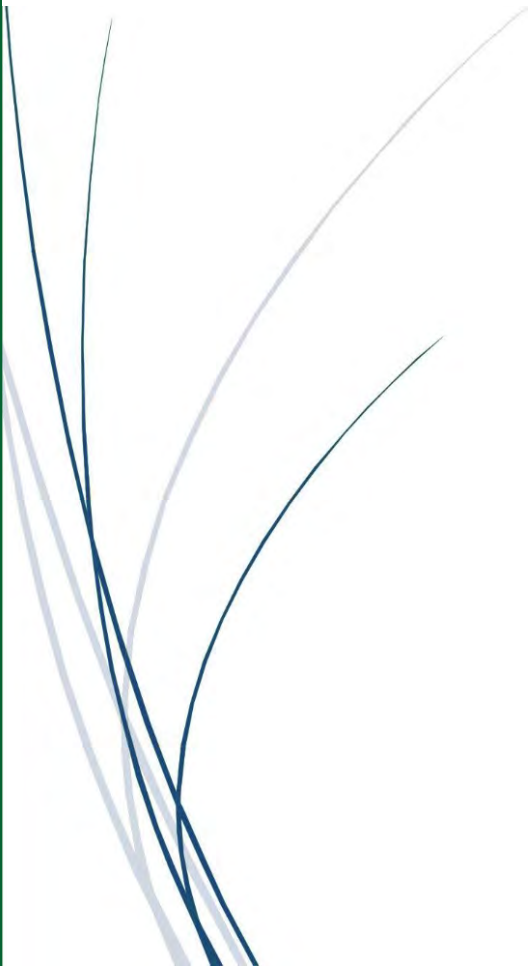


12/23/2020

# Santee Cooper 2020 Integrated Resource Plan



December 23, 2020

**VIA ELECTRONIC FILING**

Ms. Dawn Hipp  
Chief Operating Officer  
Office of Regulatory Staff  
1401 Main Street, Suite 900  
Columbia, SC 29201

RE: Integrated Resource Plan (2020) of the South Carolina Public Service Authority

Dear Ms. Hipp,

Santee Cooper is pleased to submit the attached 2020 Integrated Resource Plan Report of the South Carolina Public Service Authority (Santee Cooper). At the direction of the Executive Director of the Office of Regulatory Staff, Santee Cooper is submitting through you the attached report for consideration by the State Energy Office of South Carolina. This 2020 IRP Report documents analyses prepared by and plans developed by Santee Cooper in accordance with Section 58-37-40 of the South Carolina Code to develop a long-term plan of loads, resources, needs, and costs for the Santee Cooper system. Through its 2020 IRP, Santee Cooper has identified a twenty-year plan for a diverse and reliable portfolio of resources that incorporates innovative technologies, improves operating efficiency, and reduces environmental impacts for the benefit of Santee Cooper's retail and wholesale customers.

In developing its 2020 IRP, Santee Cooper recognizes that Section 11 of Act 135 of the General Assembly prohibits Santee Cooper from certain activities with respect to constructing new facilities, among other things. In light of such prohibition, Section 8 of this report, Short-Term Action Plan, identifies a list of activities in which Santee Cooper is currently engaged to advance its 2020 IRP, to the extent permitted by Act 135, and a list of future activities, some of which may require that Santee Cooper seek review and approval under Act 135. Santee Cooper has developed an IRP that both respects the limitations put in place by Act 135 and uses industry-accepted practices to describe a long-term resource plan that can reliably and economically serve the customers of Santee Cooper through the implementation of a diverse, flexible, innovative, and environmentally responsible portfolio of resources.

It should also be noted that Santee Cooper prepared its 2020 IRP subsequent to the execution of Act 135 on May 18, 2020, resulting in a compressed schedule for IRP development. While Santee Cooper engaged with Central Electric Power Cooperative throughout the development of its 2020 IRP, time did not permit engagement of other Santee Cooper customers or community stakeholders. Santee Cooper intends to develop and execute a stakeholder engagement process as part of its next IRP filing. As Santee Cooper continues to develop its IRP process, we look forward to working with the Energy Office to obtain its advice and consultation.

If you have any questions, please do not hesitate to contact me.

Sincerely,



Charlie Duckworth  
Deputy CEO & Chief Planning & Innovation Officer

cc: Nanette S. Edwards, Executive Director, Office of Regulatory Staff

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# Section 1

## Executive Summary

Santee Cooper is South Carolina’s state-owned electric and water utility, created in 1934 as a rural electrification and public works project. Santee Cooper’s primary business is the production, transmission, and distribution of electrical energy, both at wholesale and retail, to serve approximately two million South Carolinians in all 46 counties of the State. Territorial load requirements for 2019 totaled 23,644 gigawatt-hours, with a winter peak demand of 4,583 megawatts. Santee Cooper currently meets its typical winter peak load requirements with firm power supply from its own generating resources totaling 5,338 megawatts and firm power contracts totaling 471 megawatts. Santee Cooper’s current mix of resources is depicted in Table 1-1.

**Table 1-1**  
**Current Santee Cooper Power Supply Resources**

	Winter Capability (MW)	Percent of Total
Coal	3,530	60.8
Natural Gas and Oil	1,315	22.6
Nuclear	322	5.5
Owned Hydro Generation	142	2.5
Landfill Methane Gas	29	0.5
Solar <sup>(1)</sup>	<u>0</u>	<u>0.0</u>
Total Owned Resources	5,338	91.9
Purchases <sup>(1)</sup>	<u>471</u>	<u>8.1</u>
Total Resources	5,809	100.0

(1) Santee Cooper currently owns or purchases approximately eight megawatts of solar resources (nameplate capacity) that do not contribute firm capacity at the time of the winter peak.

Beginning with its Reform Plan submitted to the Department of Administration in November 2019 pursuant to Act 95 of the General Assembly and continuing through this 2020 Integrated Resource Plan (2020 IRP), Santee Cooper is committed to implementing a power supply roadmap to achieve a more diversified and environmentally sustainable power supply portfolio. To reach its goals, Santee Cooper has adopted the following resource planning principles.

- **Reliability:** Operate and plan the Santee Cooper system to ensure that all retail and wholesale customers are provided reliable electric power — reliability is the number one product of any electric utility
- **Customer Focus:** Provide safe, reliable, and affordable power, and provide customers with new opportunities as markets change
- **Cost Management:** Develop resource plans that provide effective cost management over the long-term

- **Environmental Stewardship:** Responsibly manage the environmental impact of Santee Cooper operations
- **Long-Term View:** Develop a long-term resource strategy to ensure flexibility and optionality over a wide range of possible future conditions
- **Reduce Financial and Planning Risk:** Develop resource plans that readily adapt as future conditions change and, when possible, add resources in increments that closely match resources to needs
- **Embrace Innovation:** Identify potential developing technologies and incorporate in resource plans when reasonable and cost-effective
- **Transparency:** Engage customers, stakeholders, Board Members, and elected officials in a transparent resource planning process that is responsive to questions and input

Overall, Santee Cooper’s goal is to create a diverse and reliable portfolio of resources that incorporates innovative technologies, improves operating efficiency, reduces environmental impacts, and results in lower overall cost. Santee Cooper’s roadmap to transform its power supply portfolio represents a dramatic evolution from a coal-heavy generating portfolio to one more dependent on sustainable and lower-emitting resources. Additionally, the power supply roadmap incorporates significant flexibility to address changing future market conditions and to minimize Santee Cooper’s capital spending.

Initially, Santee Cooper is focused on the following strategic directions for its future power supply plans.

- Retire coal resources to the extent cost-effective
- Increase utilization of resources that reduce environmental impacts
- Plan for a diversified, low-cost resource portfolio
- Increase solar resource implementation
- Incorporate advanced technologies like battery energy storage
- Encourage demand-side management and demand response implementation
- Ensure system reliability

Through this 2020 IRP, Santee Cooper has identified a power supply roadmap that will transform its power supply portfolio to achieve these strategic initiatives. This plan, the Preferred Resource Plan, as summarized below and described more fully in Section 7 of this report, was developed based on the assumptions, results, and conclusions of the analyses conducted for this 2020 IRP and is intended to depict a reasonable representation of future resource development for Santee Cooper. However, other than the initiatives outlined in Section 8, Short-Term Action Plan, Santee Cooper has not made any final decisions with respect to specific resources or development of specific generation sites.

Central Electric Power Cooperative (Central) participated throughout the development of Santee Cooper’s 2020 IRP. Central’s staff and its experts participated in numerous meetings to develop key assumptions, identify relevant scenarios, and review preliminary and final results.



The Preferred Resource Plan includes the following.

- Retire 1,150 megawatts of coal resources at the Winyah Generating Station through a phased approach (idling Unit 4 by the winter of 2020/2021, idling Unit 3 by the winter of 2021/2022, and fully retiring all four Winyah coal units by 2027)
- Add 500 megawatts of new solar resources by 2023 through a request for proposals process (amount permitted by Act 135), and plan for an additional 1000 megawatts of solar resources by 2032
- Add 200 megawatts of utility-scale battery storage to the Santee Cooper system in phases (50 megawatts by 2026, 100 megawatts by 2033, and 200 megawatts by 2036)
- Incorporate new natural gas resources into the portfolio, including: adding 552 megawatts of capacity from a combined cycle resource targeted for 2027, identifying opportunities for long-term purchases to flexibly meet future load growth and resource need, and engaging in market energy purchases, when economic, to further diversify power supply
- Implement demand response programs, consisting of direct load control, voltage control, and other measures, to avoid approximately 85 megawatts of winter peak load by 2027, increasing to 106 megawatts by 2034
- Ensure system reliability by upgrading the transmission system to accommodate resource additions and adding quick-start peaking generating resources near the Santee Cooper retail load centers

With these changes, the Preferred Resource Plan would change Santee Cooper’s power supply mix, as depicted by the following figures. Figure 1-1 illustrates the projected supply and demand balance for the Preferred Resource Plan, demonstrating increased diversity of resource types and close alignment of future resource additions to projected load requirements.

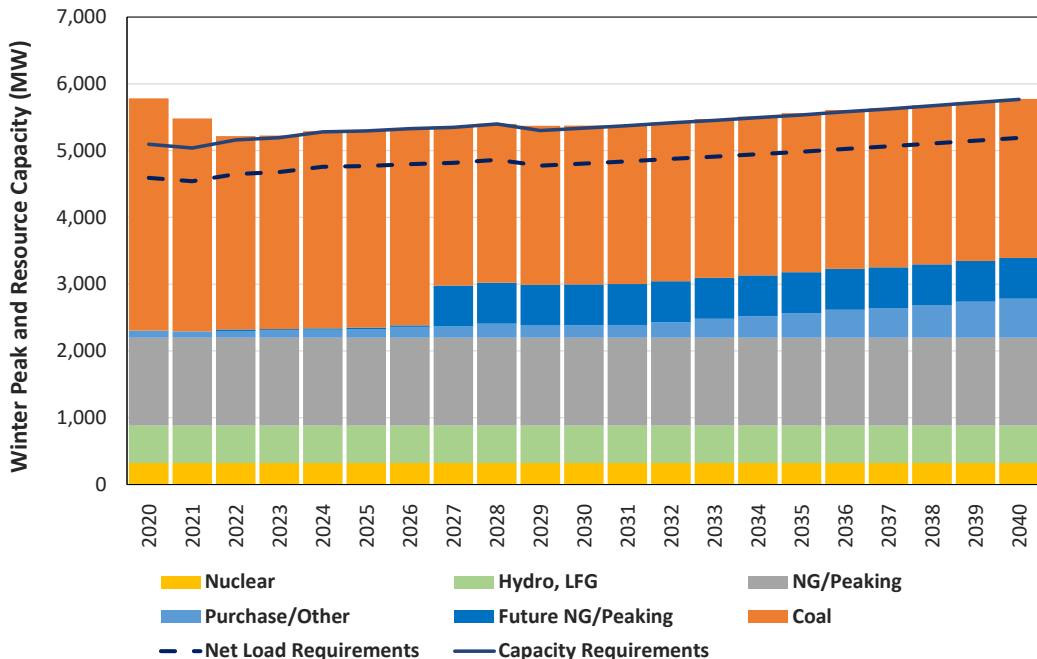
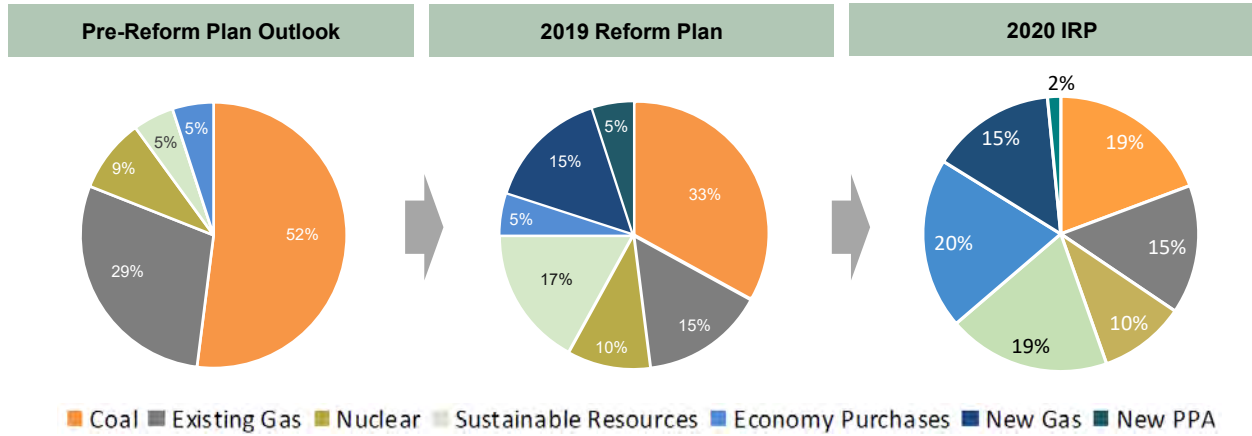


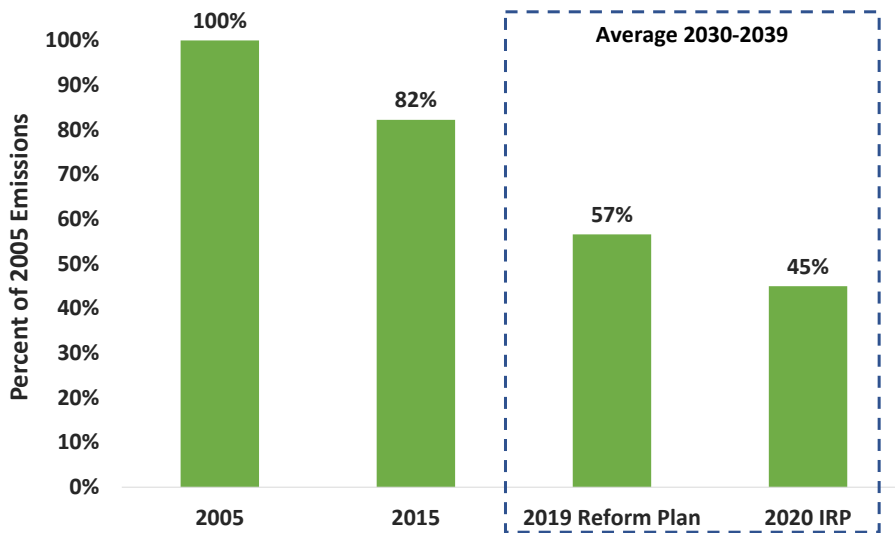
Figure 1-1: Supply and Demand Balance of Preferred Resource Plan

Figure 1-2 illustrates the changes in Santee Cooper’s projected energy generation mix for the year 2033 resulting from its Reform Plan and projected for the Preferred Resource Plan, indicating significant improvement in the diversity of energy sources used to meet Santee Cooper’s retail and wholesale energy requirements.



**Figure 1-2: Evolution of Projected Santee Cooper Generation Mix for 2033**

Figure 1-3 illustrates the improvement in Santee Cooper’s carbon dioxide (CO<sub>2</sub>) emissions profile projected for its Reform Plan and projected additional improvements under the Preferred Resource Plan, indicating an over 50 percent improvement since 2005.



**Figure 1-3: Projected CO<sub>2</sub> Emissions of the Santee Cooper System**

The IRP Report provides additional context and detail regarding assumptions, processes, and the results of Santee Cooper’s 2020 IRP. The following major topics are summarized in the report, by report section title.

- **Overview of Santee Cooper** — Overview of the Santee Cooper system, including a summary of Santee Cooper and its customers, resources, transmission interconnections, and service area.

- **Santee Cooper IRP Process** — Discussion of the process utilized by Santee Cooper in developing its 2020 IRP, including foundational principles, legislative requirements and considerations, and an overview of the functional process Santee Cooper used to prepare the 2020 IRP.
- **Santee Cooper Load Forecast** — Review of the process and projections developed for the load forecast utilized for the 2020 IRP, including forecasts of customers and sales for Santee Cooper’s retail customers, load forecasts developed by Central for its member cooperatives, projected energy requirements and peak demand for Santee Cooper’s other wholesale sales, and aggregate system requirements over 2020-2039.
- **Demand-Side Resource Plans** — Description of Santee Cooper’s existing residential, commercial, load management, and informational demand-side management programs, including summaries of program expenditures and estimate of load reductions, and Santee Cooper plans for future development of demand response, electric vehicle, and commercial and residential energy efficiency programs.
- **Santee Cooper 2020 IRP Development** — Detailed discussion of the methodology and assumptions utilized for the development 2020 IRP, including a discussion of the process, models, portfolio evaluation approach, and sensitivity analyses utilized for the IRP, plus documentation of assumptions for cost escalation, financial assumptions, system load forecast, fuel price forecasts, power market price forecast, Santee Cooper existing generating and purchase power resources, existing Santee Cooper supply-demand balance, generating resource expansion options, and transmission system considerations.
- **IRP Results & Conclusions** — Summary of the results and conclusions of the 2020 IRP, including discussions of the resource expansion analysis process; presentation of the results of the resource expansion analysis, including projected costs and resource expansion portfolios under base case and sensitivity assumptions; and conclusions and development of a Santee Cooper preferred resource plan derived from the results of the IRP analysis.
- **Short-Term Action Plan** — Summary of activities to be undertaken by Santee Cooper over the next five years to develop the Preferred Resource Plan, and a discussion of additional future activities that Santee Cooper intends to undertake to further study and develop its resource plans and future IRP filings.
- **Transmission System Planning (Appendix A)** — Summary of Santee Cooper transmission system planning process and schedule of transmission capital projects.
- **Environmental Compliance Planning (Appendix B)** — Summary of environmental regulations and permitting requirements affecting Santee Cooper’s facilities and discussion of actions and compliance of Santee Cooper, including regulations and requirements relating to airborne pollution, discharge of pollutants into waters, and disposal of solid and hazardous wastes.

## Section 2

# Overview of Santee Cooper

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Santee Cooper is South Carolina’s state-owned electric and water utility. Known formally as the South Carolina Public Service Authority (Santee Cooper or the Authority), Santee Cooper was created in 1934 as a rural electrification and public works project. Santee Cooper generated its first electricity in February 1942. Santee Cooper’s primary business operation is the production, transmission, and distribution of electrical energy, both at wholesale and retail, to citizens of the State, which is the focus of this IRP Report. Santee Cooper is one of the nation’s largest municipal wholesale utilities, serving directly or indirectly approximately two million South Carolinians in all 46 counties of the State.

Santee Cooper owns and operates 2,994 miles of distribution lines and associated facilities through which it serves approximately 189,000 residential, commercial, and small industrial retail customers in its assigned retail service territory, which consists of two non-contiguous areas covering portions of Berkeley, Georgetown, and Horry counties. Additionally, Santee Cooper serves 27 large industrial retail customers, several Central member cooperatives, and two municipal electric systems located in South Carolina, the Town of Bamberg and the City of Georgetown, all of which are directly interconnected to the Santee Cooper transmission system.

Central is an association of 20 electric distribution cooperatives, including the five electric distribution cooperatives that were formerly members of Saluda River Electric Cooperative, Inc. Central serves primarily residential, small commercial, and industrial customers in all 46 counties of the State. Santee Cooper supplies the total power and energy requirements of Central, less amounts which Central purchases directly from the Southeastern Power Administration (SEPA), amounts provided by Duke Energy Carolinas, LLC (Duke Energy Carolinas), a subsidiary of Duke Energy Corporation (DEC), as described below, and small amounts purchased from others.

In addition, Santee Cooper provides off-system wholesale sales to the City of Seneca, South Carolina, Piedmont Municipal Power Agency, Alabama Municipal Electric Authority, the Town of Waynesville, North Carolina, and the Charleston Navy Base.

Santee Cooper plans for firm power supply from its own generating capacity and firm power contracts to equal its firm load, including a 15 percent summer peak reserve margin and a 12 percent winter peak reserve margin. Santee Cooper owns generation facilities with current total maximum continuous ratings of 5,110 megawatts during the summer and 5,338 megawatts during the winter. In addition, Santee Cooper has entered into various power purchase arrangements through which Santee Cooper purchases 471 megawatts of firm capacity and associated energy. The territorial peak demand for 2019 was 4,583 megawatts, which occurred January 22, 2019. Santee Cooper typically peaks during the winter season.

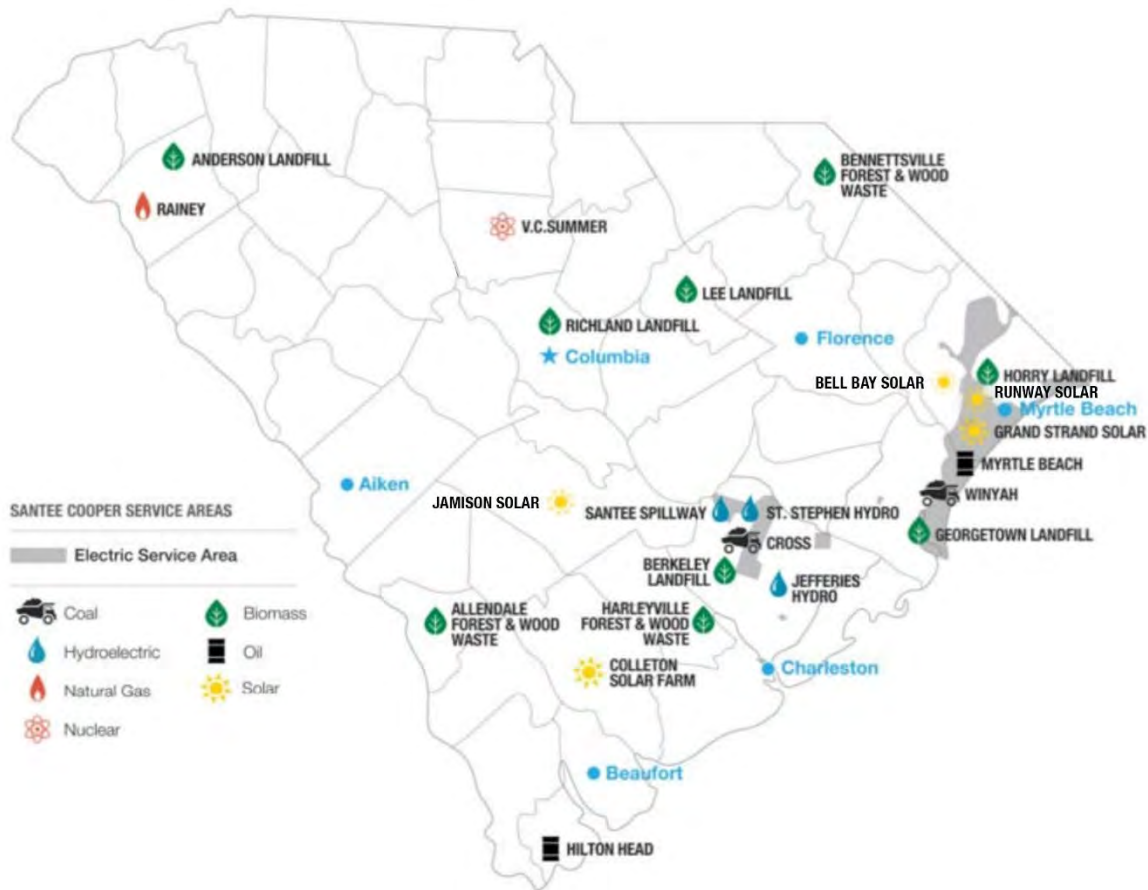
Table 2-1, below, details the winter capability of Santee Cooper’s resources by primary energy source.

**Table 2-1  
Current Santee Cooper Power Supply Resources**

	Winter Capability (MW)	Percent of Total
Coal	3,530	60.8
Natural Gas and Oil	1,315	22.6
Nuclear	322	5.5
Owned Hydro Generation	142	2.5
Landfill Methane Gas	29	0.5
Solar <sup>(1)</sup>	0	0.0
Total Owned Resources	5,338	91.9
Purchases <sup>(1)</sup>	471	8.1
Total Resources	5,809	100.0

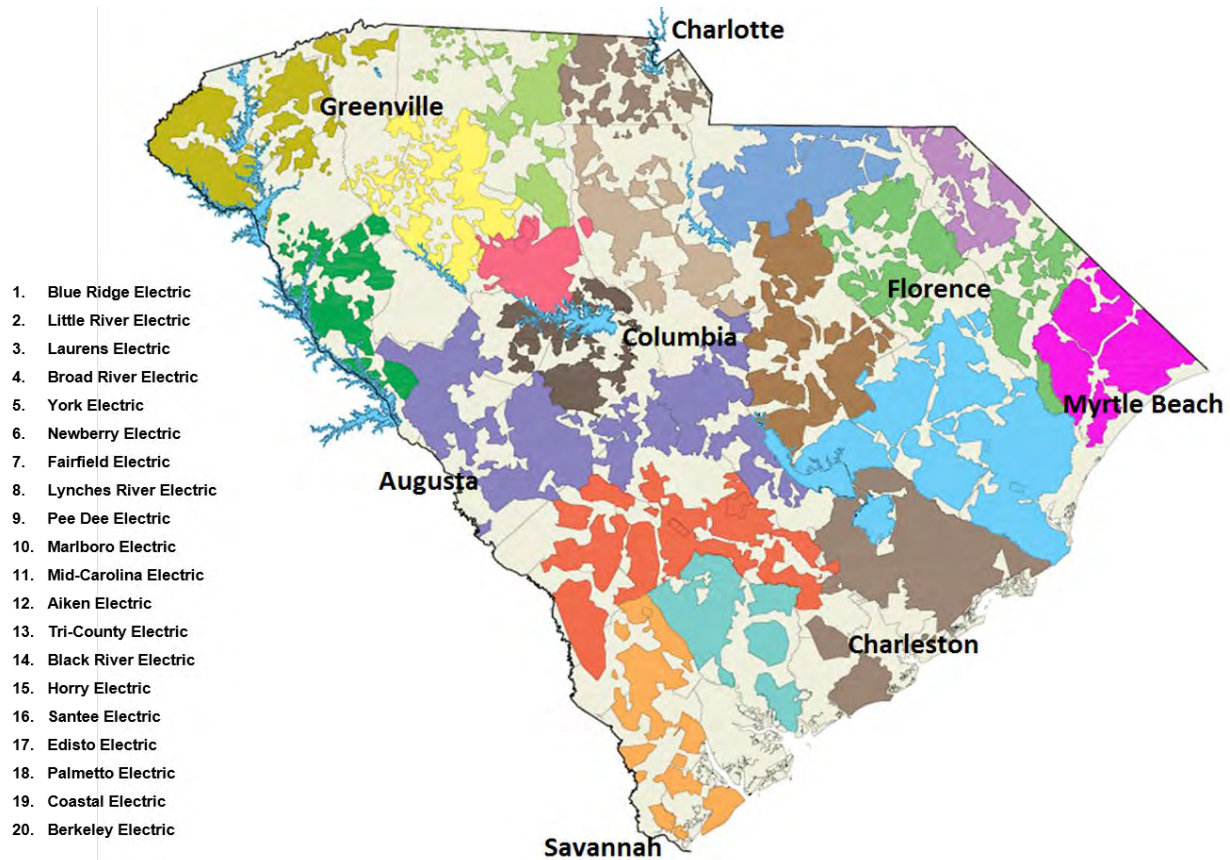
(1) Santee Cooper currently owns or purchases approximately eight megawatts of solar resources (nameplate capacity) that do not contribute firm capacity at the time of the winter peak.

Figure 2-1 illustrates the retail service areas of Santee Cooper and Santee Cooper’s major generation resources.



**Figure 2-1: Santee Cooper Retail Service Area and Major Generation Resources**

Figure 2-2 illustrates the service area of Central, which includes areas throughout the state and adjacent to Duke Energy Carolinas, Dominion Energy South Carolina, Santee Cooper, and numerous municipal utilities, including those served by Santee Cooper.



**Figure 2-2: Central Service Area**

Santee Cooper operates an integrated transmission system which includes lines owned by Santee Cooper as well as those owned by Central and maintained by Santee Cooper. The transmission system includes approximately 1,384 miles of facilities rated at 230 kilovolts, 1,933 miles rated at 115 kilovolts, 1,730 miles rated at 69 kilovolts, and 95 miles of overhead and underground transmission lines rated at 34 kilovolts and below. Santee Cooper operates 91 transmission substations and switching stations serving 87 distribution substations and 411 Central delivery points. Santee Cooper plans the transmission system to operate during normal and contingency conditions that are outlined in electric system reliability standards adopted by the North American Electric Reliability Corporation.

Santee Cooper's transmission system is interconnected with other major electric utilities in the region. It is directly interconnected with Dominion at eight locations (with four additional interconnections currently planned and under contract); with Duke Energy Progress, a subsidiary of DEC, at eight locations; with Southern Company Services, Inc. (Southern Company) at one location; and with Duke Energy Carolinas at two locations. Santee Cooper is also interconnected with Dominion, Duke Energy Carolinas, Southern Company, and SEPA through a five-way interconnection at the SEPA J. Strom Thurmond Hydroelectric Project, and with Southern Company and SEPA through

a three-way interconnection at the SEPA R. B. Russell Hydroelectric Project. Through these interconnections, the Santee Cooper transmission system is integrated into the regional transmission system serving the Southeastern region of the United States and the Eastern Interconnection (one of the three major alternating-current electrical grids in the continental U.S. power transmission grid, the others being the Western Interconnection and the Electric Reliability Council of Texas). Santee Cooper has separate interchange agreements with each of the companies with which it is interconnected which provide for mutual exchanges of power.

The electric generation, transmission, and distribution facilities owned by Santee Cooper, as well as certain transmission facilities owned by Central, are operated and maintained by Santee Cooper as a fully integrated electric system.

## Section 3

# Santee Cooper IRP Process

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Santee Cooper is committed to planning its generation and transmission systems in a manner that will result in affordable and competitively priced electricity service to the wholesale and retail customers of Santee Cooper while maintaining the very high level of system reliability that customers have come to appreciate. Moreover, Santee Cooper is focused on developing plans that will significantly reduce the carbon footprint of its generation fleet and enhance the diversity of its resource portfolio to allow Santee Cooper to adapt to changing market and economic conditions.

### Resource Planning Principles

A sound integrated resource plan is built on three foundational characteristics: a broad view about future market conditions, such as fuel prices and customer loads; consideration of cost-effective options for both new and existing resources; and evaluation of resource portfolios against a sound set of resource planning principles. For Santee Cooper, core resource planning principles include the following.

- **Reliability:** Operate and plan the Santee Cooper system to ensure that all retail and wholesale customers are provided reliable electric power — reliability is the number one product of any electric utility
- **Customer Focus:** Provide safe, reliable, and affordable power, and provide customers with new opportunities as markets change
- **Cost Management:** Develop resource plans that provide effective cost management over the long-term
- **Environmental Stewardship:** Responsibly manage the environmental impact of Santee Cooper operations
- **Long-Term View:** Develop a long-term resource strategy to ensure flexibility and optionality over a wide range of possible future conditions
- **Reduce Financial and Planning Risk:** Develop resource plans that can readily adapt as future conditions change and, when possible, add resources in increments that closely match resources to needs
- **Embrace Innovation:** Identify potential developing technologies and incorporate in resource plans when reasonable and cost-effective
- **Transparency:** Engage customers, stakeholders, Board Members, and elected officials in a transparent resource planning process that is responsive to questions and input

Overall, the goal of Santee Cooper is to create a diverse and reliable portfolio of resources that incorporate innovative technologies, improve operating efficiency, reduce environmental impacts, and result in lower overall cost.



## Legislative Considerations

### Act 95

On May 21, 2019, the State's General Assembly passed, and on May 22, 2019, the Governor signed into law Act 95 of 2019 (Act 95), a Joint Resolution of the General Assembly requiring, among other things, the State's Department of Administration to establish a process: (a) to conduct a competitive bidding solicitation for the sale of some or all of the Authority; (b) to receive management proposals that do not involve a sale of the Authority, but are designed to improve the efficiency and cost-effectiveness of the Authority's electric operations; and (c) for the Authority to submit a proposal to the Department of Administration for reform, restructuring, and changes in its operation as an alternative to a sale or management proposal.

On August 16, 2019, the Department of Administration issued an invitation to interested parties to participate in the process by submitting bids for the sale of some or all of the Authority or management proposals. On November 25, 2019, the Authority submitted its original plan for reform, restructuring, and changes in operation to the Department of Administration, which plan was subsequently modified on January 24, 2020 by the Authority following discussions with the Department of Administration and Central (the Reform Plan). The Authority's Reform Plan identified a series of changes to the Authority's generation and transmission systems as well as expense management and other initiatives intended to achieve cost savings and optimize efficient operations. In addition, the Authority's Reform Plan provided for price stability for the Authority's customers, including Central.

During the week of March 2, 2020, the respective House and Senate committees of jurisdiction made recommendations to their respective legislative bodies to reject all of the bids provided in response to Act 95. Further hearings were held related to reforming Santee Cooper and to continue further bidder negotiations outside the scope of Act 95. Due to the COVID-19 public health emergency and disruption at that time of the legislative session, further consideration of Santee Cooper was suspended as part of the passage of Act 135 of 2020.

### Act 135

Section 11 of Act 135 of 2020, a budget continuing resolution that was signed by the Governor on May 18, 2020 (Act 135), establishes certain operational guidelines for the Authority and prohibits the Authority from taking any action which would impair, hinder, or otherwise undermine from an economic, operational, feasibility, or any other perspective the ability of the General Assembly to complete its consideration regarding the Authority's status under Act 95. The provisions of Act 135 not only continue certain of the oversight and operational parameters that limited certain actions that could be taken by the Authority during the Act 95 process but also expressly permit and authorize the Authority to advance some of the key principles set forth in the Authority's Reform Plan. The provisions of Act 135 are to remain in effect through the earlier of May 31, 2021 or until an act of the General Assembly expressly supersedes the provisions of Act 135 applicable to the Authority.

Act 135 authorizes the Authority to continue to operate in the ordinary course of business and nothing in the Act prohibits the Authority from engaging in the following activities related to resource planning and operation.

- (1) Doing those things necessary for closing and decommissioning the Winyah Generating Station including, but not limited to, planning, permitting, and securing by purchase or lease one hundred megawatts of combustion turbines and minor transmission upgrades, subject to the consent of Central pursuant to the Power System Coordination and Integration Agreement between Santee Cooper and Central, as amended (the Coordination Agreement).
- (2) Doing all those things necessary for deploying up to 500 megawatts of new solar generation, within the structure described in the Authority's Reform Plan, subject to the consent of Central pursuant to the Coordination Agreement.
- (3) Entering into operational efficiency and joint dispatch agreements with neighboring utilities for a period of up to one year, with annual renewals and reciprocal cancellation clauses thereafter.
- (4) Renegotiating existing and entering into new coal supply, transportation, and related agreements that produce savings and for terms not to exceed five years or such longer period of time as may be approved by a Santee Cooper Oversight Committee (as established by Act 135).
- (5) Entering into natural gas hedging arrangements for terms not to exceed five years, or such longer period of time as may be approved by the Santee Cooper Oversight Committee
- (6) Conducting the planning, permitting, engineering and feasibility studies to develop natural gas transportation and power transmission to ensure a reliable power supply.
- (7) Entering into purchase power arrangements needed for, but not in excess of, anticipated load for a term not to exceed the Settlement Rate Period of the Cook Settlement Agreement, and supportive thereof.

Though the Santee Cooper Reform Plan was ultimately rejected by the legislative committees (along with all other bids), Santee Cooper continues to pursue certain key principles of the Reform Plan while operating under the parameters of Act 135. The Reform Plan contemplated a future power supply plan that is adaptable, allowing the Authority to respond to changing business and regulatory conditions, including (i) improving resource diversity; (ii) reducing carbon emissions; (iii) reducing reliance on coal-fired generating resources; (iv) increasing use of renewable resources; (v) maximizing purchases of low-cost energy from surrounding transmission systems (when available and cost-effective); (vi) developing plans for new generation resources that more closely align resource implementation with projected future loads; (vii) reflecting the need for transmission upgrades; and (viii) continuing efforts to reduce the Authority's indebtedness.

The 2020 IRP has been developed taking into consideration the Reform Plan and within the limitations and allowances of Act 135, including requesting proposals for solar generation within the limits provided for under Act 135, and planning and implementing retirement of the Winyah Generating Station. Santee Cooper has also taken initial planning steps to evaluate options for future natural gas fired generating facilities but understands the Office of Regulatory Staff has noted the need for

clarification on the compliance with Act 135 of this activity. Additionally, while the Act 95 process precluded Santee Cooper from coordinating or discussing its Reform Plan development with process participants, thus precluding coordination with Central, with the passage of Act 135 in May 2020, Santee Cooper began developing its 2020 IRP with participation and input from Central throughout the process. Additionally, while stakeholder outreach has been curtailed due to the limited time available since the passage of Act 135 and the onset of COVID-19, Santee Cooper is committed to expanding its stakeholder engagement process as part of continuing resource planning activities.

**Act 62**

The South Carolina Energy Freedom Act (H. 3659, R. 82) was passed by the General Assembly and signed into law by Governor McMaster on May 16, 2019 as Act 62. The Act, in part, amended the Code of Laws of South Carolina by adding Section 58-37-40, relating to Integrated Resource Plans to establish mandatory contents of IRPs and provide for certain reporting requirements. Section 58-37-40 requires Santee Cooper to submit an Integrated Resource Plan to the State Energy Office at least every three years. These IRP’s are required to be published on Santee Cooper’s website and on the website of the State Energy Office. Santee Cooper has developed this 2020 IRP to comply with the requirements of Act 62 and Section 58-37-40, but within the constraints of Act 95 and Act 135, as described above.

The following Table 3-1 outlines specific filing requirements identified by Act 62 and Section 58-37-40 of the South Carolina Code of Law pertaining to Santee Cooper’s filing of its IRP.

**Table 3-1  
Act 62 and Section 5-37-40 IRP Filing Requirements**

Act 62 and SC Code of Law	IRP Filing Requirement	Santee Cooper 2020 IRP Report
58-37-40 (A)(3)	The Integrated Resource Plan must be developed in consultation with the electric cooperatives and municipally owned electric utilities purchasing power and energy from the Public Service Authority and consider any feedback provided by retail customers	Sections 3, 4, 5, 6, 7, and 8
	and shall include the effect of demand side management activities of the electric cooperatives and municipally owned electric utilities that directly purchase power and energy from the Public Service Authority or sell power and energy generated by the Public Service Authority.	Sections 4 and 5
58-37-40 (B)(1)	An integrated resource plan shall include all of the following:	
(a)	A long-term forecast of the utility’s sales and peak demand under various reasonable scenarios;	Section 4
(b)	The type of generation technology proposed for a generation facility contained in the plan and the proposed capacity of the generation facility, including fuel cost sensitivities under various reasonable scenarios;	Section 6
(c)	Projected energy purchased or produced by the utility from a renewable energy resource;	Sections 6 and 7

Act 62 and SC Code of Law	IRP Filing Requirement	Santee Cooper 2020 IRP Report
(d)	A summary of the electrical transmission investments planned by the utility;	Section 6 and Appendix A
(e)	Several resource portfolios developed with the purpose of fairly evaluating the range of demand-side, supply-side, storage, and other technologies and services available to meet the utility’s service obligations. Such portfolios must include an evaluation of low, medium, and high cases for the adoption of renewable energy and cogeneration, energy efficiency, and demand response measures, including consideration of the following: i. Customer energy efficiency and demand response programs, ii. Facility retirement assumptions, iii. Sensitivity analyses related to fuel costs, environmental regulations, and other uncertainties or risks;	Sections 6, 7 and 8
(f)	Data regarding the utility’s current generation portfolio, including the age, licensing status, and remaining estimated life of operation for each facility in the portfolio;	Sections 2 and 6 and Appendix B
(g)	Plans for meeting current and future capacity needs with the cost estimates for all proposed resource portfolios in the plan;	Sections 6 and 7
(h)	An analysis of the cost and reliability impacts of all reasonable options available to meet projected energy and capacity needs; and	Sections 6 and 7
(i)	A forecast of the utility’s peak demand, details regarding the amount of peak demand reduction the utility expects to achieve, and the actions the utility proposes to take in order to achieve that peak demand reduction.	Sections 4 and 5

### IRP Process

Santee Cooper prepared its 2020 IRP utilizing generally accepted utility practices, including the use of overarching principles and objectives, realistic projections of economic and market conditions, historical operating characteristics for existing resources, industry-based assumptions for future resource alternatives, load forecasts developed using industry-standard techniques, integration of cost-effective demand-side management programs, evaluation of renewable and energy storage resources, screening of potential resource sites, simulation of resource dispatch, optimization of resource expansion plans, evaluation of coal resource retirements, and evaluation of resource plan sensitivities to changes in load, market, and regulatory conditions. Figure 3-1, below, provides a depiction of the overall process utilized by Santee Cooper when developing its 2020 IRP, the components of which are described in more detail in the following sections of this IRP Report.

The 2020 IRP was directed and conducted by a team of Santee Cooper staff, assisted throughout the process by nFront Consulting, LLC, an energy industry consulting firm based in Orlando, Florida. Santee Cooper and nFront Consulting worked together to determine the approach, develop

assumptions, model generation dispatch and generation expansion, and review and summarize results of the 2020 IRP. Additionally, the 2020 IRP was prepared in conjunction with Central, including participation by Central’s staff and its experts in numerous meetings to develop key assumptions, identify relevant scenarios, and review preliminary and final results. The 2020 IRP was largely prepared during May 2020 through mid-October 2020.

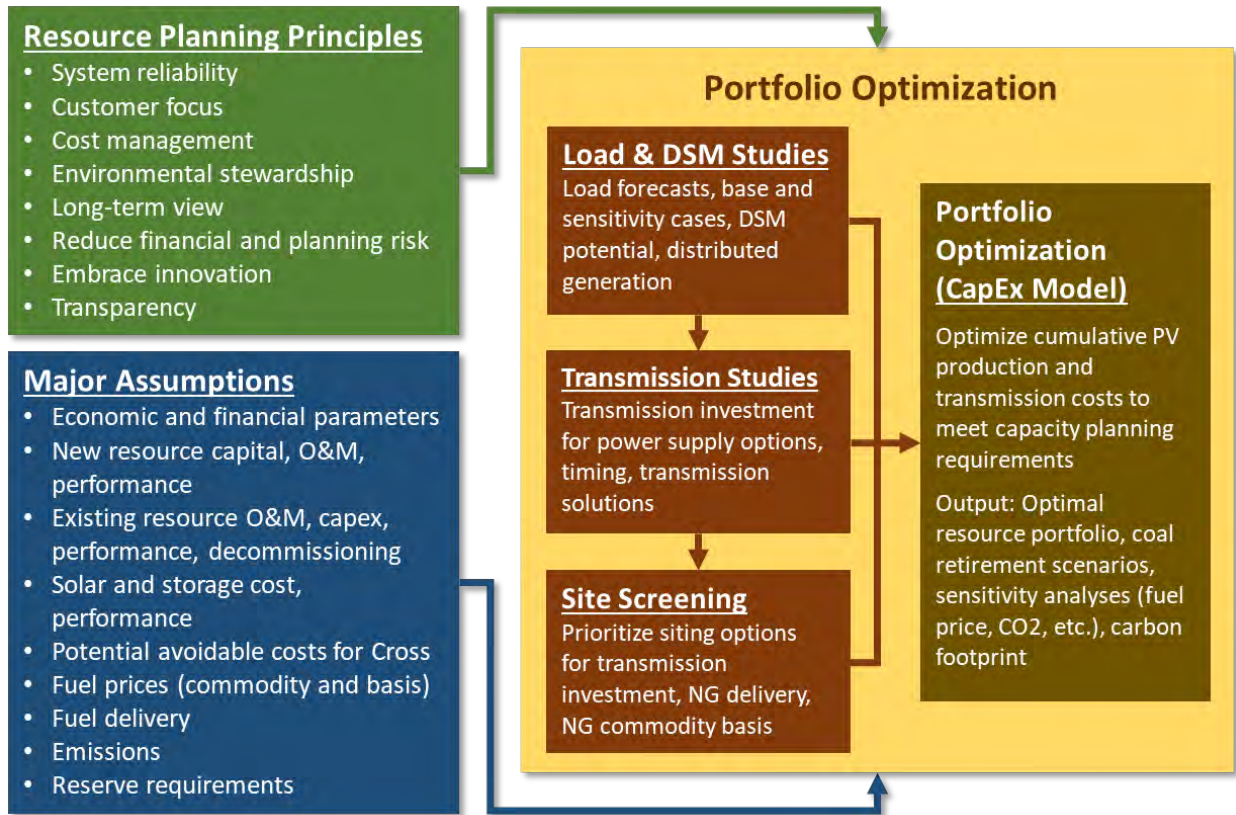


Figure 3-1: Santee Cooper IRP Process

## Section 4

# Santee Cooper Load Forecast

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The territorial load served by Santee Cooper includes retail sales to the residential, commercial, and industrial customers of Santee Cooper and wholesale sales to Central and two interconnected municipal electric utility systems in South Carolina, the Town of Bamberg and the City of Georgetown. Additionally, Santee Cooper provides off-system wholesale sales to Alabama Municipal Electric Authority (AMEA), Piedmont Municipal Power Agency (PMPA), the City of Seneca, South Carolina, the Town of Waynesville, North Carolina, and the Charleston Navy Base.

The load forecast adopted for use in the 2020 IRP (Load Forecast) was prepared by Santee Cooper in June 2020 and provides projections of customer counts, energy sales, and peak demand for Santee Cooper's retail customers; projections of energy requirements and peak demand for wholesale sales to Central and two interconnected municipal electric utility systems; projections of monthly sales to off-system wholesale customers; and projections of aggregate system level energy requirements and peak demand for 2020 through 2039. As described in more detail in Section 6 of this report, the Load Forecast includes a base case and sensitivity cases reflecting higher and lower territorial load levels based on a wide range of uncertainty in future economic conditions. These sensitivities imply variations in load levels and the number of both existing and new customers served by Santee Cooper over the forecast horizon. Importantly, the range of uncertainty in the load forecasts is of a reasonable magnitude to reflect continued service to existing retail and municipal customers of Santee Cooper and Central throughout the study period for the 2020 IRP.

As described more fully below, forecasts for Santee Cooper's residential and commercial retail loads, the Town of Bamberg, and the City of Georgetown were prepared by GDS Associates, a consulting firm based in Marietta, Georgia. Forecasts for Santee Cooper's industrial retail loads were prepared by Santee Cooper. Separately, Central prepared load forecasts of its members' systems and provided the results to Santee Cooper for inclusion in the aggregate Load Forecast, with adjustments made by Santee Cooper to include certain load that it expects to serve through 2024. Santee Cooper worked with its off-system wholesale customers to establish forecasts of energy requirements and peak demand.

### Santee Cooper Residential and Commercial Retail Classes

The forecast of Santee Cooper's residential and commercial retail rate classes is developed based on a system of econometric and hybrid econometric/end-use forecast equations that include key driving variables, such as income, employment, gross product, electricity prices, end use appliance saturation and efficiency, and weather conditions. Economic data are obtained from Moody's Analytics, a widely recognized provider of such data to the utility industry. Electricity price assumptions are based on Santee Cooper projections and reflect the historical and projected trend in average bills by class in real terms. For purposes of the load forecast, the projected trend in real electricity prices is assumed to decline slightly over the forecast period, reflecting that electricity prices are expected to

escalate at a rate slightly below the rate of inflation. Historical and projected appliance saturation and efficiency data are generally based on data developed by Santee Cooper through its periodic residential consumer surveys and data published by the Energy Information Administration in its periodic Residential Energy Consumption Survey (RECS), Commercial Building Energy Consumption Survey (CBECS), and in the Annual Energy Outlook (AEO). Weather data is obtained from the federal government, and weather conditions over the forecast horizon are assumed to be equal to the most recent 20-year average.

The residential class sales forecast is based on forecasts of residential customer counts and average usage. Residential customer counts are forecasted econometrically, as a function of Horry County households, with an adjustment to capture the gradual decline in the percentage of county households actually served by Santee Cooper (i.e., a larger portion of growth occurs in areas served by cooperatives). Residential average use is forecasted using a hybrid econometric/end-use model commonly referred to as a statistically-adjusted end use (SAE) model, which captures several driving variables within three key categories—cooling, heating, and other consumption. These variables capture trends in average income, home size, people per household, average real electricity cost, saturation and efficiency by end use type, and heating/cooling degree days.

For the commercial class, customer counts are forecasted econometrically as a function of total non-farm employment in the region. Commercial sales are forecast in an SAE model framework, similar to residential average use, but capturing trends in non-farm employment, gross product, saturation and efficiency of commercial end uses, and weather conditions.

Importantly, the historical study period that underpins the forecast ended in December 2019, and the economic data from Moody's Analytics was obtained in February 2020, prior to the onset of the COVID-19 pandemic. Santee Cooper monitored the load impacts of the pandemic utilizing weather-normalized analyses of daily metered system loads and monthly metered loads by class and for major customers and developed adjustments to the forecast to capture the extent of estimated impacts and a reasonable recovery pattern over the 2020-2021 period. This results in reduced load levels in those years and higher growth rates over the first few years of the forecast horizon.

Table 4-1 and Table 4-2, below, provide recent historical and projected numbers of customer counts and sales at the retail meter for the major retail classes.

**Table 4-1**  
**Historical Customer Counts and Sales to the Residential and Commercial Classes**

Year	Customer Counts			Electricity Sales (GWh)		
	Residential	Commercial	Total	Residential	Commercial	Total
2010	134,704	27,780	162,484	1,859	2,132	3,991
2011	136,047	27,434	163,481	1,761	2,076	3,837
2012	138,353	27,267	165,620	1,623	2,013	3,635
2013	140,126	27,517	167,643	1,679	2,011	3,690
2014	142,663	27,690	170,353	1,801	2,050	3,851
2015	145,208	27,564	172,772	1,785	2,059	3,844
2016	147,447	28,019	175,466	1,807	2,059	3,866
2017	151,044	28,294	179,338	1,746	2,013	3,760
2018	154,586	29,202	183,788	1,939	2,045	3,984
2019	158,032	29,787	187,819	1,879	2,004	3,883
Compound Avg. Growth Rates:						
2010-2019	1.8%	0.8%	1.6%	0.1%	-0.7%	-0.3%

**Table 4-2**  
**Projected Customer Counts and Sales to the Residential and Commercial Classes**

Year	Customer Counts			Electricity Sales (GWh)		
	Residential	Commercial	Total	Residential	Commercial	Total
2020	159,128	31,172	190,300	1,953	1,968	3,921
2021	162,638	31,435	194,073	1,940	2,075	4,015
2022	166,555	32,056	198,611	1,982	2,184	4,166
2023	169,741	32,598	202,339	1,994	2,191	4,185
2024	172,880	33,120	206,000	2,015	2,203	4,218
2025	176,013	33,633	209,646	2,042	2,204	4,246
2026	179,151	34,149	213,300	2,066	2,201	4,267
2027	182,249	34,681	216,930	2,087	2,202	4,289
2028	185,280	35,198	220,478	2,111	2,204	4,315
2029	188,334	35,672	224,006	2,136	2,192	4,328
2030	191,394	36,141	227,535	2,159	2,181	4,340
2031	194,464	36,614	231,078	2,181	2,186	4,367
2032	197,479	37,085	234,564	2,205	2,197	4,402
2033	200,324	37,554	237,878	2,232	2,213	4,445
2034	202,934	38,019	240,953	2,258	2,236	4,494
2035	205,329	38,484	243,813	2,283	2,258	4,541
2036	207,647	38,953	246,600	2,308	2,286	4,594
2037	209,874	39,418	249,292	2,333	2,306	4,639
2038	212,044	39,879	251,923	2,351	2,330	4,681
2039	214,180	40,348	254,528	2,375	2,356	4,731
Compound Avg. Growth Rates:						
2020-2039	1.6%	1.4%	1.5%	1.0%	1.0%	1.0%



Santee Cooper’s monthly peak demand associated with the residential and commercial retail classes is forecast econometrically, based on the aggregate sales forecast described above and peak day temperature. Peak day temperatures over the forecast horizon are assumed to be similar to long-term average historical values. Table 4-3 provides projected winter and summer peak demands associated with the residential and commercial retail classes, as delivered to the Santee Cooper distribution system.

**Table 4-3  
Projected Peak Demand of the Residential and Commercial Classes**

Year	Winter Peak (MW)	Summer Peak (MW)
2020	879	815
2021	842	857
2022	895	883
2023	903	892
2024	913	901
2025	922	910
2026	932	920
2027	941	929
2028	951	939
2029	961	949
2030	971	959
2031	981	969
2032	991	979
2033	1,003	991
2034	1,014	1,003
2035	1,025	1,013
2036	1,036	1,024
2037	1,047	1,035
2038	1,058	1,046
2039	1,070	1,058
Compound Avg. Growth Rates:		
2020-2039	1.0%	1.4%

The forecasts of retail sales by class and seasonal peak demand have been reduced for the projected impacts of demand-side management (DSM) programs. Table 4-4, below, provides the projected impacts of both historical DSM activity and expected future activity, excluding demand response programs associated with Santee Cooper’s retail load that are currently under development. Projected impacts of historical DSM decline through time based on the gradual aging and replacement of affected end uses. See Section 5, Demand-side Resource Plans, for more information.

**Table 4-4**  
**Projected Demand-side Management Program Impacts**

Year	Pre-2020 DSM Activity			Future DSM Activity		
	Energy (GWh)	Peak Demand (MW)		Energy (GWh)	Peak Demand (MW)	
		Winter	Summer		Winter	Summer
2020	(279)	(71)	(59)	(12)	(3)	(3)
2021	(256)	(71)	(59)	(29)	(6)	(6)
2022	(244)	(70)	(58)	(44)	(8)	(8)
2023	(211)	(69)	(57)	(55)	(10)	(10)
2024	(194)	(48)	(44)	(64)	(12)	(12)
2025	(180)	(44)	(41)	(70)	(13)	(13)
2026	(155)	(39)	(36)	(75)	(14)	(14)
2027	(131)	(34)	(31)	(78)	(14)	(14)
2028	(104)	(27)	(25)	(81)	(15)	(15)
2029	(73)	(20)	(19)	(84)	(16)	(16)
2030	(38)	(11)	(10)	(87)	(16)	(16)
2031	(18)	(6)	(5)	(90)	(17)	(17)
2032	(4)	(2)	(1)	(93)	(18)	(18)
2033	(4)	(1)	(1)	(86)	(16)	(16)
2034	(4)	(1)	(1)	(80)	(15)	(15)
2035	(4)	(1)	(1)	(75)	(15)	(15)
2036	(4)	(1)	(1)	(73)	(15)	(15)
2037	(4)	(1)	(1)	(70)	(14)	(14)
2038	0	0	0	(64)	(13)	(13)
2039	0	0	0	(58)	(13)	(13)

Santee Cooper has engaged in such DSM programs for many years. As this period of activity far exceeds the study period utilized in the econometric equations that underpin the forecast, it was not deemed necessary to adjust the historical data that formed the basis of the forecast equations for the impacts of DSM.

### Santee Cooper Industrial Retail Class

Santee Cooper serves 27 industrial retail customers directly interconnected to its transmission system. The forecast of demand and energy requirements for Santee Cooper's industrial retail class is based on recent actual loads, contracted quantities, expected changes in operations, and input from account representatives. Santee Cooper typically contracts with industrial customers for service under the Santee Cooper Large Light and Power Schedule, which includes an initial term of not less than five years, with automatic two-year rollover terms thereafter. The Load Forecast utilized for the 2020 IRP assumes a range of future load growth projections that is of reasonable magnitude to reflect continued service of the existing Santee Cooper industrial customers throughout the IRP study period.

The largest customers in the Santee Cooper industrial retail class include Nucor Steel (Nucor) and Century Aluminum of South Carolina, Inc. (Century). Nucor has been a customer since 1996, currently

receiving approximately 300 megawatts of power, the majority of which is provided as non-firm power. Century has been a customer of Santee Cooper since 1977, currently receiving approximately 200 megawatts of power, with 25 percent of the load served under Santee Cooper’s firm industrial rate schedule and the remainder served under Santee Cooper’s customer-supplied power rate schedule pursuant to which Century provides an off-system resource for the power and Santee Cooper transmits the provided power.

Table 4-5 provides projected customer counts, energy sales, and seasonal peak demands and of the industrial load directly served by Santee Cooper, on a delivered basis.

**Table 4-5  
Projected Industrial Class Sales and Peak Demand**

Year	Energy Sales (GWh)	Peak Demand (MW)	
		Winter	Summer
2020	3,762	474	498
2021	4,342	524	619
2022	4,549	562	626
2023	4,159	519	576
2024	4,159	519	576
2025	4,159	519	576
2026	4,159	519	576
2027	4,159	519	576
2028	4,159	519	576
2029	4,159	519	576
2030	4,159	519	576
2031	4,159	519	576
2032	4,159	519	576
2033	4,159	519	576
2034	4,159	519	576
2035	4,159	519	576
2036	4,159	519	576
2037	4,159	519	576
2038	4,159	519	576
2039	4,159	519	576
Compound Avg. Growth Rates:			
2020-2039	0.5%	0.5%	0.8%

**Central Load Forecast**

Central’s forecast is prepared by Central staff and is based on SAE and econometric models similar to those discussed above regarding Santee Cooper’s retail load forecast. Central’s forecast represents the aggregate forecast for the Central member cooperative loads served by Santee Cooper, with adjustments made by Santee Cooper to include certain load that it expects to serve through 2024. Central’s forecasted aggregate requirements include the load of some Central customers billed to Central under Santee Cooper’s L-Rate. Table 4-6, below, provides projected aggregate peak demand and energy requirements of Central’s load served by Santee Cooper, on a delivered basis.

**Table 4-6**  
**Projected Central Energy Requirements and Peak Demand**

Year	Energy Requirements (GWh)	Peak Demand (MW)	
		Winter	Summer
2020	14,017	3,295	2,756
2021	14,452	3,283	2,800
2022	14,850	3,321	2,834
2023	15,200	3,378	2,901
2024	15,528	3,437	2,971
2025	15,495	3,434	2,981
2026	15,601	3,470	3,025
2027	15,693	3,495	3,049
2028	15,834	3,524	3,072
2029	15,898	3,548	3,102
2030	15,989	3,570	3,126
2031	16,084	3,593	3,151
2032	16,225	3,619	3,176
2033	16,285	3,641	3,206
2034	16,385	3,664	3,233
2035	16,491	3,689	3,263
2036	16,650	3,720	3,292
2037	16,731	3,747	3,328
2038	16,856	3,777	3,362
2039	16,984	3,809	3,397
Compound Avg. Growth Rates:			
2020-2039	1.0%	0.8%	1.1%

### Municipal Customers on the Santee Cooper System

Santee Cooper serves two municipal electric utilities that are connected to the Santee Cooper transmission system, the Town of Bamberg, South Carolina, and the City of Georgetown, South Carolina. Santee Cooper, with the assistance of GDS Associates, prepares a forecast of the municipal systems energy requirements and contribution to the Santee Cooper system peak demand based on an econometric approach. Table 4-7, below, provides projected energy requirements and coincident peak demands for these municipal customers, on a delivered basis.

**Table 4-7**  
**Projected Municipal Energy Requirements and Peak Demand**

Year	Energy Requirements (GWh)	Peak Demand (MW)	
		Winter	Summer
2020	178	33	36
2021	182	31	37
2022	186	33	38
2023	186	33	38
2024	186	33	38
2025	186	33	38
2026	185	33	38
2027	185	33	38
2028	185	33	38
2029	185	32	38
2030	184	32	38
2031	184	32	38
2032	184	32	38
2033	184	32	38
2034	184	32	38
2035	184	32	38
2036	183	32	38
2037	183	32	38
2038	183	32	37
2039	183	32	37
Compound Avg. Growth Rates:			
2020-2039	0.1%	-0.1%	0.2%

### Other Wholesale Sales

Forecasts of wholesale sales to AMEA, PMPA, the City of Seneca, South Carolina, the Town of Waynesville, North Carolina, and the Charleston Navy Base are based either on forecasts provided by the wholesale customers or, in cases where customers do not provide a forecast, Santee Cooper uses historical and market data to develop forecasts for these customers' requirements, which have been included in the aggregate Load Forecast for the duration of each contract term.<sup>1</sup> Table 4-8, below, provides projected energy requirements and peak demand contributions of these customers, on a delivered basis, over the forecast horizon.

<sup>1</sup> Wholesale sales are included in the Load Forecast through the following terms: Charleston Navy Base through May 5, 2020, AMEA through December 2023, Seneca through June 2025, Waynesville through December 2026, and PMPA through December 2029.

**Table 4-8**  
**Projected Energy Requirements and Peak Demand of Off-system Sales**

Year	Energy Requirements (GWh)	Peak Demand (MW)	
		Winter	Summer
2020	715	192	263
2021	719	173	268
2022	736	179	273
2023	753	186	278
2024	546	143	234
2025	448	150	240
2026	356	132	210
2027	260	116	199
2028	277	122	203
2029	19	0	30
2030+	0	0	0

### Aggregate System Requirements

The total system load requirements are derived from a summation of the forecasts above and applicable losses over Santee Cooper's transmission system. Table 4-9, below, provides historical and projected energy requirements and seasonal peak demand for the aggregate Santee Cooper system, including transmission losses, over the forecast horizon.

As discussed above, the Load Forecast includes an expected reduction in 2020 sales of approximately eight percent compared to projections developed in 2019, primarily to account for the projected impacts of COVID-19. This reduction includes a downward adjustment in Central's load for 2020 of five percent. The Load Forecast reflects a reasonable recovery pattern for COVID-19 load reductions over 2020 and 2021. In the initial five months following the development of the COVID-19-reduced load forecast (April 2020 through August 2020), weather-adjusted loads appear to be approximately three percent higher than projected.

**Table 4-9**  
**Projected Santee Cooper System Energy Requirements and Peak Demand**

Year	Energy Requirements (GWh)	Peak Demand (MW)	
		Winter	Summer
2020	22,753	4,951	4,438
2021	23,897	4,932	4,656
2022	24,689	5,071	4,729
2023	24,705	5,101	4,760
2024	24,871	5,127	4,796
2025	24,776	5,140	4,821
2026	24,834	5,168	4,846
2027	24,873	5,187	4,869
2028	25,086	5,233	4,907
2029	24,936	5,145	4,773
2030	25,055	5,177	4,777
2031	25,196	5,210	4,812
2032	25,387	5,247	4,847
2033	25,500	5,281	4,890
2034	25,661	5,316	4,930
2035	25,822	5,353	4,971
2036	26,042	5,395	5,011
2037	26,173	5,433	5,059
2038	26,354	5,476	5,105
2039	26,543	5,520	5,152
Compound Avg. Growth Rates:			
2020-2039	0.8%	0.6%	0.8%

## Section 5

# Demand-Side Resource Plans

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Title 58, Chapter 37 of the S.C. Code of Laws requires Santee Cooper to invest in demand-side management (DSM) and other energy efficiency and renewable energy programs. These are utility-led programs that promote the reduction or more efficient use of energy by utilities, their energy suppliers, and their retail and wholesale customers. These programs include conservation, energy efficiency, load management, and renewable energy technologies. The projected impact in terms of load reductions from these programs are factored into the 2020 IRP, either through reductions in forecast of Santee Cooper’s retail loads or as *below-the-line* resources that otherwise reduce the need for supply-side resources.

This section describes and quantifies the Santee Cooper DSM programs and future plans to enhance and expand the programs to continue improving the efficiency of our customers’ consumption and reducing the overall cost of power on our system. Importantly, these programs are associated with Santee Cooper’s retail customers only. Central and Santee Cooper’s other wholesale customers administer similar programs and engage with their retail customers to economically reduce consumption. Hence, the scope of programs discussed herein is limited to the Santee Cooper retail customers, and the estimated DSM savings are associated with that portion of the Santee Cooper system only. The projected savings from the DSM programs being administered by Santee Cooper’s wholesale customers are embedded in the load forecasts these customers share with Santee Cooper for use in the aggregate system Load Forecast.<sup>2</sup>

### Santee Cooper DSM Overview and Goals

Santee Cooper serves eight wholesale customers, 27 military and large industrial customers, and more than 189,000 residential and commercial customers directly in Berkeley, Georgetown, and Horry counties. The relative proportions of sales to these customers during 2019 are shown in Figure 5-1, below.<sup>3</sup>

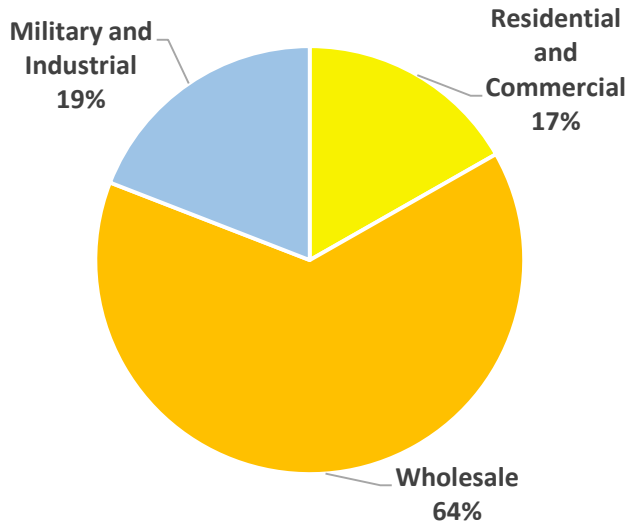
Santee Cooper mainly focuses on developing and offering DSM programs to its residential and commercial customers. Santee Cooper’s largest wholesale customer, Central Electric Cooperative, Inc., develops, implements, and administers its own DSM programs. Santee Cooper’s military and industrial customers independently make energy efficiency improvements based on the measures found to be most feasible for the specialized needs their industries.

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<sup>2</sup> Central also expects to increase its demand response resources as discussed in Section 6 under Demand-side Resources.

<sup>3</sup> Residential and commercial sales include interdepartmental sales, which comprise electricity sales to Santee Cooper water system facilities.





**Figure 5-1: Santee Cooper Customer Energy Sales Mix**

Santee Cooper has offered DSM programs for decades. Most recently, its retail customer base has benefited from the Santee Cooper DSM plan and portfolio of programs called *Reduce the Use*, which was active through 2020 and included a variety of both commercial and residential programs. In 2008, the Santee Cooper Board of Directors set a goal to reduce energy consumption by 209 gigawatt-hours by 2020, which was the basis for choosing the portfolio of DSM programs to include in the Reduce the Use plan. With the Reduce the Use plan meeting its energy reduction goals by 2018 and coming to a successful conclusion in 2020, Santee Cooper designed and implemented a successor DSM plan that will continue to serve its retail customers by empowering them to take steps to further improve their energy efficiency, establish solutions for peak demand load control, and support electric vehicle adoption through rebate initiatives. This portfolio of DSM programs, called *EmpowerSC*, embraces new technologies and focuses on the needs of our customers.

The EmpowerSC plan is comprised of voluntary load management programs, beneficial electrification, residential and commercial energy efficiency programs, and solar power offers, and provides for inclusion of new technologies, when appropriate. Santee Cooper's goal for the EmpowerSC plan is to save an additional 100 gigawatt-hours by 2030. The EmpowerSC plan is structured to be customer-focused, diversified, continuously improving, and transparent. Additionally, flexibility and responsiveness have been built into the EmpowerSC plan through the expectation of continuous evaluation and adaptation to best meet customer needs, as well as take advantage of market opportunities and technology advances.

### Current DSM Offerings

Santee Cooper's Smart Energy portfolio includes all its residential and commercial smart energy programs in one portfolio. Although program qualifications and participants vary by program, all Santee Cooper programs are measured and evaluated at a portfolio level.

## Residential Programs

### Smart Energy Loans

In addition to loans for renewable energy resources, Santee Cooper offers on-bill financing for energy efficient upgrades. A qualifying customer can secure an outstanding loan of up to \$20,000 for energy-efficiency and \$40,000 for renewable energy resources. The combined maximum outstanding loans per customer cannot exceed \$40,000. Customers receiving Smart Energy Loans can also receive rebates on qualifying equipment through the Reduce the Use residential programs. To prevent double counting, the savings from the installations are tracked as part of the rebate program, although many of the equipment upgrades would not be possible without the assistance of the Smart Energy Loan.

### Smart Energy Existing Homes Program

The Smart Energy Existing Homes Program offers home energy evaluations, incentive rebates and financial assistance through low cost loans for residential energy efficiency improvements to improve the energy efficiency of customers' homes year-round. Santee Cooper provided rebates to 1,184 customers in 2019, totaling \$337,211, with estimated savings of 1,577 megawatt-hours. Table 5-1 provides the numbers of rebates and rebate levels for the rebate measures in this program for 2019. The rebate level for the heat pump measure depends on a variety of factors, including efficiency level and application (single- versus multi-family).

**Table 5-1  
Smart Energy Existing Homes Rebate Activity During 2019**

Measure	Quantity	Incentive
Duct Replacement	148	\$500
Heat Pump Water Heater	20	\$400
Smart Thermostat	744	\$50
High efficiency heat pump	849	\$80 - \$700

### Equipment and Lighting Incentives: Residential LEDs

As prices continue to drop, LEDs have become a cost-effective lighting solution. LEDs last 20 times longer than incandescent bulbs, produce over 75 percent less heat, use over 75 percent less energy, and are available in different sizes and shapes to fit in almost any fixture. Santee Cooper energy advisors gave away 11,142 LED bulbs to 2,500 residential customers, yielding annual energy savings of 846 megawatt-hours.

Santee Cooper Residential Energy Advisors conduct site visits to perform *Home Energy House Calls*. During a House Call, the Energy Advisor evaluates the efficiency of the home and makes recommendations on opportunities to make the home more energy efficient and comfortable. During these site visits, 706 customers received a *Home Energy House Call Kit* that included LED bulbs,

faucet aerators, an LED night light, and, where needed, pipe wrap for water heaters. The estimated annual energy savings total 105 megawatt-hours.

### Smart Energy New Homes Program

The Smart Energy New Homes Program offers rebates to builders who construct homes that meet Santee Cooper's eligibility requirements and either meet Smart Energy New Homes performance path criteria or include qualifying equipment. There are three tiers of energy efficiency standards for the single-family performance pathway and two tiers for multi-family.

- **Tier 1:** Achieve a Home Energy Rating System (HERS) Index of 65 or below, which requires homes to be 35 percent more energy efficient than a standard new home. The rebate for this tier is \$3,000 for single-family homes and \$1,400 per unit for multi-family homes.
- **Tier 2:** Achieve a HERS Index of 75 or below, which requires homes to be 25 percent more energy efficient than a standard new home. The rebate for this tier is \$1,600 for single-family homes and \$400 per unit for multi-family homes.
- **Tier 3:** Achieve a HERS Index of 85 or below, which requires homes to be 15 percent more energy efficient than a standard new home. The rebate for this tier is \$800 for single-family homes only.

Under Tier 1, 94 new single-family homes and 186 multi-family homes were built during 2019 for annual savings of 979 megawatt-hours. Under Tier 2, 125 new single-family homes and 5 new multi-family homes were built for annual savings of 356 megawatt-hours. Under Tier 3, 1 new single-family home was built for annual savings of 2 megawatt-hours.

There were 9 single-family homes that Energy Star qualified, which resulted in a higher HERS Index rating overall. There were 220 new single-family homes that received an LED Bonus for installing more than 50 percent of household lighting with new LED Energy Star bulbs. The total combined incentive cost was \$764,860.

### On-site Energy Assessments

Santee Cooper offers free energy assessments to residential customers, upon request. In 2019, 260 residential energy assessments were completed.

## Commercial Programs

### Commercial Prescriptive Program

The Commercial Prescriptive program is a predefined rebate program with established qualifications and associated rebates. This comprehensive platform includes specific cost-effective energy-efficiency measures and associated rebates for commercial improvements. Projects with qualified improvements are eligible for rebates under the Commercial Prescriptive Program. In 2019, 167 projects were funded, saving an estimated total of 9,548 megawatt-hours annually, at a total combined incentive cost of \$425,940.

### Commercial Small Business Energy Saver Program

Santee Cooper determined that small business customers have limitations that make it hard to participate in traditional energy efficiency programs. These customers typically have little to no time to research options, have little upfront capital, are not equipped to perform economic evaluations of energy efficiency measures, and have no resources to manage a project. As part of the EmpowerSC plan, Santee Cooper wanted to create a program offer that would be more inclusive and targeted to this segment of customers to help address these issues. Santee Cooper implemented a Small Business Direct Install program, in which an implementation contractor, Lime Energy™, sells projects to our small business customers. After selling the project, Lime Energy then procures the materials and equipment and has the measures installed by licensed contractors, creating a seamless experience for the customer. In 2019, 455 customers participated in this program for a combined savings of 4,140 megawatt-hours and a combined incentive cost of \$434,009.

### On-site Energy Assessments

Santee Cooper offers free energy assessments to commercial customers, upon request. In 2019, 485 energy assessments were completed.

## Load Management

### Direct Load Control

Santee Cooper has not had an active direct load control program for many years. However, as discussed further below, Santee Cooper is working to implement a demand response program involving residential and commercial heat pumps and water heating end uses that is expected to function in a similar way to legacy direct load control programs but with two-way communication, more complex control options, greater participant engagement and available options, and end use data collection.

### Time-of-Use or Seasonal Rates

Santee Cooper offers time-of-use rates for residential and commercial customers, with the rate for the latter being seasonal. These options have been offered for many years, currently with three residential and 25 commercial customers.

### Standby Generation Incentives

Santee Cooper has historically offered a generator lease program. The decision was made to close this program to new participants in 2014. Santee Cooper continues to actively service the generators remaining in the lease program until the term of those leases expire. The program has 57 participants leasing a total of approximately 11 megawatts.

### Voltage Reduction

Santee Cooper has installed a Conservation Voltage Reduction (CVR) application which allows for the reduction of distribution system peak demand. The CVR application and the associated

supervisory control and data acquisition (SCADA), regulator controls, and metering upgrades have been completed in the Horry, Georgetown, and Berkeley areas. By the end of 2019, a total of 253 feeders were complete and ready for CVR. When CVR is enabled, SCADA will direct the station regulators to lower the feeder voltage until the end-of-line meters reach the lower end of the American National Standard Institute (ANSI) required range. If voltage starts to drift too close to the lower limit, SCADA directs the regulators to increase the voltage. Voltage delivered to service points must fall within an acceptable ANSI range, and the application configures the system to deliver the lowest possible voltage while staying within that range. This operational efficiency results in an overall reduction of electric demand. Results from our CVR pilot study support an expected demand reduction on the order of two percent of our distribution system's peak load. Although it will vary by month, Santee Cooper is currently able to achieve between 17 megawatts and 21 megawatts on a typical summer or winter peak. These anticipated reductions are not reflected in the forecast of Santee Cooper's retail loads being utilized for the 2020 IRP and are instead reflected within the demand response capability shown as supply-side resources.

### Public Information

#### Web-Based Customer Tips & Tools

Santee Cooper offers online energy saving tips for residential and commercial customers. We have a partnership with EnergyEarth to offer residential customers a free, online home energy audit. The online, personalized home energy checkup helps customers identify opportunities to be more energy efficient in their homes, which can reduce energy consumption and lower utility bills. The process is easy, progress and results can be saved, and when the audit is finished, suggested products that can help lower energy use are made available for customers to purchase. There is no purchase required to complete the home energy checkup and get personalized energy-saving tips.

#### Direct-to-Customer Communications

Santee Cooper communicates directly to customers to support all of our energy efficiency, conservation and DSM activities and programs. Our monthly bill inserts highlight new programs and include clear, measurable calls to action. We also use direct mail promotions and education collateral. For customers that have opted-in to e-mail notifications, we send monthly information and links to sign up for programs and submit program and participation questions that are answered by our Energy Advisors and engineers. At the end of 2019, the opt-in email program included 88,457 residential and commercial customers, and our direct mail numbers vary according to the target audience for each specific program.

#### Public Campaigns

Santee Cooper continues to use advertising and communications vehicles that target specific customers and customer groups. We advertise and promote our programs primarily through digital advertising on the web and through social media, which is highly measurable and lets us know who we are reaching and how they are responding. We analyze and measure performance of

communications, allowing us to quickly adjust promotions to achieve better results with our customers and other public stakeholders. We also promote programs through traditional advertising such as outdoor, radio and print ads, as well as press releases and press conferences. In addition, we are partnering with customers who can help spread the word, such as large property managers who help us promote energy efficiency to their property owners.

### School Programs & Resources

Through educational initiatives, Santee Cooper has established a strong, collaborative network with school districts in the state to provide educators and students with a real-world understanding of the sources and uses of electricity as well as the importance of conserving and using energy efficiently. Through our business and education partnerships, Santee Cooper is continually supporting the needs of students, teachers, and parents. The following describes the programs in place for ongoing community education and involvement in the energy efficiency and conservation aspects of Santee Cooper's operations.

- **Energy Educators Institute.** Each summer, Santee Cooper sponsors the Energy Educators Institute, a graduate level course for certified South Carolina K-12 teachers and administrators. Ninety educators explore the scientific concepts of energy, its sources, use and impact on the environment, economy and society. Since 1988, over 2,130 South Carolina educators have attended the Institute and have received relevant curriculum-based materials to enhance their teaching in areas such as energy efficiency and conservation.
- **Educational Publications.** Approximately 25,000 curriculum-based environmental/energy conservation publications (K-12) are sent to teachers in the state each year. These publications educate teachers and students about environmental issues such as the importance of *Reduce, Reuse, and Recycle*,—how renewable resources can play a part in the generation of electricity, and the need to develop life-long practices to conserve energy wisely.
- **Solar Schools' Project/Conservation of Energy Curriculum.** Santee Cooper's Solar Schools Initiative in 2007 led to the development of the Conservation of Energy science curriculum kit now being taught to all sixth-grade students in 32 middle schools in South Carolina. Teachers are trained each summer (over 150 to date) on the Conservation of Energy curriculum, equipping them with the scientific knowledge needed to understand the opportunities and limitations associated with renewable power sources, as well as the need for societies to develop lifestyles that embrace the efficient use of energy.
- **E-SMART Kids.** This interactive website is a tool to inspire teachers, students, and parents to be *green*. The intent of the website is to bring awareness and understanding about the need to be energy efficient and the steps each individual can take to prevent energy waste. Also available on this site is a link for teachers and parents to learn how Santee Cooper's green initiatives can help make homes, schools and businesses operate in a more energy efficient manner.

- **Environmental Bookmarks.** Santee Cooper’s energy conservation message is also delivered through the distribution of bookmarks, Live the Good Life and Make an Impact, (over 76,000 through 2019) at educational and community venues, such as career day events, classroom presentations and environmental fairs. The green tips shared on the bookmarks are a daily reminder to students, parents, and community members on the actions they can take every day to use energy more wisely.

## **Future DSM Programs and Program Updates**

### **Demand Response**

Santee Cooper is currently developing a demand response program for its commercial and residential customers. The program will initially be utilized to reduce demand during reliability events but will eventually be used for peak shaving. The program will begin as a residential pilot program, which, upon successful completion, will roll into a full-scale program. A commercial pilot and, ultimately, full-scale program will follow. The program initially is planned to control customers’ electric heating systems and water heaters during electric system reliability events. This program will emphasize the customer experience, including efforts to manage customer convenience as well as high-quality marketing and communication to inform our customers about the reason for needing a demand response program and how Santee Cooper is striving to ensure that our customer’s inconvenience during a called event is minimized. The program will provide customers with information about why an event was called and pay them incentives for their participation. The goal for this program is to have 35 megawatts of demand response by 2027.

This customer-focused program will work in tandem with conservation voltage reduction and Volt-VAR optimization capability that Santee Cooper has been developing, which is currently estimated to be capable of reducing the system peak by 18 megawatts. Santee Cooper expects to be able to increase the capability of the voltage reduction and Volt-VAR optimization program to 26 megawatts by 2027. The impacts of these demand response programs are not reflected in the forecast of Santee Cooper’s retail load that has been utilized for the 2020 IRP.

### **Electric Vehicles**

Santee Cooper is developing and implementing an electric vehicle (EV) program. The program has two focuses—internal advocacy of EVs and customer programs. Santee Cooper believes that internal advocacy of EVs will be a driving factor in the success of the EV programs. Therefore, Santee Cooper wants to understand EVs from users’ perspectives to better serve customers. Santee Cooper’s approach to internal advocacy will include:

- **Replacing Santee Cooper Fleets:** Fifty FleetCarma telematics devices are being rotated throughout Santee Cooper’s light duty fleet vehicles. These devices capture real-time driving patterns, such as the number of trips, trip length, and miles driven. FleetCarma analyses the data from these vehicles and determines whether the driving patterns associated with each vehicle conform with those of plug-in hybrid electric vehicles (PHEV) or battery-powered electric vehicles

(BEV). Results of the analyses are summarized in a report that provides recommendations on the type of EV that is most appropriate for each fleet vehicle's given driving pattern. In 2020, Santee Cooper has purchased four BEVs and envisions replacing at least 60 fleet vehicles over the next ten years with BEVs and PHEVs.

- **Santee Cooper's Level 2 Charging Infrastructure:** Santee Cooper is installing level 2 charging infrastructure for its EV fleet vehicles, employees that purchase EVs, and customers with EVs. By December 2020, two level 2 charging heads for fleet vehicles and two for employees and customers will be installed at Santee Cooper's main office complex in Moncks Corner. There will also be two level 2 charging heads for fleet vehicles and two for employees and customers installed at Santee Cooper's Horry-Georgetown Division headquarters by December 2020. The North Myrtle Beach Service Center will have one level 2 charging head for fleet vehicles and one for employees and customers. Santee Cooper will continue to build out this infrastructure to aid EV owners.
- **Residential Level 2 EV Charging Incentive:** Santee Cooper's EV residential customer program will begin on December 1, 2020, incentivizing the installation of level 2 charging stations at customers' homes. The incentive is designed to offset a portion of the cost of the EV charging infrastructure sufficient to encourage customers to purchase EVs. The first fifty customers who install qualified, networked, level 2 charging stations will receive a rebate of \$500. Any projects submitted after the first 50 rebates have been or will be eligible to receive a \$250 rebate.
- **Commercial Level 2 EV Charging Incentive:** Santee Cooper's commercial customer program for level 2 fleet charging station incentives is planned to begin in late 2021.
- **Commercial customer EV Fleet Replacement Incentive:** Santee Cooper plans to initiate a program to incentive commercial customers to replace gas-powered fleet vehicles with EVs that will begin in 2022.

### **Commercial and Residential Energy Efficiency**

Using the results of a DSM Market Potential Study conducted for Santee Cooper by Nexant, Inc., in August 2019, Santee Cooper has implemented additional measures as part of its commercial and residential energy efficiency programs. The Potential Study produced both a low and high estimate of potential for these programs. After consideration of the specific measure parameters and analysis of potential adoption rates, Santee Cooper decided to adopt the high case estimate to inform its DSM implementation goal. The resulting DSM program updates include a significant expansion to the residential multi-family measure offerings and additional residential single family and commercial measures to better meet customer needs and match offerings of comparable utilities. New and modified DSM measures for residential include air source and geothermal heat pump systems, household appliances, pool pump motors, thermal envelope measures (e.g., insulation and air sealing), and smart thermostats. Expanding and adapting these incentives to multi-family homes expands our programs' reach into a large segment of our residential customer base. New and modified DSM measures for commercial customers include lighting, refrigeration, water pump motors, and variable frequency drives.



## DSM Program Savings for Retail Customers

Table 5-2 provides the cumulative participants and current level of estimated savings, including transmission and distribution losses, from customers that have participated in Smart Energy Portfolio DSM measures, excluding the Good Cents program.

**Table 5-2**  
**Smart Energy Portfolio Savings (Excluding Good Cents)<sup>4</sup>**

Class	Cumulative Participants (2009-2019)	DSM Savings (at Generation)		
		Annual Energy (MWh)	Winter Demand (kW)	Summer Demand (kW)
Residential	73,028	66,802	8,215	8,215
Commercial	6,822	201,224	36,290	36,290
Total	79,850	268,026	44,505	44,505

Table 5-3 provides the current level of estimated savings, including transmission and distribution losses, from customers that have participated in the Good Cents program.

**Table 5-3**  
**Current Level of Estimated Savings from the Good Cents Program<sup>5</sup>**

Class	DSM Savings (at Generation)		
	Annual Energy (MWh)	Winter Demand (kW)	Summer Demand (kW)
Residential	25,173	17,660	29,938

Table 5-4 provides the estimated incremental savings, including transmission and distribution losses, from DSM activity projected for 2020.

**Table 5-4**  
**Projected Incremental DSM Savings for 2020**

Class	DSM Savings (at Generation)		
	Annual Energy (MWh)	Winter Demand (kW)	Summer Demand (kW)
Residential	2,632	2,724	2,724
Commercial	9,474	676	676
Total	12,106	3,400	3,400

<sup>4</sup> Incentive measure lives have been accounted for.

<sup>5</sup> Good Cents is a discontinued program from which continued load reduction benefits are expected until the end of 2022, when the useful lives of the affected end uses of this program expire.

Table 5-5 provides historical and projected incremental savings, including transmission and distribution losses, from DSM activity over the forecast horizon, excluding demand response programs associated with Santee Cooper’s retail load that are currently under development. As a large portion of the DSM activity corresponds to lighting measures, which tend to be largely or wholly off-peak, the implied load factor of the estimated DSM savings can be higher than 100 percent and varies considerably over this period depending on the relative extent of lighting measures.

**Table 5-5  
Historical and Projected Incremental DSM Savings**

Year	Annual Energy (MWh)	Peak Demand (MW)
2011	17,872	1.6
2012	13,965	2.8
2013	24,721	4.2
2014	24,284	4.6
2015	27,915	5.7
2016	31,776	5.9
2017	35,836	8.1
2018	20,221	4.9
2019	18,517	4.7
2020	12,133	3.4
2021	17,959	2.8
2022	15,824	2.5
2023	12,563	2.0
2024	9,145	1.6
2025	6,496	1.2
2026	4,716	0.9
2027	3,746	0.8
2028	3,220	0.7
2029 and beyond	2,968	0.7

The decline in incremental energy savings is generally a function of market saturation of economically feasible energy efficiency measures given current technologies and the impact of evolving building codes and appliance standards, which themselves are designed to drive implementation of economic energy efficiency improvements. Santee Cooper periodically performs DSM potential studies, like the study completed in 2019, and will revise future plans and projections as appropriate.

## Section 6

# Santee Cooper 2020 IRP Development

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Santee Cooper developed its 2020 IRP with consideration of future loads, existing resources, resource needs, future resource options, and projected costs for the Santee Cooper system. Through this process, Santee Cooper evaluated potential long-term resource plans to identify plans that reliably and economically meet future loads while providing for flexibility, resource diversity, technological innovation, improved efficiency, and reduced environmental impacts. The following section provides a detailed discussion of the methodology and assumptions utilized for the Santee Cooper 2020 IRP.

### Methodology

Santee Cooper has prepared its 2020 IRP utilizing generally accepted utility practices, including the use of overarching principles and objectives, realistic projections of economic and market conditions, historical operating characteristics for existing resources, industry-based assumptions for future resource alternatives, load forecasts developed using industry-standard techniques, identification of future power supply needs, integration of cost-effective DSM programs, evaluation of renewable and energy storage resources, screening of potential resource sites, simulation of resource dispatch, optimization of resource expansion plans, evaluation of coal resource retirements, and evaluation of resource plan sensitivities to changes in load, market, and regulatory conditions.

Santee Cooper has utilized an industry-accepted generation simulation and optimization software model to perform its resource expansion evaluations to identify a least-cost portfolio of future resources under a set of Base Case assumptions and under multiple sensitivity case assumptions reflecting changes in forecast load growth and fuel and power prices. To assure that resource plans are sufficiently flexible to address potential carbon regulations, a sensitivity case depicting a CO<sub>2</sub> tax and multiple portfolios for varying assumptions regarding retirement of Santee Cooper coal resources were investigated. Additionally, sensitivity cases were prepared to analyze the impact of lower levels of solar resource implementation.

Figure 6-1, below, provides a depiction of the overall process utilized by Santee Cooper when developing its 2020 IRP.

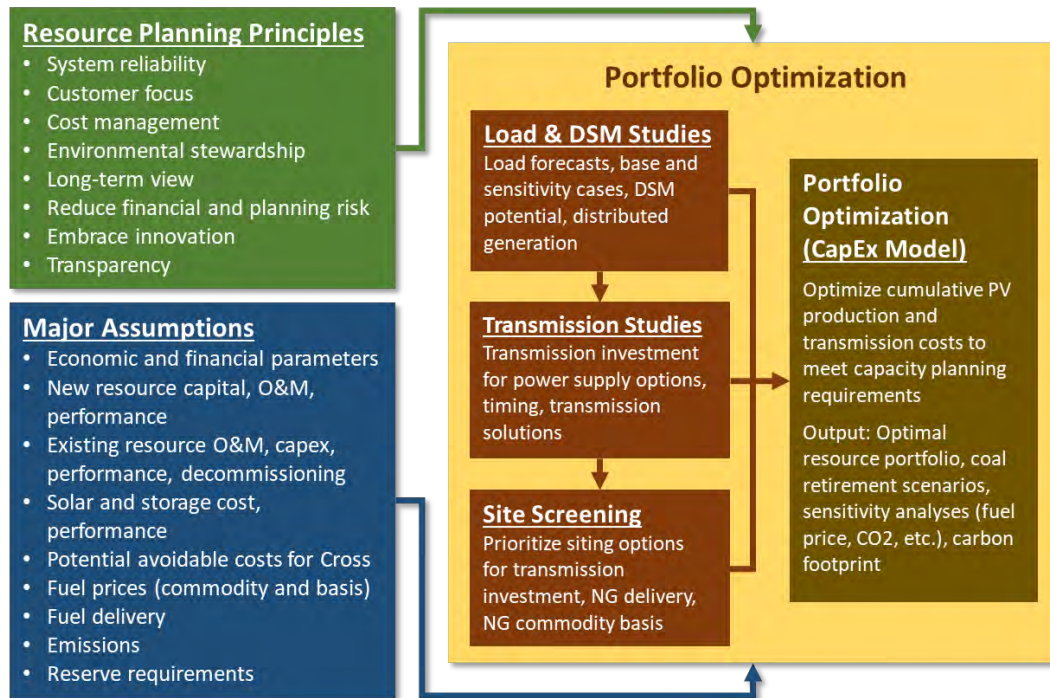


Figure 6-1: Santee Cooper IRP Process

### Capacity Expansion Model

The IRP dispatch and capacity expansion analysis was performed by Santee Cooper using the Capacity Expansion (CapEx) resource expansion optimization software model licensed by Hitachi ABB Power Grids, a leading vendor of power system simulation software applications that are widely used across the electric utility industry. CapEx is a PC-based software model capable of simulating hourly generating resource dispatch and evaluating future resource expansion plans using a mixed integer linear programming technique to identify a least-cost portfolio of resources, including future resource options identified by the user. CapEx simulates resource dispatch utilizing representative typical days and user-defined time periods.

For the 2020 IRP, the Santee Cooper electric system was modeled as a stand-alone system, with Santee Cooper generating resources and firm purchase power arrangements dispatched to meet the Santee Cooper load and wholesale sales obligations. Santee Cooper’s projected loads and wholesale obligations modeled for the 2020 IRP include Santee Cooper retail loads; sales to Central; partial requirements sales to the municipalities of Seneca, South Carolina, Waynesville, North Carolina, and Piedmont Municipal Power Agency; and other firm wholesales sales contracts, each with specific terms. Additional information on retail load and wholesale sales obligations are provided in Section 4.

Non-firm wholesale economy market purchases were simulated concurrently with the dispatch of other Santee Cooper resources, with price and import characteristics as described below. Non-firm wholesale economy market sales were not simulated as part of the IRP evaluation to eliminate the chance that the CapEx model might identify future expansion resources that rely on benefits of speculative market sales.

## Portfolio Evaluation

Santee Cooper performed resource portfolio simulations in CapEx under multiple assumptions for coal resource retirements and generation expansion options (as described in more detail below). Common to each of the portfolios evaluated is the adoption of resource retirements and resource additions targeted to achieve broader planning objectives of Santee Cooper to diversify its resource portfolio, reduce reliance on coal generation, reduce greenhouse gas emissions, and increase use of renewable and storage technologies.

### Santee Cooper Power Supply Roadmap

The Santee Cooper 2020 IRP assumes certain fixed resource retirement and resource expansion assumptions as part of all resource plans evaluated. For each of the expansion plans evaluated in CapEx, the 2020 IRP reflects the following resource additions and retirements.

- Retire the Winyah coal plant through a phased approach, idling Unit 4 by the winter of 2020/2021, idling Unit 3 by the Winter of 2021/2022, and fully retiring all four Winyah coal units by 2027.
- Add quick-start resources to ensure system reliability by installing 20 megawatts of diesel-fired reciprocating internal combustion engine (RICE) generating units in 2022 prior to idling Winyah Unit 3. The RICE units, already owned by Santee Cooper at the V. C. Summer site, will be installed at a new site near the Santee Cooper Conway substation.
- Add 500 megawatts of new solar resources by 2023 through an ongoing request for proposals (RFP) process jointly undertaken with Central, and plan for an additional 1000 megawatts of solar resources by 2032.<sup>6</sup>
- Add 200 megawatts of utility-scale battery storage to the Santee Cooper system in phases (50 megawatts by 2026, 100 megawatts by 2033, and 200 megawatts by 2036).<sup>7</sup>
- Implementation of demand response programs, consisting of direct load control, voltage control, and other measures, to avoid approximately 85 megawatts of winter peak load by 2027, increasing to 106 megawatts by 2034 (representing the total combined impacts for Santee Cooper and Central).

Some of these resource retirement and addition assumptions reflect resource decisions and plans that are already being implemented by Santee Cooper, such as the retirement of the Winyah Generating Station, installation of quick-start resources at a site near the Conway substation, and the

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<sup>6</sup> Solar resources have the potential to provide a low-cost, low environmental impact resource option for the Santee Cooper system and, as such, have been included in the long-term Santee Cooper resource plans. However, Santee Cooper intends to conduct additional analyses to evaluate the cost and reliability of integrating and operating solar resources before formal decisions regarding solar implementation beyond 500 megawatts are made.

<sup>7</sup> Phased implementation of battery storage will allow Santee Cooper to take advantage of market trends toward lower costs and to gain industry insights and experience on utility-scale battery operation.

ongoing RFP solicitation for 500 megawatts of solar resources. Other resource addition assumptions, including energy storage, additional solar, and demand response, reflect strategic choices in Santee Cooper's long-term resource roadmap. The timing for implementing these resources takes into consideration anticipated improvements in cost and technology and the need for additional studies.

### Alternative Retirement Portfolios

The IRP analysis was performed in a manner that provided for the identification of potential least-cost resource portfolios under representative scenarios for coal resource retirements. Under each coal retirement portfolio, a resource expansion optimization analysis was performed under the Base Case assumptions and under various sensitivity case assumptions (see below).

- **Retire Winyah Portfolios** – As discussed previously, Winyah is modeled to be retired in phases, with two of the four generation units being idled by the winter of 2021/2022 and all four units retired by 2027.
- **Retire All Coal Portfolios** – Under this retirement scenario, the Winyah Plant is retired as described above, and the Cross Plant is also retired, with Units 1 and 2 retired in 2030 and Units 3 and 4 retired in 2032.

### Sensitivity Analysis

For the 2020 IRP, Santee Cooper prepared resource expansion analyses examining various resources options under a Base Case set of assumptions that depicts expected market and planning conditions. In addition, Santee Cooper evaluated how resource expansion plans might change with changes in market, regulatory, load, and renewable resource planning, as follows.

- **Higher/Lower Load Growth** – Higher and lower retail and wholesale loads by one standard deviation of expected load forecast error due to economic uncertainty
- **High Natural Gas and Economy Energy Prices** – 50 percent increase in natural gas prices and an associated increase in economy power prices for market purchases in all years
- **CO2 Tax** – \$15 per ton price beginning in 2027, increasing annually by \$5 per ton until a cap of \$80 per ton is reached in 2040
- **Lower Level of Solar Resources** – Reduction in planned solar implementation by 500 megawatts

Specific assumptions utilized for the Base Case and each sensitivity case are discussed in more detail below and in the following section of the IRP Report.

For each sensitivity case, the CapEx model was allowed to optimize generation expansion portfolios specific to the assumptions for the case. Utilizing this approach, Santee Cooper was able to understand the variability of future power supply costs, recognize how resources expansion portfolios change for specific sensitivity assumptions, and identify whether specific resource expansion decisions were robust and would not change materially for changes in major assumptions.

## Major Assumptions

The following section summarizes major assumptions for cost escalation, financial assumptions, fuel prices, and economy power prices. Assumptions are provided for Base Case and sensitivity cases and were developed in consultation with Central.

### Cost Escalation

The IRP was prepared utilizing the assumptions for future annual cost escalation depicted in Table 6-1. Assumptions are based on recent long-term projections of general inflation and facility cost escalation derived from a variety of sources.

**Table 6-1  
Escalation Assumptions**

Cost Category	Annual Escalation Rate
Fixed and Variable Operating Cost	2.0%
Capital Cost for New Generating Resources	2.5%
Capital Costs for New Electric Transmission Facilities	2.0%
Capital Costs for Natural Gas Pipeline Facilities	2.0%

The IRP utilizes a constant two percent annual cost escalation assumption across a broad range of operating costs, such as fixed and variable operation and maintenance costs and administrative costs. Cost escalation for generation equipment is generally based on trends in historical cost escalation published in the Handy-Whitman Index of Public Utility Construction Costs (HWI). Cost escalation for transmission equipment and natural gas pipeline equipment was tied to assumptions for general inflation.

### Financial Assumptions

Financial cost assumptions utilized for the IRP, including the Santee Cooper cost of long-term and short-term debt and the discount rate utilized for purposes of presenting present value system power costs are provided in Table 6-2. These assumptions are based on information provided by Santee Cooper's financial advisors, PFM Financial Advisors, LLC.

**Table 6-2  
Study Financial Assumptions**

Financial Assumption	Interest Rate
Long-term Debt Interest Rate	3.76%
Interest During Construction (utilizing Commercial Paper)	2.63%
Discount Rate for Present Value Calculations	3.76%

**Load Forecast**

The Load Forecast modeled for the 2020 IRP includes the Base Case assumptions described above in Section 4, as well as sensitivity case assumptions for higher and lower load growth that reflect uncertainty in future economic conditions. Central and Santee Cooper independently produced sensitivity case forecasts for the Central and Santee Cooper loads, respectively, reflecting one standard deviation of potential variation in load growth attributable to economic uncertainty. Table 6-3 provides the resulting aggregate system annual energy requirements and firm winter peak demand for the Base Case and the Low and High Load Cases.

**Table 6-3  
Load Forecast Scenarios**

Year	Base Case		Low Load Case		High Load Case	
	Energy Requirements	Winter Peak Demand	Energy Requirements	Winter Peak Demand	Energy Requirements	Winter Peak Demand
2021	23,897	4,933	23,308	4,820	24,930	5,057
2022	24,689	5,072	23,951	4,946	25,733	5,233
2023	24,706	5,101	23,722	4,927	25,786	5,278
2024	24,872	5,127	23,702	4,910	26,079	5,328
2025	24,776	5,140	23,611	4,931	26,306	5,419
2026	24,833	5,168	23,511	4,917	26,536	5,475
2027	24,874	5,187	23,411	4,906	26,770	5,534
2028	25,087	5,233	23,488	4,922	27,176	5,622
2029	24,936	5,145	23,195	4,803	27,224	5,575
2030	25,055	5,177	23,177	4,807	27,541	5,650
2031	25,196	5,210	23,178	4,810	27,879	5,725
2032	25,387	5,247	23,232	4,819	28,268	5,805
2033	25,500	5,281	23,205	4,825	28,589	5,885
2034	25,661	5,316	23,228	4,833	28,959	5,966
2035	25,822	5,353	23,250	4,841	29,332	6,049
2036	26,042	5,395	23,329	4,856	29,764	6,139
2037	26,173	5,433	23,319	4,865	30,117	6,226
2038	26,354	5,476	23,357	4,879	30,526	6,319
2039	26,543	5,520	23,402	4,894	30,968	6,418
Compound Avg. Growth Rates:						
2021-2039	0.6%	0.6%	0.0%	0.1%	1.2%	1.3%

**Fuel Price Forecasts**

**Coal Price**

Long-term forecasts for the delivered price of coal to the Cross and Winyah units were developed by Santee Cooper based on long-term basin price forecasts obtained from Energy Ventures Analysis (EVA) and S&P Global and rail transportation costs developed by Santee Cooper. Additionally, market pricing from ICAP is used for the estimation of coal pricing through 2023. Forecast rail transport costs were developed from recent experience of Santee Cooper and reflect near-term contract prices and long-term assumptions with annual cost escalation of 1.5 percent.



Sources of supply to Santee Cooper’s coal units were assumed to include the Central Appalachian, Northern Appalachian, and Illinois Basins, with coal blends specific to each coal-fired generating resource. Figure 6-2 and Figure 6-3 depict the resulting projections of the delivered price of coal burned by unit at Cross and Winyah Station, respectively.

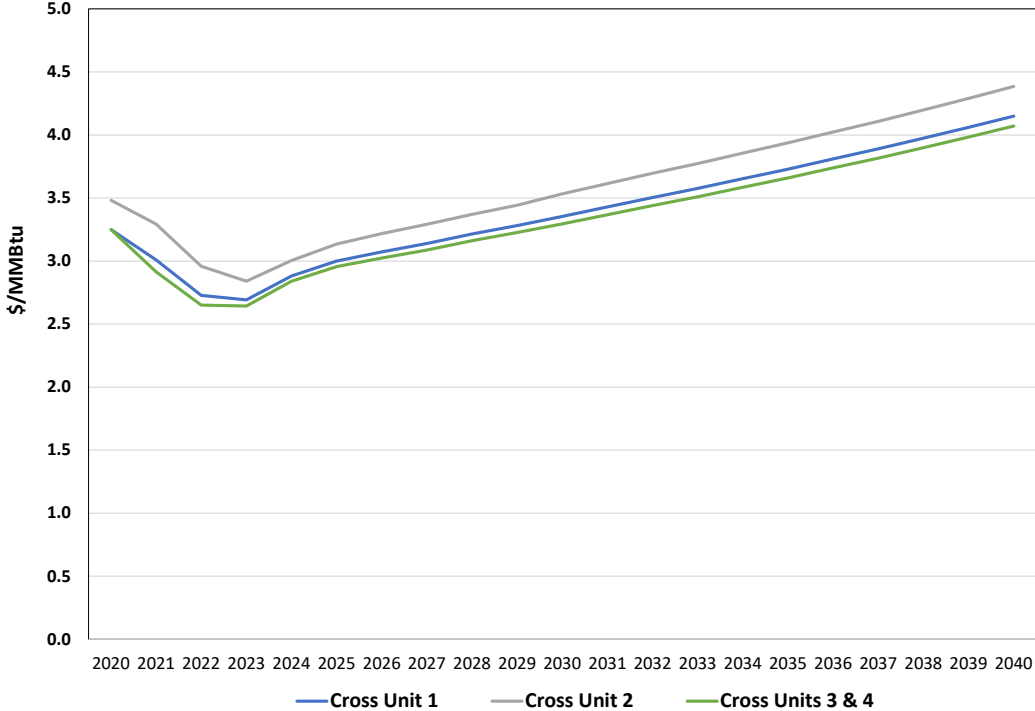


Figure 6-2: Projected Price of Coal Delivered to Cross Station

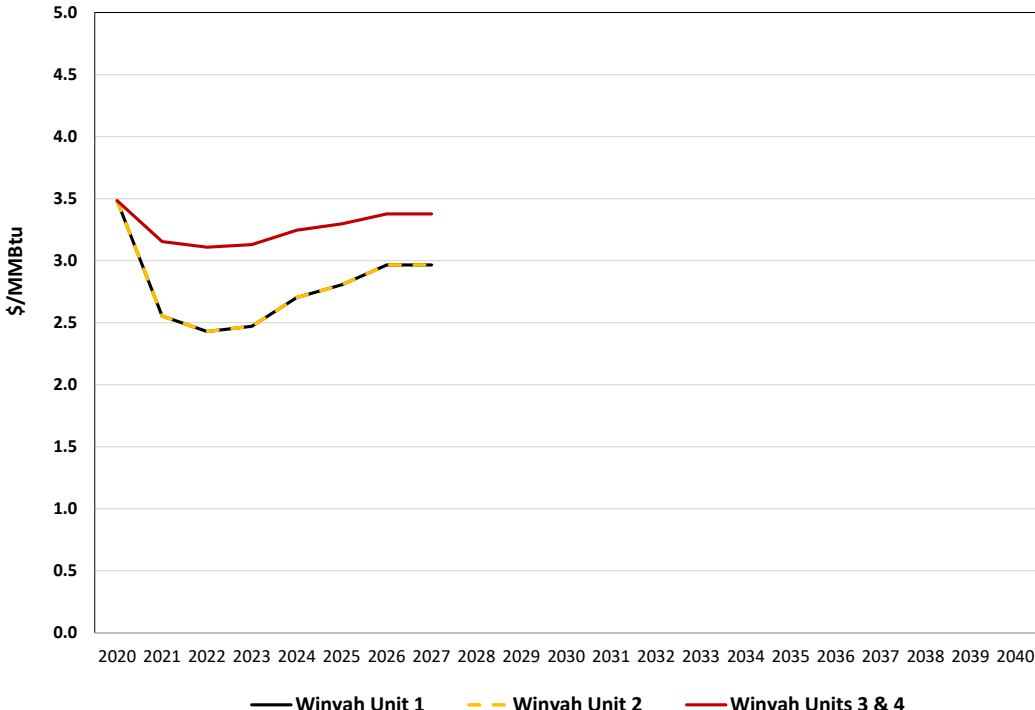
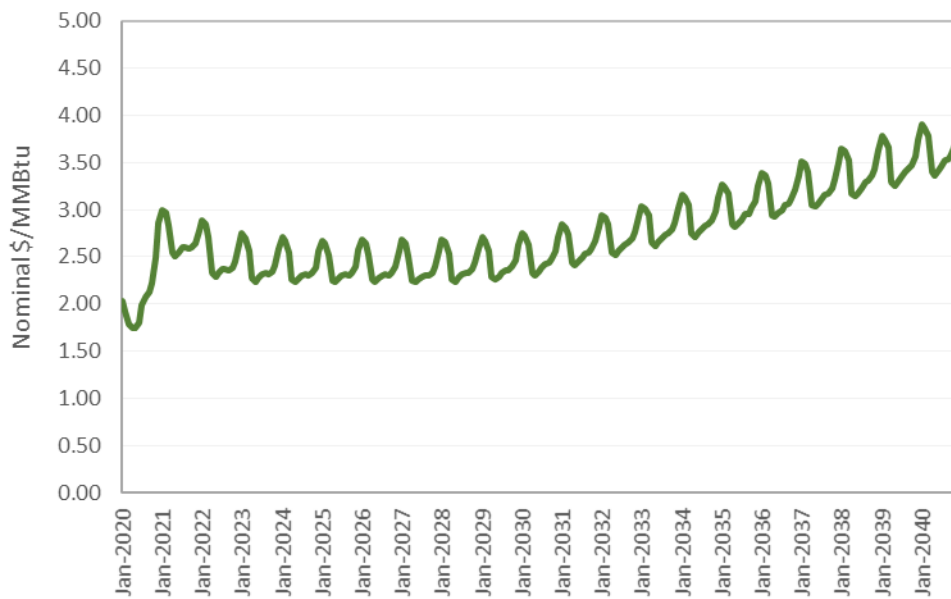


Figure 6-3: Projected Cost of Coal Delivered to Winyah Station

Natural Gas Commodity Price

Natural gas prices were developed based on an average of forecast and forward natural gas price curves for Henry Hub obtained from multiple sources. Santee Cooper utilized an average of forward NYMEX Henry Hub prices settled during the month of May 2020 published by S&P Global to provide a forecast through 2032. Beyond 2032, Santee Cooper utilized a fundamental forecast of Henry Hub prices through 2039 prepared by SNL and published S&P Global. Prices were modeled to transition uniformly from forward to forecast prices over a seven-year period through 2039. Prices beyond 2039 were escalated at the compound annual growth rate observed for the final three years of the forecast period. Figure 6-4 depicts the projected monthly nominal prices for Henry Hub assumed in the 2020 IRP for the Base Case.



**Figure 6-4: Projected Henry Hub Natural Gas Prices**

In addition, a high natural gas price case (High NG Case) was developed to test the sensitivity of resource decisions and future power costs to higher gas prices. This High NG Case assumes Henry Hub prices are 50 percent higher than the Base Case forecast. Because natural gas price are near historically low levels, Santee Cooper did not model a low natural gas price scenario for the 2020 IRP. Figure 6-5, below, depicts the projected annual nominal prices for Henry Hub assumed in the 2020 IRP for the Base Case and the High NG Case.

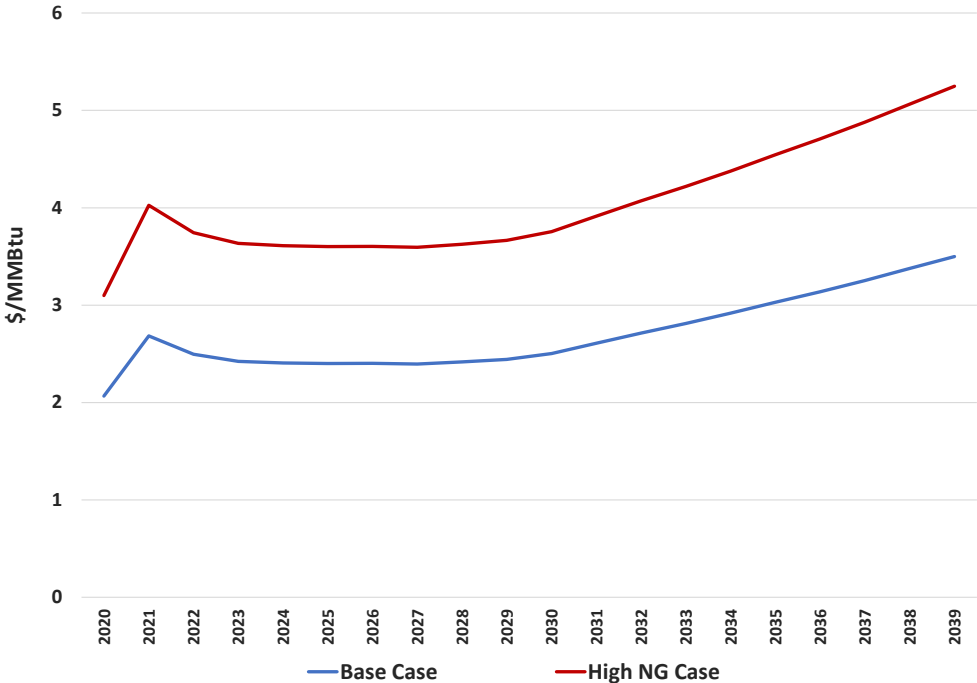


Figure 6-5: Projected Henry Hub High Natural Gas Price Sensitivity

Natural gas price basis differentials for natural gas hubs to which Santee Cooper has access (i.e., Transco Zone 4 and Transco Zone 5) were developed from the average of forecast hub prices prepared by OTC Global Holdings through 2029 and published by S&P Global during May 2020. The forecast monthly basis differentials were added to or subtracted from the forecast Henry Hub price utilized for the 2020 IRP, with basis pricing beyond 2029 held constant. Natural gas hub basis differentials were assumed to remain unchanged for the High NG Price sensitivity. Figure 6-6 depicts the forecast monthly natural gas hub basis assumed for the 2020 IRP. As depicted below, Transco Zone 5 is subject to the influence of much higher demand for natural gas as a heating fuel, primarily in the Northeast, during winter months.

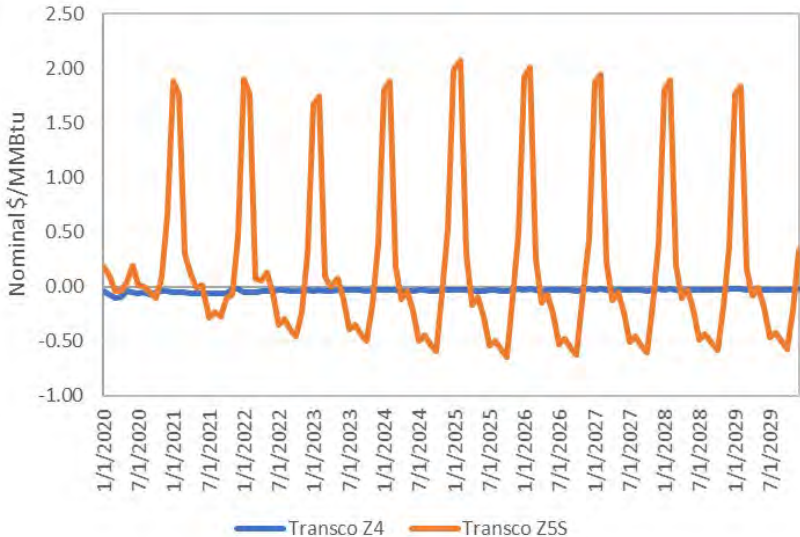


Figure 6-6: Projected Natural Gas Price Basis

### Natural Gas Transportation

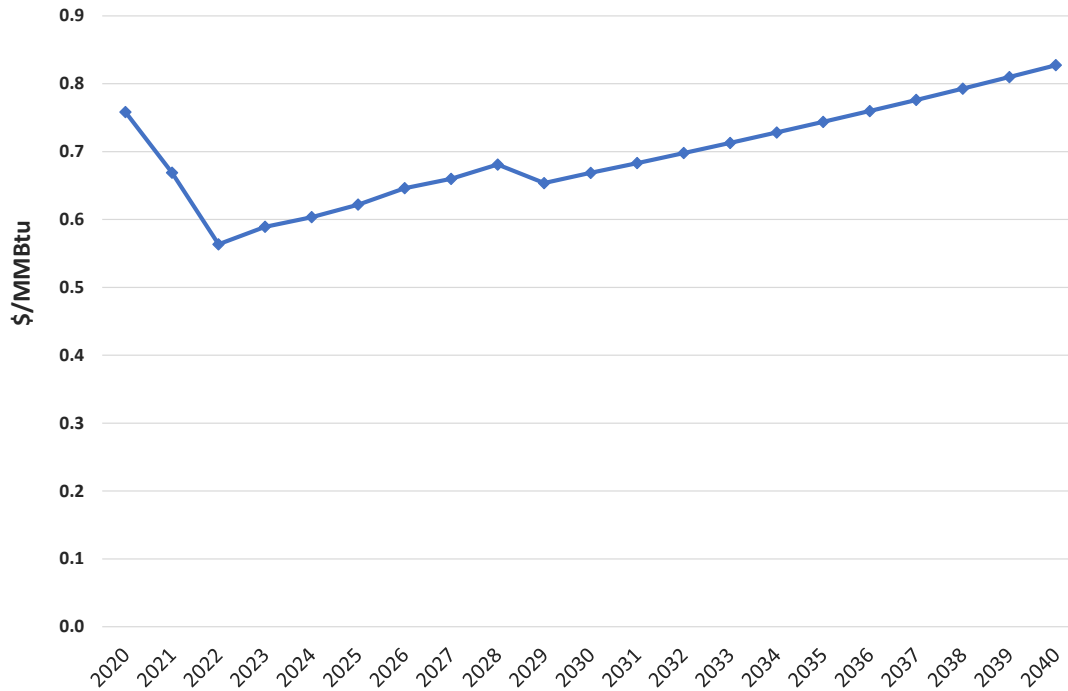
Costs for natural gas transportation were added to the forecast natural gas commodity and hub basis prices to develop delivered prices of natural gas modeled for existing and future natural gas-fired resources. Variable transportation charges (i.e., fuel use charges and variable transportation service rates and fees) were added to the delivered cost for all natural gas-fired resources. Natural gas-fired combined cycle (NGCC) resources were modeled with firm natural gas transportation service (FT service), while natural gas-fired combined cycle (NGCT) peaking resources were generally modeled using interruptible natural gas transportation service (IT service).

Use of FT service for base-loaded NGCC resources is important to assure resource capacity can be counted as firm. NGCT resources, which typically operate at low capacity factors, were modeled as having diesel fuel backup and assumed to not require FT service to assure firm capacity and instead were modeled to use IT service. Additionally, in certain instances when a portfolio might consider only new NGCT resources for expansion at a site without preexisting natural gas service, firm NG transportation service was modeled to reflect the cost of securing new pipeline facilities to the site. Where appropriate, existing Santee Cooper natural gas-fired resources were modeled assuming existing fuel supply contracts, converting to more general market assumptions following existing contract terms.

The projected price of transportation service was developed for each potential NGCC site and delivery configuration based on rate information obtained from natural gas pipeline companies and from existing pipeline tariffs. Charges for FT service were assumed to vary for the evaluated NGCC generation sites based on the proximity of each site to interstate pipelines in the region. For instance, charges for FT service at the Winyah Generating Station were assumed to be approximately twice that assumed for a site near the V. C. Summer Generating Station. Additionally, charges for FT service were assumed to decline with increasing volumes to reflect improved economy of scale associated with larger pipeline lateral installations. FT service was modeled as a fixed cost for each NGCC resource within the CapEx model by multiplying the max hourly natural gas requirement by the firm reservation charge. IT service was assumed to be equal to the firm reservation charge but was assigned as a variable cost adder to the delivered price of natural gas. Natural gas transportation charges were assumed to remain constant over the IRP study period.

### Nuclear Fuel

The projected cost of nuclear fuel at the V. C. Summer Generating Station was provided by Dominion through 2029 and escalated thereafter at the average rate computed over 2022-2029. Figure 6-7, below, depicts the projected cost of nuclear fuel at Summer over the study period.



**Figure 6-7: Projected Nuclear Fuel Cost at V.C. Summer**

**Power Market Prices**

The IRP assumes that Santee Cooper has access to economy energy purchases from the market as an additional resource to economically meet load requirements. Economy energy reflects daily and short-term purchases, with prices varying monthly with natural gas prices and daily based on assumed market conditions. Pricing includes two tiers: Tier 1 for economy purchases that are generally available year-round across all hours, and Tier 2 depicting additional amounts assumed available at a price premium, and with the modeled quantity of either tier being dependent on the economic dispatch simulated in the CapEx model. See the section entitled Transmission System Considerations, below, for additional information on modeled economy import limits.

The projected price of Tier 1 economy energy purchases is based on projections of monthly energy market prices developed by The Energy Authority (TEA) for the Southern Company market area, adjusted to be consistent with the Henry Hub prices modeled for the 2020 IRP, utilizing an implied monthly heat rate from TEA projections. TEA projections were based on market indicators, including market offers, forward prices for power and natural gas, and fundamental forecasts of power prices and natural gas prices. Projected economy energy prices are further adjusted for assumed wheeling charges to reach the Santee Cooper interface, and to reflect typical daily price volatility relative to variations in load. Tier 2 economy energy prices assume a 15 percent price premium relative to Tier 1.

Figure 6-8, below, depicts the economy energy prices modeled for the 2020 IRP under the Base Case. Economy energy prices were also modeled for the High NG Price sensitivity case utilizing the implied heat rate and other adjustments described above for the Base Case forecast. Figure 6-9, below, depicts the projections of the economy energy prices under the Base Case and High NG Price sensitivity case.

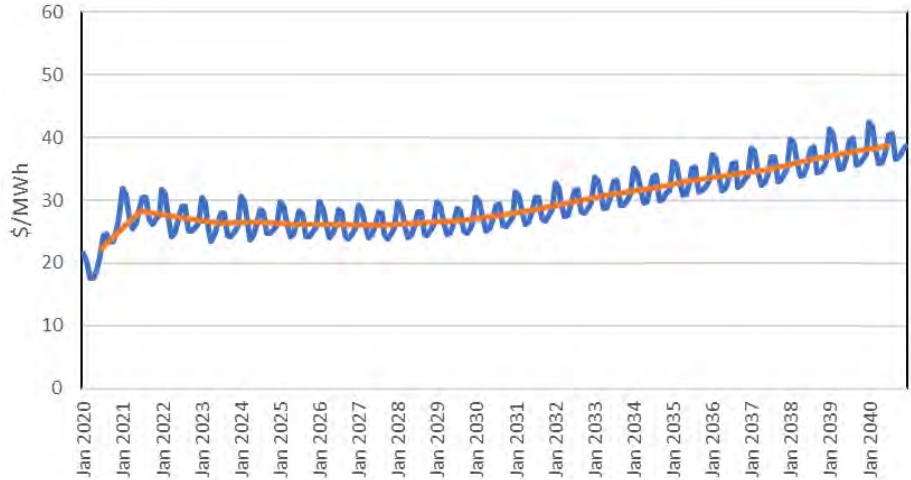


Figure 6-8: Projected Base Case Tier 1 Monthly Economy Energy Price

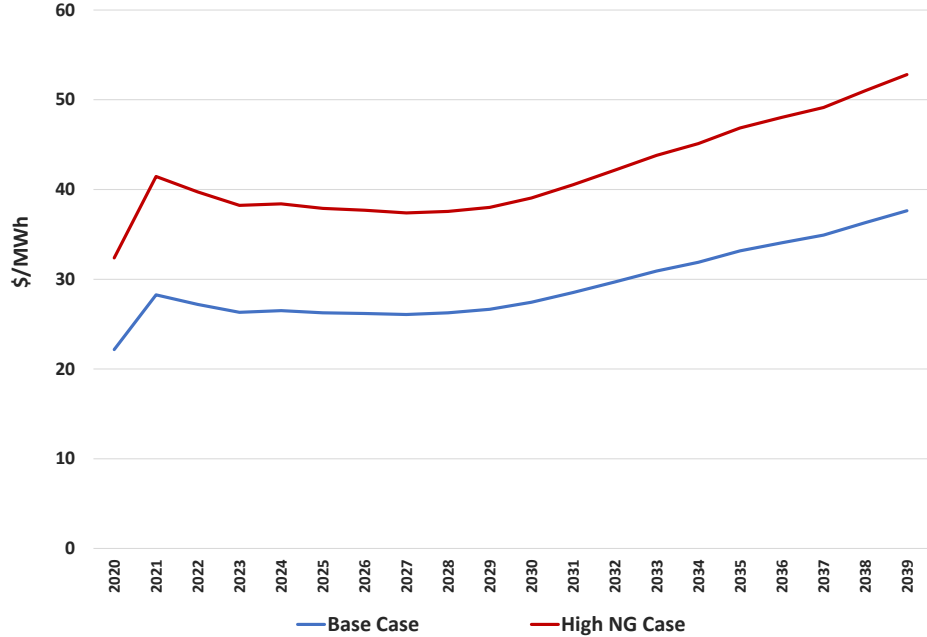


Figure 6-9: Projected Annual Base Case and High Prices for Economy Energy

**Existing Santee Cooper Resources**

Santee Cooper currently owns and operates approximately 5,338 megawatts (winter rating) of generating resources and purchases approximately 471 megawatts from other parties. Table 6-4, below, lists existing generation resources owned by Santee Cooper, including information on resource location, in-service date, winter and summer capacity ratings, and the fuel or energy source. Table 6-5, below, lists existing and planned wholesale purchases made by Santee Cooper, including information on the type of resource, purchase term, nameplate capacity rating, and winter and summer firm capacity ratings.

**Table 6-4**  
**Existing Santee Cooper Generation Resources**

Generating Facilities	Location	In Service Date	Winter MCR <sup>(1)</sup> (MW)	Summer MCR <sup>(1)</sup> (MW)	Energy Source
Jefferies Hydroelectric Generating Station <sup>(2)</sup>	Moncks Corner	1942	140	140	Hydro
Wilson Dam Generating Station	Lake Marion	1950	2	2	Hydro
Myrtle Beach CT1-CT5	Myrtle Beach	1962-1976	65	56	Oil/NG
Hilton Head CT1-CT3	Hilton Head	1973-1979	100	88	Oil
Winyah Generating Station	Georgetown				
No. 1		1975	280	275	Coal
No. 2		1977	290	285	Coal
No. 3		1980	290	285	Coal
No. 4		1981	290	285	Coal
Summer Nuclear Unit 1	Jenkinsville	1983	322	322	Nuclear
Cross Generating Station	Cross				
Unit 1		1995	585	580	Coal
Unit 2		1983	570	565	Coal
Unit 3		2007	610	610	Coal
Unit 4		2008	615	615	Coal
Landfill Gas Resources					
Horry Landfill Gas Station	Conway	2001	3	3	LFG
Lee County Landfill Gas Station	Bishopville	2005	11	11	LFG
Richland County Landfill Gas Station	Elgin	2006	8	8	LFG
Anderson County Landfill Gas Station	Belton	2008	3	3	LFG
Georgetown County Landfill Gas Station	Georgetown	2010	1	1	LFG
Berkeley County Landfill Gas Station	Moncks Corner	2011	3	3	LFG
Rainey Generating Station	Starr				
Unit 1		2002	520	460	NG
Unit 2A		2002	180	146	NG
Unit 2B		2002	180	146	NG
Unit 3		2004	90	75	NG
Unit 4		2004	90	75	NG
Unit 5		2004	90	75	NG
Total Capability <sup>(3)</sup>			5,338	5,110	

(1) Maximum Continuous Ratings (MCR).

(2) MCR updated after Hydro rebuilds.

(3) Santee Cooper currently owns 5.1 megawatts of solar resources that do not contribute to the total capability.

While Santee Cooper has announced its intent to retire the Winyah Generating Station, as discussed below, Santee Cooper has not otherwise assigned useful life estimates to other generating resources. For purposes of the 2020 IRP, Santee Cooper has assumed that standard maintenance on the existing generating assets will permit the continued operation of the resources through the IRP study period. Santee Cooper intends to periodically study the economics of retirement of its generating assets, including the Cross retirement portfolios detailed herein. See Appendix B for additional information related to environmental compliance planning for existing resources.

**Table 6-5**  
**Existing Santee Cooper Purchases**

Generating Facilities	Term	Nameplate Capacity (MW)	MCR (MW)	Energy Source
Buzzards Roost	March 2020	15	8	Hydro
Domtar	2025	38	38	Biomass
EDF Renewables	2043	36	36	Biomass
Southeastern Power Administration	Indefinite	305	305	Hydro
St. Stephens Hydro <sup>(1)</sup>	2035	84	84	Hydro
TIG Solar <sup>(2)</sup>	2033	3	0	Solar
<b>Total</b>		<b>481</b>	<b>471</b>	

(1) Santee Cooper anticipates taking ownership of St. Stephens by 2035.

(2) The MCR for TIG Solar is 0 because the Santee Cooper winter peak typically occurs early in the morning before PV production would occur.

### Winyah Generating Station Retirement

Santee Cooper has announced its intent to retire Winyah Generating Station in a phased manner over 2021-2027. Current plans call for Winyah Unit 4 to be idled in the winter of 2020/2021, followed by Winyah Unit 3 in the winter of 2021/2022, with the entire generating station being retired by 2027. Santee Cooper continues to evaluate the appropriate timing for the idling of Winyah Units 3 and 4 with consideration of uncertain territorial loads, economies of operation and idling, and technical requirements to idle the generating facilities. Santee Cooper has developed a staffing plan for the Winyah Generating Station and has begun staff reduction efforts. Additionally, future maintenance outage plans and schedules are being modified to accommodate the planned retirement.

### Gypsum Delivery Contracts

Santee Cooper has contracted with American Gypsum (AG) to deliver quantities of gypsum, produced as a byproduct of emissions control processes at Santee Cooper's coal plants. Gypsum is a byproduct of the flue gas desulfurization process utilized at Santee Cooper's coal plants to reduce sulfur content in air emissions from these plants and is utilized by AG to produce gypsum wallboard at an AG manufacturing facility located adjacent to the Winyah site. To the extent the coal plants do not produce enough wallboard quality gypsum to meet minimum required deliveries under the AG contract, Santee Cooper fulfills any shortfalls by purchasing gypsum in the open market for delivery to the AG site. Gypsum produced at the Cross plant is shipped by Santee Cooper to the AG site through 2028. Beginning in 2029, AG takes ownership of Cross-produced gypsum at the Cross site.

The IRP reflects gypsum production from the coal units based on historical production rates. Remaining gypsum requirements to satisfy the AG contract are assumed in this IRP to be fulfilled via market purchases at an assumed cost rate of \$46 per ton, escalated at the general inflation rate.



### Summer Nuclear Station Licensing

In 2004, the Nuclear Regulatory Commission (NRC) extended the operating license for Summer Nuclear Unit 1 to August 6, 2042, an additional twenty years beyond the then-current operating license period.

### FERC Hydro Licensing

Santee Cooper operates its Jefferies Hydro Station and certain other property, including the Pinopolis Dam on the Cooper River and the Santee Dam on the Santee River, which are major parts of Santee Cooper's integrated hydroelectric complex, under a license issued by the Federal Energy Regulatory Commission (FERC) pursuant to the Federal Power Act (FPA). The FERC license includes oversight of project activities such as Dams and Dikes Maintenance, Shoreline Management, Forestry Management, Mosquito Control, Water Quality Monitoring, and Aquatic Plant Management, conducted in cooperation and partnership with DHEC, the South Carolina Department of National Resources (the DNR), the U.S. Fish and Wildlife Service (USFWS), and the National Marine Fishery Service (NMFS). The project is currently undergoing relicensing and a Notice of Intent (NOI) to relicense was filed with the FERC on November 13, 2000. The final license application was submitted March 12, 2004. Due to a number of Additional Information Requests, the relicensing process has extended beyond the license expiration date. The FERC has issued a standing annual license renewal until a final license is issued.

The FERC issued its Final Environmental Impact Statement (EIS) in October 2007. The DNR, the USFWS and Santee Cooper jointly signed and filed a settlement agreement in May 2007 with the FERC that among other things, identifies fish passage and outflow guidelines during the term of the next license. The NMFS chose not to join in the settlement agreement and in January 2020 submitted final documents for mandatory fishway conditions under Section §18 of the FPA, flow recommendations under Section §10 of that Act, and a biological opinion for endangered Shortnose and Atlantic sturgeon under Section 7 of the Endangered Species Act (ESA). Santee Cooper is finalizing an engineering assessment of the impacts higher outflows prescribed by NMFS will have to the Santee Dam system. Santee Cooper cannot predict the final scope, timing, or general outcome of the FERC relicensing process.

### Supply-Demand Balance

Combining projections for the Load Forecast, existing resource capabilities, and planned phased retirement of the Winyah Generating Station yields projections of the future Santee Cooper supply-demand balance as depicted in the following Figure 6-10 and Table 6-6, below. Supply resources reflected below include only existing owned and purchased resources. Some small amounts of capacity are needed over 2022 through 2026, but the first major capacity need is triggered by the full retirement of Winyah in 2027, at which time the Santee Cooper system will be short approximately 700 megawatts. As described more fully below, Santee Cooper is planning to meet capacity needs in the near-term with new quick-start peaking resources, battery storage resources, demand response programs, and short-term capacity purchases. Longer-term capacity requirements have been

identified through the 2020 IRP by determining the most economic combination of resources to meet Santee Cooper’s load obligations over this 20-year planning horizon while balancing the objectives of the Santee Cooper planning process.

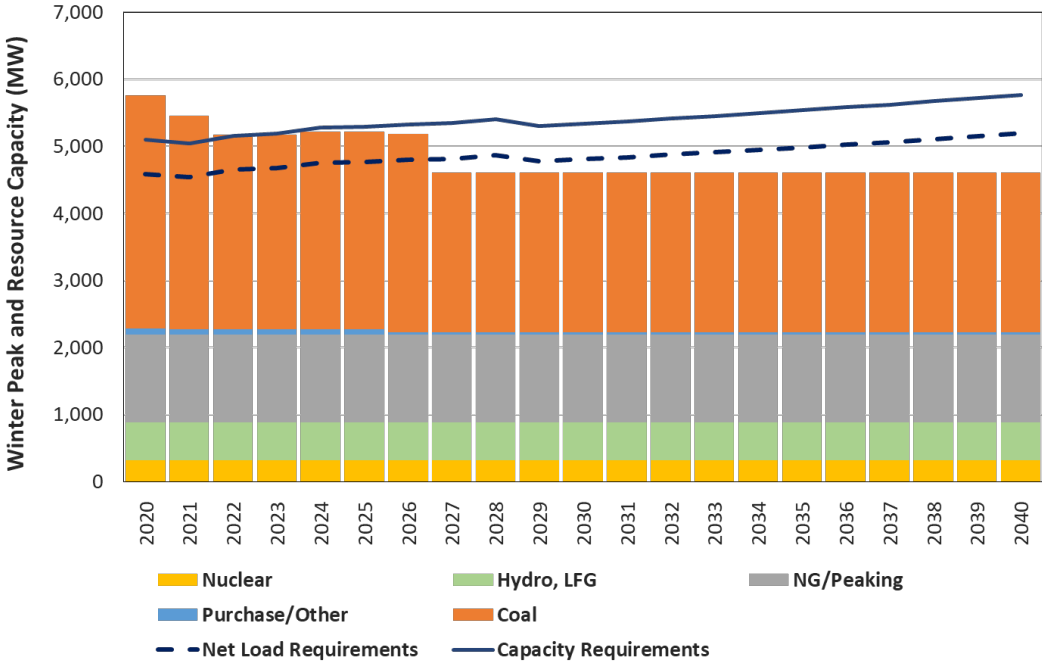


Figure 6-10: Santee Cooper System Supply and Demand Balance

**Table 6-6  
Santee Cooper System Supply and Demand Balance**

<b>Load &amp; Resources</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>2026</b>	<b>2027</b>	<b>2028</b>	<b>2029</b>	<b>2030</b>	<b>2031</b>	<b>2032</b>	<b>2033</b>	<b>2034</b>	<b>2035</b>	<b>2036</b>	<b>2037</b>	<b>2038</b>	<b>2039</b>	<b>2040</b>
<u>System Demand</u>																					
Winter Peak Demand	4,951	4,932	5,071	5,101	5,127	5,140	5,168	5,187	5,233	5,145	5,177	5,210	5,247	5,281	5,316	5,353	5,395	5,433	5,476	5,520	5,561
Less: Non-firm/Interruptible Loads	(308)	(339)	(370)	(370)	(370)	(370)	(370)	(370)	(370)	(370)	(370)	(370)	(370)	(370)	(370)	(370)	(370)	(370)	(370)	(370)	(370)
Less: Non-system Wholesale Sales	(52)	(52)	(52)	(52)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Less: Firm Hydro Resources	(389)	(389)	(389)	(389)	(389)	(389)	(389)	(389)	(389)	(389)	(389)	(389)	(389)	(389)	(389)	(389)	(389)	(389)	(389)	(389)	(389)
Net Peak Demand	4,202	4,152	4,260	4,290	4,368	4,381	4,409	4,428	4,474	4,386	4,418	4,451	4,488	4,522	4,557	4,594	4,636	4,674	4,717	4,761	4,802
<u>Resource Capacity</u>																					
Existing Resources																					
Coal Steam	3,530	3,240	2,950	2,950	2,950	2,950	2,950	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380
Nuclear	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322
NGCC/NGCT	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150
Peaking	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165
Landfill Gas	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Hydro	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142
Purchases	89	74	74	74	74	74	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
Total	5,427	5,122	4,832	4,832	4,832	4,832	4,794	4,224	4,224	4,224	4,224	4,224	4,224	4,224	4,224	4,224	4,224	4,224	4,224	4,224	4,224
Less: Unit-contingent Sales	(52)	(52)	(52)	(52)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Net Capacity	5,375	5,070	4,780	4,780	4,832	4,832	4,794	4,224	4,224	4,224	4,224	4,224	4,224	4,224	4,224	4,224	4,224	4,224	4,224	4,224	4,224
<u>Capacity Reserves</u>																					
Net Peak Demand	4,202	4,152	4,260	4,290	4,368	4,381	4,409	4,428	4,474	4,386	4,418	4,451	4,488	4,522	4,557	4,594	4,636	4,674	4,717	4,761	4,802
Planning Reserves (12%)	504	498	511	515	524	526	529	531	537	526	530	534	539	543	547	551	556	561	566	571	576
Total Capacity Requirements	4,707	4,650	4,771	4,805	4,892	4,907	4,938	4,959	5,011	4,912	4,948	4,985	5,026	5,065	5,104	5,145	5,192	5,235	5,283	5,332	5,378
Total Net Capacity	5,375	5,070	4,780	4,780	4,832	4,832	4,794	4,224	4,224	4,224	4,224	4,224	4,224	4,224	4,224	4,224	4,224	4,224	4,224	4,224	4,224
Capacity Surplus/(Deficiency)	668	419	9	(25)	(60)	(75)	(145)	(736)	(787)	(688)	(725)	(761)	(803)	(841)	(881)	(921)	(969)	(1,011)	(1,059)	(1,108)	(1,154)

## Supply-side Options

### Conventional Thermal Resource Options

Cost and operating characteristics of potential NGCC, NGCT, and aero-derivative gas turbine resource options were developed jointly by Santee Cooper and Central. Sources of these estimates included a variety of publicly available reports, original equipment manufacturer estimates, and proprietary databases and estimates developed by consultants for Central and Santee Cooper. Capital costs, operating costs, and operating characteristics were developed for two-on-one (2x1) H-class NGCC resources, both with and without duct-firing (DF), and for single H-class NGCT resources. Table 6-7 provides the capital costs, average ambient capacity rating, fixed and variable operating and maintenance (O&M) costs, and heat rate characteristics that were assumed for conventional, fossil-fueled resource options.

**Table 6-7**  
**Operating Costs and Characteristics of Conventional Resource Options**

	2x1 NGCC (no DF)	2x1 NGCC (with DF)	NGCT	LM2500
Total Project Cost (\$M)	665.9	697.8	196.0	31.3
Max Rating (MW, ambient)	1,104.6	1,315.2	347.9	32.3
Per Unit Cost (\$/kW)	602.82	530.59	563.39	970.33
Operating Cost				
Fixed O&M (\$/kW-yr)	5.07	4.26	5.46	26.00
Variable O&M (\$/MWh)	3.34	3.16	8.73	12.68
Full Load Heat Rate (Btu/kWh)	6,110	6,383	9,200	9,680

For purposes of the 2020 IRP, Santee Cooper evaluated options to build 2x1 NGCC resources, as depicted in Table 6-7, as well as options that assume NGCC additions could be developed jointly with other parties, with Santee Cooper retaining an entitlement to one-half of the unit, thereby permitting Santee Cooper to take advantage of improved economies of scale of the larger NGCC while attaining a resource that fits into Santee Cooper's resource portfolio and resource planning more effectively. For these jointly developed units, it was assumed that Santee Cooper would be entitled to one-half of the unit's capacity and energy output and be responsible for one-half of the development, construction, and operating cost of the unit, including the cost of transmission upgrades and firm natural gas service.

### Solar Resources

The IRP assumes that Santee Cooper would contract for solar power from utility-scale solar facilities developed, owned, and operated by private developers through purchase power agreements (PPA). Under such PPAs, the Seller would be responsible over the life of the project for operating, maintaining, and decommissioning its project. This approach would enable Santee Cooper to reduce energy costs and financial risk by avoiding on-balance sheet debt. It is expected that owners of these

projects will monetize the tax incentives available to solar projects and pass on the benefit to Santee Cooper through lower PPA pricing given the competitive nature of the procurement.

Under the Base Case, energy delivered under such solar PPAs are assumed at a long-term, fixed rate of \$25 per megawatt-hour, inclusive of transmission interconnection costs. This assumption is based on Santee Cooper experience and market knowledge gained primarily through recent competitive procurement processes. On October 15, 2019, Santee Cooper issued a Request for Information (RFI) from potential solar resource developers, and on June 5, 2020, Santee Cooper issued a Request for Proposals for Solar Power, to which responses are currently under evaluation. Responses to both the RFI and the RFP indicate that a price of \$25 per megawatt-hour is indicative of current market prices for solar energy. The 2020 IRP assumes that continued downward cost pressure for PV modules and balance of plant equipment will be sufficient to offset the effects of declining investment tax credits over the next several years. The IRP assumes further that such contracts could be renewed or replaced at the end of their terms, which typically span 15-25 years, and facility refurbishments made to extend the lives of the solar facilities for approximately the same pricing in nominal terms throughout the study period.

Solar facilities would be located near Santee Cooper's primary load centers near the coast but would be geographically dispersed to achieve production diversity while maintaining significant economies of scale. As Santee Cooper is winter peaking, with the peak typically occurring during the hour ending 8 AM, solar capacity would not contribute to meeting peak demand requirements. While some capacity value could be achieved toward meeting the summer peak, which typically occurs in the late afternoon, this IRP does not reflect any capacity value for solar resources.

Santee Cooper expects to execute multiple PPAs for solar resources to provide for an initial tranche of 500 megawatts of nameplate capacity through solar PPAs. The 2020 IRP reflects that an additional 1000 megawatts of solar resources will be secured over 2023-2032 period. The capacity factor of the solar resources is assumed to be approximately 28 percent, based on the estimated typical output of single-axis tracking solar resources in or near the Santee Cooper system. Table 6-8, below, provides the cumulative solar resources procured in addition to Santee Cooper's existing solar resources discussed earlier in this section under the heading, Existing Santee Cooper Resources.

**Table 6-8**  
**Solar Implementation Schedule Assumed for the IRP**

Year	Nameplate Capacity (MW)
2020	0
2021	75
2022	150
2023	500
2024	555
2025	800
2026	1,000
2027	1,000
2028	1,000
2029	1,250
2030	1,350
2031	1,425
2032+	1,500

**Storage Resources**

The 2020 IRP assumes that Santee Cooper will add battery energy storage systems (BESS) with a total capacity of 200 megawatts in 50 megawatt increments over the 2026-2036 timeframe. These BESS systems are assumed to have two-hour storage capability, primarily targeting the Santee Cooper winter peak demand and transmission reliability requirements. Utilization of BESS with low frequency of charge/discharge cycles allows for the useful life of the units to extend through the 2020 IRP study period and is consistent with relatively low operation and maintenance costs. Table 6-9 provides the cumulative BESS capacity assumed to be implemented in all resource portfolio analyses discussed herein.

**Table 6-9**  
**BESS Implementation Schedule Assumed for the IRP**

Year	Nameplate Capacity (MW)
2020-2025	0
2026	50
2027	50
2028	50
2029	50
2030	50
2031	50
2032	50
2033	100
2034	100
2035	150
2036+	200

Capital and O&M costs for BESS were jointly developed by Santee Cooper and Central based on information obtained from battery system vendors, public reports by other industry organizations, and indications from renewable resource procurement process. Cost and operating characteristics were developed for both two- and four-hour BESS for evaluation in the 2020 IRP. Initial results indicated that a BESS system with two-hours of storage would be more cost effective than a four-hour system. However, Santee Cooper recognizes the limitations of modeling BESS in the CapEx model and intends to further study BESS economics, including the operation of longer duration BESS to manage seasonal peak demand periods, intermittent resource operation, and energy arbitrage.

Figure 6-11 depicts the assumed capital cost on a unit energy capacity basis of two-hour and four-hour BESS over the study period. Fixed O&M is assumed at \$3 per kilowatt-year in 2020 dollars, with escalation at 2.0 percent per year.

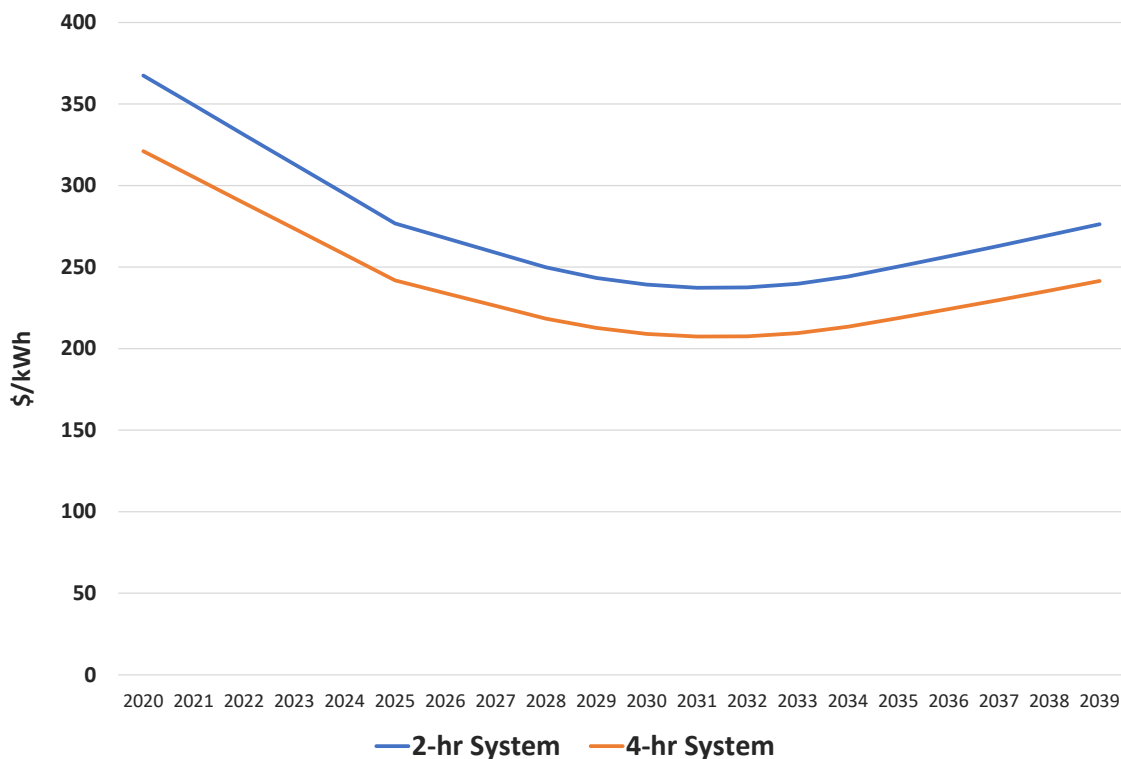


Figure 6-11: Projected Trend of Two-Hour Battery System Capital Costs

### Demand-side Resources

Santee Cooper and Central have conducted DSM programs aimed at improving the efficiency of residential and commercial end uses for many years, as discussed in Section 4 above. Central also has a variety of load management measures in place across its member cooperatives. The Load Forecast utilized for this IRP reflects the latest projections of the level of activity and impacts of these programs through reductions in future peak demand and energy requirements.

In addition, the IRP assumes the implementation of demand response programs by Santee Cooper and Central targeting peak demands and offsetting demand requirements that must otherwise be

met by supply-side resources. This includes the development of a program to control air conditioning units and water heaters at residential and commercial customers on the Santee Cooper distribution system to reduce demand for electricity. Santee Cooper is currently undertaking a process to obtain interest and information from vendors regarding potential program costs, technologies, and logistics. Santee Cooper’s projected DR capability also includes both conservation voltage reduction and Volt-VAR optimization across the Santee Cooper system, programs which have recently been under development. This measure is intended to reduce system losses and peak demand through improving voltage stability across the system and reducing voltage slightly during peak periods. The IRP also reflects the implementation and expansion of similar measures by Central. The projected incremental DR program capability is provided in Table 6-10.

**Table 6-10**  
**Projected Demand Response Program Capability**  
**Megawatts**

Year	Santee Cooper System			Central System	Total Capability
	Direct Load Control	Conservation Voltage Reduction and Other	Total		
2020	0.0	18.0	18.0	0.0	18.0
2021	3.0	18.0	21.0	3.0	24.0
2022	7.2	18.0	25.2	5.0	30.2
2023	12.8	18.0	30.8	7.0	37.8
2024	18.5	18.0	36.5	12.0	48.5
2025	24.1	18.0	42.1	16.0	58.1
2026	29.7	20.2	49.9	20.0	69.9
2027	35.3	25.6	60.9	24.0	84.9
2028	39.2	25.6	64.8	27.0	91.8
2029	41.0	25.6	66.6	30.0	96.6
2030	42.3	25.6	67.9	33.0	100.9
2031	42.9	25.6	68.5	34.0	102.5
2032	43.4	25.6	69.0	35.0	104.0
2033	43.9	25.6	69.5	36.0	105.5
2034	44.3	25.6	69.9	36.0	105.9

Santee Cooper has developed projections regarding the capital and operating costs of implementing and sustaining the program, including equipment costs, initial and continuing participant incentives, and on-going costs related to marketing, call center operations, system licensing, communication fees, and administrative costs. These costs are included in the power costs reflected in the results presented herein. These DR program impacts are not reflected in the Load Forecast but are instead modeled as supply-side resource in the 2020 IRP.



**Purchase Power Options**

The 2020 IRP includes simulation of two Purchase Power Agreements (PPA) available to Santee Cooper as resource options to meet power supply needs during 2031 to 2040. One is a unit-continent tolling agreement based on the operating and cost parameters of an NGCC resource. The other available PPA is not tied to a particular resource, but instead reflects a tolling agreement backed by multiple resources and energy prices indexed to NG hub prices and a fixed heat rate. The PPA resources were assumed to be available any year during 2031 to 2040 in five megawatt increments up to the maximum available capacity. The PPA resources were modeled as options in CapEx in the same manner as generating resource options to allow the CapEx model to optimize resource plans that included small PPA increments each year or larger, more efficient NGCC resources, or both, depending on least-cost planning decisions. Table 6-11 provides the cost and operating parameters of both PPAs that were used for the 2020 IRP.

**Table 6-11  
PPA Cost Assumptions 2031-2040**

	System Purchase	NGCC Purchase	Annual Escalation
Capacity (MW)	Up to 300 MW	Up to 200 MW	
PPA Price (2031 \$)			
Capacity Price (\$/kW-mo)	6.00	6.25	2.0%
NG FT Charge (\$/kW-mo)	1.33	2.48	0.0%
Variable O&M (\$/MWh)	3.34	3.75	2.0%
Start-up Cost (\$/start/MW)	0.00	21.50	2.0%
Heat Rate (Btu/kWh)	7,000	7,000	
Transmission Losses	2.2%	2.2%	

During the near-term period 2020 through 2030, the 2020 IRP assumes that any capacity needed to maintain the Santee Cooper planning reserve margin could be served through short-term annual capacity purchases. Pricing for these short-term purchases is based on market price information provided by TEA as depicted in Table 6-12.

**Table 6-12  
Short-term Capacity Purchase Price**

Year	Capacity Price (\$/kW-mo)
2020	3.50
2021	4.25
2022	4.79
2023	4.88
2024	4.97
2025	5.00
2026	5.08
2027	5.16
2028	5.25
2029	5.34
2030	5.43

## Transmission System Considerations

### Import Limitations

Quantities of economy energy purchases that could be imported into the Santee Cooper system were limited to hourly maximum import and export limits based on typical market trading practices of Santee Cooper. Import limits are assumed to vary by season and across the Tier 1 and Tier 2 economy purchases. Additionally, transmission studies performed by Santee Cooper have indicated that import limits are likely to vary depending on where Santee Cooper decides to add new resources to the system following the retirement of Winyah Generating Station. If new generating resources are added at the Winyah site (essentially replacing the retired Winyah resources), then import limitations are unaffected. However, if new resources are built at alternative sites, further from the Santee Cooper load centers, import limits are likely to be reduced, thus limiting access to economy purchases. By modeling varying limits for transmission imports, potential resource plans evaluated for the 2020 IRP considered the tradeoff between varying costs of developing different sites against the value of access to economy power transactions. Import limits modeled for the IRP for both economy energy purchase tiers are depicted in Table 6-13.

**Table 6-13**  
**Estimated Import Limits Across Potential Major System Resource Builds**

NGCC Development Site	Import Limits (MW)		
	Jan-Feb, Dec	May-Sep	Mar-Apr, Oct-Nov
Winyah Site			
Tier 1	650	650	650
Tier 2	150	550	350
Total	800	1,200	1,000
Near-Summer Site			
Tier 1	490	650	610
Tier 2	0	80	0
Total	490	730	610
Pee Dee Site			
Tier 1	650	650	650
Tier 2	0	320	160
Total	650	970	810

### Transmission Upgrades

As previously mentioned, the 2020 IRP considered generating resource additions at multiple sites throughout the Santee Cooper system. Resource additions were considered at the existing Winyah Generating Station and Cross Generating Station sites (when portfolios considered the retirement of the Cross coal resources). Other sites evaluated include the Pee Dee site (land currently owned by Santee Cooper) and a new site near the V. C. Summer Generating Station. When considering development at the existing Winyah or Cross sites (following retirement of the existing generating resources at these sites), only limited transmission investment would be required to reconfigure

substation interconnections since the surrounding transmission grid is already developed to accommodate significant generating capacity at these sites. However, for the Pee Dee site and the site near V. C. Summer, transmission system upgrades would be required to allow development of these sites.

To estimate transmission system upgrade costs for each site, Santee Cooper performed transmission load flow studies to identify necessary system upgrades and prepared preliminary cost estimates. These estimates include costs to reconfigure the existing substations at Winyah and Cross Generating Stations and for new bulk transmission system facilities to accommodate new generating resources at the Pee Dee site and the site near V. C. Summer. These costs were added to other capital and operating costs when evaluating least-cost resource portfolios for the 2020 IRP. Table 6-14 summarizes the incremental transmission system upgrade costs modeled for the 2020 IRP for each evaluated site. See Appendix A for additional information on planned transmission system upgrades.

**Table 6-14**  
**Estimated Incremental Costs for Transmission System Upgrades**

Generating Site	Cost of Upgrade (2020 \$Millions)
Winyah Generating Station	\$10
Cross Generating Station	\$10
New Pee Dee Site	\$84
New Site Near V. C. Summer	\$308

In addition to the transmission system upgrades described above, the transmission evaluations determined that additional quick-start generating capability would be needed near the Conway substation if new NGCC/NGCT resources are not installed at the Winyah Generating Station to replace the retiring coal units. Modeled quick-start generating resource additions included multiple RICE units totaling 20 megawatts, as discussed in more detail above, plus a new LM2500 generating unit, using assumptions summarized above, when new NGCC/NGCT resources were modeled to be developed at sites other than Winyah.<sup>8</sup>

<sup>8</sup> As discussed in more detail in Section 8 of this report, Santee Cooper is continuing to investigate multiple options for new quick-start resources to address transmission system support requirements for the retirement of the Winyah Generating Station.

## Section 7

# IRP Results & Conclusions

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### Resource Portfolio Evaluation

#### Resource Expansion Analysis

Santee Cooper has prepared its 2020 IRP utilizing electric system simulations to identify potential resource expansion plans. These evaluations were performed utilizing the assumptions described previously in this IRP Report with respect to forecast system loads, fuel prices, natural gas transportation, economy energy purchases, existing generating resources and purchase power arrangements, options for future generating and purchase power resources, renewable and storage resources, demand-side resources, and transmission system impacts. Resource portfolios with varying assumptions for coal retirement were analyzed under the Base Case assumptions and under multiple sensitivity assumptions.

It should be noted that the resource plans represented in this 2020 IRP, including generating and purchase power resource options and development of potential generating resource sites, are intended to depict reasonable representations of future resource development that Santee Cooper could undertake in the future. However, other than the initiatives outlined herein with respect to the Santee Cooper Short-term Action Plan, Santee Cooper has not made any final decisions with respect to specific resources or development of specific generation sites.

#### Resource Expansion Analysis Process

As previously discussed, Santee Cooper utilized the CapEx software to estimate hourly resource dispatch of the Santee Cooper system and to evaluate future resource expansion plans. The CapEx model uses a mixed integer linear programming technique to identify least-cost portfolios of future resource additions derived from representative options under consideration by Santee Cooper (as described above). Additionally, Santee Cooper evaluated options to develop future resources at multiple sites throughout its electric system, including developing new generating facilities at the existing Winyah Generating Station (Winyah Site), developing a new generating station at the Pee Dee site currently owned by Santee Cooper (Pee Dee Site), developing a new generating station near or adjacent to the existing V. C. Summer generating station (Summer Site), and developing new generating facilities at the existing Cross Generating Station (Cross Site) when evaluating retirement of the existing Cross generating units. By evaluating options for multiple resource types and multiple resource development sites, Santee Cooper was able to evaluate numerous potential resource configurations, for which only the most cost-effective have been reported in this 2020 IRP.

Resource expansion plans were evaluated in CapEx over a twenty-one-year Planning Period, 2020 through 2040, over which decisions on resource additions were modeled to identify least-cost plans. Additionally, total costs were modeled through a forty-one-year Study Period, through 2060, which includes an additional twenty-years beyond the Planning Period to ensure that capital costs of major

resource additions and end effects of production operating costs are captured when considering the optimum least-cost plans. Over this additional twenty-year period of the Study Period, loads and resources were held constant but fuel prices, economy energy prices, and O&M costs continued to escalate.<sup>9</sup> Potential resource plans were compared on a present value basis for costs projected over the Study Period using the Santee Cooper discount rate depicted previously in Table 6-2.

Costs modeled and reported in the 2020 IRP include the following.

- Fuel costs of existing and new resources
- Fixed and variable O&M costs of existing and new resources
- Demand and energy charges for purchase power resources
- Debt service on new resources
- Transmission upgrades (including capital and maintenance costs)
- Reduced capital additions related to the Cross Generating Station in portfolios that reflect retirement of Cross
- Decommissioning costs when retiring existing coal resources

Costs reported in the 2020 IRP do not include costs for existing debt service, operating costs for transmission and distributions systems, and customer service and administrative and general costs, nor do they reflect revenue for wholesale sales (which are consistent across all simulated cases). In this way, costs reported in the 2020 IRP that are used to compare and identify least-cost resource portfolios include all of the costs that are subject to change between potential portfolios, but do not reflect the full cost of Santee Cooper.

#### Retirement and Sensitivity Analyses

The 2020 IRP considered two alternative retirement portfolios for the Santee Cooper coal resources. Under each coal retirement portfolio, resource expansion optimization analyses were performed under the Base Case assumptions and under sensitivity case assumptions. The coal resource retirement scenarios include the following.

- **Retire Winyah Portfolios** – Winyah is modeled to be retired in phases, with two of the four generation units being idled by the winter of 2021/2022 and fully retiring all four generating units by 2027.
- **Retire All Coal Portfolios** –The Winyah Plant is retired as described above, and the Cross Plant is retired in phases beginning with Units 1 and 2 retired in 2030 and Units 3 and 4 retired in 2032.

As previously discussed, the 2020 IRP was prepared under a Base Case set of assumptions and under multiple sensitivity case assumptions for variations in pricing for fuel and economy energy markets, implementation of a CO<sub>2</sub> tax, high and low load levels, and variations in the amount of solar resources.

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<sup>9</sup> Additionally, an NGCT was allowed to be installed in 2041 if needed to replace long-term PPA purchases that were modeled for the 2031 through 2040 period.

As discussed in more detail in the prior Section 6 of the IRP Report, the evaluated sensitivity cases include the following.

- **Higher/Lower Load** – Higher and lower retail and wholesale loads by one standard deviation of expected load forecast error due to economic uncertainty
- **High Natural Gas and Economy Energy Prices** – 50 percent increase in natural gas prices and an associated increase in economy power prices for market purchases in all years
- **CO<sub>2</sub> Tax** – \$15 per ton price beginning in 2027, increasing annually by \$5 per ton until a cap of \$80 per ton is reached in 2040
- **Lower Level of Solar Resources** – Reduction in planned solar implementation by 500 megawatts

Table 7-1 summarizes the sensitivity cases modeled for the two retirement portfolios.

**Table 7-1  
Sensitivity Cases by Retirement Portfolio**

Sensitivity Case	Retire Winyah	Retire All Coal
High Load Case	✓	–
Low Load Case	✓	✓
High NG Case	✓	✓
CO <sub>2</sub> Tax Case	✓	✓
Lower Solar Case	✓	–

### Other Considerations

Over the course of developing its 2020 IRP, Santee Cooper reviewed costs to secure natural gas service through multiple pipeline sources, including over the Dominion pipeline system and through new pipeline laterals tied to the Transco pipeline that could be built either by Transco/Williams, Santee Cooper, or others. Through these analyses, Santee Cooper has identified natural gas supply as a significant resource planning consideration that could affect its decision to develop one potential generation site over another. While the assumptions presented in the IRP Report reflect current reasonable assumptions for the cost of natural gas supply, Santee Cooper is still investigating fuel supply and other considerations that could ultimately affect resource and site selections.

Additionally, Santee Cooper performed analyses to screen and identify preferred generation development sites, including relative costs for transmission upgrades and costs for natural gas supply. Through these analyses, Santee Cooper identified three preferred sites for evaluation within the 2020 IRP—the Winyah Site, the Pee Dee Site, and the Summer Site (see additional site descriptions in the section Resource Expansion Analysis Process, above). Each of these sites were analyzed with unique

assumptions for the cost of transmission upgrades, economy energy import limits, and the cost of securing natural gas service. While Santee Cooper considers the modeling of these sites to be reasonable for use in the 2020 IRP, Santee Cooper has not made any final decisions with respect to the development of specific generation sites.

### **Results of the Resource Expansion Analysis**

The following tables summarize results of the Base Case and sensitivity case analyses performed for the 2020 IRP. Table 7-2, below, provides results assuming retirement of the Winyah Generating Station. Table 7-3, below, provides results assuming retirement of all Santee Cooper coal resources (retirement of both Winyah and Cross Generating Stations). The tables depict the resources projected to be built under each retirement portfolio and each Base Case and sensitivity case and the projected present value costs for each case. As discussed above, present value costs depict certain power supply costs that can vary across different resource plans, but do not reflect certain Santee Cooper costs for existing debt and other operating and administrative and general costs that are the same across the resource plans.

By way of example, the results in Table 7-2 can be read as follows. The present value cost of the Base Case is projected to be \$24.1 billion over the 2020 to 2060 Study Period. As depicted in the right-most columns of the table, common resources assumed to be built and retired under the Base Case and all sensitivity cases include the idling and retirement of the Winyah coal resources and the installation of RICE, BESS, and DR resources over the Planning Period. Resources listed under the remaining columns for the Base Case and the sensitivity cases depict the resource additions identified through the resource optimization analyses performed for each case.

For each set of assumptions for coal resource retirements and the Base Case and sensitivity case assumptions, the resource expansion analysis performed in the CapEx model was allowed to optimize resource plans specific to the conditions associated with each case. Utilizing this approach, Santee Cooper was able to understand the variability of future power supply costs, recognize how resource expansion portfolios change for specific sensitivity assumptions, and examine whether specific resource expansion decisions were robust and would not change materially with changes in major assumptions. Results and conclusions presented herein were reviewed with Central during the development of the 2020 IRP.

**Table 7-2  
NPV Power Supply Costs and Resource Expansion Plan - Winyah Retired**

NPV (2020\$)	Base Case	Low Load	High Load	High NG Price	CO2 Tax	Lower Solar	Fixed Resource Retirements & Additions		Legend
	\$24.1 B	\$21.9 B	\$29.2 B	\$25.9 B	\$31.9 B	\$24.4 B	Resources	Demand Response	
Resource Additions									
2020								DR 18MW	Retirements
2021							Winyah Coal (290MW)	DR 6MW	NGCC
2022	Solar 75MW	Solar 75MW	Solar 75MW	Solar 75MW	Solar 75MW	Solar 75MW	Winyah Coal (290MW)	DR 6MW	NGCT
			ST Purchase Annual 125MW				Diesel RICE 20MW		SPC LT PPA
2023	Solar 350MW	Solar 350MW	Solar 350MW	Solar 350MW	Solar 350MW	Solar 350MW		DR 8MW	ST Capacity Purchase
			ST Purchase Annual 170MW						Diesel RICE
2024			ST Purchase Annual 220MW					DR 11MW	LM2500
2025	Solar 245MW	Solar 245MW	Solar 245MW	Solar 245MW	Solar 245MW	Solar 245MW		DR 9MW	Solar
			ST Purchase Annual 315MW						BESS
2026	Solar 275MW	Solar 275MW	Solar 275MW	Solar 275MW	Solar 275MW	Solar 275MW	BESS 50MW	DR 12MW	Demand Response
	ST Purchase Annual 10MW		ST Purchase Annual 355MW	ST Purchase Annual 10MW	ST Purchase Annual 10MW	ST Purchase Annual 10MW			
2027	NGCC Summer 552MW	NGCC Summer 552MW	NGCC Summer 552MW	NGCC Summer 552MW	NGCC Summer 552MW	NGCC Summer 552MW	Winyah Coal (570MW)	DR 15MW	
			2xNGCT Summer 696MW						
	LM2500 32MW	LM2500 32MW	LM2500 32MW	LM2500 32MW	LM2500 32MW	LM2500 32MW			
2028	ST Purchase Annual 35MW			ST Purchase Annual 35MW	ST Purchase Annual 35MW	ST Purchase Annual 35MW		DR 7MW	
2029	Solar 305MW	Solar 305MW	Solar 305MW	Solar 305MW	Solar 305MW	Solar 55MW		DR 5MW	
2030	Solar 100MW	Solar 100MW	Solar 100MW	Solar 100MW	Solar 100MW			DR 4MW	
					2xNGCC Summer 1105MW				
2031	Solar 75MW	Solar 75MW	Solar 75MW	Solar 75MW	Solar 75MW			DR 1MW	
	PPA 5MW			PPA 5MW		PPA 5MW			
2032	Solar 75MW	Solar 75MW	Solar 75MW	Solar 75MW	Solar 75MW			DR 2MW	
	PPA 40MW			PPA 40MW		PPA 40MW			
2033			PPA 15MW				BESS 50MW	DR 1MW	
2034	PPA 35MW		Summer NGCT 348MW	PPA 25MW		PPA 25MW		DR 1MW	
2035							BESS 50MW		
2036							BESS 50MW		
2037	PPA 25MW			PPA 30MW		PPA 30MW			
2038	PPA 45MW		PPA 35MW	PPA 50MW		PPA 55MW			
2039	PPA 50MW		PPA 110MW	PPA 50MW		PPA 45MW			
2040	PPA 45MW		PPA 110MW	PPA 45MW		PPA 45MW			



**Table 7-3**  
**NPV Power Supply Costs and Resource Expansion Plan - All Coal Retired**

NPV (2020\$)	Base Case	Low Load	High NG Price	CO2 Tax	Fixed Resource Retirements & Additions		Legend
	\$24.7 B	\$22.3 B	\$28.3 B	\$31.3 B	Resources	Demand Response	
	Resource Additions						
2020						DR 18MW	Retirements
2021					Winyah Coal (290MW)	DR 6MW	NGCC
2022	Solar 75MW	Solar 75MW	Solar 75MW	Solar 75MW	Winyah Coal (290MW)	DR 6MW	NGCT
					Diesel RICE 20MW		SPC LT PPA
2023	Solar 350MW	Solar 350MW	Solar 350MW	Solar 350MW		DR 8MW	ST Capacity Purchase
2024						DR 11MW	Diesel RICE
2025	Solar 245MW	Solar 245MW	Solar 245MW	Solar 245MW		DR 9MW	LM2500
2026	Solar 275MW	Solar 275MW	Solar 275MW	Solar 275MW	BESS 50MW	DR 12MW	Solar
	ST Purchase Annual 10MW		ST Purchase Annual 10MW	ST Purchase Annual 10MW			BESS
2027	NGCC Summer 552MW	NGCC Summer 552MW	NGCC Summer 552MW	NGCC Summer 552MW	Winyah Coal (570MW)	DR 15MW	Demand Response
	LM2500 32MW	LM2500 32MW	LM2500 32MW	LM2500 32MW			
2028	ST Purchase Annual 35MW		ST Purchase Annual 35MW	ST Purchase Annual 35MW		DR 7MW	
2029	Solar 305MW	Solar 305MW	Solar 305MW	Solar 305MW		DR 5MW	
2030	Solar 100MW	Solar 100MW	Solar 100MW	Solar 100MW	Cross Coal (1155MW)	DR 4MW	
	2xNGCC Summer 1105MW	NGCC Summer 552MW	2xNGCC Summer 1105MW	2xNGCC Summer 1105MW			
		NGCT Summer 348MW					
2031	Solar 75MW	Solar 75MW	Solar 75MW	Solar 75MW		DR 1MW	
	PPA 55MW		PPA 55MW	PPA 55MW			
2032	Solar 75MW	Solar 75MW	Solar 75MW	Solar 75MW	Coal Cross (1225MW)	DR 2MW	
	NGCC Cross 552MW	NGCC Cross 552MW	NGCC Cross 552MW	NGCC Cross 552MW			
	2xNGCT Cross 696MW	NGCT Cross 348MW	2xNGCT Cross 696MW	2xNGCT Cross 696MW			
	PPA 15MW	PPA 145MW	PPA 15MW	PPA 15MW			
2033					BESS 50MW	DR 1MW	
2034	PPA 25MW		PPA 25MW	PPA 25MW		DR 1MW	
2035					BESS 50MW		
2036					BESS 50MW		
2037	PPA 35MW		PPA 35MW	PPA 35MW			
2038	PPA 45MW		PPA 50MW	PPA 45MW			
2039	PPA 55MW		PPA 55MW	PPA 55MW			
2040	PPA 50MW		PPA 50MW	PPA 50MW			

## Conclusions

The following observations and conclusions were drawn from the 2020 IRP study results depicted in Table 7-2 and Table 7-3, above.

1. Across all sensitivity cases and under both of the coal retirement portfolios, the optimized resource portfolio includes an initial NGCC build at the Summer Site (which reflects an assumed joint build of a 2x1 NGCC). This result indicates that a decision to build an initial NGCC in 2027 reflects a robust resource planning decision.
2. Under the low load scenario, resource portfolios depicting a retirement of the Winyah Generating Station are lower cost than resource portfolios that include the retirement of both the Winyah and Cross Generating Stations.
3. Identified resource portfolios are sufficiently flexible to readily accommodate both high and low load scenarios by adapting future resource additions to meet changes in loads. Importantly, all the optimum resource portfolios identified for the high and low load scenarios include an initial NGCC build at the Summer Site in 2027.
4. Under the High NG Price scenario, a resource portfolio that includes the retirement of both the Winyah and Cross Generating Stations results in higher cost than the portfolio with Winyah retirement only, indicating that the Cross resources provide fuel diversity and a hedge against high natural gas prices.
5. Under the CO<sub>2</sub> Tax scenario, a resource portfolio that includes the retirement of both the Winyah and Cross Generating Stations is considerably lower in cost than a portfolio that includes only the retirement of the Winyah Generating Station. Santee Cooper will continue to investigate retiring the Cross Generating Station as an option to mitigate potential future carbon regulation.
6. Under all scenarios other than the CO<sub>2</sub> Tax scenario, resource portfolios depicting a retirement of the Winyah Generating Station are lower in cost than resource portfolios that include the retirement of both the Winyah and Cross Generating Stations.
7. Reducing solar implementation, as assumed in the Lower Solar implementation scenario, results in higher cost.
8. The Summer Site is the preferred site for generation development (under the natural gas transportation assumptions assumed for the 2020 IRP).

## Preferred Resource Plan

Based on the results of its 2020 IRP analysis, Santee Cooper's Preferred Resource Plan includes the key elements listed below. The Preferred Resource Plan provides a power supply roadmap that provides reliable service to customers, is based on realistic resource assumptions, can adapt as future conditions change, is not dependent on a single set of assumptions for future conditions, provides more affordable and competitive service to customers relative to other alternatives studied, and improves environmental performance under a wide range of market conditions. This plan assumes retirement of the Winyah Generating Station by 2027 and includes expansion resources depicted above in Table 7-2 for the Base Case set of assumptions. However, other than the initiatives outlined

in Section 8, Short-Term Action Plan, Santee Cooper has not made any final decisions with respect to specific resources or development of specific generation sites.

- **Retire Coal Resources**
  - Idle Winyah Units 4 and 3 by the winter 2020/21 and 2021/22, respectively
  - Retire the Winyah Generating Station by 2027
  - Continue operating Cross coal units, but evaluate retirement in the event of additional carbon regulation
  
- **Increase Natural Gas Resources**
  - Add a new jointly-developed NGCC resource targeted for 2027 and sited near the V. C. Summer Generating Station<sup>10</sup>
  - Continue to engage in market energy purchases (when economic) to further diversify power supply
  - Investigate opportunities for long-term PPA purchases to provide flexibility to meet future load growth and resource need
  
- **Ensure System Reliability**
  - Add quick-start peaking generating resources near the Conway substation coincident with the retirement of the Winyah generating units (potentially adding 20 megawatts of diesel-fired RICE generating units by 2022, already owned by Santee Cooper, and one LM2500 or similar technology by 2027)
  - Upgrade transmission facilities as needed to support the retirement of the Winyah coal resources and the addition of new natural gas-fired generating resources
  
- **Increase Solar Resource Implementation**
  - Plan for phased implementation of solar, beginning with 500 megawatts by 2023 through the current solar RFP process
  - Continue phased implementation of solar up to 1000 megawatts by 2026 and 1,500 megawatts by 2032
  
- **Incorporate Advanced Technologies**
  - Add battery storage technologies in phases to take advantage of technological advancements and expected cost decline
  - Add 50 megawatts of battery storage by 2026, 100 megawatts by 2033, and 200 megawatts by 2036
  
- **Encourage DSM and DR**
  - Execute Santee Cooper and Central DSM/conservation plans and DR program implementations and consider additional opportunities

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<sup>10</sup> Santee Cooper intends to conduct future planning and engineering studies and negotiate supplier arrangements before finalizing any resources or sites to be developed.

Figure 7-1 and Table 7-4, below, depict the supply and demand balance for the Preferred Resource Plan. The Preferred Resource Plan provides for increased diversity of resource types and is designed to closely align future resource additions to future load requirements to minimize Santee Cooper’s future capital investments and to provide flexibility in meeting future needs and market conditions.

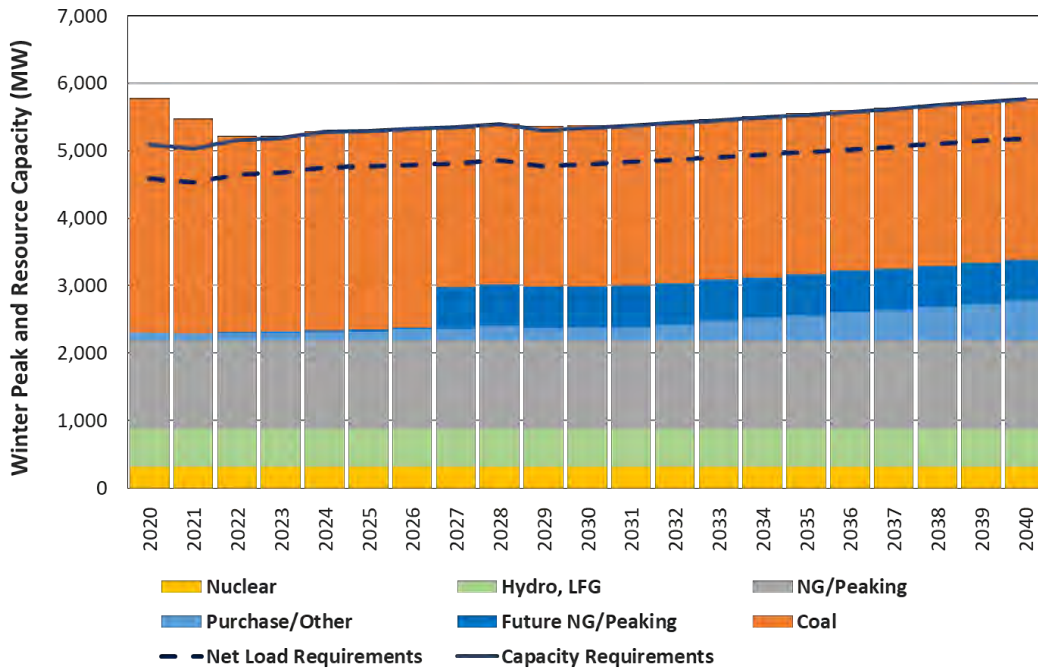
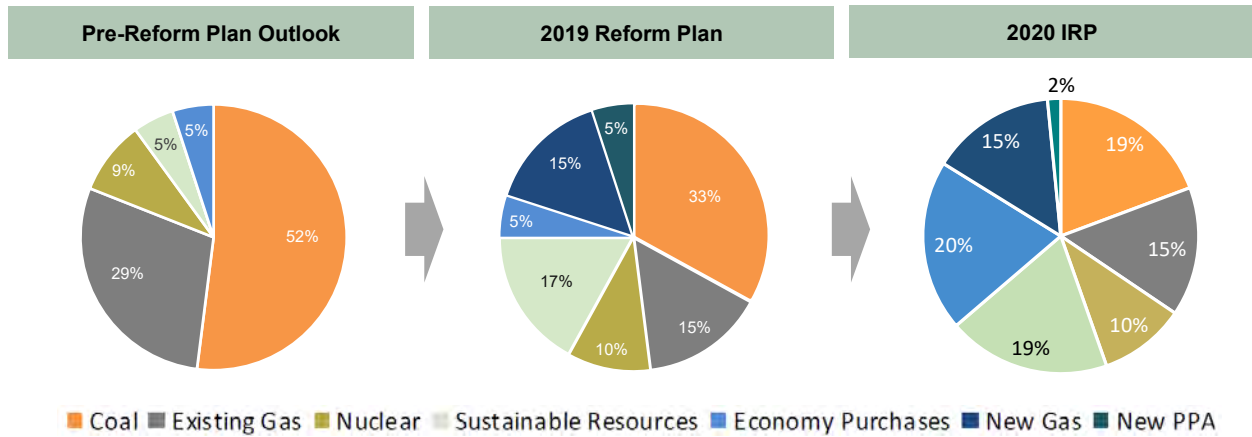


Figure 7-1: Supply and Demand Balance of Preferred Resource Plan

**Table 7-4  
Supply and Demand Balance - Preferred Resource Plan**

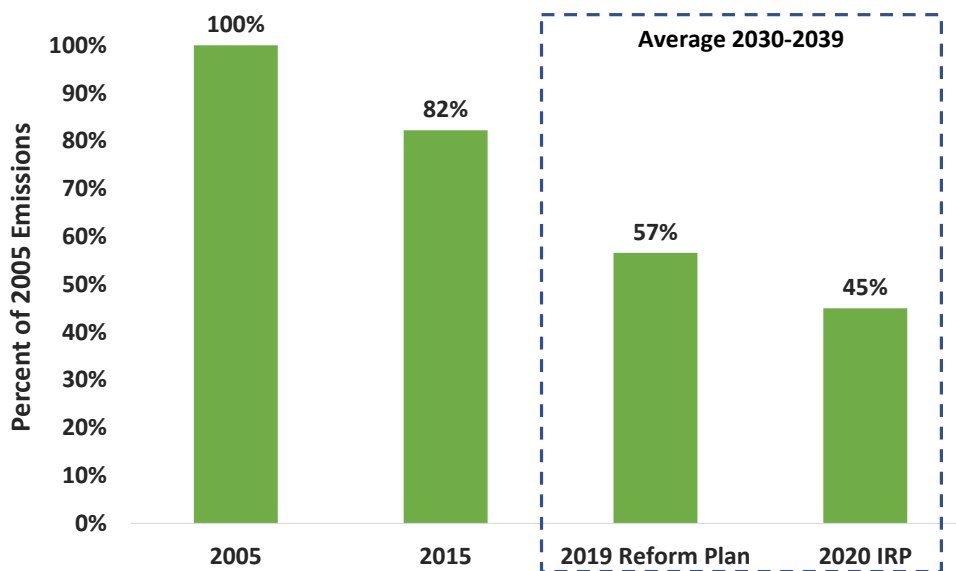
Load & Resources	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
<b>System Demand</b>																					
Winter Peak Demand	4,951	4,932	5,071	5,101	5,127	5,140	5,168	5,187	5,233	5,145	5,177	5,210	5,247	5,281	5,316	5,353	5,395	5,433	5,476	5,520	5,561
Less: Non-firm/Interruptible Loads	(308)	(339)	(370)	(370)	(370)	(370)	(370)	(370)	(370)	(370)	(370)	(370)	(370)	(370)	(370)	(370)	(370)	(370)	(370)	(370)	(370)
Less: Non-system Wholesale Sales	(52)	(52)	(52)	(52)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Less: Firm Hydro Resources	(389)	(389)	(389)	(389)	(389)	(389)	(389)	(389)	(389)	(389)	(389)	(389)	(389)	(389)	(389)	(389)	(389)	(389)	(389)	(389)	(389)
Net Peak Demand	4,202	4,152	4,260	4,290	4,368	4,381	4,409	4,428	4,474	4,386	4,418	4,451	4,488	4,522	4,557	4,594	4,636	4,674	4,717	4,761	4,802
<b>Resource Capacity</b>																					
<b>Existing Resources</b>																					
Coal Steam	3,530	3,240	2,950	2,950	2,950	2,950	2,950	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380
Nuclear	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322
NGCC/NGCT	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150
Peaking	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165
Landfill Gas	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Hydro	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142
Purchases	89	74	74	74	74	74	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
Total	5,427	5,122	4,832	4,832	4,832	4,832	4,794	4,224	4,224	4,224	4,224	4,224	4,224	4,224	4,224	4,224	4,224	4,224	4,224	4,224	4,224
<b>Future Resources</b>																					
NGCC	0	0	0	0	0	0	0	560	560	560	560	560	560	560	560	560	560	560	560	560	560
NGCT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peaking	0	0	20	20	20	20	20	52	52	52	52	52	52	52	52	52	52	52	52	52	52
Demand Response	18	24	30	38	49	58	70	84	92	97	101	102	104	105	106	105	105	104	104	104	104
Energy Storage	0	0	0	0	0	0	50	50	50	50	50	50	50	100	100	150	200	200	200	200	200
Purchases	0	0	0	0	0	0	10	0	35	0	0	5	45	45	80	80	80	105	150	200	245
Total	18	24	50	58	69	78	150	746	789	759	763	769	811	862	898	947	997	1,021	1,066	1,116	1,161
Less: Unit-contingent Sales	(52)	(52)	(52)	(52)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Net Capacity	5,393	5,094	4,830	4,838	4,901	4,910	4,944	4,970	5,013	4,983	4,987	4,993	5,035	5,086	5,122	5,171	5,221	5,245	5,290	5,340	5,385
<b>Capacity Reserves</b>																					
Net Peak Demand	4,202	4,152	4,260	4,290	4,368	4,381	4,409	4,428	4,474	4,386	4,418	4,451	4,488	4,522	4,557	4,594	4,636	4,674	4,717	4,761	4,802
Planning Reserves (12%)	504	498	511	515	524	526	529	531	537	526	530	534	539	543	547	551	556	561	566	571	576
Total Capacity Requirements	4,707	4,650	4,771	4,805	4,892	4,907	4,938	4,959	5,011	4,912	4,948	4,985	5,026	5,065	5,104	5,145	5,192	5,235	5,283	5,332	5,378
Total Net Capacity	5,393	5,094	4,830	4,838	4,901	4,910	4,944	4,970	5,013	4,983	4,987	4,993	5,035	5,086	5,122	5,171	5,221	5,245	5,290	5,340	5,385
Capacity Surplus/(Deficiency)	686	443	59	33	9	3	5	10	2	71	38	8	8	21	17	25	28	9	7	8	7
Reserve Margin	28%	23%	13%	13%	12%	12%	12%	12%	12%	14%	13%	12%	12%	12%	12%	13%	13%	12%	12%	12%	12%

This Preferred Resource Plan builds on the beneficial changes to Santee Cooper’s projected resource mix established for its Reform Plan completed in 2019. Figure 7-2 illustrates the changes in Santee Cooper’s projected energy generation mix for the year 2033 resulting from its Reform Plan and currently projected under the 2020 IRP. The projected change in the generation mix for the Preferred Resource Plan also takes into consideration reductions in the projected cost of coal and natural gas, as well as economy energy available from surrounding utilities.



**Figure 7-2: Evolution of Projected Santee Cooper Generation Mix for 2033**

This evolution in projected generation mix is also accompanied by a considerable improvement in Santee Cooper’s CO<sub>2</sub> emissions profile. Figure 7-3 illustrates that improvement by comparing average emissions over 2030-2039 to actual emissions in 2005 and 2015, all as a percentage of the 2005 emissions, which is a common comparative year in the industry for this purpose. The figure reflects a 43 percent reduction in projected emissions relative to 2005 levels for the 2019 Reform Plan and a further 12 percent reduction relative to 2005 for the 2020 IRP, which represents a 20 percent reduction versus the 2019 Reform Plan.



**Figure 7-3: Projected CO<sub>2</sub> Emissions of the Santee Cooper System**

## Section 8

# Short-Term Action Plan

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The following Short-term Action Plan identifies the activities to be undertaken by Santee Cooper over the next five years to begin implementation of the Preferred Resource Plan documented in Section 7 of this IRP Report, IRP Results & Conclusions.

### Current Activities

The following summarizes activities in which Santee Cooper is currently engaged to develop its future resource plans. As previously discussed in Section 3, Santee Cooper IRP Process, Santee Cooper interprets Act 135 to permit the following activities.

- On June 5, 2020, in coordination with Central, Santee Cooper issued a Request for Proposals for Solar Power to secure up to 500 megawatts of utility-scale, low-cost, low environmental impact power through long-term PPA arrangements with solar developers. Evaluation of submitted proposals, initial award, and negotiations are on-going. Santee Cooper intends to secure up to 500 megawatts of solar power through PPAs for installation by 2023.
- Santee Cooper is engaged in activities necessary for the closing and decommissioning of the Winyah Generating Station. Santee Cooper plans to idle Winyah Unit 4 by the winter of 2020/2021 and Unit 3 by the winter of 2021/2022. Santee Cooper continues to evaluate the appropriate timing for the idling of Winyah Units 3 and 4 with consideration of uncertain territorial loads, economies of operation and idling, and technical requirements to idle the generating facilities. Santee Cooper is planning for the retirement of the entire Winyah Generating Station by 2027. To advance these plans, Santee Cooper has developed a staffing plan for the Winyah Generating Station and has begun staff reassignment and reduction efforts. Additionally, future maintenance outage plans and schedules are being modified to accommodate the planned retirement of the station by 2027.
- Santee Cooper is investigating the installation of approximately 20 megawatts of diesel-fired RICE generating resources at a site near the Conway substation by 2022. Current plans call for relocating four RICE units from the V. C. Summer Generating Station to the site near the Conway substation to help support transmission system reliability upon the idling of Winyah Units 3 and 4. The RICE units at the V. C. Summer Generating Station are owned by Santee Cooper but are not currently in service. Santee Cooper is actively performing engineering studies regarding cost, feasibility, and permitting that may be required to relocate the RICE generating units.
- Santee Cooper has begun planning for a demand response program involving the control of residential and commercial retail customers' heat pumps and electric water heaters. Toward that end, Santee Cooper is conducting a procurement process to engage an experienced utility demand response program developer to work with Santee Cooper during initial

planning efforts. The demand response program is anticipated to work in tandem with Santee Cooper's existing conservation voltage reduction system and with similar programs administered by Central.

- Santee Cooper has begun preliminary studies of transmission system upgrades that would be required to support the Preferred Resource Plan documented in Section 7. These analyses have included transmission load flow studies to identify system upgrades required for the development of a new NGCC generating site, potentially near the existing V. C. Summer Generating Station, and preparation of preliminary cost estimates.
- Santee Cooper has begun preliminary discussions with potential teaming partners for the joint development of new generating facilities and fuel supply.

### **Future Activities and Studies**

The following reflect future activities in which Santee Cooper intends to engage to further the development of the Preferred Resource Plan documented in Section 7, IRP Results & Conclusions. Depending on the results of these studies, Santee Cooper may modify its Preferred Resource Plan as part of future IRP filings if more cost-effective resource alternatives and plans are identified. Additionally, Santee Cooper recognizes that certain future activities may be limited by Act 135; Santee Cooper will comply with its obligations established by Act 135 prior to initiating activities that may be impacted by Act 135.

- Prepare engineering studies for the retirement of the coal units at the Winyah Generating Station, including detailed plans and studies for decommissioning, engineering, and permitting.
- Conduct additional studies regarding the integration of solar, up to 1,500 megawatts, and battery storage resources within the Santee Cooper system to better quantify the costs and benefits of operating these resources.
- Continue discussions with potential partners for the joint development of new generating facilities and fuel supply.
- Prepare feasibility studies and evaluations of potential generating sites, including studies of generating resource development and costs, natural gas fuel supply development and arrangements, and electric transmission system upgrade requirements.
- Investigate the feasibility of installing quick-start peaking generating resources at a site near the Conway substation to help support transmission system reliability upon the full retirement of the Winyah Generating Station. An LM2500 aeroderivative combustion turbine was assumed for purposes of the 2020 IRP; however, Santee Cooper has not made any final decisions with respect to specific resources that may be developed for this purpose.



- Investigate the conversion of the existing electric generators at the Winyah Generating Station to operate as synchronous condensers to aid with addressing system reliability upon the full retirement of the Winyah Generating Station.
- Begin discussion with potential natural gas fuel suppliers to identify pipeline facilities and associated costs and charges to supply natural gas to a new generating site and, as warranted, conduct planning, feasibility, engineering, and permitting studies to develop natural gas pipeline facilities.
- Expand analysis of required transmission system upgrades, including submission of transmission service requests and preparation of joint planning studies that may be required prior to the development of a new generating site and, as warranted, conduct planning, feasibility, engineering, and permitting studies for new transmission facilities.
- Continue evaluations of potential DSM and DR programs, including leveraging the 2019 DSM Market Potential Study and conducting additional studies, when needed, and identify implementation scenarios for use in future Santee Cooper IRPs.
- Santee Cooper is investigating the development of a demand response program. Plans are anticipated to identify technologies to be deployed at customers' premises, identify a potential distributed energy resource management system (DERMS), define program incentive levels, develop an effective communication and marketing campaign, and develop a customer implementation and management processes. Santee Cooper intends to operate a demand response program in coordination with its existing conservation voltage reduction system and with similar programs administered by Central. Santee Cooper anticipates implementing a total of 61 megawatts of demand response capability by 2027.
- Develop a stakeholder engagement process in compliance with Act 62 and with consideration of Public Participation guidelines outlined in the consensus IRP Best Practices Guidelines produced by the State Energy Plan IRP Study Committee, as appropriate. Santee Cooper plans to begin development of a stakeholder engagement process in early 2021.<sup>11</sup>

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<sup>11</sup> With the compressed schedule since the enactment of Act 135 and onset of COVID-19, Santee Cooper was limited in its ability to engage in a robust stakeholder process for the 2020 IRP. While Santee Cooper engaged with Central in the development of the 2020 IRP, time did not permit engagement of other Santee Cooper customers or community stakeholders. Santee Cooper intends to develop and execute a stakeholder engagement process as part of its next IRP filing.



# Appendix A

## Transmission System Planning

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### Transmission Planning Assessments

Santee Cooper performs various transmission system assessments annually in order to determine whether current transmission plans are valid and to provide possible solutions to identified areas of concern on the transmission system. These assessments are conducted by performing a thorough analysis of steady state power flows, facility interrupting capabilities, and total system dynamic performance on the Santee Cooper transmission system. Study efforts test the operation of existing facilities, re-evaluate the current completion dates of existing capital construction projects, and identify additional facilities needed to maintain adequate electric service throughout the system. By annually evaluating future system operation using up-to-date load projections and resource planning assumptions, the installation of new facilities may be effectively scheduled and their need verified in order to make efficient use of Santee Cooper resources in a continuing effort to provide safe, reliable, and economical electrical energy to both wholesale and retail customers.

As outlined in the Power System Coordination and Integration Agreement between Santee Cooper and Central, the transmission assessments performed by Santee Cooper outline transmission expansion and improvement plans for the combined Santee Cooper-Central transmission system, which includes Central-owned facilities within the Santee Cooper Planning Coordinator area, for a forward-looking 10-year planning horizon. The final plan is the result of studies evaluating requirements of the combined Santee Cooper-Central system for adequately supplying the total present and anticipated future transmission system requirements of both parties and for maintaining the integrity of the combined transmission system.

Santee Cooper endeavors to maintain a degree of reliability in electric service that will satisfy customer requirements at a reasonable cost. As a member of SERC, Santee Cooper adheres to regional reliability standards and to the Reliability Standards developed by the North American Electric Reliability Corporation. In order to meet these objectives, Transmission Reliability Criteria have been developed for the Santee Cooper System that are based on North American Electric Reliability Corporation Reliability Standard TPL-001. The primary concerns on the transmission system are that (i) all facilities remain within their continuous ratings, as outlined in Santee Cooper's Transmission Facility Ratings Methodology Document during normal operating conditions, (ii) all facilities remain within their emergency ratings during selected contingency conditions, (iii) the voltage on the transmission system remains within the ratings of the facilities on the system, and (iv) the voltage at the delivery point connection to each customer is within the operating range of standard equipment for the voltage class of the delivery point connection.

The planned retirement of Winyah is expected to require significant investment in the Santee Cooper transmission system. Upgrades to existing facilities and new facility construction are planned to facilitate the retirement of these resources. In addition, network upgrades will be required to provide

further transmission system support depending on the type and location of replacement generation being added to the Santee Cooper and adjacent systems.

Santee Cooper has established numerous interconnections with neighboring utilities to enhance reliability and permit economic power transactions. Interconnections are maintained with Duke Energy Progress, Duke Energy Carolinas, Dominion Energy South Carolina, Southern Company, and the Southeastern Power Administration. The interconnected nature of the transmission system also leads to situations where conditions on neighboring systems can impact the reliability of the Santee Cooper transmission system, as well as situations where conditions on the Santee Cooper transmission system can impact the reliability of neighboring systems. Santee Cooper actively coordinates with other utilities in the region to share modeling information to assure that coordinated models reflect expected conditions as accurately as possible to facilitate the most robust assessments possible. Study results are shared between utilities where potential issues are identified and corrective actions coordinated to mitigate the concern where necessary.

Table A-1 provides a list of projects associated with Santee Cooper's current transmission plan. The recommended completion dates reported for each project are based on information available as of the date of this report. Changes in anticipated transmission system operating conditions may result in modifications to these recommendations or to the scope of work outlined for each project.

**Table A-1**  
**Current Schedule of Transmission Capital Projects**

Project Title	Recommended Completion Date
Bluffton 230-115 kV Substation: Add 115 kV Interconnection Metering Point	5/1/2021
Carnes Crossroads-Harleys Bridge 115 kV Line via McQueen Phase 2	6/1/2021
Carnes Crossroads 230-115 kV Transformer #3	6/1/2021
Series Bus Tie Breakers Hemingway 230 kV	11/1/2021
Purrysburg 230 kV Add Redundant Bus Differential Relays and Series Bus Tie Breakers	12/1/2021
115 kV Quickstart Generator Interconnections	12/1/2021
Rebuild Chiquola Spinners 115 kV Tap Line	12/1/2021
SCE&G-SCPSA Johns Island - Queensboro 115 kV Interconnection	12/31/2021
Replace Capacitor Bank ACI at Carnes Crossroads 230-115 kV Substation	12/31/2021
Charity - Industrial Customer 230 kV #2 Line	12/31/2021
Aiken 230 kV Tie Line with Dominion	12/31/2021
Reconductor North Charleston-Goose Creek 115 kV Line Section	3/31/2022
Aiken 230-115 kV Transformer #2	11/1/2022
Replace Switches at Yemassee 230 kV Switching Station	12/1/2022
Conway 230 kV Switching Station	9/1/2024
Marion-Conway 230 kV Line	9/1/2024
Chime Bell 115 kV Switching Station	12/1/2024
Replace Limiting Elements on Perry Rd - Carolina Forest 115 kV Line	12/1/2024
Kingstree 230 kV Series Bus Tie Breaker	12/1/2024

Project Title	Recommended Completion Date
Conway - Perry Road 230 kV Line	12/1/2025
Carolina Forest 230-115 kV Transformer #2	12/1/2026
Cross - Kingstree #1 and #2 230 kV Breaker and Switch Replacements	12/1/2026
Marion 230 kV Series Bus Tie Breaker	12/1/2026
Replace Limiting Elements on Jefferies-Georgetown #2 115 kV line	12/1/2026
Kingstree - Hemingway 230 kV #2 Line	12/1/2026
Dalzell - Lake City 230 kV Line	12/1/2026
Charity 115 kV Capacitor Banks	12/1/2026
Replace limiting elements on St. George-Orangeburg #1 115 kV line	12/1/2026
Replace limiting elements on Columbia-Lyles 115 kV line section	12/1/2026
Lugoff 230-69 kV Transformer #2	12/1/2027
Rebuild Blythewood-Lugoff 69 kV #1 Line	12/1/2027
Replace relaying on Lugoff - Blythewood #1 69 kV Line	12/1/2027
Bucksville - Conway 230 kV Line	12/1/2028
Varnville to Robertville 69 kV Rebuild to 115 kV	12/1/2028
Wassamassaw 230-115 kV Substation	12/1/2028
Wassamassaw-Pringletown #1 115 kV Line	12/1/2028
Rebuild Perry Road - Myrtle Beach #2 115 kV Line	6/1/2029
Nixons Crossroads - Red Bluff #1 115 kV Line	6/1/2030

### Joint Planning Activities

Santee Cooper also participates in joint planning activities with other utilities in the region and the broader Eastern Interconnection to assure reliable operation of the wide-area bulk transmission system. The following is a list of joint study activities Santee Cooper has participated in recently:

- SERC Near-Term Working Group Summer and Winter Reliability Studies
- SERC Near-Term Working Group OASIS Studies
- SERC Long-Term Working Group Reliability Study
- Carolina Transmission Collaboration Agreement Reliability Studies
- South Carolina Regional Transmission Planning Transfer Studies
- Eastern Interconnection Planning Collaborative Low Inertia Model Development

## Appendix B

# Environmental Compliance Planning

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Both the Environmental Protection Agency (EPA) and the Department of Health and Environmental Control (DHEC) have imposed various environmental regulations and permitting requirements affecting Santee Cooper's facilities. These regulations and requirements relate primarily to airborne pollution, the discharge of pollutants into waters, and the disposal of solid and hazardous wastes. Santee Cooper endeavors to ensure its facilities comply with applicable environmental regulations and standards. Federal and state standards and procedures that govern control of the environment and systems operations can change. These changes may arise from legislation, regulatory action, and judicial interpretations regarding the standards, procedures, and requirements for compliance and issuance of permits. Therefore, there is no assurance that units in operation, under construction, or contemplated will remain subject to the regulations that are currently in effect. Furthermore, changes in environmental laws and standards may result in increased capital and operating costs.

### Air Quality

#### General Regulatory Requirements

Santee Cooper is subject to a number of federal and state laws and regulations addressing air quality. The Clean Air Act (CAA) regulates certain air pollutants, including particulate matter, ozone, sulfur dioxide (SO<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>), at Santee Cooper's fossil fuel generating facilities. Mercury is also regulated through the Mercury and Air Toxics Standard (MATS). Emissions of SO<sub>2</sub> and NO<sub>x</sub> are also managed in accordance with the Acid Rain program and the Cross State Air Pollution Rule (CSAPR) through emissions allowance inventories and trading. Santee Cooper is in compliance with these regulatory requirements.

#### Evolving Regulatory Requirements

##### Greenhouse Gases

The Clean Power Plan, which established state limits on greenhouse gas emissions, was repealed in 2017. To replace it, the EPA issued the Affordable Clean Energy (ACE) Rule, in June 2019, establishing heat rate improvement (HRI) measures as the best system of emissions reduction (BSER) for CO<sub>2</sub> emissions from existing coal-fired generating units. ACE requires that states establish unit-specific "standards of performance" that reflect the emission limitations achievable through application of the BSER technologies as part of a State plan and requires State plans to be submitted within three years of the date of the final rule. EPA will then have one year to approve a State plan once submitted.

Santee Cooper is currently providing information to the DHEC as it develops unit-specific standards for the State plan. Santee Cooper has already adopted most of the proposed HRI measures at the Cross and Winyah Generating Stations and does not anticipate any significant investment or expenditures to comply with the State plan.

Santee Cooper continues to monitor possible regulatory developments with respect to greenhouse gases.

### Water Quality

#### General Regulatory Requirements

Santee Cooper is subject to a number of federal and state laws and regulations which address water quality. The Clean Water Act (CWA) prohibits the discharge of pollutants, including heat, from point sources into waters of the United States, except as authorized in the National Pollutant Discharge Elimination System (NPDES) permit program. The DHEC has been delegated NPDES permitting authority by the EPA and administers the program for the State. Industrial wastewater discharges from all stations and the regional water plants are governed by NPDES permits. The DHEC also has permitting authority for stormwater discharges and Santee Cooper manages stormwater pursuant to the DHEC issued Industrial General Permits and Construction General Permits.

#### Evolving Regulatory Requirements

##### 316(b) Fish Protection Regulations

Section 316(b) of the CWA, which became effective on October 15, 2014, requires that NPDES permits for facilities with cooling water intake structures ensure that the structures reflect the Best Technology Available (BTA) to minimize adverse environmental impacts from impingement and entrainment of fish and egg larvae. No significant impacts are expected at the existing Santee Cooper coal and natural gas fired generating stations; therefore, this regulation does not impact the 2020 IRP.

##### Effluent Limitation Guidelines

An NPDES Steam Electric Effluent Limitation Guidelines (ELG) rule was finalized late in 2020, after numerous revisions and postponements from the original rule issued in 2015. The rule requires stricter performance standards on discharges from coal-fired generating stations, requiring upgrades and installation of additional wastewater treatment systems. The new rule contained a subcategory for facilities facing retirement prior to year-end 2028. Santee Cooper is evaluating this retirement exemption for Winyah, and current financial forecasts assume that the exemption will be taken at Winyah, while the complete suite of flue gas desulfurization (FGD) wastewater treatment equipment will be installed at Cross.

##### PFAS

While not currently regulated, Santee Cooper is closely following potential regulation of Per- and Polyfluoroalkyl substances (PFAS), which are being extensively studied because of their widespread use and the potential for adverse health outcomes in humans. PFAS are typically found in consumer products such as cookware, cleaning products, and water-repellent fabrics, but can also be found in industrial products such as fire-fighting foams and in the Teflon film that coats many solar panels.

PFAS can contaminate drinking water, ground water and soil. Santee Cooper is assessing its existing facilities to determine if any PFAS exist.

### **Solid and Hazardous Waste and Hazardous Substances**

#### **General Regulatory Requirements**

Santee Cooper is subject to federal and state laws and regulations, which address solid, universal, and hazardous wastes and substances. The Resource Conservation and Recovery Act (RCRA), under Subtitle C, is the overarching regulation providing the framework for proper management of hazardous waste, while others include the Clean Water Act (CWA), which imposes penalties for spills of oil or federally-listed hazardous substances into water and for failure to report such spills; the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), which provides for the reporting requirements to cover the release of hazardous substances into the environment and imposes liability upon generators of hazardous substances; and the Superfund Amendments and Reauthorization Act (SARA), which requires compliance with programs for emergency planning and public information. Santee Cooper has comprehensive programs, policies and procedures for on-going compliance in response to these regulations.

#### **Evolving Regulatory Requirements**

##### **Coal Combustion Residuals Rule**

Santee Cooper generates coal combustion residuals (CCR), including fly ash, bottom ash, scrubber sludge, and gypsum, when coal is combusted to produce electricity. CCR are regulated as a RCRA Subtitle D, nonhazardous waste. The federal CCR Rule establishes compliance standards, such as specific location standards, which has triggered closure of the Santee Cooper surface impoundments that are regulated by the CCR Rule. Santee Cooper has ash and gypsum slurry ponds at the Winyah, Cross, and Jefferies Generating Stations, all of which are regulated by the DHEC and which are closed or undergoing closure. A portion of these ponds are also subject to the CCR Rule, as noted above. Santee Cooper complies with the requirements of the CCR Rule, even as the CCR Rule continues to evolve as new regulations are promulgated.

CCR that can be beneficially reused are considered Coal Combustion Products (CCP), and include fly ash, bottom ash, and FGD products such as gypsum. In order to minimize the CCR that are landfilled, Santee Cooper has entered into contracts for the beneficial use of CCP and continually looks for new markets for excess quantities. As noted previously, Santee Cooper provides gypsum to American Gypsum for their wallboard production requirements. Gypsum and ponded gypsum that do not meet wallboard quality standards are provided to cement companies and the agriculture industry. Additionally, dry fly ash from the operating units and ash reclaimed from the Santee Cooper ash ponds are provided to the cement industry and bottom ash is provided to concrete block manufacturers.

At Cross and Winyah Generating Stations, dry CCR that cannot be beneficially used are disposed of in on-site industrial Class 3 solid waste landfills. These landfills are permitted by the DHEC to receive



the Santee Cooper CCR waste from any of Santee Cooper coal-fired generating units and CCR ponds. As noted above, these landfills are also federally regulated under the CCR Rule. Additional landfill cells for the Cross and Winyah Class 3 landfills are already fully permitted and will be constructed as the existing cells are filled and closed in order to provide ongoing landfill capacity.