



December 6, 2017

Stacey Washington  
Energy Specialist  
Office of Regulatory Staff  
Energy Office  
1401 Main Street  
Suite 900  
Columbia, SC 29201

Re: Integrated Resource Plan (2017) from the South Carolina Public Service Authority

Dear Ms. Washington:

Enclosed is the 2017 Integrated Resource Plan (IRP) from the South Carolina Public Service Authority ("Santee Cooper") as required by SC Code Section 58-37-10, -30 and -40. The plan contains the demand and energy forecast for a fifteen-year period, as well as a program for meeting the requirements shown in the forecast. Also included are details on Santee Cooper's Energy Efficiency, Conservation and Demand-Side Management ("DSM") activities.

If you have any questions, please call me at (843) 761-4063 ext. 4274.

Sincerely,

A handwritten signature in blue ink that reads 'Lance Chaplin'.

Lance Chaplin  
Group Leader, Customer Billing

*South Carolina Public  
Service Authority  
(Santee Cooper)*



***INTEGRATED RESOURCE PLAN***

*November 2017*

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## Introduction

The South Carolina Public Service Authority (“Santee Cooper”) is a body corporate and politic of the State of South Carolina. Santee Cooper’s primary business operation is the production, transmission and distribution of electrical energy, both at wholesale and retail, to the citizens of South Carolina. Santee Cooper is also authorized to acquire, treat, transmit, distribute and sell water at wholesale within the counties of Berkeley, Calhoun, Charleston, Clarendon, Colleton, Dorchester, Orangeburg and Sumter, South Carolina. Santee Cooper began electric power operations in February 1942. The commercial operation of the regional water system began in October 1994.

Santee Cooper is one of the nation’s largest municipal wholesale utilities, whose system serves directly or indirectly approximately 2 million South Carolinians in all 46 counties of South Carolina. Santee Cooper’s direct-served customers currently include 26 large industrial customers, Central Electric Power Cooperative Inc. (“Central”), and two municipal electric systems, the city of Georgetown and the city of Bamberg (“Municipal” customers). The municipal agreements were entered into in 2013 and have initial terms ranging from 10 to 20 years. Central is a generation and transmission cooperative made up of all 20 electric distribution cooperatives, including the five upstate electric distribution cooperatives that were formerly members of the Saluda River Electric Cooperative, Inc. (“Saluda”). Central member cooperatives serve primarily residential, commercial and industrial customers in all 46 counties of the state. Through Central and the two municipal electric systems, approximately 771,000 customers are served indirectly by Santee Cooper. Santee Cooper also serves directly approximately 177,000 residential, commercial and small industrial retail customers in parts of Berkeley, Georgetown and Horry counties (“Distribution” customers).

Santee Cooper and Central adopted an amendment to the Central Agreement on May 20, 2013, that better aligns their future interests, formalizes how they will jointly plan for new resources, and defers their rights to terminate the agreement prior to December 31, 2058. Central has entered into requirements agreements with all 20 of its member cooperatives that extend through December 31, 2058.

In addition to its direct-served customers, Santee Cooper provides wholesale electric service to the City of Seneca, Piedmont Municipal Power Agency, Alabama Municipal Electric Authority, the Town of Waynesville and SCE&G pursuant to long-term contracts with terms that range from 10 to 20 years.

Santee Cooper has executed a new contract with Century Aluminum of South Carolina, Inc. (“Century”) that extends until December 31, 2018. Century has reduced its facility capacity by 50%, requiring approximately 200 MW of power. Approximately 25% of the load is served under Santee Cooper’s firm industrial rate schedule, with the remainder served under Santee Cooper’s customer-supplied power schedule with Century providing an off-system resource for the power and Santee Cooper transmitting the power. In addition to its standard termination provisions, the contract contains a provision that allows for early termination by Century upon 60 days prior written notice.

On a regular basis, Santee Cooper analyzes the existing and future demand and energy needs of its customers in order to ensure it has a plan that will serve its customers in an economical and reliable manner.

On July 31, the Santee Cooper Board of Directors voted to suspend construction of Units 2 and 3 at V.C. Summer Nuclear Station in Jenkinsville, S.C. The vote followed a comprehensive analysis of the project’s cost to complete following the bankruptcy and stated plan to reject Santee Cooper’s fixed-price contract by Westinghouse, the contractor building the new units.

Even without construction of Summer Units 2 and 3, Santee Cooper’s existing/remaining portfolio is projected to be capable of meeting its energy and capacity needs through 2031.

This Integrated Resource Plan (“IRP”) contains the demand and energy forecast for a 15-year period, as well as a program for meeting the requirements shown in the forecast. This report also includes a description of demand-side management programs as required by SC Code Section 58-37-10, -30 and -40.

# I. Load Forecast

## **Overview**

The load forecast is updated annually and includes projected monthly energy and peak demand requirements for a 20-year forecast horizon. Santee Cooper and GDS Associates, Inc. (“GDS”) prepare the energy and peak demand forecasts for all classes except Central. The forecast is based on an analysis of historical events and assumptions regarding the future. These assumptions relate to key factors known to influence energy consumption and peak demand, including economic activity, housing characteristics, appliance mix, appliance efficiencies, electricity prices, weather conditions and local area demographics. Central provides Santee Cooper with its projected loads.

The Santee Cooper territorial forecast represents the aggregate of energy and peak demand projections developed for four sectors: Distribution, Industrial, Central and Municipal. The Distribution and Industrial customers represent Santee Cooper’s retail load, and the Central and Municipal sectors represent Santee Cooper’s wholesale load. The weather-sensitive portion of the energy forecast (residential and commercial classifications for the Distribution, Central and Municipal sectors) is developed using econometric models. The non-weather sensitive industrial energy forecast is developed based on historical trends and information provided by individual industrial customers.

Peak demand projections are developed by sector. Econometric models are used to project peak demand for the Distribution, Municipal and Central sectors. Industrial demand is forecasted individually by customer and reflects any additions or changes to existing contracts, as well as known or probable future changes.

The 2017 load forecast includes energy and peak demand savings from future energy efficiency and conservation programs. The “base case” load forecast quantifies the impacts of numerous factors influencing energy consumption and reflects normal weather conditions, which are based on the most recent 20-year averages.

## **Process**

### *1) Database Development*

The load forecast database is updated annually to include the most recent historical data. Database elements include: electric system data (e.g., number of customers, kWh sales, and revenues by customer class), economic and demographic data, electricity prices, market characteristics, housing characteristics and weather data. Additionally, historical data and projections for the key influences on energy consumption and peak demand are updated.

### *2) Economic Outlook*

The economic outlook is updated each year to address recent trends in economic activity and to develop growth trends for key economic and demographic factors, including: population, number of households, employment, personal income, retail sales, gross state product and inflation. Economic outlooks are maintained for the Santee Cooper service area (Myrtle Beach metropolitan statistical area) and for the state of South Carolina. Santee Cooper's economic outlook is based on data obtained from Moody's Analytics. Central's economic outlook is based on data obtained from IHS Global Insight.

### *3) Forecast Development*

The Santee Cooper load forecast represents a territorial load covering portions throughout the state of South Carolina. The territorial load forecast is comprised of projections developed for the Distribution, Industrial, Central and Municipal sectors, which are aggregated to produce the combined Santee Cooper territorial load forecast.

The Load Forecast also includes off-system sales, which are comprised of Alabama Municipal Electric Authority (AMEA), Piedmont Municipal Power Agency (PMPA), City of Seneca, Town of Waynesville and SCE&G.

*Territorial Load Sectors:*

*3.1 Distribution*

Distribution requirements include retail energy sales, peak demand, and distribution losses for the residential, commercial and small industrial classifications.

The number of residential customers is projected using a regression model that specifies a relationship between number of customers and number of households. A statistically adjusted end-use model is used to project average energy use per residential customer. The model quantifies the impacts of real household income, price of electricity, household size, housing characteristics, market share of major electric end-uses, appliance efficiencies and weather conditions. Energy sales are computed as the product of number of customers and average energy use per customer.

The number of commercial and small industrial customers is projected using a regression model that specifies a relationship between number of customers and employment. Average use per customer is projected using a regression model specifying a relationship between energy use per customer, price of electricity and weather conditions. Energy sales are computed as the product of number of customers and average energy use per customer.

Projections of peak demand are developed at the aggregate sector level by season (summer and winter). An econometric model is used to project monthly peak demand as a function of weather normalized energy sales and average daily temperature on the peak day.



### 3.2 *Industrial*

Projections of industrial energy sales and peak demand are developed individually for each customer. Projections are based on historical trends, contract demands, state economic data and information regarding customers' plans and operations during the forecast horizon.

### 3.3 *Central Requirements*

Central's 2017 load forecast was prepared by Central and reviewed by Santee Cooper staff. This forecast is based on econometric and statistically adjusted end-use models and represents the aggregate 20-year forecast for Central's 20 member cooperatives. The Central forecast reflects the six-year transition of approximately 950 MW from Santee Cooper to another provider. This transition started in 2013 and will be completed in 2019.

### 3.4 *Municipal*

Energy and peak demand requirements for the Municipal sector represent less than one percent of total system requirements. The number of municipal customers is assumed at the current level of two throughout the forecast. The number of customers served by the individual cities is not projected. Regression equations, including heating degree days, cooling degree days and an autoregressive parameter, are used to project total energy sales for each of the two municipal systems.

Regression models are developed to project the municipal systems' peak demand. Model inputs include total energy requirements.

### 3.5 *Total Territorial Requirements*

Total territorial requirements include the combined energy and peak demand requirements for the four sectors (i.e., Distribution, Industrial, Central and Municipal). The peak demand projections represent the highest simultaneous 60-minute load for the combined four sectors. High and low

range peak demand forecast scenarios are developed to address weather sensitivity by combining the respective weather impacts for each sector. Impacts for the Distribution sector are based on application of extreme seasonal load factors to projected energy requirements. Impacts for the Central sector are based on regression model estimates incorporating extreme and mild temperatures on the peak day. No weather impacts for the Industrial sector are developed since that sector is not weather sensitive.

The following table (Table 1) contains the forecasted demand and energy included in LF1701. Table 2 contains historical energy and demand.

**Table 1**  
**2017 LOAD FORECAST** <sup>(1)</sup>

	<b>Summer Peak (MW)</b>	<b>Winter Peak (MW)</b>	<b>Energy Sales (GWH)</b>
<b>2017</b>	4,353	4,825	22,959
<b>2018</b>	4,234	4,695	22,388
<b>2019</b>	4,212	4,638	22,342
<b>2020</b>	4,236	4,652	22,437
<b>2021</b>	4,274	4,681	22,537
<b>2022</b>	4,314	4,728	22,709
<b>2023</b>	4,359	4,779	22,922
<b>2024</b>	4,403	4,835	23,193
<b>2025</b>	4,452	4,879	23,373
<b>2026</b>	4,499	4,928	23,589
<b>2027</b>	4,546	4,977	23,801
<b>2028</b>	4,594	5,033	24,066
<b>2029</b>	4,647	5,083	24,253
<b>2030</b>	4,691	5,127	24,444
<b>2031</b>	4,740	5,174	24,654

(1) Excludes all off-system sales.

**Table 2**  
**Historical Sales and System Peak Loads**

Year	Sales (GWH)	System Peak Load <sup>(1)</sup> (MW)
2016.....	23,700.....	4,794
2015.....	26,498.....	5,869
2014.....	27,353.....	5,673
2013.....	26,364.....	5,029
2012.....	26,756.....	5,387
2011.....	27,552.....	5,676
2010.....	28,182.....	5,743
2009.....	25,813.....	5,590
2008.....	26,687.....	5,650
2007.....	27,221.....	5,563
2006.....	25,422.....	5,195
2005.....	25,064.....	5,371
2004.....	24,451.....	5,088
2003.....	24,060 .....	5,373
2002.....	24,121 .....	4,795

(1) Excludes all off-system sales to other utilities.

## II. Existing Resources

Santee Cooper's total summer Maximum Continuous Rating ("MCR") is 5,104 MW for owned generating facilities (see Table 3). In addition, Santee Cooper presently receives 84 MW of firm supply from the U.S. Army Corps of Engineers (the "Corps") and 296 MW of firm hydroelectric power from the Southeastern Power Administration ("SEPA"). The SEPA allocation consists of 161 MW for wheeling to the SEPA preference customers served by Santee Cooper and 135 MW purchased by Santee Cooper for its customers. Santee Cooper also receives 8 MW of dependable capability (15 MW MCR) from the Buzzards Roost hydroelectric generating facility which it leases from Greenwood County, South Carolina and 74 MW of biomass capacity and associated energy under four power purchase agreements (the first commenced in September 2010 and the most recent in November 2013, with varying terms from 15 to 30 years). There is also an agreement to purchase the output from a 3 MW solar photovoltaic facility that started producing power in December of 2013 and has a 20-year term.

**Table 3  
Santee Cooper Owned Generating Facilities in MW<sup>(1)</sup>**

<b>Generating Facility</b>	<b>Units</b>	<b>Location</b>	<b>Summer MCR</b>	<b>Winter MCR</b>	<b>Fuel</b>	<b>Began Commercial Operation</b>
Jefferies Station	1, 2, 3, 4, and 6	Moncks Corner	140	140	Hydro	1942
Wilson Dam		Lake Marion	2	2	Hydro	1950
Myrtle Beach Combustion Turbines <sup>(2)</sup>	1 and 2	Myrtle Beach	16	20	Oil/Gas	1962
	3 and 4		19	20	Oil	1972
	5		21	25	Oil	1976
Hilton Head Combustion Turbines	1	Hilton Head Island	16	20	Oil	1973
	2		16	20	Oil	1974
	3		52	60	Oil	1979
Winyah Station	1	Georgetown	275	280	Coal	1975
	2		285	290	Coal	1977
	3		285	290	Coal	1980
	4		285	290	Coal	1981
V.C. Summer Nuclear Station <sup>(3)</sup>	1	Jenkinsville	322	322	Nuclear	1983
Cross Station	1	Cross	580	585	Coal	1995
	2 <sup>(4)</sup>		565	570	Coal	1983
	3		610	610	Coal	2007
	4		615	615	Coal	2008
Horry County Landfill Gas		Conway	3	3	Landfill methane gas	2001
Lee County Landfill Gas		Bishopville	11	11	Landfill methane gas	2005
Richland County Landfill Gas		Elgin	8	8	Landfill methane gas	2006
Anderson County Landfill Gas		Belton	3	3	Landfill methane gas	2008
Georgetown County Landfill Gas		Georgetown	1	1	Landfill methane gas	2010
Berkeley County Landfill Gas		Moncks Corner	3	3	Landfill methane gas	2011
Rainey Station	Combined Cycle	Starr	460	520	Gas	2002
	CT 2A		146	180	Gas	2002
	CT 2B		146	180	Gas	2002
	CT 3		75	90	Gas	2004
	CT 4		75	90	Gas	2004
	CT 5		75	90	Gas	2004
<b>Total Capacity</b>			<b>5,110</b>	<b>5,338</b>		

(1) Generating Facilities as of December 31, 2016.

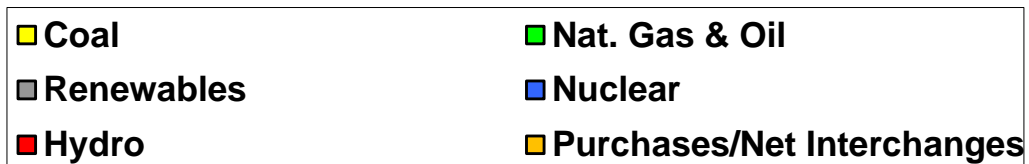
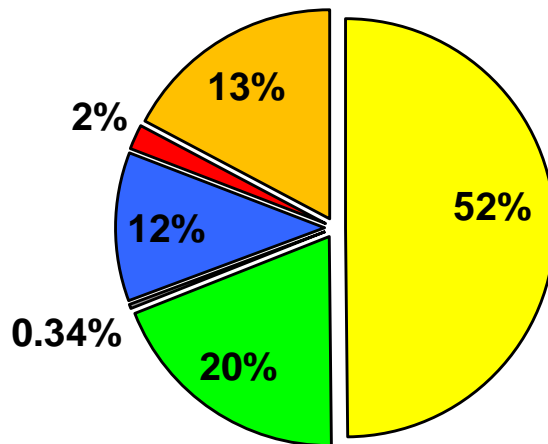
(2) Myrtle Beach Combustion Turbine No. 4 is currently unavailable until further notice.

(3) Represents Santee Cooper's one-third ownership interest.

(4) Santee Cooper idled Cross Unit 2 on March 1, 2017.

In 2016, Santee Cooper's total energy needs were met primarily by coal at 52% (see Figure 1). Nuclear energy supplied 12% of the total energy needs, natural gas and oil supplied 20%, purchases supplied 13%, and remaining needs supplied by hydro and renewables.

**Figure 1**  
**2016 Total Energy Supply**



### **III. Projections of Load, Capacity and Reserves**

Santee Cooper meets its customers' demand and energy requirements through the use of Santee Cooper generation facilities, as well as purchased power contracts. In addition, Santee Cooper ensures there is available capacity over and above that amount necessary to meet the load requirements. This reserve capacity is used to cover unexpected events, such as unit outages, adverse weather conditions, unexpected demand, or an unplanned loss in the transmission system. Santee Cooper evaluates its planning reserve targets periodically and for the purposes of these projections has used reserve targets of 12% and 15%, respectively, for the winter and summer months.

In planning for future reserve needs, the load forecast's firm load requirements, less any requirements that are served by reserved resources such as SEPA, are used. The amount of future reserves needed is compared to the amount of current and planned generation to gauge the need for future generating units.

The load forecast, as well as reserve margin and capacity information, is contained in the table that follows (see Table 4).



**Table 4**  
**Seasonal Projections of Load, Capacity, and Resources <sup>(1)</sup>**

W=Winter, S=Summer

	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S		
	17/18	2018	18/19	2019	19/20	2020	20/21	2021	21/22	2022	22/23	2023	23/24	2024	24/25	2025	25/26	2026	26/27	2027	27/28	2028	28/29	2029	29/30	2030	30/31	2031
<b>Forecast Requirements</b>																												
1 Santee Cooper System Peak	4,744	4,295	4,670	4,246	4,686	4,270	4,715	4,308	4,763	4,348	4,813	4,394	4,869	4,437	4,913	4,486	4,962	4,533	5,011	4,581	5,068	4,628	5,117	4,681	5,161	4,726	5,208	4,774
2 Interruptible Load	(367)	(392)	(372)	(398)	(372)	(398)	(372)	(398)	(372)	(398)	(372)	(398)	(372)	(398)	(372)	(398)	(372)	(398)	(372)	(398)	(372)	(398)	(372)	(398)	(372)	(398)	(372)	(398)
3 Firm Sales	<u>206</u>	<u>310</u>	<u>210</u>	<u>316</u>	<u>209</u>	<u>291</u>	<u>186</u>	<u>295</u>	<u>190</u>	<u>301</u>	<u>195</u>	<u>307</u>	<u>150</u>	<u>264</u>	<u>155</u>	<u>238</u>	<u>136</u>	<u>245</u>	<u>119</u>	<u>237</u>	<u>125</u>	<u>244</u>	<u>131</u>	<u>252</u>	<u>135</u>	<u>258</u>	<u>141</u>	<u>265</u>
4 Total Reserved Load	4,583	4,213	4,507	4,163	4,523	4,163	4,529	4,205	4,580	4,250	4,635	4,302	4,646	4,303	4,695	4,326	4,725	4,379	4,758	4,419	4,820	4,474	4,875	4,534	4,924	4,585	4,976	4,640
5 Load Not Requiring Reserve	<u>(416)</u>	<u>(416)</u>	<u>(411)</u>	<u>(411)</u>	<u>(411)</u>	<u>(411)</u>	<u>(411)</u>	<u>(411)</u>	<u>(411)</u>	<u>(411)</u>	<u>(411)</u>	<u>(411)</u>	<u>(359)</u>	<u>(359)</u>	<u>(359)</u>	<u>(359)</u>	<u>(359)</u>	<u>(359)</u>	<u>(359)</u>	<u>(359)</u>	<u>(359)</u>	<u>(359)</u>	<u>(359)</u>	<u>(359)</u>	<u>(359)</u>	<u>(359)</u>	<u>(359)</u>	<u>(359)</u>
6 Total Load Requiring Reserve	4,167	3,797	4,097	3,753	4,113	3,753	4,119	3,795	4,170	3,840	4,225	3,892	4,287	3,944	4,336	3,967	4,366	4,020	4,399	4,060	4,461	4,115	4,516	4,175	4,565	4,226	4,617	4,281
<b>Cumulative System Capacity</b>																												
7 Available Generating Capacity	5,387	5,158	5,387	5,158	5,387	5,158	5,387	5,158	5,387	5,158	5,387	5,158	5,387	5,158	5,387	5,158	5,387	5,158	5,387	5,158	5,387	5,158	5,387	5,158	5,387	5,158	5,387	5,158
8 Projected Renewable Resources <sup>(2)</sup>	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	36	36	36	36	36	36	36	36	36	36	36	36	36
9 Projected Resource Additions	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 Projected Retired Units <sup>(3)</sup>	0	0	0	0	0	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)
11 Projected Unavailable Units <sup>(4)</sup>	(598)	(592)	(598)	(592)	(598)	(592)	(598)	(592)	(598)	(592)	(598)	(592)	(598)	(592)	(598)	(592)	(28)	(27)	(28)	(27)	(28)	(27)	(28)	(27)	(28)	(27)	(28)	(27)
12 Net Available Generating Capacity	4,862	4,639	4,862	4,639	4,862	4,624	4,847	4,624	4,847	4,624	4,847	4,624	4,847	4,624	4,847	4,624	5,379	5,151	5,379	5,151	5,379	5,151	5,379	5,151	5,379	5,151	5,379	5,151
<b>Cumulative Purchase (Sales) Contracts</b>																												
13 Long Term	364	364	359	359	359	359	359	359	359	359	359	359	359	359	359	359	359	359	359	359	359	359	359	359	359	359	359	359
14 Mid Term Contract	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15 Proj Short Term Contract	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0
16 Cumulative Production Capacity	5,227	5,004	5,221	4,998	5,221	4,983	5,206	4,983	5,206	4,983	5,206	4,983	5,206	4,983	5,216	4,983	5,738	5,510	5,738	5,510	5,738	5,510	5,738	5,510	5,738	5,510	5,738	5,510
<b>Reserves</b>																												
17 Generating Reserves	643	791	714	835	698	820	677	778	626	733	571	681	560	680	521	657	1,013	1,131	980	1,091	918	1,036	863	976	814	925	762	870
18 % Reserve Margin	15%	21%	17%	22%	17%	22%	16%	21%	15%	19%	14%	18%	13%	17%	12%	17%	23%	28%	22%	27%	21%	25%	19%	23%	18%	22%	17%	20%

(1) Based on LF1701 with known load adjustments.

(2) Includes Santee Cooper resources and long-term renewable purchases.

(3) Buzzards Roost Hydro contract terminates in March of 2020.

(4) Myrtle Beach 4 is considered unavailable for the term of the forecast. Cross 2 idled after March 1, 2017 and returns Dec. 1, 2025.

## IV. Generation Expansion Plan

Santee Cooper's overall power supply objective is to continue to satisfy the electric demand and energy needs of its customers with economical and reliable service. In developing a generation expansion plan to accomplish these objectives, Santee Cooper follows a systematic process in accordance with standard industry practice.

The company begins its resource planning process by reviewing its past load history and developing a load forecast that extends 20 years into the future. Following the determination of future load, potential supply-side generating resources are screened to determine which units are both viable and cost effective. These units are then included for consideration in the plan. Santee Cooper considers the possible addition of new power resources, the retirement of existing resources and other modifications to its resource plan.

Assumptions about the future operating environment, as well as the various costs associated with operating the new units and the overall system, are also defined during the process of screening supply-side options. All of these assumptions are used to develop a recommended generation resource plan.

Santee Cooper then undergoes a rigorous financial and risk analysis to verify that the recommended generation resource plan meets Santee Cooper's needs under a variety of different scenarios.

As already noted, on July 31, the Santee Cooper Board of Directors voted to suspend construction of Units 2 and 3 at V.C. Summer Nuclear Station in Jenkinsville, S.C. The vote followed a comprehensive analysis of the project's cost to complete following the bankruptcy and stated plan to reject Santee Cooper's fixed-price contract by Westinghouse, the contractor building the new units.

Even without construction of Summer Units 2 and 3, Santee Cooper's existing/remaining portfolio is projected to be capable of meeting its energy and capacity needs through 2031.

Santee Cooper will explore unidling its Cross 2 unit, a 565 MW coal unit, as required by future needs. The unidling process is estimated to take two years. This option will continuously be evaluated against the cost/value of other resource options. For the purposes of this report, (Table 4) shows Cross 2 returning on December 1, 2025.

## V. Transmission System Adequacy

Santee Cooper operates an integrated transmission system, which includes lines owned and leased by Santee Cooper as well as those owned by Central. The transmission system includes approximately 1,351 miles of 230 kilovolt (“kV”), 1,886 miles of 115 kV, 1,724 miles of 69 kV, and 95 miles of 34 kV and below overhead and underground transmission lines. Santee Cooper operates 106 transmission substations and switching stations serving 87 distribution and industrial substations and 458 Central delivery points. Communications sites at 95 locations are in place to support the monitoring and controlling of integrated power system operations. 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 (“NERC”) and to maintain system voltages that are consistent with good utility practice.

Santee Cooper’s transmission system is interconnected with other major electric utilities in the region. It is directly interconnected with SCE&G at eight locations; with Duke Energy Progress 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 SCE&G, Duke Energy Carolinas, Southern Company and SEPA through a five-way interconnection at SEPA’s J. Strom Thurmond Hydroelectric Project, and with Southern Company and SEPA through a three-way interconnection at SEPA’s R. B. Russell Hydroelectric Project. Through these interconnections, Santee Cooper’s transmission system is integrated into the regional transmission system serving the southeastern areas of the United States and the Eastern Interconnection. Santee Cooper has separate interchange agreements with each of the companies with which it is interconnected which provide for mutual exchanges of power.

Santee Cooper is party to the Virginia-Carolinas Reliability Agreement (“VACAR”), which exists for the purpose of safeguarding the reliability of the electric service of the parties thereto. Other parties to the VACAR agreement are SCE&G, Duke Energy

Progress, Duke Energy Carolinas, APCI-Yadkin Division, Dominion Virginia Power, and Public Works Commission of the City of Fayetteville.

Santee Cooper is also a member of the SERC Reliability Corporation, which is one of eight regions under the NERC.

## **VI. Energy Efficiency, Conservation and Demand-Side Management (“DSM”) Activities**

For over 20 years, Santee Cooper has offered demand-side management programs. These programs have measures that save energy and/or demand. The energy and/or demand impacts of the actual and projected participation of Santee Cooper’s directly-served retail customers are considered when updating the energy and/or demand needs in the generation plan.

### **Existing Energy Efficiency Programs**

#### **Reduce The Use South Carolina**

Santee Cooper launched its “Reduce The Use South Carolina” energy efficiency effort in September 2009. The goal of this 10-year-long effort is to substantially reduce the use of electricity and improve energy efficiency among its 177,000 direct-served residential and commercial customers through rebate programs.

The comprehensive “Reduce The Use South Carolina” energy efficiency effort includes energy efficiency initiatives to help achieve an annual savings of 209 million kilowatt hours by 2020.

Santee Cooper has launched the following programs:

#### **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’s maximum outstanding loan cannot exceed \$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 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 for residential energy efficiency improvements to improve the energy efficiency of customers’ homes year-round.

<b>Measure</b>	<b>Customers</b>	<b>Incentive</b>
<b>Air Infiltration</b>	<b>39</b>	<b>\$38 - \$193</b>
<b>Ceiling Insulation</b>	<b>29</b>	<b>\$55 - \$260</b>
<b>Duct Improvement</b>	<b>110</b>	<b>\$90 - \$2,100</b>
<b>Heat Pump Install</b>	<b>905</b>	<b>\$200 - \$775</b>
<b>Heat Pump Tune Up</b>	<b>1,049</b>	<b>\$50</b>
<b>Smart Thermostat</b>	<b>187</b>	<b>\$125</b>
<b>Heat Pump Water Heater</b>	<b>12</b>	<b>\$400</b>
<b>Solar Water Heater</b>	<b>0</b>	<b>\$700</b>

In 2016, there were 1,900 customers participating for a savings of 2,134 MWh. The total incentive cost was \$497,735. Since inception, 138,962 MWh have been saved with a total incentive cost of \$6,988,700.

***Equipment and Lighting Incentives: Residential LEDs***

As prices continue to drop, LEDs are quickly becoming a great lighting solution. LEDs last 20 times longer than incandescent bulbs, produce over 75% less energy, use over 75% less energy, and are available in different sizes and shapes to fit in almost any fixture. Santee Cooper energy advisors gave away 6,458 LED bulbs to 1,039 residential. The annual energy savings total 792 MWh. Since inception, 69,700 MWh have been saved with a total incentive cost of \$621,783.

### ***Smart Energy New Homes Program***

The Smart Energy New Homes Program offers rebate to builders who construct homes that meet Santee Cooper's eligibility requirements and either meet Smart Energy New Home 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 HERS Index of 65 or below, which require that homes be 35% 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 require that homes be 25% 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 require that homes be 15% more energy efficient than a standard new home. The rebate for this tier is \$800 for single family homes only.

Under Tier 1, 35 new single-family homes and one multi-family home was built for a savings of 172 MWh. Under Tier 2, 74 new single-family homes and 85 new multi-family homes were built for a savings of 286 MWh. Under Tier 3, 101 new single-family homes were built for a savings of 162 MWh. Two homes received qualifying equipment rebates for 17+ SEER Split heat pumps for a savings of 3.6 MWh. No qualifying performance pathway rebates were paid for multi-family homes in 2016. The total combined incentive cost was \$341,280. Since inception, 57,243 MWh have been saved with a total incentive cost of \$2,583,523.

### ***On-site Energy Assessments***

Santee Cooper offers free energy assessments to residential customers upon request.



## **Commercial Programs**

### ***Commercial Prescriptive Program***

Santee Cooper offers its commercial customers rebates for qualifying energy efficient upgrades to their facilities through the Commercial Prescriptive Program. The Program offers rebates for qualifying energy-efficient lighting, HVAC, building envelope, refrigeration, pumps, and variable frequency drives. Rebates are available for new construction, major renovation, and retrofit applications. The purpose of this program is to reduce the incremental cost to the customer to upgrade to high-efficient units from standard-efficient units while also providing Santee Cooper with the lowest cost resource. In 2016, the Prescriptive Program had 548 projects, which saved a total of 22,636 MWh. The total combined incentive cost was \$1,716,150. Since inception, 976,345 MWh have been saved with a total incentive cost of \$16,123,804.

### ***Commercial Custom Program***

In addition to the Commercial Prescriptive Program, Santee Cooper offers its commercial customers the opportunity to receive rebates for energy-efficient upgrades to their facilities through the Commercial Custom Program. The Commercial Customer Program offers rebates for any energy saving measures that are not addressed in the Commercial Prescriptive Program. These measures are typically new technology that needs to be vetted or existing technology that has highly variable energy savings based on the facility. Once a project is accepted into the program, Santee Cooper determines the baseline consumption of the old unit, as well the consumption of the new unit, with energy monitoring equipment in order to determine the difference in energy usage. Santee Cooper then rebates the customer based on the actual energy saved on a yearly basis. The Custom Program is separated into four sections: HVAC controls, non-HVAC controls, lighting, and custom measure. The custom measure section is a catch-all for any project not included in the other three sections. An example of each type of project can be found below:

- HVAC Controls – HVAC Cooling Loop
- Non-HVAC Controls – Domestic Water Pump
- Lighting – Specialty Lighting

- Custom Measure – Regenerative Elevator Drives

In 2016, 58 customers participated in the Commercial Custom Program for a combined savings of 2,721 MWh. The combined incentive cost was \$260,649. Since inception, 177,769 MWh have been saved with a total incentive cost of \$3,917,080.

### ***On-site Energy Assessments***

Santee Cooper offers free energy assessments to commercial customers upon request.

## **Load Management**

### ***Interruptible / Economy Power Pricing Rates***

Santee Cooper has developed and offers time-of-use, non-firm and off-peak rates to its direct-served commercial and industrial customers to encourage them to reduce their peak demand. The use of these rates is taken into account when developing the load forecast and generation plan.

An “economy power” rate is available to industrial customers, and is based on an hourly incremental energy rate. This is a real-time pricing rate; the price for energy changes each hour. Customers must schedule their usage each hour. This service is curtailable in emergency situations by Santee Cooper. Pricing alternatives are available under this rate where the energy price is fixed during certain hours. There is also an interruptible rate available to industrial customers which allows for curtailment under certain circumstances.

As part of Santee Cooper’s demand control program, currently there are 555 MW of load taking service under the industrial interruptible and economy power schedules. The portion of this load estimated to be on the system at the peak is excluded from the peak demand calculations for generation planning and reserves resource planning.

## **Public Information for the promotion of Energy Efficiency and Conservation**

Web-based Customer Tips & Tools: Santee Cooper offers online energy saving tips for residential and commercial customers. Santee Cooper partnered with EnergyEarth to offer residential customers a free, online home energy checkup. The online personalized home energy checkup helps customers identify places to be more energy efficient in their homes, which can reduce energy consumption and lower their utility bills. The process is easy, progress and results can be saved, and when the checkup 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: 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, measureable calls to action. We utilize direct mail promotions and communication, and email customers through our opt-in program, with monthly information and links to sign up or have questions answered. In 2016, that opt-in email program included more than 71,000 customers, and our direct mail numbers vary according to the target audience for each specific program. We also communicate with customers through Facebook, Twitter, Instagram, LinkedIn and YouTube. Santee Cooper has more than 4,300 followers on Twitter, over 1,300 followers on Instagram, 10,100 on LinkedIn and our Facebook fans are more than 89,000 strong. Our YouTube videos were viewed more than 194,000 times. All of these avenues of communication saw growth in the last year.

Public Campaigns: Santee Cooper continues to use advertising and communications vehicles that target specific customers and customer groups. We advertise and promote our programs through digital advertising on the web and through Facebook and Twitter, which is highly measureable 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 public

stakeholders. We also promote programs through press releases and press conferences, if warranted, to round out our public communications. In addition, we are partnering with customers who can help spread the word, such as large property managers who help us include energy efficiency promotions 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 real-world understanding of the power and purpose of electricity as well as the importance of conserving and using power 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 2,090 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 power as well as 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 (145 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 75,000 through 2017), 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.

## VII. Renewable Resources and Programs

### *1. Renewable Energy*

#### HYDRO

Santee Cooper's largest source of renewable energy is the hydroelectric facilities that were developed during the birth of Santee Cooper. Since the 1940s the water that flows through the Santee Cooper lake system has played an integral role in the ability of Santee Cooper to provide low-cost, reliable power. Originally, the hydro units were Santee Cooper's only source of generating capacity. As Santee Cooper grew over the years, the hydroelectric units on the lake have gradually shifted from the sole source of electric generation to being used mainly as peaking capacity today.

While there are no practical larger hydro projects the scale of the Santee Cooper lake system available in the state, there may be the potential to develop small scale projects distributed throughout the state. Santee Cooper is in the process of evaluating the viability of several small hydro locations at existing impoundments around the state.

#### BIOMASS

In 2001, Santee Cooper became the first utility in South Carolina to produce electric power using methane gas from landfills as a fuel source. Santee Cooper now has six sites totaling 29-MW of generating capacity that is fueled by methane gas collected at large landfills.

Santee Cooper is looking for ways to increase the use of various forms of biomass to produce electricity. Santee Cooper is investigating the potential of using various wood sources as a fuel, and the potential for methane produced from agricultural waste.

EDF Renewable Energy has two 17.8-MW facilities in Allendale and Dorchester counties that utilize wood chips and waste wood for fuel. Santee Cooper continues to purchase the output of these facilities since they were declared commercial in the fall of 2013. Santee

Cooper also purchases the output from the 38-MW Domtar biomass facility located in Marlboro County that began operation in 2010.

### SOLAR

Santee Cooper has developed a Green Power Solar Schools (“GPSS”) program for middle schools around the state. At the participating schools, Santee Cooper and the local electric cooperative install a 2-kW photovoltaic solar panel (PV) and provide a science curriculum that meets state standards. To provide training opportunities for the teachers who will be using the curriculum, a similar 2-kW PV panel has also been installed at Santee Cooper’s Wampee Conference Center. Since it began in 2007, Santee Cooper has continued to expand the Solar School program and to date there are now 28 Solar School installations across the state with a total capacity of 60-kW.

Santee Cooper continues to investigate and utilize solar power. In addition to the GPSS installations, Santee Cooper built a 16-kW Solar Pavilion at Coastal Carolina University, a 20-kW installation at the Center for Hydrogen Research in Aiken, a second 20-kW installation in December of 2009 at the Technical College of the Lowcountry in Bluffton, and an 8-kW solar project in Rock Hill was completed and placed in service in early 2014. In 2016, the first dual axis tracking array in combination with a fixed array, a total of 4-kW, was constructed at the Center for Advance Technical Studies in Chapin, S.C. In 2017, the first bifacial solar array, totaling 4-kW, was installed at Trident Technical College’s Berkeley Campus. With partial funding from the American Recovery and Reinvestment Act, Santee Cooper completed the 311-kW Grand Strand Solar Station in Myrtle Beach in early 2011.

In October of 2013, Santee Cooper signed an agreement with TIG Sun Energy I LLC to buy the output of a 3-MW solar farm in Walterboro which began operating in January 2014. Santee Cooper will be using the project to learn more about integrating solar power into the generation portfolio, both from a cost and reliability standpoint, and as part of the state’s first Community Solar program.

## WIND

In 2005, Santee Cooper began investigating the wind generating potential in the state. Santee Cooper partnered with the U.S. Department of Energy and the South Carolina Energy Office to contract with AWS Truewind to provide wind mapping of South Carolina. Since the completion of the mapping, Santee Cooper has joined several partnerships to further the study of potential wind generation in the state.

Meteorological Towers: Santee Cooper helped install and maintain 50m anemometer towers at Waites Island in Horry County and the Baruch Institute in Georgetown. Santee Cooper worked with Coastal Carolina University, Clemson University, Savannah River National Labs, Secondwind and the Baruch Foundation to complete these projects. While the towers proved that inland wind resources were not strong enough to sustain utility scale wind turbines, they also partially validated the estimates produced by AWS Truewind in 2005 that predict a large wind resource exists in SC's offshore waters. Also, the Baruch Tower was used to validate an emerging wind measuring technology, developed by Secondwind.

Wind Education project: A 2.4-kW Skystream wind turbine was installed at Oceanfront Park in North Myrtle Beach in November of 2010 and has since been in continuous operation. Santee Cooper has also contracted to purchase the output of a 2.4-kW wind turbine owned by City of North Myrtle Beach at Burgess Preserve.

Offshore Wind Research: In March 2009, Santee Cooper, Coastal Carolina University and the South Carolina Energy Office announced a joint buoy deployment measuring ocean winds that could lay the foundation for offshore wind energy in the Palmetto State.

After collecting data for a full year, all six buoys were removed in August 2010. Coastal Carolina researchers, working closely with counterparts at NC State



University, have analyzed the buoy data to help better understand the wave, current, tidal, and wind energy available in South Carolina's state waters.

Based on the buoy data, designs for an offshore meteorological platform were completed in 2011. While the costs for building this research platform remain high, Santee Cooper is pursuing collaboration opportunities that would minimize the costs for continuing offshore wind research.

In 2015, Santee Cooper again partnered with Coastal Carolina University in deploying a Sonic Detection and Ranging System (SODAR) to remotely gather wind data at "hub height." This system is located on Waites Island and continues to collect data.

## ***2. GOFER Program***

Santee Cooper's Give Oil For Energy Recovery ("GOFER") program, in place since 1990, provides do-it-yourself oil changers a place to safely dispose of used motor oil. In 2016, Santee Cooper collected 1,332,340 gallons of used oil from more than 450 do-it-yourself collection sites. GOFER will also collect used oil from industries, commercial operations and farmers when it meets the regulatory criteria.

## ***3. Green Power Program***

Santee Cooper entered the arena of Green Power in 2001, being the first electric utility in South Carolina to offer electricity generated from renewable resources. Green Power costs more to generate than Santee Cooper's traditional generation, and the money raised through Green Power sales is put entirely into the development of new renewable energy. As already noted, Santee Cooper currently generates Green Power through landfill gas facilities, solar panels and wind. Participation for 2016 was 1,460 participants purchasing 12,447 MWh of energy.

Green-e Energy certifies Santee Cooper's Green Power, meaning what we produce meets strict and specific national environmental standards.

#### ***4. Green Tags***

Approval was given in September 2006 for the development of a new environmental program to offer to everyone in South Carolina, for the first time, the ability to purchase local renewable energy through a Green Tag program. This program allows all citizens and businesses in the state to do something positive to improve their environment, no matter their electric provider. Participation in 2016 was 39 Green Tag customers.

#### ***5. Solar Incentive Package***

Santee Cooper customers interested in purchasing or leasing rooftop solar panels or buying into a community solar program will benefit under a comprehensive incentive package. The incentive package focuses on three areas:

- **Rooftop Rebates:** Up-front rebates for the installation of solar PV systems are set as a one-time payment of \$1.60/watt paid based on the system's rated capacity (watt AC). Solar Home and Solar Business Rebates are capped at \$9,600 per account number. Nonprofit customers are eligible for an additional rebate of \$0.25/watt (AC), capped at a maximum of \$1,500.
- **Energy Credit:** Solar customers will receive an energy credit as outlined in the Distributed Generation Rider of about 3.8 cents per kWh for any excess solar power produced that is put back on the grid. The first 500 residential rooftop customers to sign up will receive an additional 3-cents per kWh credit for excess electricity through 2018. The credit is available for residential customers who own or lease the panels.
- **Community Solar:** Customers have the opportunity to subscribe to a share of the capacity at the Colleton Solar Farm, Santee Cooper's first community solar project. Solar Share allows customers to own solar output without having to install a rooftop solar electric system at their home or business. Customers will use their share's output each month to offset the total electricity they need to run their home or business. Solar Share costs \$1.82 per watt and Santee Cooper's rebate amount is \$1.40 per watt. Solar Share is sold per kW, which equates to a rebate amount of

\$1,400 per kW. There is a 6 kW cap for rebates. (The amount per watt and the rebate amount will be reviewed each year.) Santee Cooper plans to use Santee Cooper Green Power funds to seed future community solar projects once the Colleton project is fully subscribed.

Santee Cooper launched Solar Home, Solar Business and Solar Share on April 1, 2016. The incentive package is approved for three years and is subject to expansion depending on customer response.

## VIII. Environmental Considerations

The mission of Santee Cooper is to be the state's leading resource for improving the quality of life for the people of South Carolina. One of the chief ways of doing that is by protecting the environment. As such, Santee Cooper has developed the following Environmental Policy statement:

*Santee Cooper is committed to:*

Compliance with all applicable federal, state and local environmental statutes, regulations, enforceable agreements, and permits, and continual improvement in environmental performance, through

1. Proactively seeking ways to enhance compliance,
2. Promoting conservation and renewable energy initiatives,
3. Minimizing environmental risks,
4. Promoting pollution prevention, and
5. Dedicating personnel, equipment, training, and materials for the comprehensive Environmental Management System.

## Conclusion

Santee Cooper has been a leader in protecting the environment, being the first utility in the state to offer Green Power, generating electricity using landfill gas, promoting conservation and energy efficiency, installing state-of-the-art emission control technology, and funding innovative research into alternative forms of energy. Santee Cooper continues to evaluate and adjust the load forecast and resource plans as needed to meet future customer demand in a reliable and cost effective manner. Demand-side management programs are evaluated on a regular basis for their effect on energy and demand. Santee Cooper offers these DSM programs where cost effective, and has completed generation resource planning necessary to ensure a reliable generation plan to meet projected customer requirements through 2031.

Santee Cooper will continue to deliver on its responsibility to provide low-cost, reliable energy, water and other essential services and to do so with excellent customer service. Santee Cooper is also committed to operating according to the highest ethical standards, maintaining a quality workforce, being a steward of the environment and being a leader in economic development.