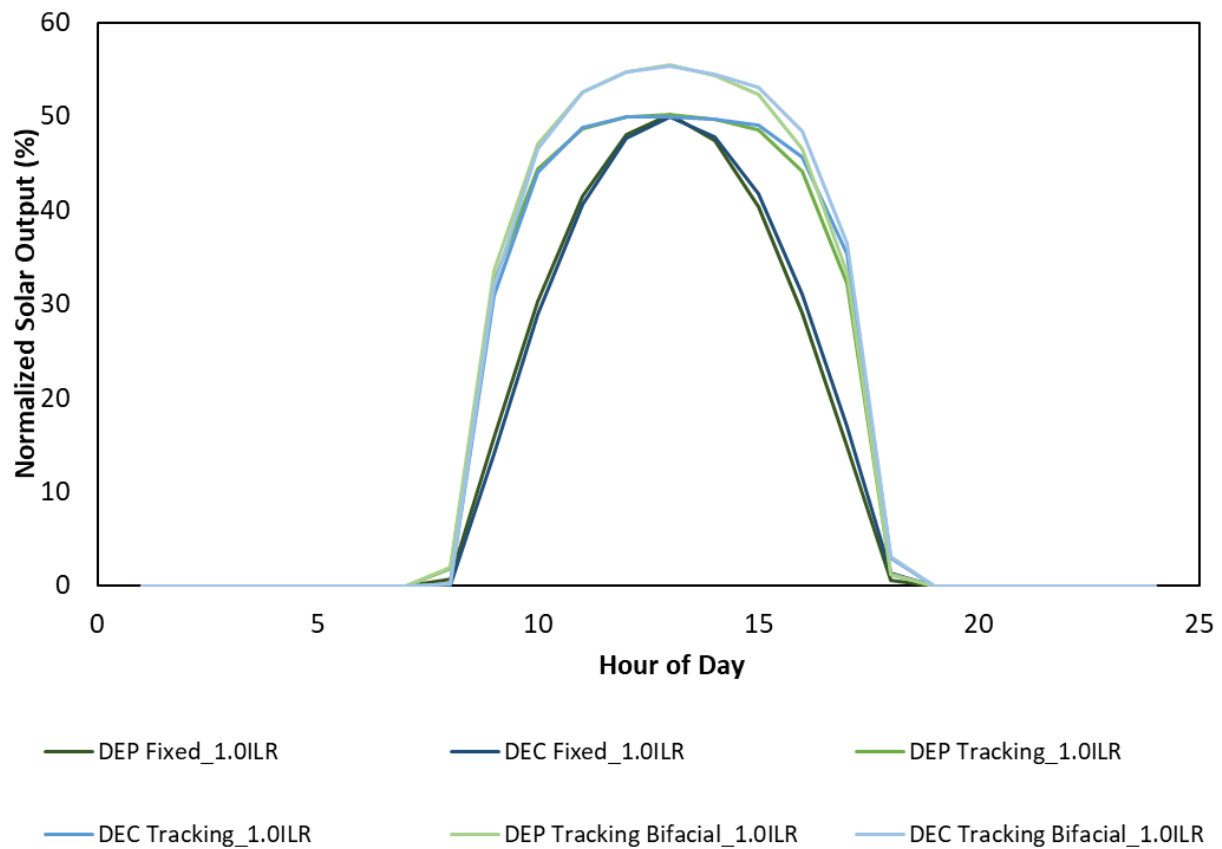
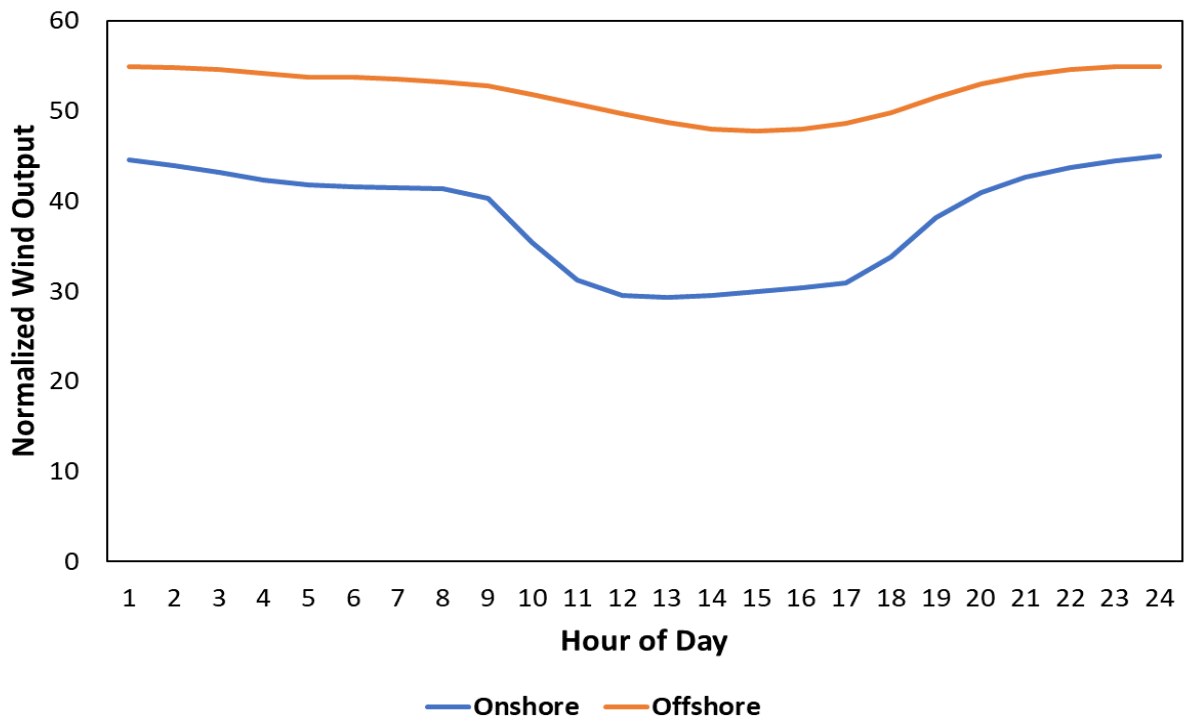
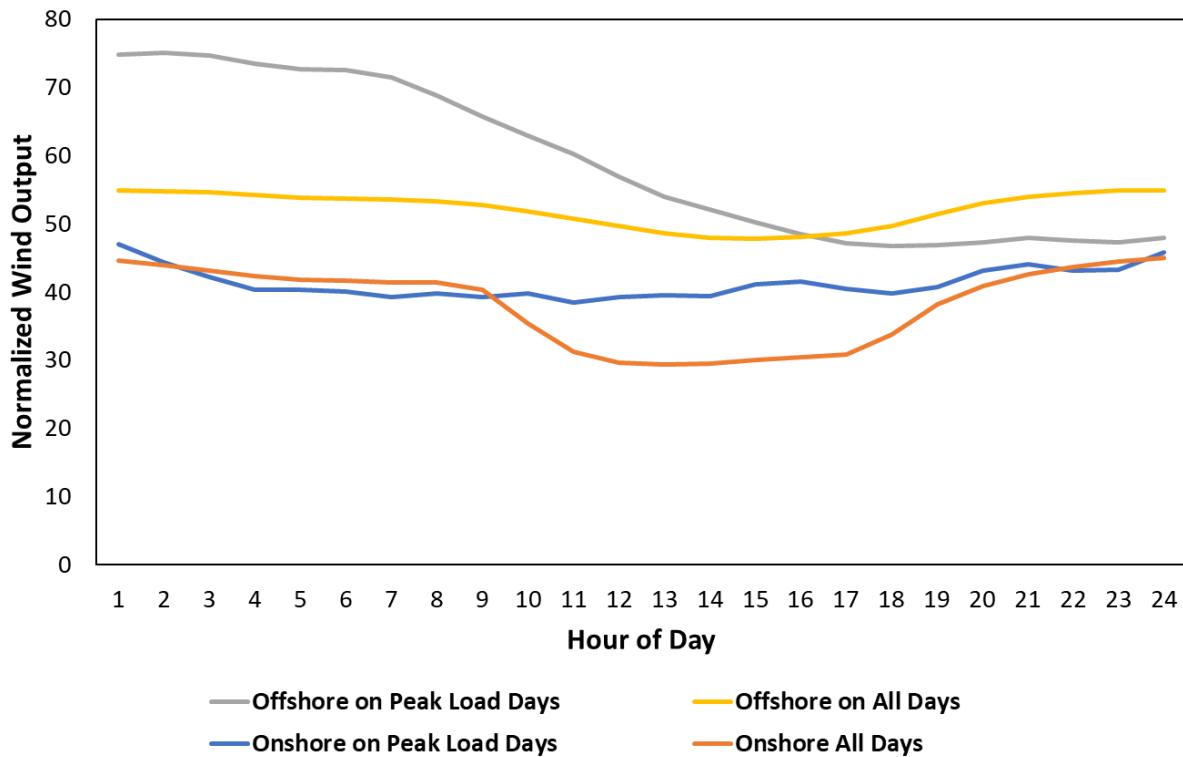


Figure 3. Average January Solar

The onshore and offshore wind profiles were provided by DEC and DEP and were derived from ERA-5 meteorological data. Figures 4 and 5 outline their average output and then a comparison of their output on peak days. Given the high output of offshore profiles on peak days, it is understandable that these profiles would result in a high ELCC value.

Figure 4. Average January Onshore and Offshore Wind Output**Figure 5. Peak Load Day January Onshore/Offshore Wind Output**

G. Summer Solar and Wind ELCC Values

While summer was not the focus of this study, summer ELCC values were calculated for solar and wind for reserve margin accounting purposes. The Solar ELCC values are listed in Table 15 below. This analysis was only performed for DEC since there was summer LOLE in the Base Case before any solar was added. There was essentially zero LOLE in the summer in DEP even before solar is added so additional runs were not performed DEP because it would require manipulating the Base Case further to produce summer LOLE. These summer values give reasonable estimates for reserve margin accounting purposes and can be reasonably used for both Companies. But as discussed previously, because solar increases summer capacity more than winter capacity, summer reserve margins are increasing faster making future resource decisions driven by winter capacity need.

Table 15. Summer Solar ELCC Values

Solar MW	Storage (MW)	Summer Solar Average ELCC	Summer Solar Marginal ELCC
2000	300	67%	37.9%
3000	600	56%	34.3%
4000	1,200	51%	30.8%
5000	2,400	46%	24.0%
6000	3,200	42%	18.6%
8000	3,200	35%	7.9%

Onshore wind was found to provide approximately 11% in the summer and offshore wind was found to provide approximately 37% in the summer.

H. Discussion of Reliability Metrics (LOLE vs. EUE)

As part of the analysis, Astrapé did examine the impact the reliability metric used had on the ELCC values. Traditional resource adequacy only considers LOLE which counts the number of days customers are not served. LOLE is counted as one day whether the day has one hour or ten hours of load shed. Under this metric, two portfolios can have the same number of days of load shed but one portfolio could have substantially more load shed from an energy standpoint. This is illustrated in Figure 6 below where the first, second and fourth portfolios have the same number of days from a LOLE perspective but may differ in the number of hours and customer energy unserved.

Figure 6. LOLE Illustration¹¹



Expected Unserved Energy (EUE) is another reliability metric which measures all customer energy demand not served. To better understand the impact a change in reliability metric may have on the results, Astrapé analyzed battery capacity values using EUE instead of LOLE as the ELCC

¹¹ Clarifying the Interpretation and Use of the LOLE Resource Adequacy Metric-2021 NERC Probabilistic Analysis Forum October 5th, 2021

metric. The winter results seen in Table 16 show that for short term storage, the capacity values based on EUE are substantially lower than of the LOLE results. This is logical because a 2-hour battery may still eliminate some events that a fully dispatchable resource can eliminate, but during events that remain it is likely that there will be more EUE with short duration battery. This is an interesting finding of the study that should be noted for future analysis. The opposite occurs for solar because solar cannot typically eliminate the entire event since most of the load shed in the winter events are before the sun rises, but it can eliminate EUE in hours 8 and 9. These results are shown in Table 17. For this reason, using EUE as the metric actually benefits solar. Planning reserve margin studies across the industry have used LOLE and the 1-day in 10-year standard so changing metrics for ELCC would create an accounting disconnect that would require further adjustments to the overall resource adequacy framework.

Table 16. DEC LOLE vs EUE Winter Battery ELCC Results

Battery (MW)	Duration(hours)	Average Battery Capacity Values with no solar included LOLE Base Results	Average Battery Capacity Values with no solar included EUE Results	Delta (EUE - LOLE)
400	2	97.8%	60.7%	-37.1%
600	2	96.4%	60.0%	-36.4%
800	2	95.1%	57.8%	-37.3%
600	4	99.8%	82.1%	-17.8%
1,200	4	98.5%	77.5%	-21.0%
2,400	4	87.3%	75.4%	-11.9%
3,200	4	73.5%	59.6%	-14.0%
600	6	99.4%	93.4%	-6.1%
1,200	6	97.4%	90.1%	-7.3%
2,400	6	88.7%	78.3%	-10.4%
3,200	6	79.2%	70.2%	-9.0%
600	8	99.6%	95.1%	-4.4%
1,200	8	98.1%	94.0%	-4.1%
2,400	8	89.6%	84.7%	-4.9%
3,200	8	79.8%	69.7%	-10.1%
600	12	99.8%	98.2%	-1.7%
1,200	12	99.5%	93.1%	-6.4%
2,400	12	97.7%	93.7%	-4.0%
3,200	12	90.2%	84.4%	-5.8%

Table 17. DEC LOLE vs EUE Winter Solar ELCC Results

Solar (MW)	Average Solar Capacity Value with no storage included LOLE Results	Average Solar Capacity Value with no storage included EUE Results
2,000	6.1%	8.2%
3,000	5.0%	6.2%
4,000	4.1%	5.7%
5,000	3.4%	5.1%
5,000	2.9%	4.9%
5,000	2.4%	3.8%

CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing has been furnished by electronic mail on this 11th day of June, 2024, to the following:

Office of General Counsel
Jennifer Crawford / Major Thompson /
Shaw Stiller
Florida Public Service Commission
2540 Shumard Oak Blvd.
Tallahassee, FL 32399-0850
JCrawfor@psc.state.fl.us
MThomps@psc.state.fl.us
SStiller@psc.state.fl.us

Office of Public Counsel
W. Trierweiler/C. Rehwinkel/M.
Wessling/A. Watrous
c/o The Florida Legislature
Tallahassee FL 32399
(850) 488-9330
rehwinkel.charles@leg.state.fl.us
Trierweiler.walt@leg.state.fl.us
watrous.austin@leg.state.fl.us
wessling.mary@leg.state.fl.us

Florida Industrial Power Users Group
Jon C. Moyle, Jr./Karen A. Putnal
c/o Moyle Law Firm
Tallahassee FL 32301
(850) 681-3828
(850) 681-8788
jmoyle@moylelaw.com
kputnal@moylelaw.com

Earthjustice
Bradley Marshall/Jordan Luebke
111 S. Martin Luther King Jr. Blvd.
Tallahassee FL 32301
(850) 681-0031
(850) 681-0020
bmarshall@earthjustice.org
jluebke@earthjustice.org

Duke Energy
Matthew R. Bernier/Stephanie A. Cuello
106 E. College Avenue, Suite 800
Tallahassee FL 32301
(850) 521-1428
(850) 521-1437
FLRegulatoryLegal@duke-energy.com
matthew.bernier@duke-energy.com
stephanie.cuello@duke-energy.com

Duke Energy
Melissa Seixas / Dianne M. Triplett
299 First Avenue North
St. Petersburg FL 33701
(727) 820-4692
(727) 820-5041
Dianne.triplett@duke-energy.com

Duke Energy
Mr. Robert Pickels
106 East College Avenue, Suite 800
Tallahassee FL 32301-7740
Robert.Pickels@duke-energy.com

Verition Fund
Richie Ciciarelli
rciciarelli@veritionfund.com

Stone Law Firm
James W. Brew/Laura W. Baker/Sarah B. Newman
1025 Thomas Jefferson St., NW, Ste. 800
Washington DC 20007
(202) 342-0800
(202) 342-0807
jbrew@smxblaw.com
lwb@smxblaw.com
sbn@smxblaw.com

Stone Law Firm
P. J. Mattheis/M. K. Lavanga/J. R. Briscar
1025 Thomas Jefferson St. NW, Suite 800 West
Washington DC 20007
(202) 342-0800
(202) 342-0807
jrb@smxblaw.com
mkl@smxblaw.com
pjm@smxblaw.com

Lewis Law Firm
F.L. Aschauer, Jr./A.J. Charles/L. Killinger/J. Melchior
106 East College Ave., Suite. 1500
Tallahassee FL 32301
(850) 222-5702
Faschauer@llw-law.com
Acharles@llw-law.com
Lkillinger@llw-law.com
jmelchior@llw-law.com

Garner Law Firm
William C. Garner
3425 Bannerman Road, Unit 105, No. 414
Tallahassee FL 32312
(850) 320-1701
(850) 792-6011
bgarner@wcglawoffice.com

Gardner Law Firm
Robert Scheffel Wright/John T. LaVia, III
1300 Thomaswood Drive
Tallahassee FL 32308
(850) 385-0070
(850) 385-5416
jlavia@gbwlegal.com
schef@gbwlegal.com

Keyes Law Firm
Nikhil Vijaykar
580 California St., 12th Floor
San Francisco CA 94104
(408) 621-3256
nvijaykar@keyesfox.com

EVgo Services, LLC
Lindsey Stegall
11835 W. Olympic Blvd., Ste. 900E
Los Angeles CA 90064
(303) 941-1729
Lindsey.Stegall@evgo.com

Troutman Law Firm
Molly Jagannathan/Melissa O. New
600 Peachtree Street NE, Ste. 3000
Atlanta GA 30308
(404) 885-3939
Molly.jagannathan@troutman.com
Melissa.butler@troutman.com

AARP Florida
Chante' Jones
(850) 272-0551
cejones@aarp.org

/s/ Drew Mammel
/s/ Drew Mammel
Drew Mammel
Sierra Club
50 F St. NW, Eighth Floor
Washington, DC 20001
(202) 650-6075
drew.mammel@sierraclub.org