PUBLIC SERVICE COMMISSION OF SOUTH CAROLINA

In re: 2023 Integrated Resource Plan for the South Carolina Public Service Authority	**Docket No. 2023-154-E**

DIRECT TESTIMONY of

DEVI GLICK

ON BEHALF OF

SIERRA CLUB

September 22, 2023

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(PUBLIC VERSION)

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1. INTRODUCTION AND PURPOSE OF TESTIMONY

Q Please state your name and occupation.

A My name is Devi Glick. I am a Senior Principal at Synapse Energy Economics, Inc. (Synapse). My business address is 485 Massachusetts Avenue, Suite 3, Cambridge, Massachusetts 02139.

Q Please describe Synapse Energy Economics.

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

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

Q Please summarize your work experience and educational background.

A At Synapse, I conduct economic analysis and write testimony and publications that focus on a variety of issues related to electric utilities. These issues include power plant economics, electric system dispatch, integrated resource planning, environmental compliance technologies and strategies, and valuation of distributed energy resources. I have submitted expert testimony before state utility regulators in more than a dozen states.

In the course of my work, I develop in-house models and perform analysis using industry-standard electricity power system models. I am proficient in the use of spreadsheet analysis tools, as well as optimization and electric dispatch models. I have directly run EnCompass and PLEXOS and have reviewed inputs and outputs for several other models.

Before joining Synapse, I worked at Rocky Mountain Institute, focusing on a wide range of energy and electricity issues. I have a master's degree in public policy and a master's degree in environmental science from the University of Michigan, as well as a bachelor's degree in environmental studies from Middlebury College. I have more than 10 years of professional experience as a consultant, researcher, and analyst. A copy of my current resume is attached as Exhibit DG-1.

Q On whose behalf are you testifying in this case?

A I am testifying on behalf of Sierra Club.

Q Have you testified previously before the Public Service Commission of South Carolina?

A Yes, I submitted testimony in Docket No, 2021-3-E, Docket No. 2018-3-E, Docket No. 2018-2-E, and Docket No, 2018-1-E.

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

A In this proceeding, I review the South Carolina Public Service Authority's ("Santee Cooper" or "the Company") 2023 Integrated Resource Plan (2023 IRP) and evaluate its final portfolios, modeling methodology, and input assumptions. I update the Company's Preferred Portfolio to reflect compliance with the U.S. Environmental Protection Agency's (EPA) proposed Greenhouse Gas Standards

and Guidelines for Fossil-Fuel-Fired Power Plants issued under Section 111 of the Clean Air Act (Section 111 Rules), and then I present the results of Synapse's alternative clean energy analysis. Synapse's Section-111-Compliant Clean Energy Portfolio (the "Clean Energy Portfolio") meets the Company's load forecast and avoids the need to build a new 1.15 GW combined cycle power plant to be shared with Dominion Energy South Carolina (DESC) (the "Shared Resource"), while retiring the coal-fired Winyah Generating Station (Winyah) and coal-fired Cross Generating Station (Cross) earlier, building substantially more clean energy resources, emitting less carbon dioxide (CO_2), and only marginally changing the costs to ratepayers relative to Santee Cooper's 111-Compliant Baseline Portfolio.

Q How is your testimony structured?

A In Section 2, I summarize my findings and recommendations for the Commission. In Section 3, I review Santee Cooper's resource plan. I summarize the major themes of this IRP, including the Company's plan to delay the retirement of Winyah and replace it with the Shared Resource, as well as the low capital cost estimates that Santee Cooper relies on in modeling its proposed Shared Resource. In addition, I describe Santee Cooper's resource portfolios, its findings on resource additions and retirements, and its modeling methodology. I discuss how the Company is proposing to retire Winyah in 2031, two years after its own modeling indicated it was optimal to retire.

In Section 4, I introduce the Section 111 Rules and explain Santee Cooper's compliance options at its fossil-powered generators as the rule is currently proposed.

In Section 5, I present the results of Synapse's alternative analysis. I describe our modeling tool and its capabilities. I describe the scenarios and sensitivities we modeled and outline our input assumptions with a focus on where our assumptions aligned with Santee Cooper's and where they differed. I present the results of Synapse's modeling and show how our results compare to the results the Company presented. I then explain the main differences between Synapse's modeling results and Santee Cooper's.

In Section 6, I provide more context on issues surrounding Santee Cooper's IRP development, including assumptions around the Shared Resource, the power purchase agreements (PPA) that Central Electric Power Cooperative ("Central") recently entered into, Santee Cooper's market energy assumptions, renewable input assumptions and the accompanying reports Astrapé Consulting recently completed. In this section I also discuss the implications of other proposed environmental regulations, on the future of gas and coal development in the United States.

Q What information do you rely upon for your analysis, findings, and observations?

A My analysis relies primarily on the workpapers, exhibits, and discovery responses of Santee Cooper's witnesses. I also rely on other publicly available documents and data, which I cite throughout my testimony.

Q Are you sponsoring any exhibits?

A Yes. I am sponsoring the following exhibits:

Exhibit Number	Description of Exhibit	Public/Confidential
Exhibit DG-01	Resume of Devi Glick	Public
Exhibit DG-02	Winyah Generating Station Notice of Planned Participation in 2020 Effluent Limitation Guidelines Retirement Subcategory, October 8, 2021	Public
Exhibit DG-03	Santee Cooper Board Statement - *Santee Cooper approves new contract with Century Aluminum, sets Winyah retirement deadline,* March 22, 2021	Public
Exhibit DG-04	Santee Cooper Response to ORS Request 1-10	Public
Exhibit DG-05	Santee Cooper Response to Sierra Club 1-9	Public
Exhibit DG-06	Santee Cooper Response to Sierra Club Request 1-10	Public
Exhibit DG-07	Santee Cooper Response to Sierra Club Request 1-19	Public
Exhibit DG-08	Santee Cooper Response to Sierra Club 1-5(a)	Public
Exhibit DG-09	Santee Cooper Response to Sierra Club 1-6B	Public
Exhibit DG-10	Santee Cooper Response to ORS 5-8(a)	Public
Exhibit DG-11	Santee Cooper Response to Sierra Club 1-3	Public
Exhibit DG-12	Santee Cooper Response to Sierra Club 1-12, Part 2	Public
Exhibit DG-13	Santee Cooper Response to Sierra Club 3-3	Public
Exhibit DG-14	Santee Cooper Response to Sierra Club 3-5	Public
Exhibit DG-15	Santee Cooper Response to ORS 1-12(b)	Public
Exhibit DG-16	Santee Cooper Response to Sierra Club 1-4(a)	Public
Exhibit DG-17	Central Electric Cooperative Response to Santee Cooper Interrogatory 2-1	Public
Exhibit DG-18	Santee Cooper Response to ORS 5-11	Public
Exhibit DG-19	Santee Cooper Response to ORS 1-11(B) and (C)	Public
Exhibit DG-20	Santee Cooper Response to Sierra Club 2-1	Public
Exhibit DG-21	Santee Cooper Response to Sierra Club 3-7(a), (b)	Public

2. FINDINGS AND RECOMMENDATIONS

Q Please summarize your findings.

A My primary findings are:

1. Santee Cooper is planning to delay the retirement of Winyah from 2026 to the end of 2030 and bring online a new Shared Resource at that time, despite its own IRP analysis showing retirement of Winyah by the end of 2028 to be the more economic option.
2. Santee Cooper is planning to continue operating Cross throughout the entire planning period (through 2052). If the Section 111 Rules are finalized, it will be more economic for the Company to retire Cross by the end of 2034 and replace it with a combination of renewables and long and short-duration BESS.
3. None of the portfolios that Santee Cooper includes in its 2023 IRP are economically optimized, including the portfolio it calls "Economically Optimized" Portfolio.
4. Synapse's independent modeling analysis shows that, with the inclusion of the proposed Section 111 Rules, retiring Winyah and Cross earlier will avoid costly environmental retrofits at the plant, only marginally change projected costs, reduce pollution and improve human health.
5. With implementation of the Section 111 Rules, the cost to operate the Company's new and existing fossil resources, including Cross beyond 2034, the Shared Resource, the John S. Rainey Combined Cycle Power Plant (Rainey), and any other new gas plants, will be substantially higher

and operations more limited than Santee Cooper projected and modeled in its 2023 IRP.

6. Santee Cooper's cost and operational assumptions for new resources and market energy purchases skewed the Company's modeling results in favor of new gas resources and against renewables and market purchases. These assumptions included: high capital and integration costs for new renewable resources; low effective load carrying capacities (ELCC) and annual build caps for new renewable resources; low capital costs for new gas resources (most notably, the proposed Shared Resource), and minimal modeling of market energy.

Based on these findings, I offer the following recommendations:

1. Due to the massive impact the proposed Section 111 Rules will have on ratepayers, Santee Cooper should revise its 2023 IRP to model the compliance pathways available for each of its existing and proposed fossil-fuel powered generators (especially its combined cycle and coal plants) under the Section 111 Rules.
2. Santee Cooper should revise its 2023 IRP by making the following updates to its core assumptions or model additional portfolio sensitivities:

Recommended updates to modeling assumptions	
1	Relax the annual build limits on solar PV and battery energy storage systems (BESS) that Santee Cooper imposed on the Preferred Portfolio
2	Offer the model long-duration BESS as a resource option
3	Replace low ELCCs for 8-hour BESS and wind by extrapolating ELCC values from existing, regionally relevant studies or conduct a study of 8-hour BESS on Santee Cooper's own system
4	Model updated capital costs for new solar PV, wind, and BESS resources that reflect more current costs and market trends
5	Model capital costs for the proposed Shared Resource that more closely align with the projections DESC uses, or which otherwise reflect the possibility the project will face cost escalation relative to the Company's optimistic projections
6	Allow for increased levels of market energy purchases that more closely align with industry standards of 10 to 15 percent market energy reliance

3. Santee Cooper should begin issuing an All-Source Request for Proposals (RFP) and focus its near-term resource planning efforts on obtaining as much new renewable capacity and energy as soon as possible.
4. Any future certificate of public convenience and necessity (CPCN) proceeding for the Shared Resource should be informed by an All-Source RFP that allows for bids from battery storage resources and renewables.

3. SANTEE COOPER'S OPTIMIZED AND PREFERRED RESOURCE PORTFOLIO

Q How is Santee Cooper's 2023 IRP different from its prior resource planning exercises?

A The 2023 IRP is Santee Cooper's first official IRP since S.C. Act No, 90 of 2021 ("Act 90")[1] was passed. Act 90 introduced the requirement for Santee Cooper to submit its IRP to the Commission for approval subject to a full evidentiary process.[2] This 2023 IRP builds off the Company's 2020 IRP,[3] as well as the power supply roadmap that Santee Cooper presented in its 2019 Reform Plan. The 2023 IRP was created with the same goal of improving affordability, preserving reliability, and reducing the carbon footprint of its generation fleet. Unlike the Company's prior IRP and resource planning exercises, for the 2023 IRP, Santee Cooper utilizes full capacity expansion and production cost modeling.

Q What recent changes has Santee Cooper had to account for in designing its 2023 IRP?

A Over the past few years, there have been several significant legislative and regulatory changes that impact the power sector. Specifically, the 2022 Inflation Reduction Act ("IRA") provides tax incentives for renewables and battery storage. Additionally, the EPA proposed the Section 111 Rules, which aim to limit CO_2 and other greenhouse gas emissions from power generation under Section 111 of the federal Clean Air Act. Santee Cooper modeled the IRA in the 2023 IRP; however, it did not model the proposed Section 111 Rules.

[1] Santee Cooper 2023 IRP at 34.
[2] *Id*. at 44.
[3] *Id*. at 46.

Additionally, there have been numerous changes in the Santee Cooper region. Among the most significant: (1) Central is making resource procurement decisions that could impact Santee Cooper's long-term resource needs; (2) Santee Cooper is projecting higher levels of load growth than it did even a year ago; (3) concerns about maintaining system reliability are elevated in the region in the wake of winter storms Uri and Elliot; and (4) the global energy system is still recovering from record inflation and supply chain disruptions. Santee Cooper also cited concerns with tightening power markets in the region. Additionally, the Astrapé Consulting reserve margin study found that Santee Cooper's primary reserve margin should be set based on winter requirements, since winter reliability is the limiting factor.

Q Which of Santee Cooper's portfolios do you focus on for your analysis?

A Santee Cooper evaluates four resource portfolios and then develops a single Preferred Portfolio based on the results of its modeling analysis. My testimony focuses on the Preferred Portfolio, and to a limited extent on the "Economically Optimized" Portfolio (P1). I used the Preferred Portfolio as the baseline for comparison with the Synapse alternative portfolio. Santee Cooper also evaluated the Future Coal Retirement Portfolio (P2), the No New Fossil Generation Portfolio (P3), and the Net Zero CO2 by 2050 Portfolio (P4). Portfolios P1–P4 are referred to as Foundational Portfolios. Critically, none of the Company's portfolios were fully economically optimized. Not even that "Economically Optimized" Portfolio was fully optimized—instead, the Company locked in the retirement dates for Winyah and Cross.

Q Please define an optimized portfolio.

A An optimized portfolio is a portfolio where the model is allowed to make relatively unconstrained resource retirement and addition decisions. The modeler still has to make decisions about which inputs and constraints to include in the model (including cost, operating characteristics, and availability of new and existing resources as well as constraints imposed by regulations and the market) but with an optimized portfolio, the modeler does not fix specific resource additions or retirements in the model. The results of an optimized portfolio provide a baseline of information on what resource retirement and additions are most economic for the Company and for ratepayers.

It may be reasonable for a utility's ultimately preferred portfolio to differ from an optimized portfolio after factoring in logistical constraints and realities outside the model, but critically, all deviations should be carefully justified. Any portfolio where the modeler hard-codes in retirement dates for existing resources or online dates for new resources (for reasons other than regulatory compliance) is inherently not an economically optimized portfolio.

Q Please summarize the resource retirements Santee Cooper modeled over the study period in the Preferred Portfolio.

A In the Preferred Portfolio, Santee Cooper modeled the retirement of Winyah by year end 2030, but Cross stayed online for the entire Study Period, which extends out through 2052.[4][5] As shown in Table 1 below, Winyah's retirement date in the

[4] Santee Cooper 2023 IRP at 8.

[5] Winyah was retired by 2029 in all four of its foundational portfolios, but Cross only retired in 2034 in two of the portfolios.

Preferred Portfolio deviates by two years from the retirement date in the "Economically Optimized" Portfolio (the end of 2028). It also deviates from several other prior retirement announcements the Company made:

1. The Santee Cooper 2020 IRP assumed Winyah would retire by end of 2027.[6]
2. Santee Cooper filed a Notice of Planned Participation (NOPP) with the South Carolina Department of Health and Environmental Control in October 2021 stating that Winyah would be retired at the end of 2028.[7]
3. On March 22, 2021, the Santee Cooper Board issued a press release stating it approved the retirement of the Winyah units by the end of 2027.[8]

Aside from Winyah, in the Preferred Portfolio, Santee Cooper also retired in 2034 the five combustion turbines (CT) at Myrtle Beach (65 MW) and the three CTs at Hilton Head (100 MW) for a combined 165 MW of capacity. These CTs were built in the early 1960's and 1970's and will be over 70 years old (Myrtle Beach) and 60 years old (Hilton Head) by the time they retire.[9] Santee Cooper plans to continue relying on its existing fossil resources at Cross and Rainey, as well as its nuclear power from V.C Summer Unit 1, and its hydro power and landfill gas from multiple sites.[10]

[6] Santee Cooper 2020 IRP at 39.
[7] Winyah Generating Station Notice of Planned Participation in 2020 Effluent Limitation Guidelines Retirement Subcategory, October 8, 2021, attached as Exhibit DG-02.
[8] *Santee Cooper approves new contract with Century Aluminum, sets Winyah retirement deadline,* March 22, 2021, attached as Exhibit DG-03.
[9] Santee Cooper 2023 IRP, Appendix I, Table I-1.
[10] Ibid.

Table 1. Unit Retirements from "Economically Optimized" Portfolio and Preferred Portfolio

Year	"Economically Optimized" Portfolio	Preferred Portfolio
2026		
2027		
2028		
2029	Winyah (1,150 MW)	
2030		
2031		Winyah (1,150 MW)
2032		
2033		
2034	Myrtle Beach CTs (65 MW) Hilton Head CTs (100 MW)	Myrtle Beach CTs (65 MW) Hilton Head CTs (100 MW)
2035-2052		
Total	1,315 MW	1,315 MW

Sources: Santee Cooper 2023 IRP, Tables D-1 and D-5.

Q How did Santee Cooper select the retirement dates it tested for Winyah?

A Santee Cooper did not allow the model to economically optimize the retirement date for Winyah in *any* of its scenarios. Although the Company never provided a defensible explanation for why it selected the end of 2028 as Winyah's retirement date in the "Economically Optimized" Portfolio in the 2023 IRP,[11] it is likely, based on the NOPP that the Company filed in October 2021,[12] that Santee Cooper selected end of 2028 to avoid the need to comply with the EPA's 2020 Effluent Limitations Guidelines ("ELG") rule. The most insight Santee Cooper provided on the 2028 date was to state in a discovery response that the Santee Cooper Reform Plan supported retiring Winyah in the late 2020s, noting however that the timing of

[11] Santee Cooper Response to ORS Request 1-10, attached as Exhibit DG-04.
[12] *See* Exhibit DG-02.

retirement is tied to the availability of replacement generation.[13] In its Preferred Portfolio, Santee Cooper timed the retirement date of Winyah in 2031 to coincide with DESC timeline for building the new Shared Resource.[14]

Q What resources did Santee Cooper add to its system in the Preferred Portfolio?

A As shown in Table 2, in its Preferred Portfolio, Santee Cooper adds a new 1,360 MW NGCC in 2031, 2,400 MW of solar PV between 2026 and the end of 2031, and 400 MW of BESS between 2029–2030. Over the study period, Santee Cooper adds 3,900 MW of solar PV, 1,100 MW of wind, and 500 MW of BESS resources.

[13] Exhibit DG-04.
[14] Santee Cooper 2023 IRP at 24.

Table 2. Capacity Additions in Santee Cooper Preferred Portfolio

Year	NGCC	Peaking	Solar	Onshore Wind	BESS	SMR	Total
2026			300				300
2027			300				300
2028			300				300
2029			300		350		650
2030			300		50		350
2031	1,360		900				2,260
2032			150				150
2033							0
2034		447	100				557
2035			200				200
2036							0
2037							0
2038			100				100
2039			50				50
2040			50				50
2041			150				150
2042			50				50
2043			100				100
2044				100			100
2045				350			350
2046			250				250
2047			150		50		200
2048			50		50		100
2049			50	150			200
2050				150			150
2051			50	200			250
2052				150			150
Total	**1,360**	**447**	**3,900**	**1,100**	**500**	**0**	**7,306**

Source: Santee Cooper 2023 IRP, Appendix D

Q How does that differ from the resource additions in Santee Cooper's "Economically Optimized" Portfolio?

A Table 3 below shows the annual resource additions by resource type through 2052 for the "Economically Optimized" Portfolio. In the "Economically Optimized" Portfolio, Santee Cooper brings online the new Shared Resource as well as over

2,200 MW of solar PV[15] and peaking resources all in 2029. The timing of these resource additions coincides with the retirement of Winyah at year end 2028. Over the study period, the "Economically Optimized" Portfolio adds 4,000 MW of Solar PV, 850 MW of onshore wind, and 600 MW of BESS.

Table 3. Capacity Additions in Santee Cooper's "Economically Optimized" Portfolio

Year	NGCC	Peaking	Solar	Onshore Wind	BESS	SMR	Total
2026							
2027							
2028							
2029	1,360	447	2,200				4,006
2030							
2031							
2032			100		50		1,50
2033							
2034					50		50
2035			300	50			350
2036							
2037							
2038			100		50		150
2039			150		50		200
2040			100		50		150
2041			100	100			200
2042			100		50		150
2043			100		50		150
2044			50		50		100
2045			50	300	50		400
2046			250				250
2047			100				100
2048			150		150		300
2049			100				100
2050				100			100
2051			50	100			150
2052				200			200

[15] The "Economically Optimized" Portfolio adds all 2,200 MW of solar PV in 2029 rather than phasing it in over several years (as Santee Cooper does in the Preferred Portfolio). This is because the model has foresight—it sees the upcoming solar cost declines and waits as long as possible to add the solar PV. It may be reasonable to phase in the solar PV over several years instead of waiting until the year it is needed.

Year	NGCC	Peaking	Solar	Onshore Wind	BESS	SMR	Total
Total	1,360	447	4,000	850	600	0	7,256

Source: Santee Cooper 2023 IRP, Appendix D

Q How did Santee Cooper create the portfolio of resources it presents in its Preferred Portfolio?

A Santee Cooper used the EnCompass model, a capacity expansion and production cost optimization model designed by Anchor Power Solutions. As mentioned above, the Company did not allow the model to optimize most near-term retirement and resource addition decisions, and instead programmed in specific resource additions and retirement decisions.

First, Santee Cooper did not model the retirement of Winyah or Cross endogenously within the EnCompass model in any of its scenarios (i.e., it did not allow the model to make economic coal-plant retirement decisions). In the Preferred Portfolio, Santee Cooper programmed the retirement of Winyah at year end 2030, and assumed Cross operated throughout the study period.[16]

For resource additions, Santee Cooper offered the model several different natural gas resource options that represented the potential Shared Resource with DESC that Santee Cooper plans to bring online to replace Winyah.[17] Santee Cooper programmed in a phased-in build-path for all near-term solar PV, adding 300 MW per year each year between 2026 and 2030, and then 900 MW in 2031. Santee Cooper also programmed in 400 MW of BESS between 2029 and 2030 as an alternative to a CT. All resource additions before 2031 were locked-in in the

[16] Santee Cooper Response to Sierra Club 1-9, attached as Exhibit DG-05.
[17] Santee Cooper Response to Sierra Club Request 1-10, attached as Exhibit DG-06.

Preferred Portfolio. Only resource additions *after* 2031 were optimized by the model.

Q How did Santee Cooper create the portfolio of resources it presents in its "Economically Optimized" Portfolio?

A In the "Economically Optimized" Portfolio Santee Cooper programmed the retirement of Winyah by year end 2028 and assumed Cross would operate for the entire study period. The retirement of Cross was programed in, and not economically selected by the model. The model made all other resource addition and retirement decisions, including additions of solar PV, BESS, and CTs, without build limits or constraints based on least-cost economics and optimization. This means the model economically opted to add the 2,200 MW of solar PV in 2029 and 447 MW of CTs in 2029.

Q Should Santee Cooper be using the result of its "Economically Optimized" Portfolio instead of its Preferred Plan?

A Not necessarily. First, as I explained before, the "Economically Optimized" Portfolio isn't actually optimized. Even if it was, while the use of optimized capacity expansion modeling is critical to the IRP process, that alone does not ensure the best outcome for ratepayers. A model is not a replacement for thinking critically and asking the right questions. An optimized model run will produce the lowest-cost portfolio under a specific set of circumstances. But an optimization will not automatically show you all the other alternative portfolios that maintain reliability without materially increasing costs to ratepayers, or under slightly different assumptions. To see that solution set, Santee Cooper must ask the model

to test specific alternative portfolios. In this case, evaluating a more phased-in approach for the solar PV, and testing BESS as a substitute for CTs made sense because it is likely lower risk, more feasible, and ultimately similar in cost if not more economic. But what doesn't make sense is Santee Cooper's failure to consider the full impact of delaying the retirement of Winyah. Given the magnitude of potentially avoidable environmental compliance costs the Company could realize from early retirement, it is concerning that the Company did not factor those costs into the modeling.

Q What constraints did Santee Cooper place on the model in creating its Preferred Portfolio?

A Santee Cooper placed an annual build limit on solar PV additions in the near-term. Specifically, in the Preferred Portfolio, Santee Cooper both locked in and capped solar PV additions at 300 MW/year between 2026 and 2030.[18] The Company did not allow new onshore wind to be added until 2030, and offshore wind was not allowed until 2040.[19]

[18] Santee Cooper 2023 IRP at 134.
[19] Santee Cooper Response to Sierra Club Request 1-19, attached as Exhibit DG-07.

4. SECTION 111 RULES

Q Explain the recently proposed Section 111 Rules and their impact on both existing and new fossil resources.

A The proposed Section 111 Rules apply to both coal- and gas-fired units, existing and new, and provide several pathways for compliance.[20] These pathways differ based on: (1) whether the unit is coal or gas; (2) whether the unit is existing or new; (3) how much the unit runs; and (4) when the unit is scheduled to retire.[21] Santee Cooper does not contemplate any new coal in its IRP, so the Section 111 Rules would apply only to Santee Cooper's existing coal, existing gas, and new gas resources.

Q Does Santee Cooper incorporate the proposed Section 111 Rules in its modeling?

A No. The proposed Section 111 Rules came out shortly after Santee Cooper filed its 2023 IRP. Given this timing, it would have been impossible for Santee Cooper to model compliance with the proposed Section 111 Rules in its original IRP.[22] Regardless of timing, Section 111 Rules will have a significant impact in limiting future emissions from new and existing fossil plants (particularly Cross, Rainy, and the Shared Resource). These plants will necessitate either a change in operational practices or installation of costly capital upgrades to continue business-as-usual operations. Therefore, I considered those costs in evaluating Santee Cooper's Preferred Portfolio and designing the Synapse alternative scenarios. I understand

[20] 88 Fed. Reg. 33240 (May 23, 2023).
[21] *Id*. at 33243.
[22] Santee Cooper Response to Sierra Club Request 1-5(A), attached as Exhibit DG-08.

that Santee Cooper can't be expected to update its modeling every time a new regulation is proposed or finalized, but the Section 111 Rules (as with the IRA that preceded it) are unique regulations worth evaluating.

Q Is there any evidence from Santee Cooper's modeling that a CO_2 policy will impact the relative economics of continued reliance on the Cross power plant?

A Yes. Santee Cooper tested several CO_2 price sensitivities. Assuming a high carbon price, the Company found that retiring Cross would be the lowest-cost option. Specifically, Santee Cooper stated:

> Imposition and implementation by the government of a policy that would impose on utilities additional costs related to CO_2 emissions would materially increase projected future Combined System costs and therefore increase charges to customers under all four foundational portfolios by amounts ranging from $2 billion to $5 billion under the Medium CO_2 Price sensitivity cases and $7 billion to $13 billion under the High CO_2 Price sensitivity cases. Should the level of costs imposed reach the levels assumed in the High CO_2 price case, portfolios that assume retirement of Cross may become more cost effective. However, further evaluation is needed to determine if additional costs would be incurred to maintain system reliability as discussed in the Short-term Action Plan section.[23]

Q How will the Section 111 Rules impact each of Santee Cooper's fossil fuel power plants, including their planned retirement dates and operational decisions?

A If the proposed Section 111 Rules are finalized, Santee Cooper cannot run Cross through 2052 without reducing its operations or making major investments for natural gas co-firing, or carbon capture and sequestration (CCS) conversion, if feasible, given the availability of carbon transportation and sequestration

[23] Santee Cooper 2023 IRP at 17-18.

infrastructure. Cross has a current retirement date past 2040; therefore, it would need to install CCS by 2030 to operate through its planned retirement date.[24] And Santee Cooper cannot run Rainey and its Shared Resource at above a 50 percent capacity factor without having to co-fire on hydrogen or install CCS. Table 4 below shows the Section 111 Rules compliance options available to Santee Cooper at its fossil fuel power plants.

Table 4. Section 111 Compliance Options at Santee Cooper's Coal- and Gas-Fired Power Plants Based on Current Retirement Dates

	All Portfolios	
Power Plant	**Retirement Date (EOY)**	**111 Compliance Options**
Winyah	2030	No action required
Cross	None (beyond 2050)	Install CCS to operate beyond 2040, Co-fire on natural gas at 40% starting in 2030 and retire by 2040, Reduce capacity factor to under 20% starting in 2030 and retire by 2035, Retire by 2032
Rainey NGCC	2052-2054	Reduce capacity factor to under 50% starting 2032, 90% CCS by 2035, 30% H_2 by 2032 and 96% H_2 by 2038
Myrtle Beach CTs	2034	No action required
Hilton Head CTs	2034	No action required
New Shared NGCC	None	Reduce capacity factor to under 50% starting 2032, 90% CCS by 2035, 30% H_2 by 2032 and 96% H_2 by 2038
New CTs	None	20% capacity factor limit or 30% H_2 by 2032
Existing CTs	Various	No action required

Source: Synapse analysis.

[24] 88 Fed. Reg 33240, 33359, Table 5.

Q In the Synapse scenarios, how did you model Section 111 Rules compliance?

A I assumed that Cross would retire in 2034. I also assumed that Santee Cooper would opt to reduce the capacity factors for Rainy and the Shared Resource to below 50 percent instead of installing co-firing technologies or CCS. Lastly, I assumed that, for new CTs, Santee Cooper would limit operation to around 20 percent to avoid further compliance costs. Table 5 below shows the compliance options modeled in the Company's Preferred Portfolio and in the 111-Compliant Baseline Portfolio and the Clean Energy Portfolio.

Table 5. 111 Compliance Options Modeled in the Santee Cooper Preferred and 111-Compliant Portfolios

	Preferred Portfolio		111-Compliant Baseline Portfolio		Clean Energy Portfolio	
Power Plant	**Retire Date (EOY)**	**111 Option**	**Retire Date (EOY)**	**111 Option**	**Retire Date**	**111 Option**
Winyah (coal)	2030	NA	2030	NA	2029	NA
Cross (coal)	None (beyond 2050)	Nothing modeled by Santee Cooper	2034	Reduce capacity factor to under 20% starting in 2030	2034	Reduce capacity factor to under 20% starting in 2030
Shared Resource	NA		NA	Reduce capacity factor to under 50% starting 2032	NA	Reduce capacity factor to under 50% starting 2032
Rainey CC	NA		NA		NA	
New CTs	NA		NA	Reduce capacity factor to 20% upon operation	NA	Reduce capacity factor to 20% upon operation
Existing CTs	Various		Various	No action required	Various	No action required

Source: Synapse analysis based on Section 111 Rules.

At Cross, I assumed that the Company would not consider CCS at this point, based on Santee Cooper's statement that it has not evaluated the cost of installing CCS[25] and based on the existence of critical constraints on storing captured carbon that limit CCS's commercial viability. I also assumed the Company would not invest in new gas pipeline infrastructure at Cross to allow the plants to co-fire on natural gas and operate through 2052. I based this assumption on the EPA pipeline extension database which shows that there is no gas pipeline at or near Cross[26] and that the projected cost of the pipeline extension and conversion cost is $1.5 billion in 2023 dollars.[27]

For the Shared Resource, the unit's modeled heat rate[28] will allow it to stay below the Section 111 Rules emissions threshold of 1,000 lb CO_2/MWh-gross,[29] provided it stays below a 50 percent capacity factor from 2032 onward. I assumed that Santee Cooper would opt for that compliance pathway over co-firing on hydrogen or installing CCS. For the Rainey gas plant, the unit can avoid any emissions requirements if it stays below a 50 percent capacity factor.[30] I assumed Santee Cooper would select that compliance option as well.

[25] Santee Cooper Response to Sierra Club Request 1-6 B, attached as Exhibit DG-09.
[26] Santee Cooper Response to ORS Request 5-8(a), attached as Exhibit DG-10.
[27] U.S. Environmental Protection Agency, Documentation for Power Sector Modeling Platform v.5.13 at Table 5-22: Cost of Building Pipelines to Coal Plants (Nov. 27, 2013), *available at* https://tinyurl.com/6wvrpxrr.
[28] Confidential Santee Cooper EnCompass Outputs.
[29] EPA 111 regulation, as summarized in *Clean Air Act Section 111 Regulation of Greenhouse Gas emissions from fossil fuel-fired electric generating units*, *available at* https://www.epa.gov/system/files/documents/2023-05/111%20Power%20Plants%20Stakeholder%20Presentation2_4.pdf.
[30] *Id.*

5. SYNAPSE'S CLEAN ENERGY SCENARIOS

Q Please describe the modeling exercise that Synapse completed relating to Santee Cooper's 2023 IRP.

A For the Synapse analysis, I also used the EnCompass capacity optimization and dispatch model to simulate resource choice and impacts in Santee Cooper's service territory. I started my analysis and scenario design with the EnCompass database created by Santee Cooper, and I implemented various updates that I will discuss below. I used the same version of the model as Santee Cooper to ensure there were no differences based on model vintage.

Q Describe the scenarios that Synapse modeled.

A Synapse modeled two scenarios and two sensitivities—all are compliant with the proposed Section 111 Rules. We also re-ran Santee Cooper's Preferred Portfolio and "Economically Optimized" Portfolio without making any modifications to validate and confirm that our model was producing identical results to Santee Cooper.

- **Santee Cooper 111-Compliant Baseline Portfolio ("111-Compliant Baseline Portfolio"):** We maintained the fixed retirement date for Winyah (year-end 2030) and online date for the new Shared Resource addition (beginning 2031) that Santee Cooper modeled in its Preferred Portfolio. We also locked in all resources that Santee Cooper locked in for its Preferred Portfolio—specifically 300 MW per year of solar PV from 2026 to 2030 and 400 MW total of BESS between 2029 and 2030. Then, to comply with Section 111 Rules, we assumed Cross reduces its capacity factor 20 percent starting in

2030 and retires by 2034. Rainey gas plant and the new Shared Resource both operate at or below 50 percent capacity factors starting in 2032. Any new CTs that come online cannot operate above a 20 percent capacity factor. I then let the model re-optimize[31] to address any changes it would need to implement based on the addition of the Section 111 requirements. I ran this scenario to compare the resulting revenue requirement of the Company's preferred retirement path for Winyah, assuming Section 111 Rules are finalized, to Synapse's Clean Energy Portfolios.

- **Synapse 111-Compliant Clean Energy Portfolio ("Clean Energy Portfolio"):** In this scenario, I removed the build limit for solar PV that Santee Cooper had used before 2030 in the Preferred Portfolio. I did not offer the model the Shared Resource or any other combined cycle gas resource options. I added in market energy purchases[32] and allowed the model to select long-duration battery storage and a clean firm energy resource. I added all known and likely environmental and sustaining capital costs for Winyah and Cross so the model could optimize the coal plant retirement decisions based on avoidable costs.[33] I also modeled all Section 111 compliance assumptions applied to the 111-Compliant Baseline Portfolio. The EnCompass model then optimized[34] the remaining clean energy resources additions and retirements.

[31] I programed in one additional CT over what the model optimized for in the production cost runs to address an unserved energy need that was not being met by the optimized portfolio.
[32] Market purchases were set at 10 percent of total energy demand in all years except one, where we increased it to 11 percent to meet an unserved energy need.
[33] Santee Cooper Response to Sierra Club Request 1-3, attached as Exhibit DG-11.
[34] I programed in one additional firm clean capacity resource over what the model optimized for in the production cost runs to address an unserved energy need that was not being met by the optimized portfolio.

- **Synapse 111-Compliant Clean Energy Sensitivity ("Clean Energy Sensitivity"):** This sensitivity is identical to the Clean Energy Portfolio except it evaluates lower capital costs for renewables, higher capital costs for the proposed Shared Resource, and higher ELCC assumptions for the 8-hour battery storage resources, consistent with levels used by neighboring Duke Energy Progress. I applied these same cost and operational adjustments to the 111-Compliant Baseline Portfolio as well to ensure a valid baseline for evaluating the sensitivity.

Q Why did you re-optimize the 111-Compliant Baseline Portfolio instead of just applying Section 111 Rules to the Preferred Portfolio as Santee Cooper designed it?

A To model the Section 111 Rules, I had to reduce the Cross capacity factors starting in the early 2030s and assume it retired by the end of 2034. I also had to reduce the capacity factors for Rainy and the new Shared Resource starting in 2032, and cap operational levels at all new CTs as soon as they come online. With these changes, the Preferred Portfolio will no longer produce sufficient generation to meet demand. This means that Santee Cooper would have to add new resources to meet load that was previously projected to be served by its fossil resources. I maintained Winyah's retirement date at the end of 2030 and the online date of the new Shared Resource in 2031 and locked in the solar and BESS that Santee Cooper locked in. I let the model re-optimize all other resource retirement and addition decisions in the new Section 111 Rules-Compliant context.

Q How do Synapse's input assumptions and model parameters compare to Santee Cooper's?

A To ensure our results were comparable to Santee Cooper's, we maintained as many of Santee Cooper's assumptions and model settings as possible in our scenarios. We did this by starting with the EnCompass modeling files provided by Santee Cooper. Specifically, we used the Company's assumptions for peak and annual energy, load shape, energy efficiency and demand-side management assumptions, reserve margin, distributed solar additions, commodity prices (fuel, CO_2, and hourly energy market prices), and resource capital costs. Table 6 below shows our sources for any input assumptions that we updated or modeled in any of the portfolios.

Table 6. Synapse Modeling Input Assumptions

Input	Main Scenario Source	Sensitivity Source
Load Forecast	Santee Cooper model	Santee Cooper model
Load Shape	Santee Cooper model	Santee Cooper model
Reserve Margin	Santee Cooper model	Santee Cooper model
Coal Prices	Santee Cooper model	Santee Cooper model
Gas Prices	Santee Cooper model	Santee Cooper model
Market Energy Imports	NREL Cambium for Clean Energy Portfolio	NREL Cambium for Clean Energy Portfolio
Onshore Wind Costs	Santee Cooper model	ATB 2023
Solar Costs	Santee Cooper model	ATB 2023
Battery Costs	Santee Cooper model	Santee Cooper model
Combined Cycle Costs	Santee Cooper model	Santee Cooper higher cost sensitivity
Combustion Turbine Costs	Santee Cooper model	Santee Cooper model
Avoidable Capital Costs	Santee Cooper response 1.3.1 Sierra Club 06162023 ELG Costs	Santee Cooper response 1.3.1 Sierra Club 06162023 ELG Costs
Heat Rates	Santee Cooper model	Santee Cooper model
ELCC Values	Santee Cooper model	Astrapé ELCC Study for Santee Cooper; Astrapé ELCC Study for Duke
Renewable Capacity Factors	Santee Cooper model	Santee Cooper model
Fossil Capacity Factors	Maximum capacity factor limit for fossil units based on proposed Section 111-Rules	Maximum capacity factor limit for fossil units based on proposed Section 111-Rules
WACC	5.25% (IRP at 8)	5.25% (IRP at 8)

** Note: Many of these input sources include voluminous spreadsheet data. As such, the input sources are not attached as exhibits to this testimony but can be provided to the Commission and properly authorized parties upon request. Any source that is not "Santee Cooper model" reflects a change from what the Company assumed.*

Q Which of Santee Cooper's inputs or assumptions most concern you?

A I am concerned about the Company's assumptions for its existing fossil resources, for new resources, and for non-company-owned resources. I will summarize my concerns here and provide a more complete background in Section 6.

Existing coal plants:

1. Santee Cooper is not testing optimized coal plant retirement dates and is instead programming retirement dates in all portfolios. By not allowing the model to make optimized retirement decisions, Santee Cooper is not providing the Commission with critical information on the most economic retirement option for ratepayers.
2. Santee Cooper is not accounting for environmental compliance costs associated with both the finalized 2020 ELG rule and the proposed 2023 Supplemental Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category (the "Proposed 2023 ELG Rule"). The compliance costs associated with the Proposed 2023 ELG Rule are avoidable at Winyah if Santee Cooper maintains its original plan to retire the plant by the end of 2028 in lieu of complying with the 2020 ELG rule.

New resources:

1. Santee Cooper is unnecessarily restricting solar builds before 2030 in its Preferred Portfolio and has provided no justification for its selected 300 MW/year limit. Results from the Company's "Economically Optimized"

Portfolio show that the model will economically add much more than 300 MW of solar PV each year if allowed.

2. Santee Cooper relies on poorly explained or justified adjustments to the National Renewable Energy Laboratory (NREL) 2022 Annual Technology Baseline (ATB) baseline assumptions to develop baseline renewable cost assumptions that are unreasonably high in today's market and therefore make renewables appear expensive.

3. Santee Cooper's projected capital cost for the new proposed Shared Resource is extremely low, and much lower than DESC used in its IRP.[35] This makes the new Shared Resource look less expensive than it likely is.

4. Santee Cooper is using a low ELCC assumption for 8-hour battery storage resources that is unsupported and out of line with ELCC values from neighboring utilities.[36] This is making 8-hour battery storage look less valuable than it actually is to Santee Cooper's system.

5. Santee Cooper did not model long-duration battery storage. Long-duration battery storage is currently available in pilot projects and is a critical firm energy resource.

For non-Santee Cooper resources:

1. Santee Cooper modeled almost no market energy purchases, despite its exceptionally high reliance on market energy in 2022 (26 percent of its

[35] Dominion South Carolina, 2023 Integrated Resource Plan, Docket No. 2023-9-E (Jan. 30, 2023), Pg. 52.
[36] *Duke Energy Carolinas and Duke Energy Progress Effective Load Carrying Capability (ELCC) Study.* Astrapé Consulting. April 24, 2022.

energy mix in 2022[37]). Market power is available to Santee Cooper in the near term and can help Santee Cooper lower energy costs.

2. Santee Cooper did not model the Central PPAs which are all but certain.[38] These non-shared resources reduce the amount of power that Santee Coper has to procure and provide to Central and therefore the amount of resources that it needs to build itself.

Q On which renewable cost assumptions did you rely?

A For renewable costs and operational assumptions, I relied on Santee Cooper's assumptions in two of my scenarios (the 111-Compliant Baseline Portfolio and the Clean Energy Portfolio) to ensure a valid comparison between the base and alternative portfolios. I then added a sensitivity that used the NREL 2023 ATB costs assumptions (in the Clean Energy Sensitivity) that are more in line with current market trends and industry data available today (relative to the assumption on which Santee Cooper relied), and also more transparent in how they were developed.

Q Why did you conduct a sensitivity with different cost and operational assumptions for renewables?

A Renewable costs are starting to come down and the regulatory bottlenecks that have slowed renewable deployment over the past several years are easing. This represents a shift in the market even from a few months ago. Additionally, Santee Cooper relied on poorly justified cost adjustors in modeling its renewable costs. For

[37] Santee Cooper 2023 IRP at 39.
[38] *Id.* at 26.

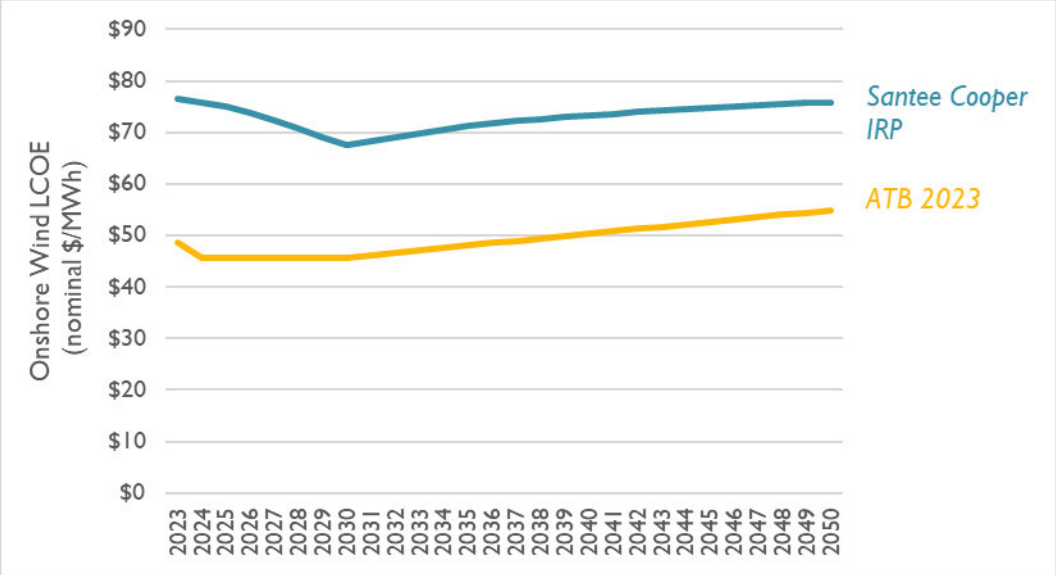
the renewable costs, I compared Santee Cooper's cost projections for solar PV, onshore wind, and battery storage to the NREL 2023 ATB. I found the Company's cost assumptions for wind especially were much higher than NREL's 2023 ATB costs across the entire study period and were too high in light of trends in falling renewable costs and movement on interconnection reform. The Company's solar PV cost assumptions showed less divergence from the NREL 2023 ATB costs over the long run, and were ultimately lower over the long term, but much higher in the near term.

Part of the reason the costs were so high was that the Company relied on arbitrary adjustments to its renewable costs of as much as 20 percent (provided without adequate justification). Santee Cooper's high renewable cost forecasts are likely explained in part by the timing of when the Company created its cost projections—when inflation and supply chain issues were still creating uncertainty in the market. Even so, I found the Company's explanation of how it adjusted its forecast up (based on NREL's 2022 ATB) for market factors to be concerning and poorly justified. For onshore wind resources in particular, Santee Cooper admitted it applied an additional 20 percent cost adder to its already adjusted NREL 2022 ATB data because it believed that was a "reasonable allowance for higher costs that may be incurred to develop such resources in South Carolina, as no such resources have yet been built in the state."[39] Adjustments such as these should be made based on economic or market and industry data rather than on the Company's belief that wind development in the region might be hard.

[39] *See,* Santee Cooper Response to Sierra Club Request 1-12, Part 2, attached as Exhibit DG-12; Santee Cooper Response to Sierra Club Request 3-3, attached as Exhibit DG-13.

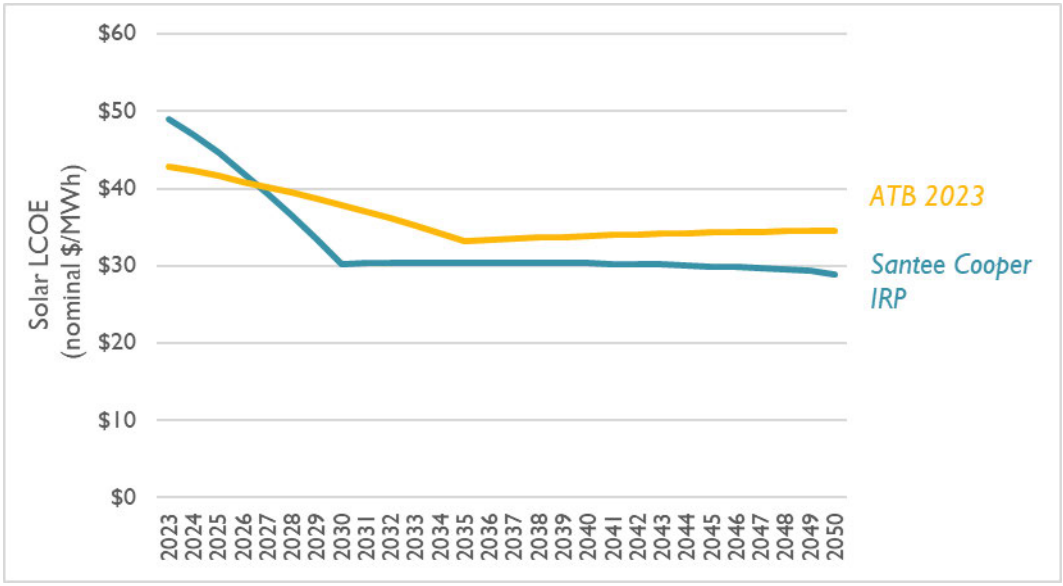
In contrast with Santee Cooper's cost assumptions, I find that the NREL 2023 ATB reasonably balances and accounts the countervailing forces of inflationary and supply chain challenges that drove up costs in the near term, and the regulations and market reforms expected to return renewable costs to pre-pandemic cost decline trajectories over the mid to long term. Figure 1 and Figure 2 below show the comparison of the costs Santee Cooper modeled for onshore wind and solar PV (which are the costs I modeled in the 111-Compliant Baseline Portfolio and the Clean Energy Portfolio) and the NREL 2023 ATB costs that I modeled in the Clean Energy Sensitivity.

Figure 1: Comparison of Santee Cooper and NREL ATB Onshore Wind Costs



Sources: NREL 2023 ATB; Santee Cooper EnCompass Inputs

Figure 2: Comparison of
Santee Cooper and NREL ATB Solar PV Costs



Sources: NREL 2023 ATB; Santee Cooper EnCompass Inputs

Q Why are you concerned about Santee Cooper's Shared Resource cost assumption?

A For the new proposed Shared Resource, I am concerned that Santee Cooper is under-representing the likely cost of building the project. The Company indicated that its capital cost estimates were based on a study it commissioned Black and Veatch to perform. Santee Cooper's team subsequently modified the study results using "up to date" vendor equipment data and generic site assumptions.[40] But these costs are substantially lower than industry-average estimates from the NREL 2023 ATB[41] and, more importantly, much lower than the costs that DESC modeled for the same Shared Resource in its recently filed 2023 IRP.[42]

[40] Santee Cooper Response to Sierra Club Request 3-5, attached as Exhibit DG-14.
[41] National Renewable Energy Laboratory, Electricity Annual Technology Baseline (ATB) 2023, *available at* https://atb.nrel.gov/electricity/2023/data.
[42] Dominion South Carolina, 2023 Integrated Resource Plan at 52, Docket No. 2023-9-E (Jan. 30, 2023).

Q Why did you test a sensitivity with higher ELCC for 8-hour BESS?

A The ELCCs that Santee Cooper relies on for 8-hour BESS are much lower than those modeled by utilities in the region. While the solar PV short-duration BESS ELCC assumptions are supported by an Astrapé Consulting ELCC study, its assumptions for wind and 8-hour BESS are not.

I reviewed the BESS ELCC study that Astrapé Consulting conducted for Duke Energy Progress (DEP) and Duke Energy Carolinas (DEC).[43] This study found that average ELCCs for 8-hour battery storage were much higher than what Santee Cooper relied on, starting at 100 percent and slowly declining before eventually flattening out at 66.9 percent with 9 GW of BESS on the Company's system. In contrast, Santee Cooper modeled all 8-hour BESS with an ELCC of only 67 percent.[44]

Q How does the retirement timeline in the Clean Energy Portfolio compare to the timeline in Santee Cooper's Preferred Portfolio?

A In the Preferred Portfolio, Santee Cooper hard-codes in the retirement of Winyah by 2031. Cross does not retire during the study period. In the 111-Compliant Baseline Portfolio, Winyah still retires by the beginning of 2031, but the retirement of Cross moves up to the end of 2034 to comply with 111(d) requirements. In the Clean Energy Portfolio, the model optimizes the retirement of Winyah by the end of 2028, and Cross retires by the end of 2034 to comply with Section 111 Rules. Table 7 below shows the coal plant retirement dates for each scenario.

[43] Astrapé Consulting, *Duke Energy Carolinas and Duke Energy Progress Effective Load Carrying Capability (ELCC) Study* (Apr. 25, 2022).
[44] Santee Cooper EnCompass Input Data, file 6.0 ELCC.

Table 7. Coal Plant Retirement Dates by Scenario (End of Year)

Unit	Preferred Plan	"Economically Optimized" Portfolio	111-Compliant Baseline Portfolio	Clean Energy Portfolio
Winyah	2030	2028	2030	2029
Cross	None	None	2034	2034

Q What drove the differences in the retirement dates across the Santee Cooper and Synapse portfolios?

A As discussed above, Santee Cooper did not economically optimize the retirement dates of Winyah and Cross in any of its portfolios. Santee Cooper timed the retirement date of Winyah in its Preferred Portfolio at year end 2030 to coincide with the DESC timeline for building a new Shared Resource. Previously, the Company tied its plan for a year-end-2028 retirement with avoiding ELG compliance costs. It is likely that the ELG rule drove its assumption of a year-end-2028 retirement date for the "Economically Optimized" Portfolio here, too.

The Clean Energy Scenario allows for the endogenous retirement of Winyah and finds year end 2028 to be the optimal retirement date. This is two years earlier than Santee Cooper is planning to retire Winyah. The model identified this retirement date based on the relative economics of continued operation of the coal plant compared to the falling cost of renewables and battery storage.

Q Based on the result of your modeling, do you recommend retirement of Winyah at year end 2028 and adding a large quantity of replacement resources all in that one year?

A Yes and no. Retirement of Winyah by year end 2028 is the most economic option, and Santee Cooper should commit to that. But the Company should adopt a more phased-in approach to its deployment of replacement resources.

First, retirement before the end of 2028 will avoid at least $200 million and likely as much as $350 million in ELG costs.[45] Retirement of Winyah in advance of 2028 will save ratepayers hundreds of millions in avoided environmental compliance costs.

Second, Santee Cooper should adopt a phased approach to replacing the capacity from Winyah, as originally planned and discussed in its prior IRP. This would involve the Company gradually deploying at least 1,500 MW of solar PV and 50 MW of BESS over the next five years to replace the plant.

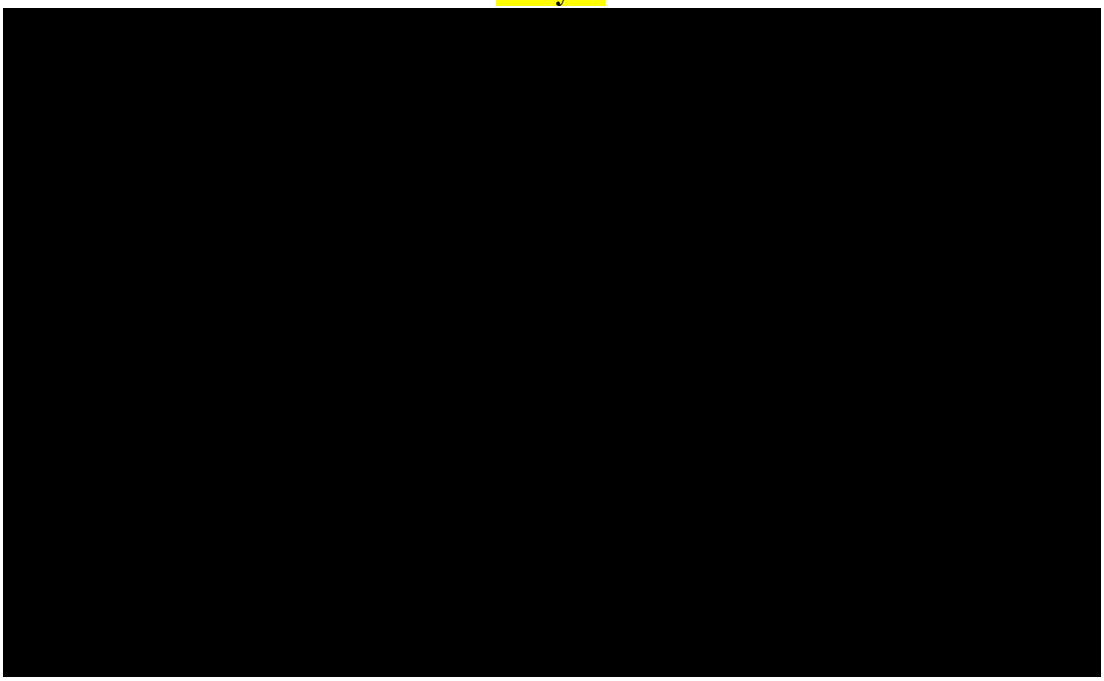
Q What are the risks of continued reliance on the Winyah and Cross coal plants?

A There are risks to reliability from continued reliance on thousands of megawatts of aging coal capacity. Confidential Figure 3 and Confidential Figure 4 show the recent historical and projected capacity factors for Santee Cooper's coal-fired power plants. What is concerning here is that at both plants Santee Cooper is projecting a large increase in utilization in the near term. At Winyah, the Company

[45] Santee Cooper Response to ORS 1-12(b), attached as Exhibit DG-15; Santee Cooper Response to Sierra Club 1-4(a), attached as Exhibit DG-16.

is projecting that utilization will nearly triple from around 20 percent historically to around [redacted] across all four units over the next eight years.

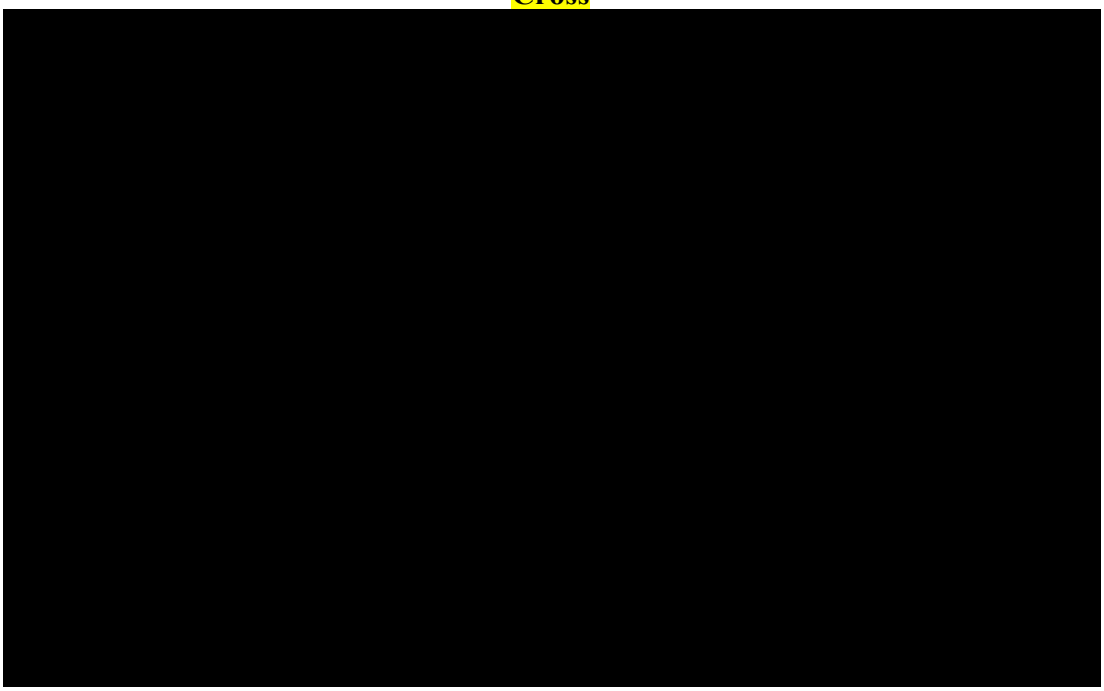
Confidential Figure 3. Historical and Projected Capacity Factors for Winyah



Source: Santee Cooper 2023 IRP, Table I-4; Confidential Santee Cooper 2023 IRP Model Outputs and Results.

At Cross, too, Santee Cooper is projecting a near term dramatic increase in utilization from around 38 percent historically to around [redacted] over the next eight years. After the new Shared Resource comes online, Santee Cooper projects Cross's utilization will drop to around [redacted].

Confidential Figure 4. Historical and Projected Capacity Factors for Cross



Source: Santee Cooper 2023 IRP, Table I-4; Confidential Santee Cooper 2023 IRP Model Outputs and Results.

Santee Cooper's projections of increasing utilization are concerning because coal units become more costly to maintain as they age and are more likely to break down and require repairs. Winyah units came online in 1975–1981 and will be over 50 years old by the time they retire. As shown in Table 8 below, outages rates at the Company's coal plants over the past five years (2018–2022) have been relatively high at some of the coal units. One unit at each plant has had an outage rate above 15 percent in at least one of the past five years. As the plants age, it is expected that they will need to be shut down more often for repairs—not less.

Table 8. Equivalent Forced Outage for Winyah and Cross

	2018	2019	2020	2021	2022	Avg.
Winyah 1	2.04%	0.54%	1.51%	1.31%	3.15%	1.71%
Winyah 2	15.67%	25.48%	0.00%	5.37%	35.50%	16.40%
Winyah 3	4.94%	6.26%	1.30%	8.52%	1.67%	4.54%
Winyah 4	10.65%	6.68%	1.00%	1.84%	4.41%	4.92%
Cross 1	14.50%	0.46%	4.93%	5.08%	2.75%	5.54%
Cross 2	5.15%	4.59%	3.26%	4.92%	3.72%	4.33%
Cross 3	17.71%	5.83%	0.91%	0.69%	1.81%	5.39%
Cross 4	0.77%	1.82%	6.99%	0.00%	8.99%	3.71%

Sources: Santee Cooper 2023 IRP at I-2.

Q How do the resource additions compare between the Preferred Plan, the 111-Compliant Baseline Portfolio and the Clean Energy Portfolio?

A The Clean Energy Portfolio adds more renewables and less gas capacity than Santee Cooper's Preferred Plan and the 111-Compliant Baseline Portfolio. Table 9 below shows total installed capacity additions as of 2052 for Preferred Plan, the 111-Compliant Baseline Portfolio, and the Clean Energy Portfolio. I also show the change in resource builds with NREL ATB costs used in place of Santee Cooper's costs; we did not test the renewable cost sensitivity for the Preferred Portfolio.

Table 9. Comparison of Total Capacity across Portfolios, 2052 (MW)

Resource Type	Preferred Portfolio	111-Compliant Baseline Portfolio	Clean Energy Portfolio
Coal	2,340	-	-
Combined Cycle	1,880	1,880	520
Combustion Turbine	1,077	2,035	630
Firm Resource	-	-	767
Nuclear	322	322	322
Landfill	25	25	25
Hydro	531	531	531
Biomass	37	37	37
Solar	3,907	4,657	6,907
DG Solar	533	533	533
Onshore Wind	1,100	3,250	2,750
Battery Storage	500	1,950	3,690
Contract Purchase	-	-	300
Central Resources		665	665
Total	12,252	15,885	17,677

Note: Preferred Plan does not include Central Resources. All Synapse modeling does include Central Resources.

In the Clean Energy Scenario, with the model allowed to economically optimize the retirement of Winyah and the relaxation of the build limits on solar, the model retires its coal plants faster and builds more clean energy resources than in Santee Cooper's Preferred Portfolio or the 111-Compliant Baseline Portfolio. When I used the NREL 2023 ATB costs assumptions, the model essentially substituted wind for solar PV and BESS part of the least-cost resource mix in the Clean Energy Portfolio. This was driven by the substantially lower wind costs in the NREL 2023 ATB.

Q How do the resource additions differ by year between the 111-Compliant Baseline Portfolio and the Clean Energy Portfolio?

A As shown in Table 10 below, the resource builds are different between the Clean Energy Portfolio and 111-Compliant Baseline Portfolio.

Table 10. Annual Incremental Capacity Additions (MW) by Resource Type[46]

	111-Compliant Baseline Portfolio				Clean Energy Portfolio			
Year	Firm Capacity Resource	Solar PV	Wind	BESS	Firm Capacity Resource	Solar PV	Wind	BESS
2026	-	300	-	-	-	1,500	-	50
2027	-	300	-	-	-	-	50	-
2028	-	300	-	-	-	-	-	-
2029	-	300	-	350	-	900	800	550
2030	256	300	2,700	50	256	250	1,150	-
2031	1,360	-	-	-	-	-	-	-
2032	-	500	-	-	-	300	450	-
2033	-	-	-	-	-	150	-	-
2034	-	100	-	-	511	-	-	170
2035	1,150	950	150	250	511	1,700	-	2,200
2036	-	100	-	-	-	300	-	50
2037	-	-	-	-	-	-	-	40
2038	-	150	50	50	-	100	-	40
2039	-	-	-	50	-	150	-	40
2040	-	100	-	50	-	100	-	50
2041	-	150	100	50	-	150	-	40
2042	-	50	-	50	-	150	100	40
2043	-	100	-	100	-	-	-	40
2044	-	250	-	150	-	200	50	30
2045	-	50	50	50	-	150	-	70
2046	-	250	-	150	-	250	-	30
2047	-	-	-	100	-	-	50	30
2048	-	100	100	50	-	100	50	50
2049	-	150	100	100	-	-	-	40
2050	-	100	-	150	-	400	-	50
2051	-	-	-	100	-	-	-	40
2052	-	50	-	100	-	50	50	40

[46] I modeled a CT as a placeholder for a firm capacity resource because the costs and operational characteristics of CTs are relatively well known. We anticipate, however, that Santee Cooper will have access to an increasing array of technologies capable of providing firm capacity without the environmental impacts and fuel considerations of gas CTs.

	111-Compliant Baseline Portfolio				Clean Energy Portfolio			
Year	Firm Capacity Resource	Solar PV	Wind	BESS	Firm Capacity Resource	Solar PV	Wind	BESS
Total	**2,765**	**4,650**	**3,250**	**1,950**	**1,278**	**6,900**	**2,750**	**3,690**

In the original Santee Cooper Preferred Portfolio, the Company hard-coded in all near-term resource additions. This includes the 1,360 MW Shared Resource, 1,500 MW of solar PV by 2030, and 400 MW of BESS in 2029 and 2030. The model added the remaining 2,400 MW of solar PV, 1,100 MW of onshore wind, and 100 MW of BESS based on economic optimization from 2032–2052.

In the 111-Compliant Baseline Portfolio, I programmed in all Preferred Portfolio resources that the Company added prior to 2031, and let the model re-optimize the remaining resource additions for Section 111 compliance. The model added a total of 1,500 MW of solar PV, 400 MW BESS, 256 MW of firm capacity, and 2,700 MW of onshore wind by 2030. The model also added the Shared Resource in 2031. To replace Cross when it retires in 2035, the model adds 1,150 MW of CTs, 950 MW of solar PV, 150 MW of onshore wind and 250 MW of BESS. The model added a total of 4,650 MW of solar PV, 3,250 MW of onshore wind, 1,950 MW of BESS, and 2,765 MW of firm energy resources by the end of the study period.

In the Clean Energy Scenario, the model added 2,400 MW of solar PV, 2,000 MW of wind, 600 MW of BESS and 256 MW firm capacity resources prior to 2031 using Santee Cooper's cost assumptions. To replace Cross when it retires in 2035, the model adds 2,200 of BESS, which includes 1,000 MW of 50-hour battery storage. The model also adds 1,700 MW of solar PV and 511 MW of firm

capacity resources. By 2052, the model added a total of 6,900 MW of solar PV, 2,750 MW of onshore wind, 1,278 MW of clean firm resources, and 3,690 MW of battery storage. This is 2,250 MW more solar PV and 1,740 MW more battery storage than in 111-Compliant Baseline Portfolio.

Figure 5 and Figure 6 below show the installed capacity for the 111-Compliant Baseline Portfolio and the Clean Energy Portfolio.

Figure 5. 111-Compliant Baseline Portfolio Nameplate Capacity by Resource Type

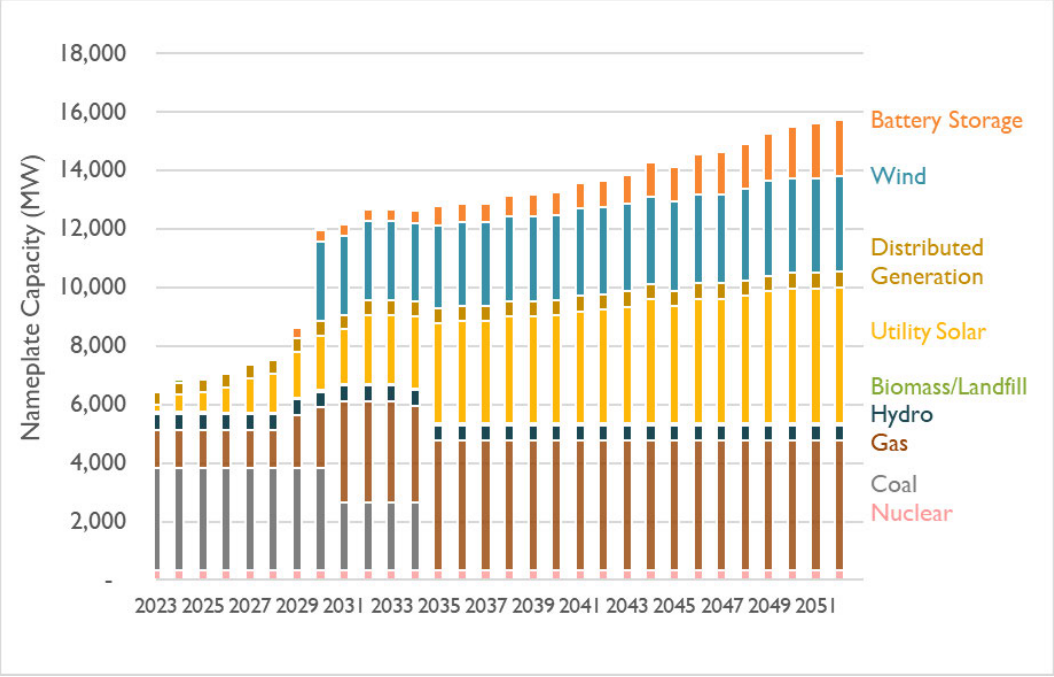
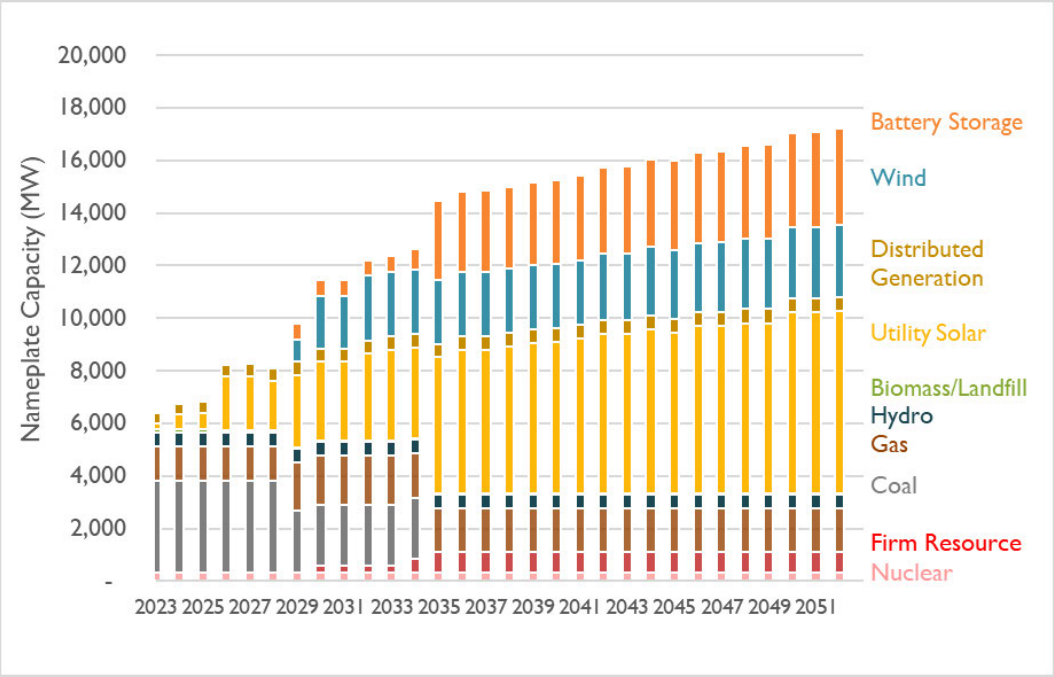


Figure 6. Clean Energy Portfolio Nameplate Capacity by Resource Type



Q Why did the model add so many resources all in one year in the Clean Energy Portfolio while resource additions were staggered in the Preferred Portfolio?

A In the Clean Energy Portfolio, the model sees solar PV costs falling until around 2030, when they begin to flatten out. Based on that cost trajectory, and the model's foresight, the model opts to wait until it has a capacity need to begin building out solar PV. This is not necessarily the best option for Santee Cooper.

Proactive planning and action preserves optionality. In this case, beginning to bring solar PV online immediately is a low-to-no-regrets option. It gives the Company more options and flexibility in retiring Winyah and doesn't lock it into continued reliance on the plant beyond the end of 2028. Acting sooner also reduces risk to the Company that replacement resources won't be available in time given the reality in the market today that project timelines can be hard to predict, and

delays can happen. Phasing in solar development also can protect ratepayers from price volatility of existing fossil resources that the Company would have to continue relying on in the even that replacement resource timelines are delayed. All of these factors are not fully captured in the scenarios I modeled (fuel and market price volatility can be captured in the model with additional model runs). Santee Cooper recognized the benefits of staggering its resource additions in its Preferred Portfolio. The only problem is that it limited annual additions each year to too low a cap (300 MW/year).

Q How did generation levels by resource type differ between the 111-Compliant Baseline Portfolio and the Clean Energy Portfolios?

A Generation levels for Cross are relatively similar in both the 111-Compliant Baseline Portfolio and Clean Energy Portfolio. This is because coal generation levels are capped at 20 percent in both portfolios starting in 2032 and all coal plants are assumed to retire by 2034 to comply with Section 111 Rules. This is in contrast with the Santee Cooper Preferred Plan where coal generation continues throughout the entire study period, with Cross Units 3 and 4 maintaining relatively capacity factors (just below 60 percent) for the last few decades of the study period.

In the 111-Compliant Baseline Portfolio, gas generation levels are substantially higher than in the Clean Energy Portfolio. This is because the 111-Compliant Baseline Portfolio has both the Rainey CC and the Shared Resource operating throughout the study period. In the Clean Energy Portfolio, Santee Cooper only has the Rainey CC.

In the Clean Energy Portfolio, solar and wind generation ramps up starting in 2029 when Winyah retires and continues to ramp up throughout the study period. In the 111-Compliant Baseline Portfolio, solar and wind generation ramp-up is delayed until after 2030, and the ramp-up is smaller due to the addition of the Shared Resource. Although the 111-Compliant Baseline Portfolio continues to deploy renewables throughout the study period, generation levels are below those seen in the Clean Energy Portfolio. This trend of increasing renewable generation is even more pronounced for Clean Energy Portfolio when I use the more realistic and up-to-date NREL 2023 ATB costs in place of the Santee Cooper's resource costs. Figure 7 and Figure 8 below show the generation results of the 111-Compliant Baseline Portfolio and the Clean Energy Portfolio.

Figure 7. 111-Compliant Baseline Portfolio Generation by Resource Type

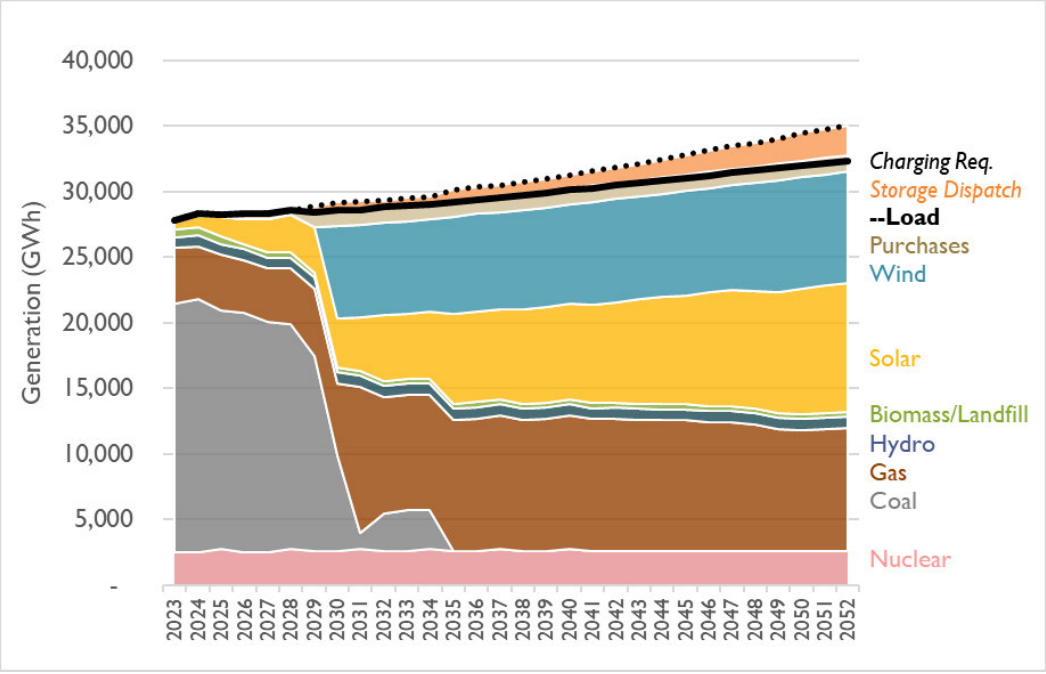
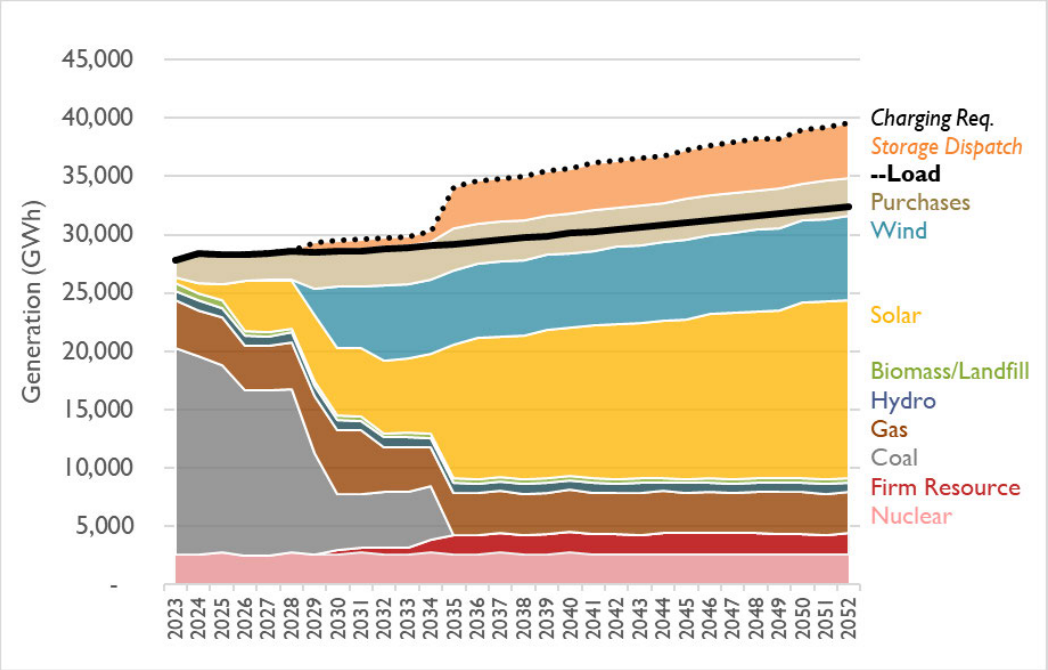


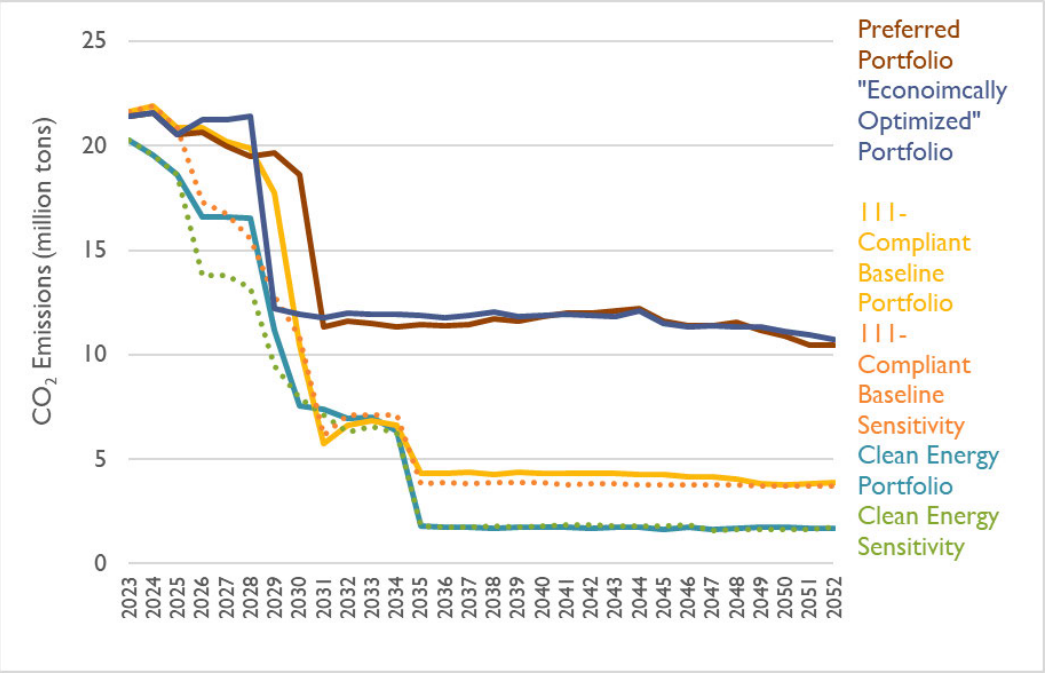
Figure 8. Clean Energy Portfolio Generation by Resource Type



Q How did CO_2 emissions compare between the 111-Compliant Baseline Portfolio and the Clean Energy Portfolios, and the original Santee Cooper Preferred Portfolio?

A As shown in Figure 9, CO_2 emissions were lower in both the 111-Compliant Baseline Portfolio and the Clean Energy Portfolio relative to the Preferred Portfolio. The Clean Energy Portfolio sees lower emissions than the 111-Compliant Baseline Portfolio —particularly after 2029, when solar, wind, and storage capacity increase faster than in the 111-Compliant Baseline Portfolio. Santee Cooper's emissions fall even lower especially in the near in the sensitivity cases where the NREL ATB costs are used for new solar PV and wind resources.

Figure 9: Santee Cooper Greenhouse Gas Emissions by Modeled Scenario



Q How did the revenue requirement and total system costs compare between the Santee Cooper 111-Compliant Baseline Portfolio and the Compliant Clean Energy Portfolio?

A The total cost to ratepayers is similar in both scenarios, as shown below in Table 11. The revenue requirement difference between the Santee Cooper 111-Compliant Baseline Portfolio and the Synapse 111-Clean Energy Scenario widens with lower clean energy costs. In the NREL ATB cost sensitivities, clean energy portfolios become even more economic compared with Santee Cooper's Baseline Portfolio, demonstrating the risk of deploying solar and battery storage too slowly.

Table 11. NPV for Synapse Portfolios and Sensitivities

Scenarios	NPV, 2052	Delta ($B)	Delta (%)
111-Compliant Baseline Portfolio	$26.14	-	
Clean Energy Portfolio	$25.98	-$0.17	-0.6%
111-Compliant Baseline ATB Sensitivity Portfolio	$24.36	-	
Clean Energy Portfolio ATB Sensitivity	$24.03	-$0.33	-1.4%

Q What should the Commission take away from the Synapse modeling?

A Based on the proposed Section 111 Rules to limit greenhouse gases from carbon emitting resources, it is more economic for Santee Cooper to retire Winyah by year end 2028 and replace it with renewables and battery storage than keep it online another two years, incur substantial ELG compliance costs, and then replace it with a large gas plant that itself will be limited in operation. Further, I find that a clean energy portfolio that retires the Cross coal plant as well by 2035 and replaces it with a combination of renewables, long and short-duration BESS is cost-competitive and lower risk than the Company's current plan to keep many of its fossil units online beyond 2050. Assuming clean energy costs continue to fall, and interconnection queue back-ups are cleared, the savings to Santee Cooper ratepayers from investing in renewables will grow even larger.

Q What are your recommendations on unit retirements?

A Santee Cooper should retire Winyah as soon as possible, but no later than the end of 2028 to avoid ELG compliance costs. The Company should also retire Cross no later than the end of 2034 to comply with Section 111 Rules. Doing so will allow Santee Cooper to avoid incurring ongoing operations and maintenance costs

(O&M), sustaining capital costs, and environmental compliance costs at its aging fossil units—and allow it to invest instead in new clean energy resources.

Q What are your recommendations on new resource additions?

A Santee Cooper should issue All Source RFPs and begin to procure solar PV, onshore wind, and BESS to meet Santee Cooper's load and allow the immediate retirement of Winyah. Higher renewable costs over the past few years did slow the pace of renewable deployment, but costs are now falling and barriers to deployment are lifting. Synapse's analysis shows that Santee Cooper needs to be planning for the retirement of Winyah immediately (no later than 2028) and Cross in the next decade, and to do that it needs to start procuring clean energy replacement resources as soon as possible.

6. ECONOMIC AND REGULATORY FACTORS IMPACTING THE IRP

Q Explain Santee Cooper's Plan to build a Shared Resource with DESC.

A In both Santee Cooper's 2023 IRP and DESC's 2023 IRP, the companies discuss their plans to develop a Shared Resource. This proposal is concerning for Santee Cooper ratepayers because it seems to be driving the delay in Winyah's retirement. Specifically, Santee Cooper had been planning for a much earlier retirement date for Winyah during all prior resource planning exercises, board meetings, permit applications, and statements to the press.[47] But now, with the option to share a resource with DESC, it has pushed back Winyah's retirement date to align with

[47] *See e.g.*, Exhibits DG-2, DG-3.

DESC's resource needs. Keeping Winyah online solely to accommodate the Shared Resource is not in the best interest of Santee Cooper's ratepayers.

Q Explain your concerns with the cost assumptions that Santee Cooper relied on for the new Shared Resource.

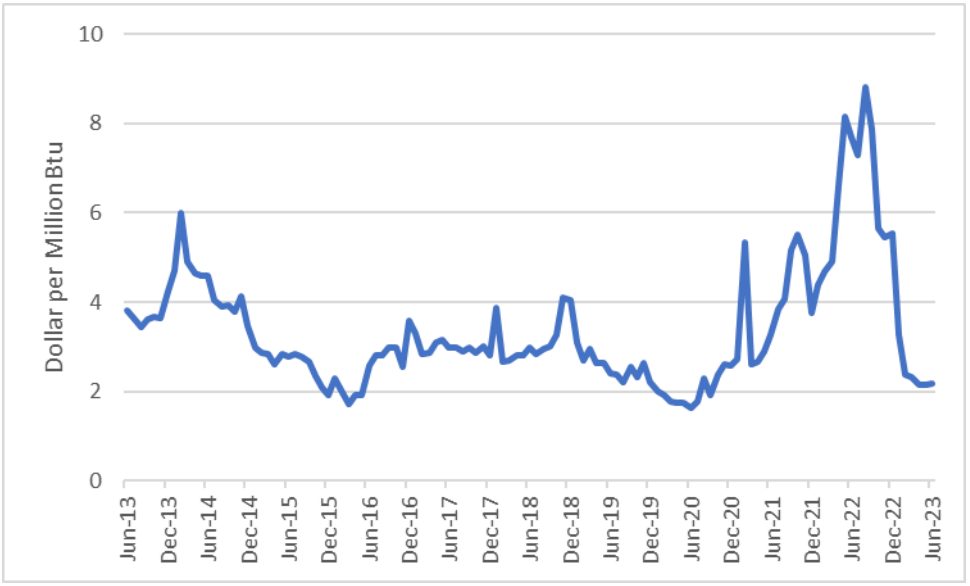
A As discussed above, the cost assumptions that Santee Cooper relied on for the new Shared Resource are below industry-average projections and below the capital cost estimate that DESC itself used in its 2023 IRP. This is concerning because when utilities underestimate the cost for new resources in their initial applications of analyses, it's still the final higher costs that ratepayers are stuck with (unless the Commission has instituted a cost cap on the project). In the case of the Orange County Advance Power Stations in Texas, for example, Entergy initially estimated the 1,215 MW project would cost $1.19 billion which works out to only $979/kW. But the project cost estimate went up to $1.37 billion ($1,128/kW) between the time the application was filed, and the hearing was held. The Administrative Law Judge for the case recommended a cost cap of $1.37 billion. This cost cap was ultimately removed in the final order. The most recent cost range in the final order on rehearing was between $1.58 billion–$2.5 billion ($1,130/kW - $2,058/kW) an increase of between 33 and 110 percent relative to the Company's original cost estimate in its application.[48] Santee Cooper's capital cost estimates for the Shared Resource are lower than even the low end of the cost range seen at Orange County.[49]

[48] Order on Rehearing at 1-3, Docket No. 52487 (Pub. Util. Comm'n of Tex. Jan. 12, 2023), *available at https://interchange.puc.texas.gov/search/documents/?controlNumber=52487&itemNumber=517*.
[49] Dominion South Carolina 2023 IRP at 52.

Q Are there risks to Santee Cooper's reliance on a large gas-fired resource?

A Yes. Natural gas is a global commodity, and gas prices are inherently volatile. Although gas prices have come down this year, they reached record highs last year when global supplies tightened due to the war in Ukraine. Continued reliance on a large, gas-fired resource subjects Santee Cooper ratepayers to continued volatility. Figure 10 below shows how volatile natural gas prices have been over the past decade.

Figure 10. Henry Hub Gas Spot Prices over the Past Decade



Source: *Henry Hub Natural Gas Sport Market Prices*, U.S. Energy Information Administration (July 21, 2023), *available at* https://www.eia.gov/dnav/ng/hist/rngwhhdm.htm.

Q Explain Santee Cooper's relationship with Central.

A Santee Cooper provides power to Central under the terms of the Coordination Agreement. Central has all-requirements power agreements with 20 member cooperatives, and Santee Cooper generally supplies the total power and energy to

the 15 members who are connected to the Combined System.[50] Any amount of power that Central purchases directly from the Southern Power Administration of the U.S. Department of Energy (SEPA), from Central's non-shared resources (NSR) and from alternative purchases generally reduces the supply required from Santee Cooper.[51] Each party is responsible for the fixed costs and fuel costs associated with the NSRs they use to supply their own load.

Q Explain the Central PPAs and how they relate to the proposed Shared Resource and Santee Cooper's larger system.

A The Central PPAs are considered NSRs. Central has indicated its intention to opt out of the proposed Shared Resource and has procured these NSRs as an alternative to Santee Cooper's proposed Shared Resource.[52] But there are several things about the Central PPAs that made them challenging to incorporate into the 2023 IRP planning process.

First is the timing. During Santee Cooper's IRP process, Central announced its decision to enter into three PPAs. Two of the contracts were executed and a third was awaiting counterparty approval. The biggest outstanding risk facing Central was procuring sufficient transmission rights to deliver the power to the Santee Cooper Balancing Authority.[53]

[50] Duke Energy Carolinas serves the remaining five Central members.
[51] Santee Cooper 2023 IRP at 50.
[52] *Id.* at 26.
[53] *Id.* at 27.

Second is the lack of full information on the PPAs. Central declined to provide full information on the cost and emission profiles of the PPAs due to its stated obligations under non-disclosure agreements with the projects.[54]

Third is the impact these PPAs would have on Santee Cooper's resource planning decisions. These PPAs would provide a large amount of the NSRs that Central is obligated to provide. But because the resources are not located within the Santee Cooper Balancing Authority, Central has to also procure firm transmission rights to bring the power into the Santee Cooper Balancing Authority.[55] The PPAs would be considered "Pooled Resources", meaning that Santee Cooper would dispatch them to meet "Pooled Load" without respect for ownership. The baseload resource would be scheduled on a must-run basis, and the other two would be scheduled on a day-ahead basis. None would be available to be dispatched real-time.[56]

Fourth, the Central PPAs and Central's opting out of the Shared Resource makes cost allocation for the purposes of an IRP revenue requirement tricky.

Q Did Santee Cooper include the Central PPAs as part of its Preferred Portfolio?

A No. Santee Cooper only modeled the Central PPAs in a single scenario. Synapse, however, included them in all our scenarios given our understanding that two out of the three are already under contract, and therefore they are likely to be part of Santee Cooper's system during the planning period.

[54] Central Electric Cooperative Response to Santee Cooper Interrogatory 2-1, attached as Exhibit DG-17.
[55] Santee Cooper 2023 IRP at 25-26.
[56] Santee Cooper Response to ORS request 5-11, attached as Exhibit DG-18.

Q Explain the ELG compliance costs that are potentially avoidable with an early Winyah retirement.

A In August 2020, the EPA finalized a rule revising the regulations for Steam Electric Power Generating units (2020 ELG Rule).[57] The compliance deadline for the 2020 ELG Rule is the end of 2025. Then, in March 2023, the EPA proposed a supplemental rule to further strengthen wastewater discharge standards and implement zero-discharge limitations for all flue gas desulfurization (FGD) wastewater.[58] This rule is not yet final.

In its 2023 IRP, Santee Cooper acknowledges that pushing back Winyah's retirement date from year end 2028 to year end 2030 requires it to upgrade the station to comply with the 2020 ELG rule.[59] When asked if the Company had considered issuing an RFP to procure resources or short-term capacity to come online in 2029, which would avoid the need to make the 2020 ELG investments, the Company responded that due to both the capacity and transmission requirements it would be costly and could not be completed by 2029.[60] Santee Cooper went on to state that to meet the compliance deadline of December 31, 2025, it had to begin work in March 2023, prior to when it completed its IRP.[61]

What is concerning is that the $150 million in 2020 ELG costs were fully avoidable had Santee Cooper acted sooner to procure replacement resources. Santee Cooper progressively changed Winyah's planned retirement date from a phase-out

[57] 85 Fed. Reg. 65640 (Oct. 13, 2020); see also 40 C.F.R. §§ 423.13(g)(1)(i), (h)(1)(i), (i)(1)(i), (k)(1)(i); see also 40 C.F.R. § 423.11(t).
[58] 88 Fed. Reg. 18824 (Mar. 29, 2023).
[59] Santee Cooper 2023 IRP at 24.
[60] Santee Cooper Response to ORS Request 1-11 B and C, attached as Exhibit DG-19.
[61] Exhibit DG-19.

plan starting in 2023 and ending in 2027 in its 2020 IRP (and the 2019 Santee Cooper Reform Plan), to the end of 2028 in its "Economically Optimized" Portfolio and then to end of 2030 in the Preferred Portfolio in the current IRP. This delay significantly increased the Company's environmental compliance obligations. Santee Cooper is projected to incur nearly $350 million in ELG costs for just an additional two years of operation at Winyah—an unreasonable and imprudent use of ratepayer money. That includes around $150 million in ELG at Winyah to comply with the 2020 ELG Rule[62] and an estimated $200 million in costs it will very likely incur in the future to comply with the proposed 2023 ELG Rule.[63]

Q Explain the trends you are seeing in falling renewable costs today.

A A report published by LevelTen Energy on July 17, 2023, found that solar power purchase agreement prices fell by around 1 percent (in aggregate) across the United States in the second quarter of 2023, following three years of large price increases. The report goes on to state that the aggregate 1 percent decline is actually composed of much larger declines in most parts of the country and was skewed upward by a 14 percent price jump in Texas due to its unstable legislative climate.[64] Thus, for non-Texas regions in the aggregate, the price decline is greater than 1 percent.

Q Should the Commission take this trend into consideration?

A Yes, absolutely. As has been seen in previous trajectories of clean energy technology costs, underlying fundamental drivers of lower real costs for solar, wind, and battery energy storage arise from economies of scale, scope, and

[62] Exhibit DG-11, Attachment 1.3.1 Sierra Club 0616203 ELG costs.xls.
[63] Exhibit DG-16.
[64] Emma Penrod, Solar PPA prices drop for first time since onset of COVID-19: LevelTen, Utility Dive (July 18, 2023), *available at* https://tinyurl.com/bdcy4u98.

improvements in technologies. The trend of lower costs for these resources is re-establishing prominence over the shorter-term disturbances seen in the cost trends that arose from the aftermath of the pandemic and related supply chain pressures and inflationary increases.

Q Explain the recent generation interconnection reform.

A On July 27, 2023, the Federal Energy Regulatory Commission (FERC) issued an order on Improvements to Generators Interconnection Procedures and Agreements. This order adopts reforms to (1) implement a first-ready, first-served cluster study process; (2) speed up interconnection queue processing; (3) incorporate technological advancements into the interconnection process; and (4) establish an effective date and a transition process.[65] These reforms are expected to alleviate the interconnection backlogs and speed up project approval timelines in the future.

Q Explain your concerns with the ELCC study and assumptions on which Santee Cooper relied.

A Santee Cooper had Astrapé Consulting conduct a Reserve Margin and ELCC study. In this study, Astrapé Consulting evaluated the amount of dependable capacity that could be counted on from a renewable portfolio for resource adequacy purposes.[66] This study evaluated solar PV and BESS both individually and combined in portfolios. The ELCC study did not evaluate onshore or offshore wind, or longer

[65] Federal Energy Regulatory Commission, Fact Sheet: Improvements to Generators Interconnection Procedures and Agreements (July 27, 2023), *available at* https://tinyurl.com/nhjhhjpc.

[66] Astrapé Consulting, *Santee Cooper Reserve Margin and Effective Load Carrying Capability (ELCC) Study* (Mar. 30, 2023), *available at* https://www.santeecooper.com/About/Integrated-Resource-Plan/Reports-and-Materials/Santee-Cooper-Reserve-Margin-ELCC-Study-Report-Updated.pdf.

duration BESS. Therefore, these assumptions are not grounded in current, regionally specific analysis.

Q Explain the role of market energy purchases in Santee Cooper's system and your concerns with the Company's regional assumptions.

A Energy purchases are part of Santee Cooper's daily energy purchases strategy, but not part of its resource planning strategy. Specifically, when asked about market energy purchases the Company states that it monitors energy markets to determine if it is more cost-effective to purchase power from the market rather than generate it itself through its own generation.[67] But when asked why the Company modeled no market energy purchases in the IRP, Santee Cooper stated that it only modeled firm resources. The Company went on to state that it does not plan for economy market purchases to meet long-term load requirements, and instead views economy purchases just as short-term opportunities to manage energy costs.[68]

While it is reasonable for Santee Cooper to not plan around an outsize reliance on the market, it is also reasonable to plan for at least *some* market energy purchases, especially in the near term where surplus regional supply is more predictable. In 2022 alone, Santee Cooper obtained 26 percent of its energy from economy market purchases.[69] As a rule of thumb, it is generally acceptable for a utility to plan for around 10-15 percent of its energy from market purchases.[70]

[67] Santee Cooper Response to Sierra Club Request 2-1, attached as Exhibit DG-20.
[68] Santee Cooper Response to Sierra Club Request 3-7(a) and (b), attached as Exhibit DG-21.
[69] Santee Cooper 2023 IRP at 39.
[70] Based on my experience participating in numerous utility resource planning dockets, 10-15 percent is generally discussed as a reasonable amount to plan around.

Q What are your main takeaways from this IRP and the resource planning modeling the Company performed?

A Santee Cooper is deviating from all its prior analyses and planning by opting to keep Winyah operating for at least two years more than necessary. In doing so, Santee Cooper is incurring over $300 million in avoidable ELG investment costs. These are costs that Santee Cooper should not have to pay if the Company retires and replaces Winyah by the end of 2028. Santee Cooper is also bringing online a large new gas resource that will lock its system into a volatile fuel source for the next several decades, or else become a stranded asset.

Q Does this conclude your testimony?

A Yes.