



November 28, 2016

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

Re: Integrated Resource Plan (2016) from the South Carolina Public Service Authority

Dear Ms. Washington:

Enclosed is the 2016 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, Pricing and Customer Billing

*South Carolina Public
Service Authority
(Santee Cooper)*



INTEGRATED RESOURCE PLAN

November 2016

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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 176,000 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 beginning January 1, 2017, 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 on 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 the Authority’s firm industrial rate schedule, with the remainder served under the Authority’s customer-supplied power schedule with Century providing an off-system resource for the power and the Authority 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.

Santee Cooper has evaluated its capital improvement program and long-term power supply plan in light of the softer economy, the reduction in previously anticipated sales to Central, as described in the Integrated Resource Plan – Load Forecast Overview, and new EPA regulations which increase the operating costs of coal-fired generating units. As a result, Santee Cooper retired six electric generating units, as described in the Integrated Resource Plan – Generation Expansion Plan, and has entered into an agreement whereby SCE&G would purchase an additional 5% ownership interest in Summer Nuclear Units 2 and 3. The 5% ownership interest will be acquired in three stages, with 1% to be acquired at the commercial operation date of the first new nuclear unit, an additional 2% to be acquired no later than the first anniversary of such commercial operation date and the final 2% to be acquired no later than the second anniversary of such commercial operation date. Under the terms of the agreement, SCE&G will own 60% of the new nuclear units and Santee Cooper will own 40%.

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 an economic outlook and generate 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. Econometrics are used to project peak demand for the Distribution, Municipal and Central sectors. Industrial customer demand is forecast based on contract demand.

The 2016 load forecast includes energy and peak demand savings from future energy efficiency and conservation programs. The recent economic downturn and estimated recovery is also taken into account. The “base case” load forecast is based on projected economic activity and normal weather conditions, which are based on the most recent 20-year averages. In addition to the base case load forecast, high and low-range projections of energy and peak demand requirements are developed to address uncertainties regarding the future.

Process

1) Data Collection

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.

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. For the purposes of the 2016 load forecast, historical and projected economic and demographic data were obtained from both Moody’s Analytics and IHS Global Insight.

3) Forecast Development

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

3.1 *Distribution*

Distribution requirements include 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). Econometric models are used to project peak demand as a function of weather normalized energy sales and weather conditions during peaking periods.

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 future plans collected from the individual industrial customers.

3.3 *Central Requirements*

Central's 2016 load forecast was prepared by Central and reviewed by Santee Cooper staff. The forecast was 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 of the Saluda load 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 two throughout the forecast period. The number of customers served by the individual cities is not projected. A regression equation, including heating degree days, cooling degree days and an autoregressive parameter, is used to project total energy sales for each of the two municipal systems comprising the municipal sector.

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

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 were developed to address weather sensitivity by combining the respective weather impacts for each sector. Impacts for the Distribution sector were based on application of extreme seasonal load factors to projected energy requirements. Impacts for

the Central sector were based on regression model estimates incorporating extreme and mild temperatures on the peak day. The weather impact for the Municipal sector was assumed at 4 MW. No weather impacts for the Industrial sector were developed since that sector is not weather sensitive.

The following table (Table 1) contains the forecasted demand and energy included in LF1601. Table 2 contains historical energy and demand.

Table 1
2016 LOAD FORECAST ⁽¹⁾

	Summer Peak (MW)	Winter Peak (MW)	Energy Sales (GWH)
2016	4,377	4,996	23,256
2017	4,272	4,842	22,601
2018	4,192	4,761	22,308
2019	4,140	4,713	22,149
2020	4,179	4,748	22,363
2021	4,222	4,787	22,548
2022	4,264	4,835	22,773
2023	4,307	4,883	23,003
2024	4,346	4,934	23,252
2025	4,395	4,981	23,467
2026	4,439	5,029	23,696
2027	4,484	5,078	23,925
2028	4,525	5,130	24,182
2029	4,575	5,178	24,398
2030	4,621	5,225	24,629

(1) Excludes all off-system sales.

Table 2
Historical Sales and System Peak Loads

Year	Sales (GWH)	System Peak Load ⁽¹⁾ (MW)
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
2001.....	22,400	4,803

(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 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 2.5 MW solar photovoltaic facility that started producing power in December of 2013 and has a 20 year term. Additionally, Santee Cooper has entered into a purchase agreement with The Energy Authority for 250 MW for all on peak hours and 150 MW for all off peak hours of firm energy only that began January 1, 2016 and continues through December 31, 2016.

**Table 3
Santee Cooper Owned Generating Facilities in MW**

Generating Facility	Units	Location	Summer MCR	Winter MCR	Fuel	Began Commercial Operation
Jefferies Station	1, 2, 3, 4, and 6	Moncks Corner	134	134	Hydro	1942
Wilson Dam		Lake Marion	2	2	Hydro	1950
Myrtle Beach Combustion Turbines ⁽¹⁾	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 ⁽²⁾	1	Jenkinsville	322	322	Nuclear	1983
Cross Station	1	Cross	580	585	Coal	1995
	2 ⁽³⁾		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
Total Capacity			5,104	5,332		

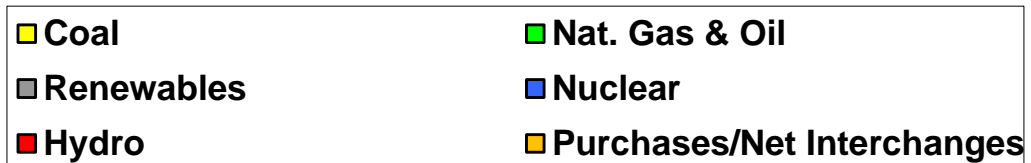
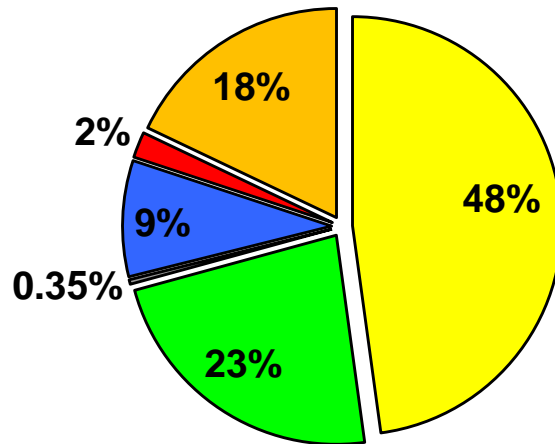
(1) Myrtle Beach Combustion Turbine No. 4 is currently unavailable until further notice.

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

(3) The Authority recently implemented a plan to lower O&M expenses by idling Cross Unit 2 after March 1, 2017. Upon idling the unit, a return to service period of up to two years would be required to operate the unit.

In 2015, Santee Cooper's total energy needs were met primarily by coal at 48% (see Figure 1). Nuclear energy supplied 9% of the total energy needs, natural gas and oil supplied 23%, while purchases supplied 18%.

Figure 1
2015 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 ⁽¹⁾

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		
	16/17	2017	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
Forecast Requirements																												
1 Santee Cooper System Peak	4,894	4,343	4,814	4,262	4,765	4,210	4,800	4,250	4,839	4,292	4,887	4,334	4,935	4,377	4,986	4,417	5,033	4,465	5,081	4,509	5,130	4,554	5,182	4,596	5,231	4,646	5,277	4,691
2 Interruptible Load	(371)	(374)	(371)	(374)	(371)	(374)	(371)	(374)	(371)	(374)	(371)	(374)	(371)	(374)	(371)	(374)	(371)	(374)	(371)	(374)	(371)	(374)	(371)	(374)	(371)	(374)	(371)	(374)
3 Firm Sales	<u>224</u>	<u>302</u>	<u>232</u>	<u>310</u>	<u>240</u>	<u>319</u>	<u>248</u>	<u>327</u>	<u>230</u>	<u>310</u>	<u>238</u>	<u>319</u>	<u>246</u>	<u>327</u>	<u>203</u>	<u>286</u>	<u>212</u>	<u>261</u>	<u>195</u>	<u>269</u>	<u>182</u>	<u>263</u>	<u>189</u>	<u>271</u>	<u>196</u>	<u>278</u>	<u>203</u>	<u>286</u>
4 Total Reserved Load	4,746	4,270	4,674	4,198	4,633	4,154	4,676	4,203	4,697	4,228	4,753	4,279	4,809	4,330	4,817	4,328	4,873	4,352	4,904	4,404	4,940	4,443	4,999	4,492	5,055	4,550	5,109	4,603
5 Load Not Requiring Reserve	(424)	(424)	(416)	(416)	(411)	(411)	(411)	(411)	(411)	(411)	(411)	(411)	(411)	(411)	(359)	(359)	(359)	(359)	(359)	(359)	(359)	(359)	(359)	(359)	(359)	(359)	(359)	(359)
6 Total Load Requiring Reserve	4,322	3,846	4,258	3,782	4,222	3,743	4,265	3,792	4,286	3,817	4,342	3,868	4,398	3,919	4,458	3,969	4,514	3,993	4,545	4,045	4,581	4,084	4,640	4,133	4,696	4,191	4,750	4,244
Cumulative System Capacity																												
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 ⁽²⁾	74	74	74	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
9 Projected Resource Additions ⁽³⁾	0	0	0	0	0	0	491	484	938	925	894	881	894	881	894	881	894	881	894	881	894	881	894	881	894	881	894	881
10 Projected Unit Retirements ⁽⁴⁾	(28)	(592)	(598)	(592)	(598)	(592)	(598)	(592)	(598)	(592)	(598)	(592)	(598)	(592)	(598)	(592)	(598)	(592)	(598)	(592)	(598)	(592)	(598)	(592)	(598)	(592)	(598)	(592)
11 Available Generating Capacity	5,432	4,639	4,862	4,639	4,862	4,639	5,354	5,124	5,801	5,564	5,756	5,520	5,756	5,520	5,756	5,520	5,756	5,520	5,718	5,482	5,718	5,482	5,718	5,482	5,718	5,482	5,718	5,482
Cumulative Purchase (Sales) Contracts																												
12 Long Term	372	372	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
13 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
14 Proj Short Term Contract																												
15 Cumulative Production Capacity	5,804	5,011	5,227	5,004	5,221	4,998	5,713	5,483	6,160	5,923	6,115	5,879	6,115	5,879	6,115	5,879	6,115	5,879	6,077	5,841	6,077	5,841	6,077	5,841	6,077	5,841	6,077	5,841
Reserves																												
16 Generating Reserves	1,058	742	553	806	588	845	1,037	1,280	1,463	1,696	1,362	1,601	1,306	1,550	1,298	1,552	1,242	1,528	1,173	1,438	1,137	1,399	1,078	1,350	1,022	1,292	968	1,239
17 % Reserve Margin	24%	19%	13%	21%	14%	23%	24%	34%	34%	44%	31%	41%	30%	40%	29%	39%	28%	38%	26%	36%	25%	34%	23%	33%	22%	31%	20%	29%

(1) Based on LF1601 with known load adjustments.

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

(3) Reflects ultimate 40% ownership share of two 1,100MW nuclear units at V. C. Summer Nuclear Station including transtion of 5% ownership interest to SCE&G.

Projected substantial completion dates do not reflect the October 2015 Amendment to the Guaranteed Substantial Completion Dates for Units 2 and 3.

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

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.

Santee Cooper has evaluated its capital improvement program and long-term power supply plan in light of the softer economy, the reduction in previously anticipated sales to Central, and new EPA regulations which increase the operating costs of coal-fired generation. As such, the Santee Cooper generation expansion plans include:

- 1) Continuation of the remainder of the work required to supply, construct, test, and start up two AP1000 nuclear power plant units as is consistent with the AP1000 certified design.
- 2) The sale by Santee Cooper to SCE&G of an additional 5% ownership interest in Summer Nuclear Units 2 and 3. Under the terms of the agreement, SCE&G will own 60% of the new nuclear units and Santee Cooper will own 40%. The 5% ownership interest will be acquired in three stages, with 1% to be acquired at the commercial operation date of the first new nuclear unit, an additional 2% to be acquired no later than the first anniversary of such commercial operation date and the final 2% to be acquired no later than the second anniversary of such commercial operation date.
- 3) The retirement of six electric generating units to include Jefferies Generating Station Nos. 1 - 4 and Grainger Generating Station Nos. 1 and 2.
- 4) Santee Cooper recently implemented a plan to lower O&M expenses by idling Cross 2 after March 1, 2017. Upon idling the unit, a return to service period of up to two years would be required to operate the unit.
- 5) Monitoring of existing and potential regulation and permitting requirements affecting Santee Cooper's existing and future generation facilities.
- 6) Periodic evaluation of the generation expansion plan to determine the impacts of items such as potential environmental legislation or regulation, changes in the load forecast, and updated cost information.

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 1,344 miles of 230 kilovolt (“kV”), 1,834 miles of 115 kV, 1,754 miles of 69 kV, and 97 miles of 34 kV and below overhead and underground transmission lines. Santee Cooper operates 105 transmission substations and switching stations serving 87 distribution and industrial substations and 455 Central delivery points. Communications sites at 91 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 176,000 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 Existing Homes Program

The Smart Energy Existing Homes Program is an integral part of Santee Cooper's program and offers home energy evaluations and financial assistance for energy efficiency improvements that are designed to improve the affordability of your home year-round.

Santee Cooper provides rebates and low-interest financing for qualifying energy efficiency improvements.

Measure	Customers	Incentive
Air Infiltration	68	\$27 - \$592
Ceiling Insulation	31	\$27 - \$364
Duct Improvement	104	\$81 - \$2,235
Heat Pump Install	714	\$200 - \$675
Heat Pump Tune Up	1,661	\$50
Smart Thermostat	96	\$125
Heat Pump Water Heater	13	\$400
Solar Water Heater	0	\$700

In 2015, there were 2,456 customers participating for a savings of 3,229 MWh. The total incentive cost was \$264,856. Since inception, 113,364 MWh have been saved with a total incentive cost of \$5,688,824.

On-site Energy Assessments

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

Smart Energy New Homes Program

The Smart Energy New Homes Program began on Nov. 1, 2009. The Smart Energy New Home Program offers rebate to homebuilders 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 (SF) performance pathway and two tiers for multi-family (MF).

- Tier 1: Achieve a Home Energy Rating System (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 (SF) homes and \$1,400 per unit for multi-family (MF) 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 (SF) homes and \$400 per unit for multi-family (MF) 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 (SF) homes only.

There were 26 SF new homes built that qualified under Tier 1 for a savings of 125 MWh. There were 75 SF new homes built that qualified under Tier 2 for a savings of 211 MWh. There were 130 SF new homes built that qualified under Tier 3 for a savings of 208 MWh. There were 2 qualifying equipment rebates paid out for 15 SEER split heat pumps for a savings of 2.6 MWh. There were no qualifying performance pathway rebates paid out for MF in 2015. The total combined incentive cost was \$302,000. Since inception, 38,570 MWh have been saved with a total incentive cost of \$2,156,131.

Equipment and Lighting Incentives: Residential CFL's

The Residential CFL program ended in 2014. Since inception, 568,252 MWh have been saved with a total incentive cost of \$2,174,591.

Residential LED Giveaway

There were 2,100 residential customers who received LED bulbs each for a total for 11,094 bulbs given out through our retail offices. The energy savings was 1,361 MWh. 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 heat, use over 75% less energy and are available in different sizes and shapes to fit in almost any fixture. Since inception, 58,849 MWh have been saved with a total incentive cost of \$596,569.

Commercial Programs

Commercial Prescriptive Program

The types of measures that qualify are Lighting, HVAC, Building Envelope and Refrigeration. In 2015, there were 559 customers who participated for a savings of 19,540 MWh. These savings came from several different measures implemented as an individual project or in combination with other measures. The incentive cost was \$1,471,183. Since inception, 704,585 MWh have been saved with a total incentive cost of \$13,175,857.

Commercial Custom Program

Custom rebates are tailored specifically to provide unique energy saving initiatives on a business-by-business basis. The rebate is based on \$0.10 for every kWh saved during the first year, not to exceed 50% of the qualifying measure's incremental cost. Customers will be subject to a maximum rebate of \$200,000 per facility per calendar year for the Commercial Custom Program and an overall rebate cap of \$300,000 per facility per calendar year for participation in multiple energy efficiency programs offered by Santee Cooper. For the purposes of Santee Cooper's energy efficiency programs, a customer facility is defined as one or several adjacent buildings owned or operated by a single customer. In 2015, 61 customers participated for a combined savings of 2,328 MWh. The incentive cost was \$226,287. Since inception, 136,947 MWh have been saved with a total incentive cost of \$3,395,897.

Commercial Direct Install Lighting Program

Santee Cooper's Direct Install Program ended in 2014. Since inception, 61,389 MWh have been saved with a total incentive cost of \$2,650,132.

On-site Energy Assessments

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

Commercial CFL's

The Commercial CFL program ended in 2014.

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 537 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 also 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 2015 that opt-in program included more than 64,700 customers, and our direct mail numbers vary according to the target audience for each. We also communicate with customers through Facebook, Twitter, Instagram, LinkedIn and YouTube. Santee Cooper has more than 3,000 followers on Twitter, 9,000 on LinkedIn and more than 76,000 fans on Facebook. Our YouTube videos were viewed more than 163,000 times. All of these avenues of communication saw substantial 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, 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 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.

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.

Green Energy Solutions ("GES") continues to pursue their first agricultural waste fueled facility, which utilizes poultry waste in an anaerobic digestion process. Santee Cooper's contract with GES allows them to provide up to 25 MW of biogas-fueled renewable energy from multiple facilities around the state.

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 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. In 2013 and 2014, Santee Cooper expanded the Solar School program to include an additional six middle schools around the state: Muller Road, Clover, Hardeeville-Ridgeland, Haut Gap, Plainview and Merriwether Middle Schools. In total there are 27 Solar School installations across the state with a total capacity of over 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. 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. The solar farm, which began operating in January 2014, is currently the largest in the state. 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.

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 of 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 2015, Santee Cooper collected 1,149,923 gallons of used oil from more than 450 do-it-yourself sites and approximately 1,500 industrial, commercial and farm sites.

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 2015 was 1,583 participants purchasing 12,880 MWh of energy.

Green-e 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 2015 was 40 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 \$1.30/watt paid based on the system's rated capacity (watt AC). Solar Home and Solar Business Rebates are capped at \$5,200 per account number. Non-profit customers are eligible for an additional rebate of \$0.25/watt (AC), capped at a maximum of \$1,000.
- **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 and South Carolina's largest solar farm. 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 \$1.88 per watt and Santee Cooper's rebate amount is \$1.00 per watt. Solar Share is sold per kW, which equates to a rebate amount of \$1,000 per kW. There is a 4 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 we do 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 our 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 2030.

Santee Cooper will continue to deliver on our responsibility to provide low-cost, reliable electricity that promotes economic development, and to do so with excellent customer service.

As we look to the future, Santee Cooper will continue to emphasize sound business practices that will keep us lean and agile.