INDEPENDENT TECHNICAL AND ENVIRONMENTAL ASSESSMENT

Santee Cooper

B&V PROJECT NO. 403338

PREPARED FOR

South Carolina Department of Administration

25 OCTOBER 2019

BLACK & VEATCH

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Disclosure Notice

Separate from this independent technical and environmental assessment prepared for the South Carolina Department of Administration, Black & Veatch Management Consulting LLC was retained by Santee Cooper in December 2018 to perform a depreciation study of Santee Cooper assets. The high level scope items of that depreciation study are summarized below:

- Mass property analysis
- Unit property analysis
- Preparation of a depreciation study report based on the results of the mass and unit property analyses

In conducting the depreciation study, Black & Veatch relies upon historical actuarial data, capital expenditure budgets, and unit service life information provided by Santee Cooper and does not make or recommend changes to Santee Cooper's reported capital expenditure budget or reported retirement dates for generation assets in the study.

The depreciation study for Santee Cooper consists of separate scope from the independent technical and environmental assessment for the South Carolina Department of Administration, and is being conducted by a separate team of professionals that has been firewalled from the team that has prepared the technical and environmental assessment. The depreciation study is regular, periodic work that has been performed by Black & Veatch for Santee Cooper approximately every 5 years. The current depreciation study is the third study Black & Veatch has been contracted to perform for Santee Cooper, following previous studies in 2007 and 2013

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1.0 Executive Summary

1.1 INTRODUCTION

Black & Veatch Management Consulting, LLC (Black & Veatch) was retained by the South Carolina Department of Administration (Admin) to provide an independent technical and environmental assessment of the electric and water utility South Carolina Public Service Authority (Santee Cooper or the Company), headquartered in Moncks Corner, South Carolina. Black & Veatch understands that Admin has been mandated to evaluate a potential sale, change in management arrangements, or other restructuring of Santee Cooper following the results of a competitive bid process pursuant to the Joint Resolution (Act No. 95 of 2019) adopted by the General Assembly of the State of South Carolina on May 21, 2019, and signed by the governor on May 22, 2019.

Santee Cooper is involved in the production, transmission, and distribution of electrical energy, both in wholesale and retail markets, to approximately 2 million residents of 46 different counties in South Carolina. Santee Cooper's direct-served customers currently include approximately 185,000 residential and commercial customers, small industrial retail customers in parts of Berkeley, Georgetown, and Horry counties, 27 large industrial customers, the Central Electric Power Cooperative Inc. (Central), and six other municipal electric systems. Through Central and the two main municipal electric systems, approximately 787,000 customers are served indirectly by Santee Cooper. Santee Cooper began electric power operations in February 1942.

Santee Cooper is also authorized to acquire, treat, transmit, distribute, and sell water at a wholesale level within the counties of Berkeley, Calhoun, Charleston, Clarendon, Colleton, Dorchester, Orangeburg, and Sumter in South Carolina. The commercial operation of the regional water system began in October 1994.

Figure 1-1 depicts Santee Cooper's water and electric generation assets.

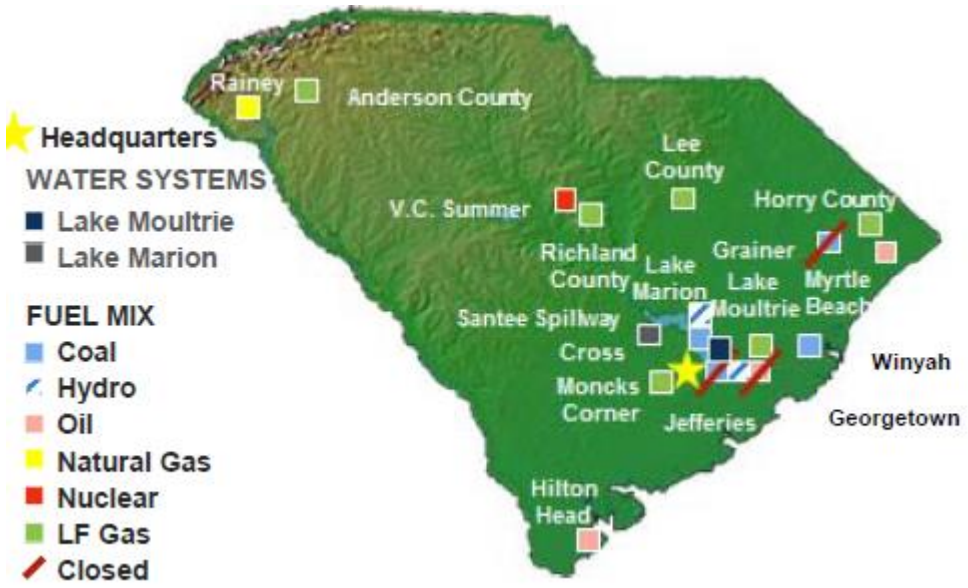


Figure 1-1 Santee Cooper's Service Area and Generation Fleet (Source: Santee Cooper)

Santee Cooper's owned generation fleet currently has an aggregate operating capacity of approximately 5,110 megawatts (MW), net summer capacity. In addition, Santee Cooper owns and

operates approximately 4,464 circuit miles of overhead transmission lines, 6 miles of underground transmission lines, and 2,967 miles of distribution lines. Santee Cooper also owns two water treatment plants using water resources from the nearby Lake Marion and Lake Moultrie.

This technical and environmental assessment report has been prepared in accordance with the scope of work included in Schedule A of a Management Consulting Services Agreement (MCSA) dated September 5, 2019, as well as communications with Admin. Black & Veatch notes that, as part of the evaluation process of Santee Cooper, Admin has also engaged other advisors, including Energy and Environmental Economics, Inc. (E3) and Moelis and Company (Moelis) to further assist Admin and process participants.

1.2 SCOPE OF WORK

To conduct this technical and environmental assessment, Black & Veatch provided the following services:

- Review of the general asset designs.
- Review of Santee Cooper's general organization and management structure.
- Site visits to selected Santee Cooper generation transmission and distribution facilities, and interviews with Santee Cooper personnel at the facilities visited.
- Review of historical performance data for Santee Cooper's generation, transmission, and distribution facilities.
- An assessment of operations and maintenance (O&M) practices and historical O&M costs.
- An assessment of historical capital expenditures (CAPEX) and operational expenditures (OPEX) on the basis of available data.
- A review of technical assumptions behind Santee Cooper's September 9, 2019 business plan with the file name "2019-09-09-Santee-Cooper-Business-Forecast.pdf" (Business Plan) as well as its resulting financial forecast developed by Santee Cooper with the file name "Electric – Baseline Output.xlsm." Black & Veatch also reviewed the financial forecast developed by Santee Cooper at the request of Admin with the file name "Electric – Sensitivities Output.xlsm," resulting from sensitivity analysis to the Baseline Case in which natural gas from the Atlantic Coast Pipeline (ACP) is assumed to not be available, CCGT siting is assumed to move from Pee Dee to VC Summer and SCCT capacity is increased from 100 MW to 200 MW, the natural gas price forecast is higher to align with the U.S EIA AEO 2019 Reference Case, and no proceeds are assumed from the sale of VC Summer 2 and 3 parts (Sensitivities Case).
- An enterprise-level environmental compliance assessment.

Information gathered and key findings or conclusions observed from this effort are summarized in this report.

1.3 APPROACH AND METHODOLOGY

To assess Santee Cooper and its underlying assets, Black & Veatch conducted site visits on September 17 through September 20, 2019 (collectively, the Site Visit). The visited sites included representative electric transmission and distribution assets, Jefferies hydroelectric generating station, Cross and Winyah coal generating stations, Myrtle Beach gas/oil fired combustion turbine generating station, Rainey natural gas fired combustion turbine and combined cycle generating

station, and the VC Summer nuclear generating station. These sites were selected because of their representative nature of the overall Santee Cooper asset portfolio. Additional conference calls were held and additional data were provided as necessary.

Black & Veatch's general field observations during the Site Visit included interviews with Santee Cooper personnel as well as visual observations of aboveground infrastructure and equipment of selected areas. Black & Veatch deemed the information collected adequate to allow comment on the sites and the operation of the facilities as a supplemental and confirmatory review in addition to Black & Veatch's desktop diligence. As detailed in this report, based on the aggregate of desktop and in-person review, Black & Veatch believes that Santee Cooper's compliance policies and practices are in accordance with industry accepted practices and indicate that any issues with regard to such matters would have been identified.

The due diligence reviews were based on documentation provided; interviews with Santee Cooper management personnel, plant managers, and asset managers; and information obtained by the Black & Veatch Site Visit team.

1.4 ASSUMPTIONS

Black & Veatch has used and relied upon certain information provided by representatives of Santee Cooper in developing this assessment. Black & Veatch believes the information provided is true and correct and reasonable for the purposes of this report. In preparing this report and the opinions presented herein, Black & Veatch has made certain assumptions with respect to conditions that may exist, or events that may occur in the future. Black & Veatch believes that the use of this information and assumptions is reasonable for purposes of this report. However, some events may occur or circumstances change that cannot be foreseen or controlled by Black & Veatch and that may render these assumptions incorrect. To the extent the actual future conditions differ from those assumed herein or provided to Black & Veatch by others, the actual results will differ from those that have been forecast in this report.

Throughout this report, Black & Veatch has stated assumptions and reported information provided by others, all of which were relied upon in the development of the opinions and conclusions of this report. The following is a summary of key considerations and assumptions made in developing the opinions expressed in this report:

- Fuel supplies and associated transportation will continue to be available in the quantities and qualities required by the assets.
- Each asset will continue to be operated in accordance with good industry practice, that the assets will continue to be appropriately staffed with qualified personnel, and that replacements and renewals will be made in a timely manner.
- All equipment for each asset will not be operated in a manner to cause it to exceed equipment manufacturer's recommendations.
- All licenses, permits and approvals, and permit modifications (if necessary) will be obtained and/or renewed on a timely basis.

1.5 CONCLUSIONS

On the basis of Black & Veatch's studies, analyses, and investigations, Black & Veatch has formed the key conclusions and observations summarized below.

1.5.1 Generation, Transmission, and Distribution Assets

- The various technologies and equipment utilized in Santee Cooper's electrical generation transmission and distribution facilities and water facilities are from well-established and reputable original equipment manufacturers (OEMs) and represent decades of successful operation and evolution of design. The performance of Santee Cooper generation, transmission, and distribution facilities has generally matched or outperformed other similar facilities in the region.
- The Santee Cooper facilities visited by Black & Veatch appear to have been well constructed, are in good condition for assets of their vintage, and have been appropriately maintained since achieving commercial operation. Black & Veatch considers the Santee Cooper personnel interviewed to be very knowledgeable and capable of properly maintaining and operating the facilities.
- Black & Veatch considers Santee Cooper's O&M practices and procedures to be consistent with best industry practices for the assets in Santee Cooper's portfolio. Each facility has been well staffed with an appropriate level of personnel with the right knowledge and skill sets to provide effective and reliable operations of the facilities.
- Proper maintenance and CAPEX investments have been made where appropriate at the facilities where Santee Cooper deemed such investments appropriate and prudent. Based on discussions with Santee Cooper and desktop review of asset condition reports, Black & Veatch believes that Santee Cooper has a well-established and effective process for prioritizing asset maintenance and capital improvement projects.

1.5.2 Environmental, Health, and Safety

- Santee Cooper's key safety metrics are similar to or better than averages for similar utilities, indicating that Santee Cooper's safety programs appear to be having a real and meaningful impact on the overall health and safety of the Santee Cooper employees.
- Santee Cooper has maintained adequate compliance with its applicable environmental permits and requirements; no significant violations or ongoing litigations were identified in the review.
- Santee Cooper maintains a thorough list of environmental incidents and near misses; the list and systems that support it capture information on environmental incidents in all aspects of its operations. The list documents a generally responsible company with only a reasonably expected range of more minor incidents in the reviewed 2014 to 2019 period, with no major incidents identified.
- The budgeted costs associated with ongoing environmental remediation and decommissioning efforts for Santee Cooper's assets, most notably coal generation ash pond closure, appear reasonable according to the remediation plans provided by Santee Cooper as well as Black & Veatch's expectations for similar obligations in the region.
- Santee Cooper's primary responsibly regarding environmental compliance and decommissioning of VC Summer Unit 1 is funding its portion of the decommissioning trust fund (DTF), which Black & Veatch understands is adequately funded on schedule.

1.5.3 Business Plan and Financial Forecasts

- Overall, Black & Veatch believes the approaches taken by Santee Cooper in development of its Business Plan appear prudent and consistent with approaches adopted by other similar utilities.
- Overall, Black & Veatch believes that the major assumptions and associated spending behind the Business Plan appear reasonable; however, Black & Veatch believes that certain assumptions merit additional investigation and sensitivity analysis because of their materiality to the Business Plan as well as events outside of Santee Cooper's control:
    - Black & Veatch believes that the $425 million of expected proceeds from selling VC Summer Unit 2 and 3 equipment appears optimistic. As described in Subsection 4.6.6 of this report, Black & Veatch has identified potential barriers to selling this equipment, which could negatively impact the resale market value of that equipment.
    - Black & Veatch notes that Santee Cooper's Business Plan heavily features new gas fired generation capacity and assumes gas will be made available through the ACP, which has halted construction because of legal challenges at the time of this report. A sensitivity analysis of the Business Plan has been provided to examine the potential cost and feasibility impacts to the Business Plan in the event that the ACP could be delayed or canceled.
    - New natural gas CCGT generation will require appropriate electric and natural gas interconnection and transmission facilities to receive fuel and export energy. Overall Black & Veatch believes that it is feasible to site new generation at the locations identified by Santee in the Baseline Case and Sensitivities Case..
        - The Baseline Case assumes that the new CCGT generation will be located at the Pee Dee site, which was originally identified as a potential location for a coal generating facility by Santee Cooper although that facility was ultimately not developed. Black & Veatch understands that the Pee Dee site was selected due to its proximity to existing 230 kV transmission facilities as well as the planned ACP route, which would minimize gas and electric interconnection costs. Based on electric power flow and gas flow studies provided by Santee Cooper, Black & Veatch believes the Pee Dee site is feasible for both gas and electric interconnection.
        - The Sensitivities Case assumes that the new CCGT generation will be located at the existing VC Summer site. Black & Veatch understands that the on site interconnection facilities and associated transmission upgrades which were built for the planned VC Summer Units 2 and 3 are fully operational and adequate to export the energy from these potential new gas units. Additionally, Black & Veatch has not identified any technical issues with interconnecting generation at the VC Summer site to the Transco pipeline, and the Sensitivities Case's assumed $200 million budget for a lateral interconnection appears reasonable.
- Overall, the construction CAPEX and OPEX associated with new generation assets considered in the Base Case and Sensitivities Case appear reasonable for their respective technology types and potential development sites as identified by Santee Cooper.
- Santee Cooper forecasts a future reduction in transmission major maintenance CAPEX compared to historical actuals. Black & Veatch believes that it is reasonable to achieve

some cost savings in transmission major maintenance through condition-based replacements, given the relatively young age of Santee Cooper's transmission assets as well as Santee Cooper's gravitation toward steel transmission structures instead of wood in recent decades.

2.0 Overview of Santee Cooper

Santee Cooper is a state-owned electric and water utility in South Carolina, founded in 1934 by the South Carolina General Assembly to first develop federally-funded hydroelectric and rural electrification projects under the New Deal. Today, Santee Cooper is one of South Carolina's largest electric utilities, providing electric generation, transmission, and distribution to customers throughout 46 counties in South Carolina. Santee Cooper's water system services include the management and operations of two distinct water systems. Santee Cooper is headquartered in Moncks Corner, South Carolina.

Santee Cooper owns and operates approximately 4,464 miles of electric transmission lines and 89 substations throughout South Carolina and provides O&M services for Central's 646 miles of transmission assets under a long-term arrangement with the cooperative. Through Central, Santee Cooper indirectly services 20 distribution cooperatives with electricity. Santee Cooper's power delivery department employs more than 230 professionals working across a variety of engineering, project management, maintenance, operations, and technical roles.

Santee Cooper primarily generates electricity at a number of hydroelectric, combustion turbine, coal, nuclear, combined cycle, solar, and landfill gas generating facilities. Santee Cooper conducts all routine O&M services for each of its fully-owned generation assets and employs approximately 530 professionals to manage the day-to-day operation of the generating facilities as well as the ongoing development of new generation resources, including renewable generation.

As a retail electricity service provider, Santee Cooper maintains an electric distribution network of 288 circuits, 54 substations, and 2,967 miles of distribution lines in Horry, Georgetown, and Berkeley counties, South Carolina. Santee Cooper has approximately 185,000 retail customers throughout those three counties and employs nearly 300 professionals to carry out the operations and management activities for the distribution network.

Santee Cooper also owns two water treatment plants using water resources from Lake Marion and Lake Moultrie. Santee Cooper's water operations serve approximately 185,000 people in eastern South Carolina; the utility owns and operates water treatment and transmission facilities and serves the municipalities on a wholesale basis.

2.1 SANTEE COOPER MANAGEMENT

Santee Cooper is overseen by a governor-appointed 12 member board of directors; the directors represent each of South Carolina's seven congressional districts, the three counties in which Santee Cooper provides retail electricity services, and two at-large seats. Director seats are filled for 7 year terms and are confirmed by the South Carolina Senate.

Santee Cooper's executive leadership team is made up of a Chief Executive Officer (CEO) and five reporting department heads as summarized on Figure 2-1.

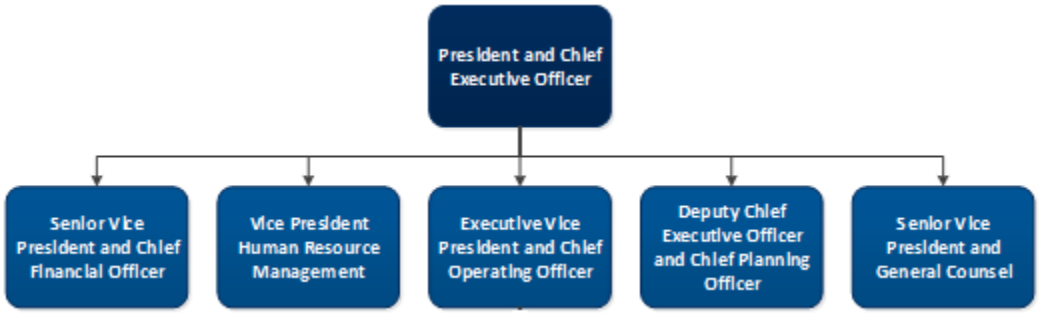


Figure 2-1 Santee Cooper's Leadership Organization Chart

Santee Cooper's six primary executive leaders each have substantial experience working in the industry; they share a combined 163 years of utility experience, and three of the executive leaders have held multiple other positions within the organization prior to being promoted into their current role. Santee Cooper's President and CEO and Deputy CEO and Chief of Planning were both hired by Santee Cooper's Board of Directors in July 2019, and each brings more than 40 years of industry experience, having most recently served in similar roles at Salt River Project in Tempe, Arizona.

Santee Cooper's leadership team includes six operations executives that report to the Executive Vice President and Chief Operating Officer. The Vice President of Generation oversees all aspects of the management, operation, and development of Santee Cooper's owned generation assets, with the exception of Santee Cooper's nuclear holdings, which are managed by the Senior Vice President and General Counsel. The Senior Vice President of Technology Services manages the utility's telecommunications and enterprise-wide technology infrastructure, including having responsibility for technology planning across all areas of Santee Cooper's operations and serving as the Chief Information Officer. The Senior Vice President of Power Delivery oversees the management and operation of Santee Cooper's transmission system. The Vice President of Retail Operations oversees all aspects of service to residential and commercial customers which includes all contracting, engineering, and operations associated with the distribution and retail operations of Santee Cooper in eastern South Carolina. The Group Manager of Station Construction oversees all aspects related to generation construction needs for Santee Cooper. The Vice President of Wholesale and Industrial Services oversees purchasing and supply needs for Santee Cooper. Management and operations of Santee Cooper's water systems are overseen by the Senior Vice President and Chief Financial Officer (CFO).

In general, Santee Cooper's overall reporting structure appears typical and in line with Black & Veatch's expectations for a public utility of this nature. Most key functional responsibilities are divided among the executive leadership in a manner that is consistent with Black & Veatch's understanding of the utility's business operations.

2.2 SUMMARY OF ASSET OPERATIONS

2.2.1 Transmission and Distribution Overview

Santee Cooper owns approximately 4,500 miles of electric transmission lines as summarized in Table 2-1, in addition to Central's 700 miles that it also operates and maintains on behalf of Central. Most of the transmission lines are overhead lines. The distribution system is made up of almost 3,000 miles of lines, slightly over half of which are underground.

Table 2-1 Santee Cooper Transmission and Distribution Assets

DESCRIPTIONS	PARAMETER
Transmission	
Voltage (kV)	69 kV, 115 kV, and 230 kV
Lines Installed (miles)	4,464
Number of Substations	89
Distribution	
Voltage (kV)	12 kV and 34 kV
Lines Installed (miles)	2,967
Number of Substations	54

2.2.2 Electric Generation

Santee Cooper owns a variety of electric generation assets, as summarized in Table 2-2. These are located across several counties in South Carolina and are made up of coal, combustion turbine, reciprocating engine, nuclear, hydroelectric, and solar facilities. Many plants are further composed of multiple units, and Santee Cooper retains 100 percent ownership of the capacity of all generating assets with the exception of nuclear generation.

Table 2-2 Santee Cooper Generation Assets

PLANT TYPE	SANTEE COOPER OWNED CAPACITY (MW)(1)	PERCENT OF TOTAL CAPACITY	COD OF OLDEST ASSET
Total Coal	3,500.0	67.1%	Mar 1975
Total CCCT	460.0	8.8%	Sep 2001
Total SCCT	676.0	13.0%	May 1962
Total Reciprocating Engine	27.4	0.5%	Aug 2001
Total Nuclear	322.0	6.2%	Jan 1984
Total Hydroelectric	226.0	4.3%	Dec 1942
Total Solar	2.7	0.1%	Dec 2017
Total Portfolio	**5,214.1**	**100.0%**	

1. Net winter capacity.

2.2.3 Water System Overview

Santee Cooper's water portfolio includes two facilities that treat water from Lake Marion and Lake Moultrie, as summarized in Table 2-3. The water systems have a combined capacity of 50 million gallons a day (mgd) and 146 miles of product water transmission pipelines.

Table 2-3 Santee Cooper Water Assets

PARAMETER	LAKE MOULTRIE WATER TREATMENT PLANT	LAKE MARION WATER TREATMENT PLANT
Capacity (mgd)	42	8
Transmission Pipeline (miles)	26	45
COD	Oct 1994	May 2008

2.3 RETAIL OPERATIONS

2.3.1 Customer Programs

To increase the support of solar-generated power Santee Cooper has created programs such as Solar Share, Solar Home, and Solar Business. These programs allow customers to purchase shares of the solar farm and provide incentives for those who install solar generation in their homes and businesses.

Santee Cooper also started an effort to reduce annual energy usage by 209 GWh in 2020 through demand-side management, which was reportedly achieved early in 2018. This was accomplished via residential and commercial programs that offered rebates and assessments for customers willing to join the effort.

2.3.2 Large Customers

A considerable revenue source for Santee Cooper is its industrial and wholesale customers, who contribute 76 percent of the utility's revenues. Central specifically accounts for 58 percent. Some of Santee Cooper's large industrial customers include Nucor, Century Aluminum, and Amoco. They all have electricity supply contracts that include demand charges, extended notice requirements to prevent sudden terminations, and a 60 percent interruptible load.

2.4 SAFETY AND HEALTH PERFORMANCE

Santee Cooper has a formally established occupational safety department that spans all divisions of the company and governs all work conducted by Santee Cooper employees and subcontractors. The department is made up of safety specialists with significant occupational experience as well as safety-specific qualifications. Santee Cooper has reported long-term improvement in its reported safety metrics, including a reduction of its annual reported Occupational Safety and Health Association (OSHA)-defined Recordable Incident Rate (RIR) from around 8 in the mid-1980s down to its lowest point in Santee Cooper's history at 0.58 in 2018; a lower RIR indicates a lower (better) frequency of recordable incidents. OSHA reports that, in 2017, the average incident rate for total recordable cases in the electric power generation, transmission, and distribution utilities industry was 1.9.

Figure 2-2 also shows Santee Cooper's reported annual Lost Time Incident Rate (LTIR) from 2004 through 2018.

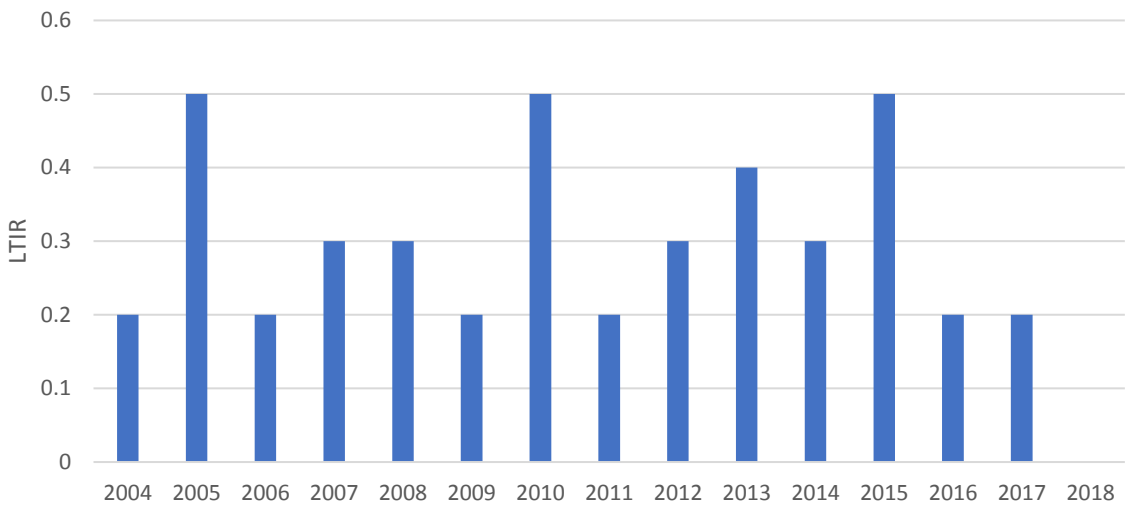


Figure 2-2 Lost Time Incident Rate 2004 to 2018

Santee Cooper had zero reported LTIR in 2018 and was awarded first place in the American Public Power Association's Safety Award for Excellence for utilities with more than 1 million and less than 4 million worker-hours of exposure. Santee Cooper was awarded second place for the same category for work in 2017.

Santee Cooper's steady reduction in RIR and LTIR metrics over the long- and short-term demonstrate that the utility's safety programs appear to be having a real and meaningful impact on the overall health and safety of the Santee Cooper employees.

2.5 HISTORICAL CAPITAL AND O&M EXPENDITURES

Black & Veatch reviewed the historical 2014 through 2018 CAPEX and OPEX for Santee Cooper.

2.5.1 Historical Capital Expenditures

Figure 2-3 and Table 2-4 illustrate the historical CAPEX from 2014 through 2018. The total CAPEX in this period was approximately $4.1 billion, including spending on energy production, nuclear, transmission, distribution, and "other" expenses, which generally include facilities improvements, fleets, equipment, and development and construction of the Camp Hall industrial area prior to its completion.

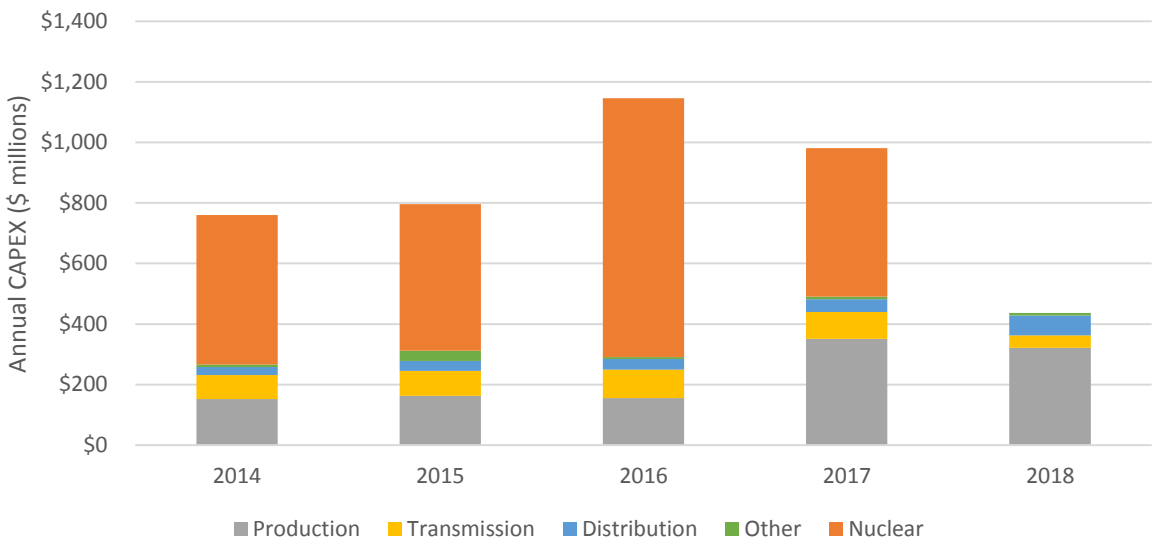


Figure 2-3 Santee Cooper CAPEX, 2014 – 2018 ($ Million)

Table 2-4 Santee Cooper CAPEX, 2014 - 2018 ($ Million)

TYPE	2014	2015	2016	2017	2018	AVERAGE
Nuclear	$494	$484	$855	$490	$0	$465
Production	$152	$163	$155	$351	$321	$228
Transmission	$80	$82	$95	$89	$42	$78
Distribution	$26	$33	$34	$42	$65	$40
Other	$8	$34	$7	$9	$9	$13
TOTAL	**$760**	**$796**	**$1,146**	**$981**	**$437**	**$824**

Black & Veatch notes that large capital projects for electric utility assets can fluctuate year over year, depending on retirements, new development needs, major maintenance, and other factors, and accordingly, Black & Veatch would expect some annual variation. Black & Veatch understands that the variation in annual CAPEX from 2014 through 2018 was primarily driven by the following events:

- The largest CAPEX component from 2014 through 2017 has been construction costs associated with two new nuclear generation assets, VC Summer Units 2 and 3, totaling approximately $2.3 billion over this time period. The construction was suspended in 2017, and therefore, no additional CAPEX was incurred in 2018.
- Production CAPEX has averaged approximately $228 million per year on average. However, this represents an increase from approximately $155 million annually in 2014 through 2016 to approximately $330 annually in 2017 and 2018. Santee Cooper reports that this additional approximately $175 million per year was due to the environmental costs associated with pollution control and ash pond closures at both currently operating

and retired coal units, improvement projects on Rainey Generating Station, and upgrades for the hydroelectric facilities.

- Transmission and distribution CAPEX and other CAPEX are relatively consistent during this period. The transmission and distribution combined CAPEX and other CAPEX are approximately $118 million and $53 million per year on average, respectively. Black & Veatch understands that higher than average distribution CAPEX in 2018 was due to a larger volume of new residential interconnection and a need to build out Santee Cooper's system to accommodate the growth. Black & Veatch understands that, on average, the 2014 through 2018 transmission CAPEX is higher than in typical years prior to that period, which reflects on investments made to increase transmission capacity to VC Summer in anticipation of Units 2 and 3.

2.5.2 Historical O&M Expenditures

Figure 2-4 illustrates the historical OPEX from 2014 through 2018. OPEX includes O&M expenses for electric and water systems. The total OPEX decreased from 2014 through 2016 because of the reduction in electrical system operating expenses and appeared to be consistent from 2016 through 2018.

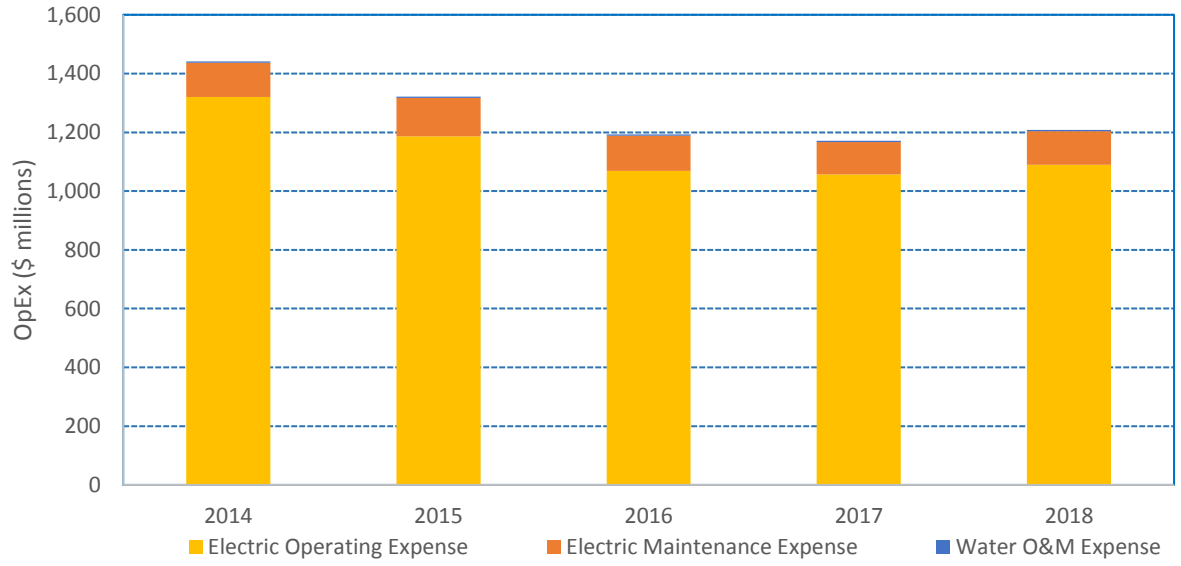


Figure 2-4 OPEX 2014 to 2018

Electric system operating expense is the largest cost component, accounting for approximately 90 percent of the total OPEX through the period. The electrical system operating expenses reduced by 19 percent from 2014 to 2016 because of reduced dispatch and, therefore, lower fuel costs and variable O&M at Santee Cooper's coal facilities because of favorable economics of natural gas fueled generation.

The wholesale water system O&M expenses are consistent from 2014 through 2018, with an average cost of $4 million each year.

2.6 SANTEE COOPER BUSINESS PLAN

On September 9, 2019, Santee Cooper published its Business Plan, which outline's Santee Cooper's objectives and planned actions over a 20 year period from 2020 through 2039. While the Business Plan contains a variety of strategies to reliably provide power and water to Santee Cooper's customers while maintaining or reducing customer rates, Black & Veatch has focused its review on the technical aspects of the Business Plan, namely Santee Cooper's new resource plan, which includes the following:

- Retirement of the Winyah coal generating station in two phases: Units 3 and 4 in 2023, followed by Units 1 and 2 in 2027.
- Add approximately 1,000 MW of solar generation via power purchase agreement (PPA).
- Add approximately 200 MW of battery storage.
- Add over 100 MW of dual fuel aeroderivative turbines, as well as 500 to 1,000 MW of natural gas combustion turbines.
- Reduce carbon emissions by 30 percent.

In addition to the above changes to Santee Cooper's electric generation resources, the Business Plan also includes plans for paying down the debt associated with the construction of VC Summer Units 2 and 3.

Overall, Black & Veatch believes that the major assumptions and associated spending behind the Business Plan as summarized in the file "Electric – Baseline Output,xlsm" appear reasonable; however, Black & Veatch believes that certain assumptions merit additional investigation and sensitivity analysis because of their materiality to the Business Plan as well as events outside of Santee Cooper's control. Accordingly, Black & Veatch notes that Santee Cooper has performed sensitivity analyses around key assumptions at the direction of Admin to understand the potential impact of those assumptions to the Business Plan, including:

- The ACP will not be completed, and natural gas will instead be made available to new gas turbine generation through new lateral pipelines built by Santee Cooper to interconnect with the existing Transco pipeline.
  - Due to the absence of ACP natural gas, the assumed location for new natural gas generation has been changed. The Sensitivities Case assumes that new CCCTs will be constructed at the VC Summer Site, while the Baseline Case assumes that new CCCTs will be constructed at Pee Dee.
  - While both the Baseline Case and Sensitivities Case assume that new SCCTs will be constructed at the Winyah site, the Sensitivities Case assumes that 200 MW of SCCTs will be constructed for load balancing, while the Baseline Case assumes 100 MW.
- Natural gas commodity pricing (aside from demand charges and basis difference) is assumed to be consistent with U.S. Energy Information Administration (EIA) Annual Energy Outlook (AEO) 2019 Reference case forecast.
- The resale value of VC Summer Units 2 and 3 equipment is assumed to be zero.

Throughout this report, Black & Veatch has provided technical commentary on key aspects of the Business Plan, the Baseline Case, and the Sensitivities Case.

Figure 2-5 illustrates the comparison of Santee Cooper's CAPEX forecast from 2020 through 2039 as shown in the Business Plan to the historical actual CAPEX from 2014 through 2018. Overall, Santee Cooper budgeted approximately $5.3 billion in total CAPEX from 2020 through 2039.

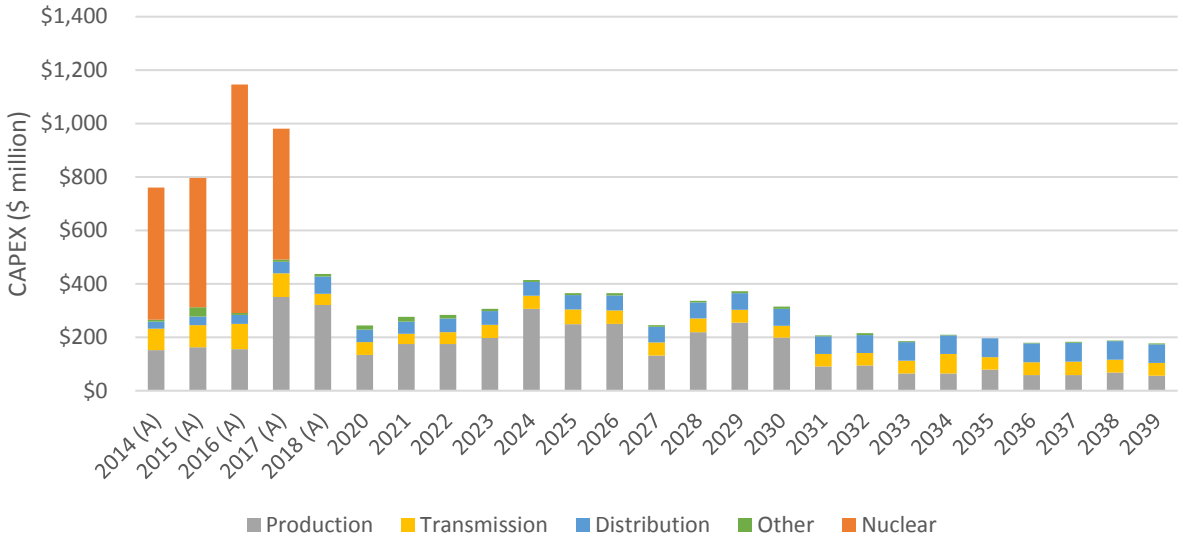


Figure 2-5 Business Plan 2020 - 2039 Forecast CAPEX and Historical CAPEX Comparison

The Business Plan CAPEX forecast broadly comprises four categories, including generation, transmission, distribution, and other expenses that covers corporate and customer services expenses. The CAPEX drivers behind these categories, which are discussed in more detail in Section 8.0, are summarized as follows:

- With regard to generation, the total CAPEX is approximately $2.9 billion from 2020 through 2039, consisting of $1.2 billion for implementation of a new resource plan, $341 million for environmental compliance projects, $80 million for Federal Energy Regulatory Commission (FERC) licensing, $107 million for the Rainey service agreement payment, $442 million for VC Summer Unit 1 major maintenance and upgrades, and $790 million for general improvements and other projects such as capital equipment and pollution control projects.
- Transmission CAPEX totals approximately $1.0 billion from 2020 through 2039, averaging approximately $50 million annually. This is lower than the 2014 through 2018 annual average, which Santee Cooper explained was higher than long-term historical averages because of transmission upgrades to support VC Summer Units 2 and 3, and the 2020 through 2033 average is more in line with those long-term historical averages. The budget includes approximately $536 million for new system expansions from load growth and $436 million for system upgrades and improvements.
- The total estimated CAPEX for distribution is approximately $1.2 billion from 2020 through 2039 for customer growth, system improvements, and advanced metering infrastructure implementation.

3.0 Electric Transmission and Distribution Facilities

3.1 KEY SYSTEM CHARACTERISTICS

Santee Cooper owns and operates an electric transmission and distribution system that delivers energy to approximately 185,000 electric customers throughout Santee Cooper's electric service area, including Horry, Georgetown, and Berkeley counties, and provides energy to Santee Cooper's industrial and cooperative customers. Black & Veatch reviewed major equipment component descriptions and operating data provided by Santee Cooper, performed a Site Visit to representative portions of the electric transmission and distribution system, conducted interviews with key Santee Cooper operating personnel, and reviewed Santee Cooper's current ongoing initiatives to invest in system safety and reliability. A summary of Santee Cooper's electric transmission and distribution system is shown in Table 3-1.

Table 3-1 Key Electric Transmission and Distribution System Characteristics

DESCRIPTIONS	VALUE
Transmission	
Voltage (kV)	12 kV (<1% of system), 34 kV (2% of system), 46 kV (<1% of system) 69 kV (31% of system) 115 kV (36% of system) 230 kV (31% of system)
Overhead Lines Installed (miles)	4,464
Underground Lines Installed (miles)	6
Number of Substations	89
Number of Circuits	387
Transmission Structures	41,764
Transmission Poles	57,517 (33% steel, 61% wood, 6% concrete)
Distribution	
Voltage (% of System)	12 kV (95% of system) 34 kV (5% of system)
Overhead Lines Installed (miles)	1,379
Underground Lines Installed (miles)	1,555
Number of Substations	54
Number of Power Transformers	85
Power Transformer Capacity (MVA)	1,788
Number of Circuits	288

Santee Cooper's transmission system consists of approximately 4,464 circuit miles of 69 kV, 115 kV, and 230 kV transmission lines. At the time of this Report, nearly all transmission lines are overhead except for 6 miles of underground in the Monck's Corner, Hilton Head, Winsboro, and Georgetown areas. Black & Veatch notes that Santee Cooper's service area introduces some complications for overhead lines, such as damp environments and unpredictable weather; however, these issues are understood and addressed in Santee Cooper's asset management and O&M practices in a manner that Black & Veatch believes is similar to other utilities facing similar challenges. The Santee Cooper transmission system is directly interconnected with the transmission systems owned by Duke Energy (Duke), Dominion Energy, Southeastern Power Administration, and Southern Company. Figure 3-1 shows Santee Cooper's electric transmission system.

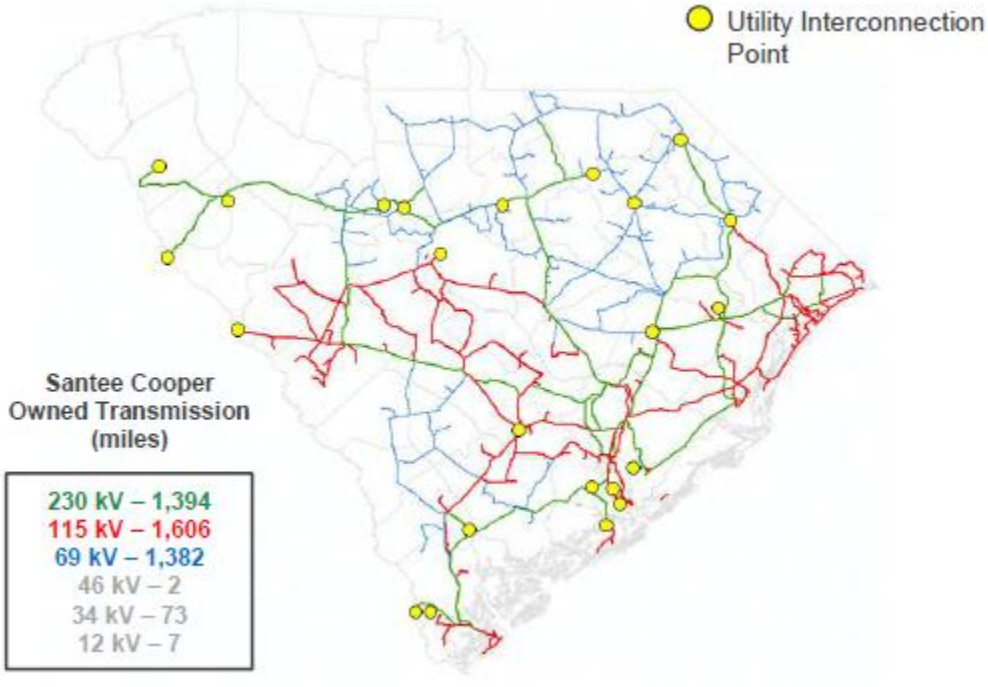


Figure 3-1 Transmission System Map

Black & Veatch notes that Santee Cooper performed an electric load flow study in support of the Business Plan, in order to evaluate adequacy of transmission resources to transmit power from generating stations to loads, and the feasibility of potential sites for new generation from an electrical interconnection standpoint. In the Business Plan and Baseline Case, Santee Cooper has identified the Pee Dee site as the optimal location for the planned CCCT generation. The Pee Dee site had formerly been selected by Santee Cooper as the preferred location for a new coal facility due to its proximity to two 230 kV transmission lines with a rating of 767 kVA and direct interconnection to Santee Cooper's load centers, although that coal facility was ultimately not built. Based on the load flow studies performed, the existing transmission lines would be adequate to support the interconnection of the first phase of CCCT development, assumed to have a capacity of 549 MW. Santee Cooper reports that a second 230 kV transmission line with a length of approximately 20 – 25 miles would be required to supplement the existing transmission

infrastructure to export the power from the second phase of CCCT generation at Pee Dee, representing another 549 MW. The costs associated with this second 230 kV transmission line as well as generator interconnection facilities have been included in the Baseline Case CAPEX forecast, which Black & Veatch finds to be reasonable.

Black & Veatch performed an age analysis of both the overhead and underground transmission cables installed across Santee Cooper's transmission system; the age profile is illustrated on Figure 3-2 and Figure 3-3. Additional information is summarized in Table 3-2.

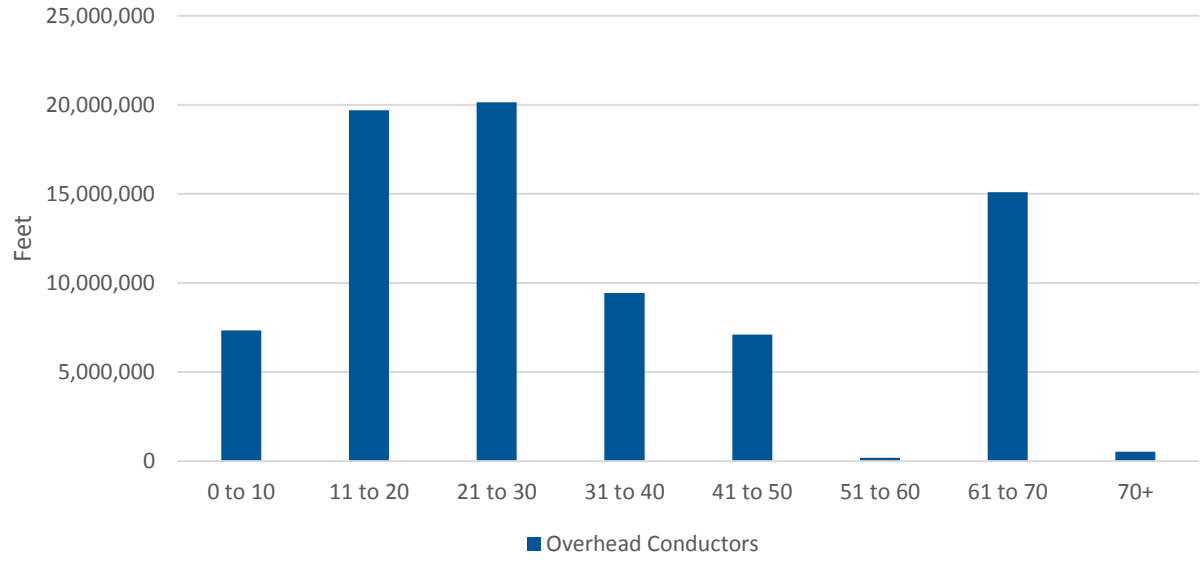


Figure 3-2 Transmission Overhead Conductor Age Profile

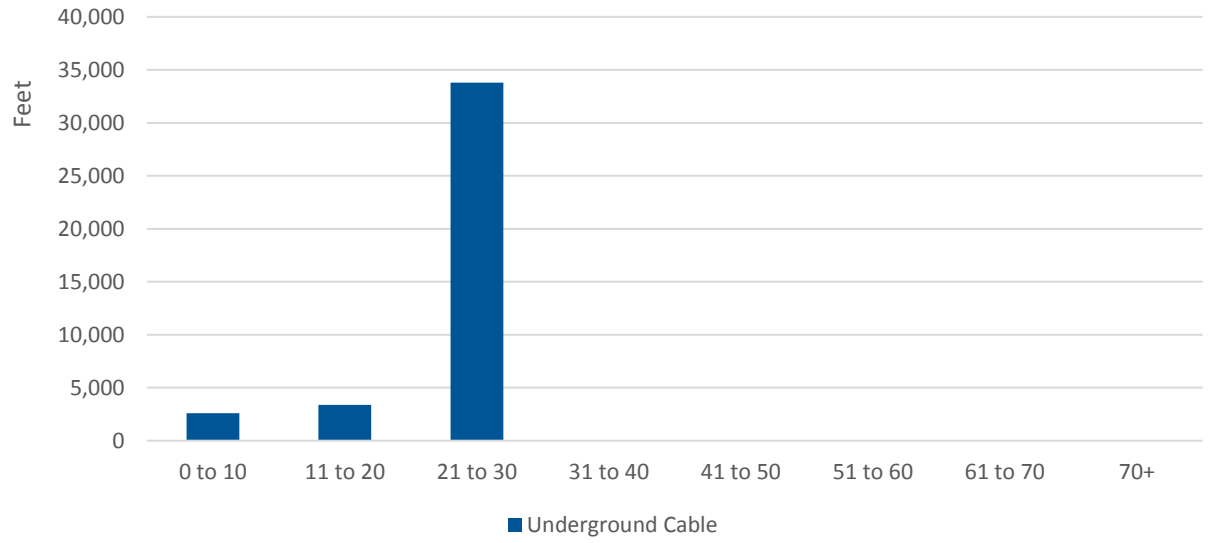


Figure 3-3 Transmission Underground Cable and Piping Age Profile

Black & Veatch would expect similar overhead conductor and underground transmission cables to be able to achieve an average technical useful life of approximately 60 years or greater. As shown above, approximately 85 percent of Santee Cooper's overhead conductor and 100 percent of underground transmission cables and piping are within the typical average service life.

Black & Veatch also performed an age analysis of the transformers installed across Santee Cooper's transmission system; the age profile is illustrated on Figure 3-4. Additional information is summarized in Table 3-2.

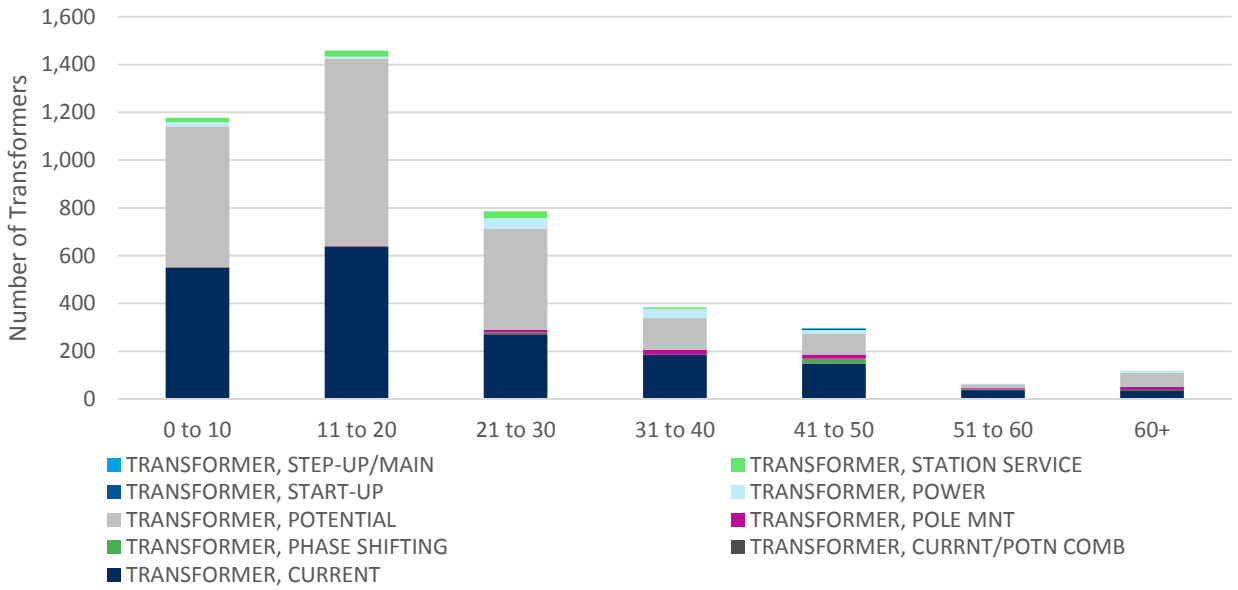


Figure 3-4 Transmission System Transformer Age Profile

Black & Veatch would expect similar transformers to be able to achieve an average technical useful life of approximately 50 to 60 years. As shown above, approximately 97 percent of the transformers installed on Santee Cooper's transmission system are within the typical average service life.

Santee Cooper reports approximately 41,568 towers and pole structures installed across its transmission system. The transmission infrastructure includes steel, foundational, concrete, and wood structures. Wood and steel structures comprise approximately 61 percent and 33 percent, respectively, of all poles and towers installed on Santee Cooper's transmission system. The remaining 6 percent include concrete poles and foundation towers. Black & Veatch performed an analysis of the transmission poles and towers ages across Santee Cooper's transmission system; the age profile is illustrated on Figure 3-5. Additional information is summarized in Table 3-2.

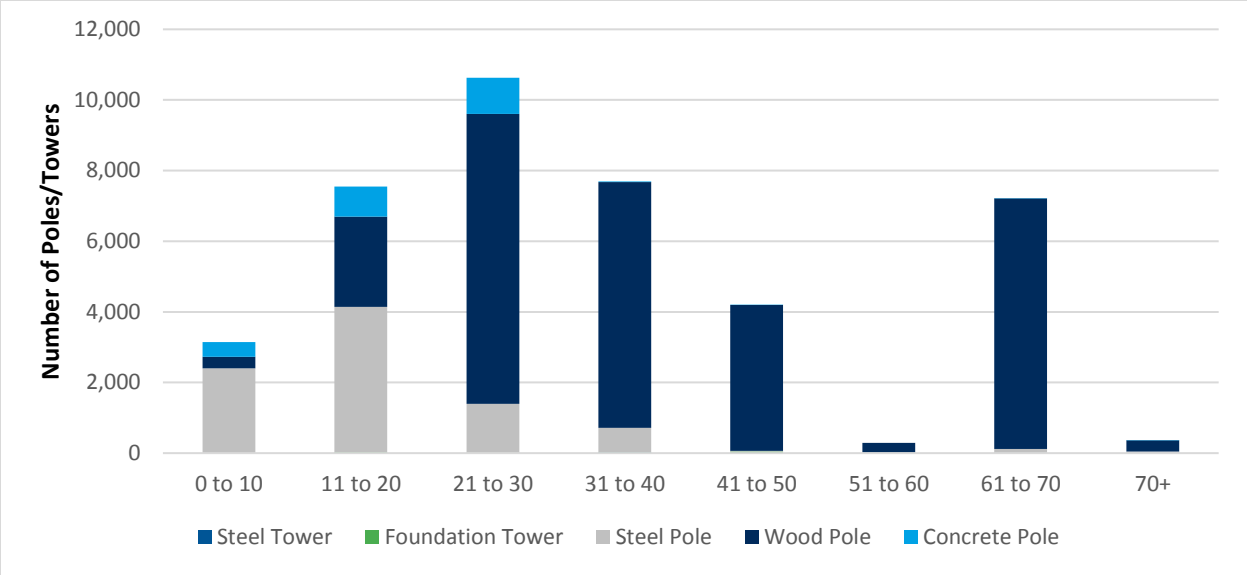


Figure 3-5 Transmission Tower & Pole Age Profile

Typically, Black & Veatch would expect similar transmission structures to be able to achieve an average technical useful life of approximately 70 years for steel and concrete structures and 40 to 50 years for wood structures. As shown above, Santee Cooper has relatively young steel and concrete fixtures, with materially all still within the expected average useful life. The majority of wood poles, approximately 74 percent, are also within the typical average service life. Black & Veatch notes that Santee Cooper practices condition-based transmission and distribution asset replacements, and Black & Veatch has previously seen wood poles of similar vintage in service beyond the average service life, provided that they are maintained and in good operating condition. Overall, Black & Veatch believes that the age distribution of Santee Cooper's transmission structures appears typical and notes that ages are relatively evenly distributed which does not indicate a larger than average portion of the system would likely reach end of useful life at once.

Black & Veatch notes that Santee Cooper appears to be installing relatively more steel pole infrastructure than was installed in older aged equipment, which consists primarily of wood poles. Black & Veatch understands that this shift in preferred material is based on the typically longer useful life of steel compared to wood, which reduces maintenance and replacement costs in the future.

Santee Cooper's distribution system consists of approximately 2,790 circuit miles of 12 kV and 144 circuit miles of 34 kV distribution lines (approximately 1,379 circuit miles of overhead line and 1,555 circuit miles of underground line). Black & Veatch notes that Santee Cooper generally favors underground lines for new distribution projects and system rebuilds if economically permissible because of the significant reliability benefits of underground versus overhead lines. Generally, underground distribution lines help prevent outages in the face of storms such as hurricanes, and can be an aesthetic preference to highly visible overhead lines. Additionally, Santee Cooper reports that most franchise agreements with its municipal clients require underground distribution for new construction, and contain a funding mechanism for converting existing overhead lines to underground. For these reasons, Black & Veatch understands that nearly all subdivisions, which represent much of Santee Cooper's residential customer growth, constructed in Santee Cooper's

service areas in the past 30 – 40 years have been built with underground distribution systems. Figure 3-6 shows Santee Cooper's distribution system.

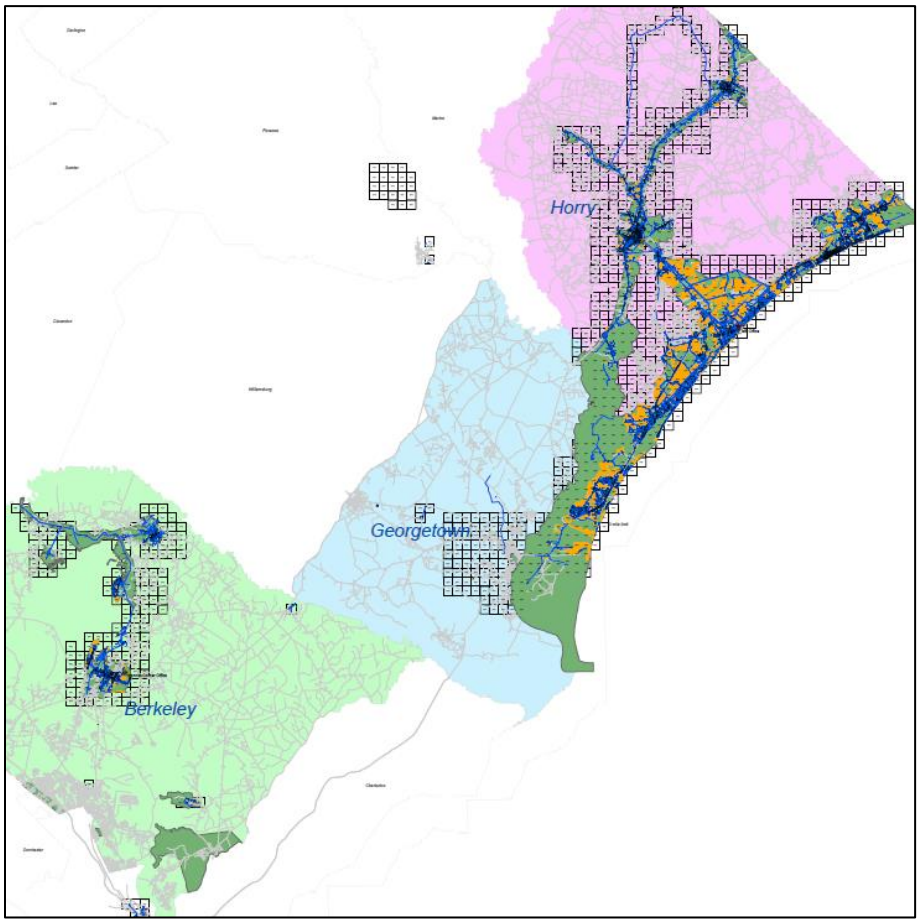


Figure 3-6 Distribution System Map

Santee Cooper reports that all underground distribution circuits and approximately 75 percent of aboveground distribution circuits are looped, which allows power to be transferred from multiple substations if one is experiencing an outage or overload. Black & Veatch notes that radial versus loop configuration designs are typically based on a cost/benefit analysis of the additional costs compared to the reliability of the additional redundant load serving infrastructure. Black & Veatch believes that Santee Cooper's distribution system contains a relatively high percentage of looped circuits, which Black & Veatch believes is reasonable, given that Santee Cooper owns distribution circuits predominately in urban or relatively densely populated areas.

Black & Veatch performed an age analysis of the underground distribution cables installed across Santee Cooper's distribution system; the age profile is illustrated on Figure 3-7. Additional information is summarized in Table 3-2.

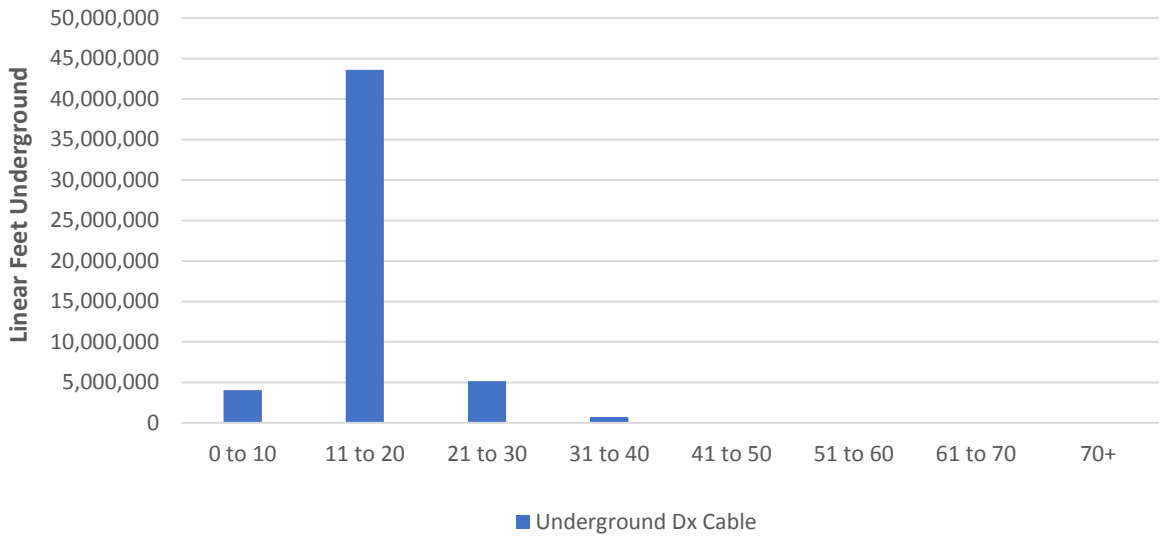


Figure 3-7 Distribution Underground Cable Age Profile

Black & Veatch would expect similar underground distribution cables to be able to achieve an average technical useful life of approximately 60 years or greater. As shown above, 100 percent of Santee Cooper's underground distribution cables and piping are within the typical average service life. As noted above, Black & Veatch understands that Santee Cooper began strongly favoring underground distribution lines approximately 30 – 40 years ago and now utilizes underground distribution systems for nearly all new construction, which is why nearly all underground circuits are between 0 to 30 years old, with the majority between 11 and 20 years old.

Santee Cooper reports approximately 46,171 transformers installed across its distribution system. The transformers consist of pad-mount and pole-mount transformers ranging from 10 to over 300 kVA. Black & Veatch performed an analysis of the transformer ages across Santee Cooper's distribution system; the age profile is illustrated on Figure 3-8. Additional information is summarized in Table 3-2.

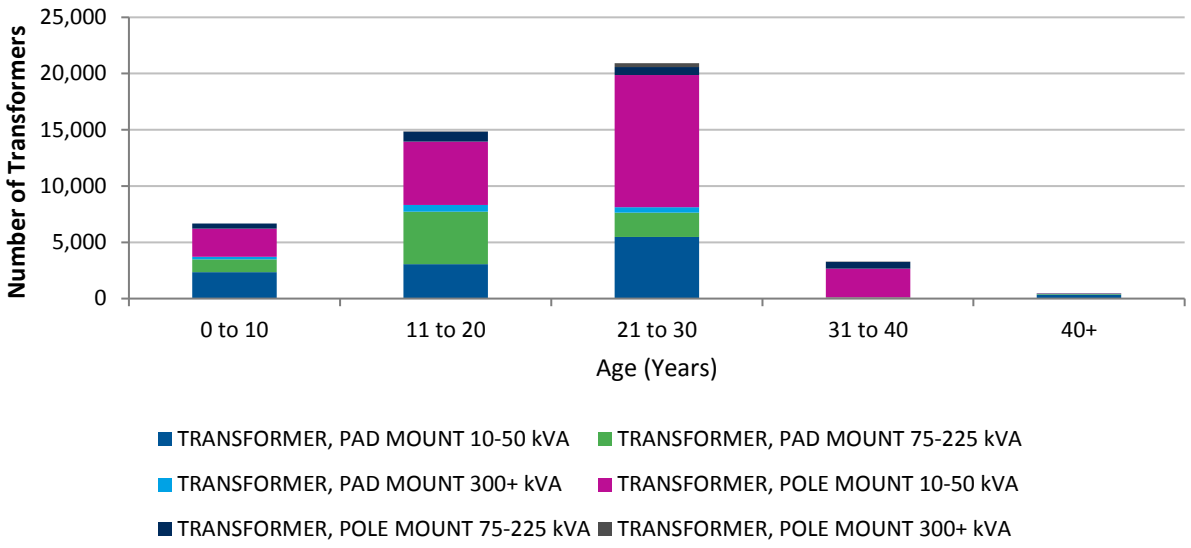


Figure 3-8 Distribution Transformers Age Profile

Santee Cooper reports approximately 62,105 poles installed across its distribution system, nearly all consisting of wood poles, with steel or concrete structures utilized only as approaches to substations where higher loads are anticipated, or in less accessible right-of-way (ROW) to reduce the frequency of O&M activities. Black & Veatch performed an analysis of the distribution pole ages across Santee Cooper's distribution system; the age profile is illustrated on Figure 3-9. Additional information is summarized in Table 3-2.

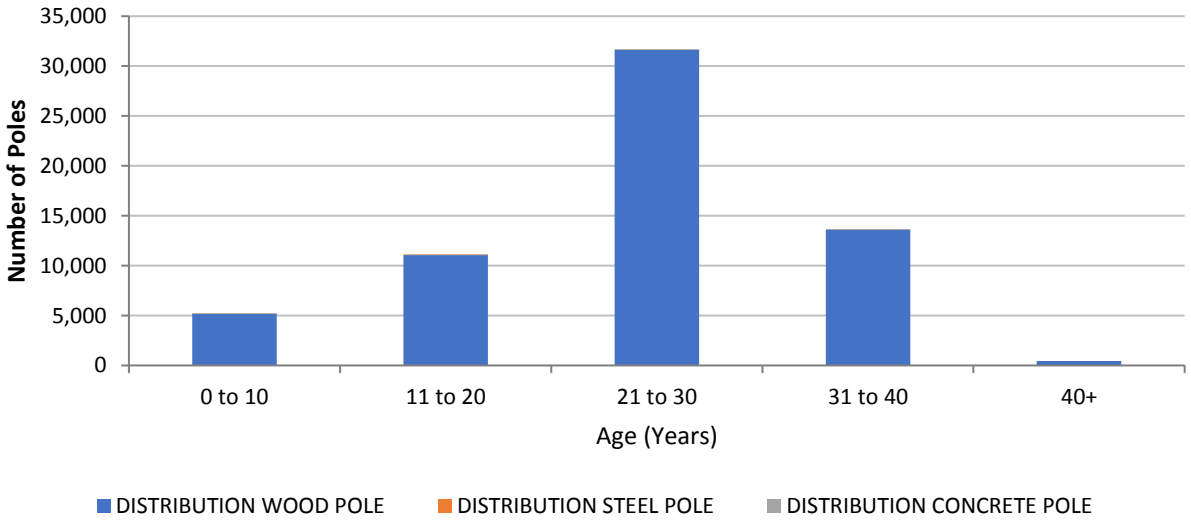


Figure 3-9 Distribution Poles Age Profile

Black & Veatch notes that a large percentage of Santee Cooper's distribution poles are 21 to 30 years old and understands that this is largely due to the magnitude of distribution system growth and improvements executed by Santee Cooper completed in the 1990's. Overall, Black & Veatch considers the age distribution of these assets to be typical and notes that nearly all poles are within the typical technical useful life range for wood poles, which is also approximately 40 to 50 years, as previously mentioned for transmission wood poles.

A comprehensive overview of Black & Veatch's observations regarding the age of certain infrastructure across Santee Cooper's transmission and distribution systems is summarized in Table 3-2. Black & Veatch notes that the percentages included in the table are based on the total system units reported by Santee Cooper.

Table 3-2 Summary of Key Transmission and Distribution Equipment Age Profile

Equipment		% of Total						
Transmission	**Total System Units**	**0-10 Years**	**11-20 Years**	**21-30 Years**	**31-40 Years**	**41-50 Years**	**51-60 Years**	**60+ Years**
Foundation Towers	73	0%	33%	7%	11%	41%	5%	3%
Steel Towers	60	0%	13%	5%	38%	22%	0%	22%
Steel Poles	8,758	27%	47%	16%	8%	0%	0%	2%
Wood Poles	29,882	1%	9%	27%	23%	14%	1%	25%
Concrete Poles	2,330	18%	37%	44%	1%	0%	0%	0%
Underground Cable	39,770 feet	7%	8%	85%	0%	0%	0%	0%
Transformers	8,564	27%	34%	18%	9%	7%	1%	3%
Distribution	**Total System Units**	**0-10 Years**	**11-20 Years**	**21-30 Years**	**31-40 Years**	**40+ Years**		
Wood Poles	61,967	8%	18%	51%	22%	1%		
Steel Poles	110	31%	55%	11%	3%	0%		
Pad Mount Transformer 10-50 kVA	11,219	21%	27%	49%	0%	3%		
Pad Mount Transformer 75-225 kVA	8,149	14%	57%	27%	1%	1%		
Pad Mount Transformer 300+ kVA	1,332	18%	46%	36%	0%	0%		
Pole Mount Transformer 10-50 kVA	22,456	11%	25%	52%	11%	0%		
Pole Mount Transformer 75-225 kVA	2,661	17%	33%	27%	23%	0%		
Pole Mount Transformer 300+ kVA	354	0%	0%	94%	6%	0%		
Underground Cables	39,770 feet	7%	8%	85%	0%	0%		

Overall, Black & Veatch considers Santee Cooper's electric transmission and distribution system characteristics to be typical to those of other similar-sized utilities in the region.

3.2 OPERATIONS AND MAINTENANCE

3.2.1 Organizational Structure

Figure 3-10 illustrates Santee Cooper's transmission and distribution operations organizational structure, which includes both Power Delivery and Retail Operations overseen by Santee Cooper's Executive Vice President and Chief Operating Officer. The Power Delivery and Retail Operations departments include headcounts of approximately 237 and 288 employees, respectively. Black & Veatch considers Santee Cooper's transmission and distribution operations to have a well-organized and adequate functional organizational structure in place to ensure the proper planning, operations, and maintenance of its electric transmission and distribution systems.

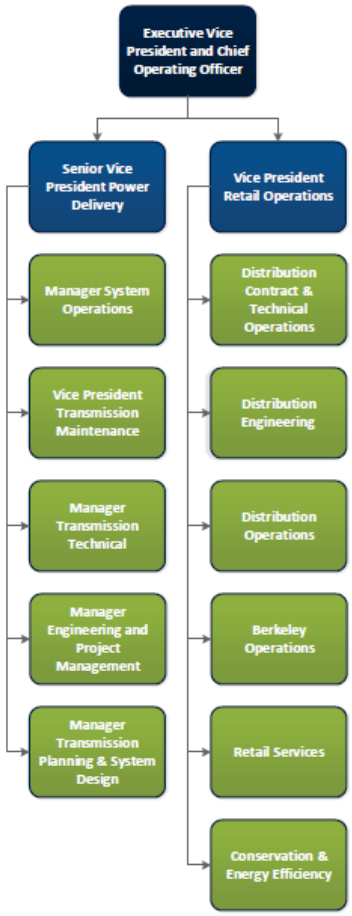


Figure 3-10 Santee Cooper Transmission and Distribution Operations Organizational Chart

3.2.2 O&M Plan and Procedures

Black & Veatch understands that Santee Cooper self-performs routine O&M activities, such as circuit inspections, vegetation spot trimming, substation maintenance and repair, and emergency or simple line repairs.

Santee Cooper also conducts the following distribution system preventative maintenance activities in cycles:

- Overhead inspections performed annually on a 10 year cycle.
- Underground inspections performed every 3 years.
- Underground cable replacements are evaluated and prioritized based on cable vintage and outage frequency.
- Tree trimming performed every 4 years.
- Summer and winter contingency switching studies performed each year to ensure all load can be served under peak conditions in the event of power loss by a transformer or circuit.
- Reliability calculations executed and analyzed monthly.

Black & Veatch notes that Santee Cooper distribution crews have a normal outage target repair time of 30 minutes, which is reportedly generally achieved. Santee Cooper reports that, because of the geographic distribution of regional O&M bases, distribution crews are capable of reaching any part of the transmission and distribution system within approximately 30 minutes of an outage or fault notification. Santee Cooper also requires root-cause analyses to be performed on circuits that have experienced four momentary customer interruptions with unknown cause.

Santee Cooper tracks and records all outage events to continuously update improvement plans for its distribution system, such as Santee Cooper's distribution capacity plan. The distribution capacity plan is used to identify and schedule new substation additions and expansions, as well as ad-hoc system improvement plans to address previously uncovered issues. The switching studies performed as preventive maintenance are also used to uncover potential improvement plans, such as line upgrades, load shifts, and additional switching points.

On the transmission side, Santee Cooper performs a transmission planning assessment study each year, which is required by the NERC and performed in accordance with standard TPL-001. The purpose of the study is to establish transmission system planning performance criteria requirements within the planning horizon. The planning criteria are formulated using computer simulations and account for all existing and planned facilities, known outages of transmission facilities with a duration of at least 6 months, real and reactive load forecasts, and other similar parameters. Completed simulations offer both near-term assessments which identify transmission system improvements that should be considered to maintain adequate system reliability.

3.3 SITE VISIT OBSERVATIONS

During the Site Visit, two representatives from Black & Veatch visited representative electric transmission and distribution assets within Santee Cooper's system, as summarized below:

- Representative roadside ROW poles.
- Switchyards at each generating station.

- Various distribution substations.
- 48th Avenue 115/12 kV transmission/distribution substation in Myrtle Beach.
- Burroughs Road 115/12 kV transmission/distribution substation in Myrtle Beach.
- Carolina Forest 230/115 kV transmission substation in Myrtle Beach.
- Various junction boxes for underground distribution new construction in Myrtle Beach.

Black & Veatch notes that Santee Cooper's substations tend to use similar equipment providers, design principles, and construction methodology, so Santee Cooper's fleet of substations not observed by Black & Veatch are materially similar to those inspected during the Site Visit. Black & Veatch performed a walkdown of the substation bays, viewed representative vegetation management surrounding the substation as well as in the approaching transmission and distribution line ROW, and observed the control center building at the Carolina Forest substation. Overall, Black & Veatch considers the substations and associated facilities to be clean, well maintained, and organized in accordance with industry practices.

3.4 HISTORICAL PERFORMANCE

Electricity transmission and distribution utilities use a number of service reliability indices, such as the System Average Interruption Frequency Index (SAIFI) and the System Average Interruption Duration Index (SAIDI), to understand the quality and robustness of the system as well as the key outages impacting system performance in their respective service areas. Typically, utilities monitor planned and unplanned interruptions of five minutes or more to track the following grid reliability indices:

- SAIFI is the average number of forced sustained interruptions experienced per customer served per year (measured in number of outages). SAIFI is calculated as "Total Customer Interruptions" divided by "Total Number of Customers."
- SAIDI is the average forced sustained interruption duration per customer served per year (measured in minutes). SAIDI is calculated as "Total Customer Minutes of Interruptions" divided by "Total Number of Customers."

To analyze system reliability performance that could affect its customers, Black & Veatch reviewed actual historical grid reliability indices for Santee Cooper's residential distribution system provided in Santee Cooper's distribution system outage data records and as reported to the Public Service Commission of South Carolina (PSCSC) on an annual basis. Black & Veatch notes that Santee Cooper provides operating metrics as calculated in accordance with the Institute of Electrical and Electronics Engineers (IEEE) 1366-2012 standards and utilizes the 2.5 Beta methodology for identification of Major Event Days. Santee Cooper's reliability metrics as discussed are reflective of Santee Cooper's retail customers only and do not consider industrial customers or customers indirectly served through Santee Cooper's municipal electric clients.

Black & Veatch notes that, because not all utility service areas are the same, reliability performance as measured by SAIFI and SAIDI may vary even with prudent O&M practices. For example, utilities with low customer density areas may have longer outage durations on average because of additional time required to locate and mobilize a repair crew to a remote fault, and utilities with dense vegetation around the service area may experience more frequent trips because of power line interference from trees.

Santee Cooper reliability indices without major events, as reported to the PSCSC over the distribution system assets only, are shown in Table 3-3.

Table 3-3 Santee Cooper Distribution System Reliability Indices, Excluding Major Events

	2014	2015	2016	2017	2018	AVERAGE
SAIDI	18.8	17.9	23.0	23.5	18.8	20.4
SAIFI	0.3	0.3	0.3	0.4	0.3	0.33

Santee Cooper's annual recorded SAIFI remains generally consistent over time, while its annual SAIDI has a much higher degree of volatility, indicating that overall reliability will be impacted more by the duration of outages than the frequency. An overview of the outage categories, defined by Customer Minutes of Interruption (CMI), affecting the reliability of Santee Cooper's distribution system from 2014 to 2018 is provided on Figure 3-11.

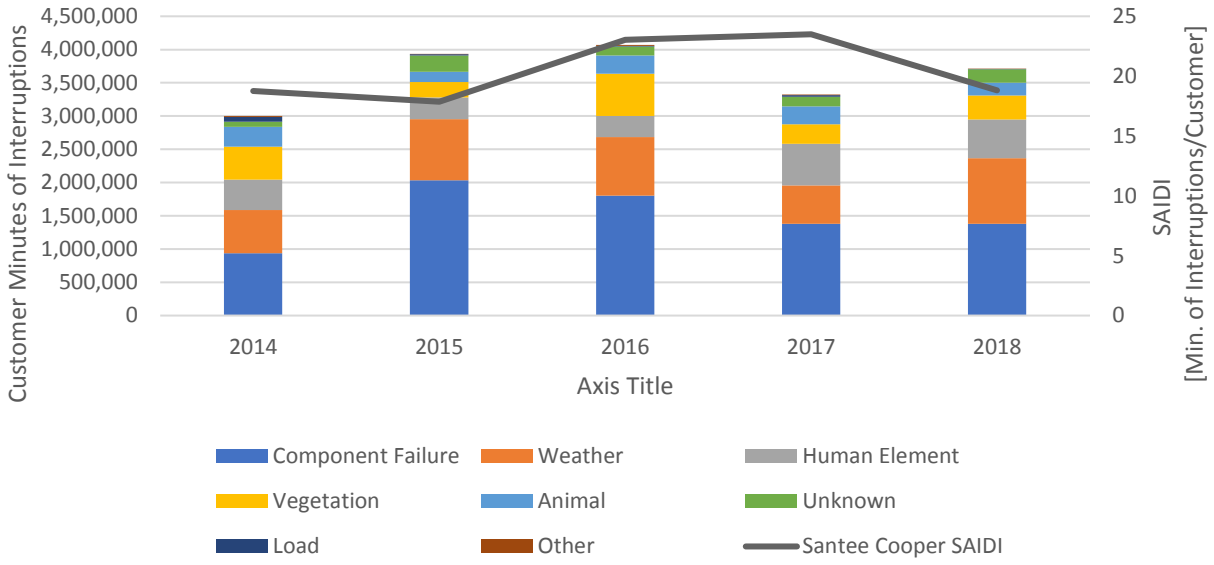


Figure 3-11 Annual Distribution Customer Minute Interruptions by Outage Category (2014 – 2018)

Santee Cooper has experienced approximately 18 million CMIs since 2014 and has averaged approximately 3.6 million CMIs per year over the analyzed period. Black & Veatch has reviewed a comprehensive list of outages affecting the distribution system since 2014 and notes that the key outage categories include component failures, vegetation, human element, and weather. Component failures have averaged around 50 percent of the total recorded CMIs each year. Common sources resulting in the failure of distribution components include aged equipment requiring replacement, transformer failures, cable splices, destroyed distribution poles and cabling, and other similar equipment-related issues. Vegetation and human element outages have each accounted for approximately 13 percent of the total recorded CMIs each year. Vegetation outages typically involve events where tree branches or other plant-based debris have fallen onto distribution lines disrupting service. Human element issues typically include events that are outside

of the plant management team's control such as a vehicle accident involving a distribution pole. Black & Veatch notes that human element outages are not commonly viewed as high priority issues to address because of the unpredictable nature of their occurrence.

The reviewed outage events (excluding those applicable to weather) typically reflect one-time issues with no material impact on future functionality of the system.

Overall, Black & Veatch believes that Santee Cooper's overall reliability metrics are within the range expected for similar utilities, and the primary causes of distribution system downtime are typical of electric distribution systems which can reasonably managed and mitigated through proper O&M practices and distribution system improvements. Black & Veatch notes that Santee Cooper's preference for underground distribution cables effectively removed many of the typical failure modes leading to customer interruptions for those portions of the distribution system, which is generally correlated with lower SAIDI and SAIFI.

3.5 HISTORICAL PERFORMANCE BENCHMARKING

To further evaluate the performance of Santee Cooper's distribution system, Black & Veatch compared Santee Cooper's performance to a peer group of electric utilities who own and operate similar electric distribution systems. The peer group, shown below, consists of other utilities who report reliability information to the South Carolina PUC and has been selected by Black & Veatch based on relatively similar customer densities. Black & Veatch notes that Santee Cooper's retail customers are generally located in urban areas, resulting in higher customer densities, which is typically correlated with lower (better) SAIFI and SAIDI metrics.

- Duke Energy Carolinas
- Duke Energy Progress
- Berkeley Electric Coop
- Palmetto Electric Coop
- Pee Dee Electric Coop
- Tri-County Electric Coop
- Dominion

The analysis revolved around data reported by the United States Energy Information Administration (EIA), who on an annual basis since 2012 prepares an electric power industry report, Form EIA-861, to help track the performance over 1,100 utilities located across the United States.

A benchmark of the Santee Cooper system's SAIFI and SAIDI against the selected peer group is presented on Figure 3-12 and Figure 3-13.

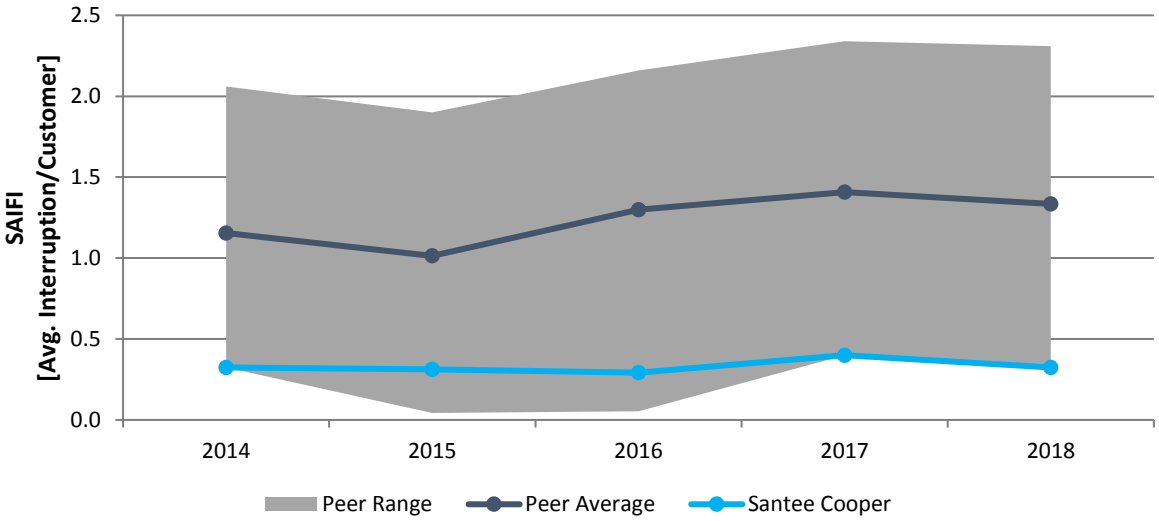


Figure 3-12 Santee Cooper Versus Large Peer Group SAIFI Comparison (Excluding Major Events)

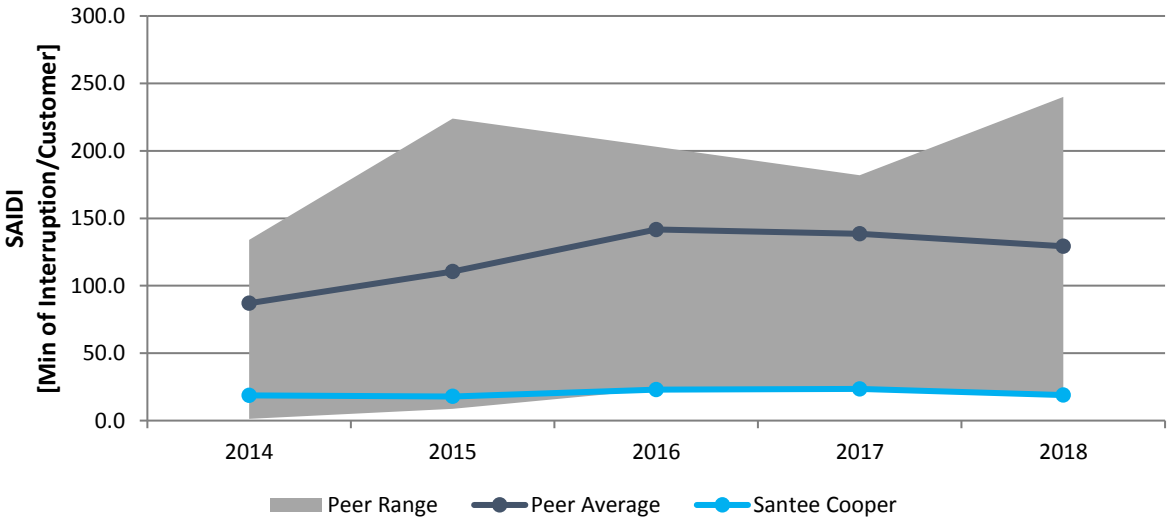


Figure 3-13 Santee Cooper Versus Large Peer Group SAIDI Comparison (Excluding Major Events)

As shown on these figures, both Santee Cooper's SAIFI and SAIDI are lower (better) than the average of other peer utilities in each year evaluated and consistently trend to the lower (better) boundaries of the peer ranges. This indicates that Santee Cooper's system has experienced a lower annual number of customer interruptions and has the ability to address, isolate, and remediate outages at a quicker and more efficient pace compared to peer utilities.

4.0 Generating Facilities

4.1 ASSETS OVERVIEW

Santee Cooper owns and operates a fleet of various electric generation assets, including coal driven steam turbines, oil and gas fueled combustion turbine plants, diesel and landfill gas driven reciprocating engines, nuclear facilities, hydroelectric plants, and solar facilities, all located across the state of South Carolina. Table 4-1 shows the plants' locations, operating capacities, and the portions of the capacity owned by Santee Cooper.

Table 4-1 Santee Cooper Generation Assets Portfolio

PLANT NAME	TYPE	LOCATION (COUNTY, STATE)	SUMMER OPERATING CAPACITY (MW)	SANTEE COOPER OWNERSHIP (%)	SANTEE COOPER OWNED CAPACITY (MW)
Cross	Coal	Berkeley County, SC	2,370	100.00%	2,370
Winyah	Coal	Georgetown County, SC	1,130	100.00%	1,130
Total Coal			**3,500**		**3,500**
Rainey Generating Station CC	CCCT	Anderson County, SC	460	100.00%	460
Total CCCT			**460**		**460**
Rainey Generating Station CT	SCCT	Anderson County, SC	517	100.00%	517
Hilton Head CT	SCCT	Beaufort County, SC	84	100.00%	84
Myrtle Beach CT	SCCT	Horry County, SC	56	100.00%	75
Total SCCT			**676**		**676**
Lee County Landfill	Recip./ IC	Lee County, SC	11.2	100.00%	11.2
Richland County Landfill	Recip./ IC	Richland County, SC	8.7	100.00%	8.7
Anderson Landfill IC	IC	Anderson County, SC	3.2	100.00%	3.2
Georgetown County Landfill	IC	Georgetown County, SC	1.1	100.00%	1.1
Berkeley Green Power Project	IC	Berkeley County, SC	3.2	100.00%	3.2
Total Reciprocating Engine			**27.4**		**27.4**
V.C. Summer	Nuclear	Jenkinsville, SC	322[1]	33.33%	322
Total Nuclear			**322**		**322**
Jefferies Hydroelectric	Hydro	Moncks Corner, SC	140	100.00%	140
Spillway	Hydro	Berkeley County, SC	2	100.00%	2

[1] Represents Santee Cooper's one-third share of VC Summer total capacity.

PLANT NAME	TYPE	LOCATION (COUNTY, STATE)	SUMMER OPERATING CAPACITY (MW)	SANTEE COOPER OWNERSHIP (%)	SANTEE COOPER OWNED CAPACITY (MW)
Total Hydro			**226**		**226**
Bell Bay Solar Farm	Solar	Horry County, SC	1.56	100.00%	1.56
Jamison Solar Farm	Solar	Orangeburg County, SC	1.1	100.00%	1.1
Total Solar			**2.66**		**2.66**
Total Portfolio			**5,110**		**5,214**

4.2 OPERATIONS AND MAINTENANCE OVERVIEW

Figure 4-1 illustrates Santee Cooper's generation organizational structure. Santee Cooper's Vice President of Generation Stations reports directly to the Executive Vice President and Chief Operating Officer and oversees the five functional groups consisting of a staff of 530 employees as of July 31, 2019:

- Cross Plant – Responsible for the operations of the Cross coal units.
- Winyah Plant – Responsible for the operations of the Winyah coal units.
- Rainey Generation Station – Responsible for the operations of the combined cycle facility and the simple cycle combustion turbine driven units of the Rainey Generation Station.
- Hydro, Landfill, and Combustion (HLC) Turbines – Responsible for the operations of the hydroelectric generation assets, the landfill gas fueled reciprocating engines, and the renewable generation.
- Generation Services – Responsible for providing operations support services.

The director for each of the functional groups reports directly to the Vice President of Generation Stations. Each of the functional group's directors has direct responsibility for the personnel and activities within the functional group while ensuring seamless collaboration and coordination among the functional groups.

Black & Veatch considers Santee Cooper's generation assets to have a well-organized and adequate functional organizational structure and plan in place to provide for the proper planning, operations, and maintenance of its generating facilities.

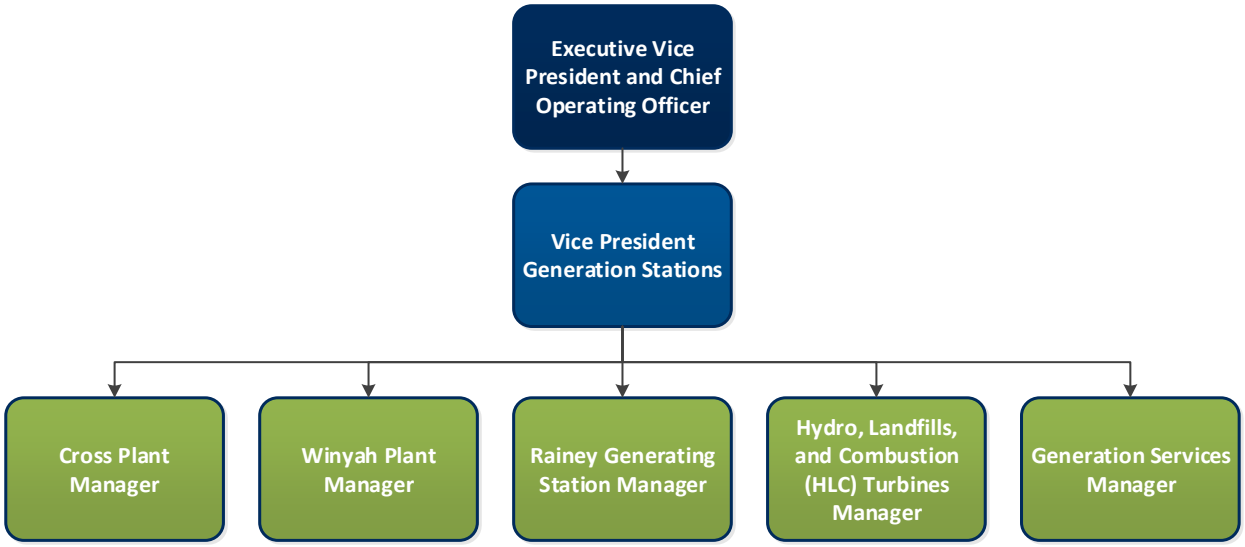


Figure 4-1 Santee Cooper Operations Organizational Chart

Specific O&M structures and practices for generation facilities by technology type are discussed in more detail in the following subsections.

4.3 COAL FIRED PLANTS

4.3.1 Overview

Santee Cooper owns two coal fired electric generating facilities, Cross and Winyah, located in Berkeley County and Georgetown County, South Carolina, respectively. Cross has four coal fired electric generating units, with a net generation capacity of 2,370 MW. Winyah has four electric generating units with a net generation capacity of 1,130 MW. In total, Santee Cooper's coal fired portfolio represents 3,500 MW of owned capacity, which is approximately 67 percent of Santee Cooper's total available capacity, making it the largest current component of Santee Cooper's generation fleet in terms of capacity. An overview of Santee Cooper's coal fired electric generation facilities is shown in Table 4-2.

Table 4-2 Overview of Santee Cooper's Coal Fired Assets

PARAMETER	CROSS	WINYAH
Location	Berkeley County, SC	Georgetown County, SC
Summer Operating Capacity	2,370 MW	1,130 MW
Number of Units	Unit 1: 580 MW Unit 2: 565 MW Unit 3: 610 MW Unit 4: 610 MW	Unit 1: 275 MW Unit 2: 285 MW Unit 3: 285 MW Unit 4: 285 MW

PARAMETER	CROSS	WINYAH
Santee Cooper Ownership	Unit 1: 100% Unit 2: 100% Unit 3: 100% Unit 4: 100%	Unit 1: 100% Unit 2: 100% Unit 3: 100% Unit 4: 100%
Operator	Santee Cooper	Santee Cooper
COD	Unit 1: May 1995 Unit 2: 1983 Unit 3: January 2007 Unit 4: October 2008	Unit 1: March 1975 Unit 2: July 1977 Unit 3: May 1980 Unit 4: November 1981

4.3.2 Design and Major Equipment

Table 4-3 provides an overview of the design and major equipment of Santee Cooper's coal fired electric generation facilities.

Table 4-3 Cross and Winyah Design and Major Equipment

PARAMETER	CROSS	WINYAH
Boiler	Unit 1: Foster Wheeler. Type: Natural Circulation Unit 2: Combustion Engineering. Type: Controlled Circulation, radiant reheating Unit 3 and 4: Alstom. Type: Controlled Circulation, radiant reheating	Units 1-4: Riley Stoker Watertube
ST Generator	Units 1-4 4: General Electric 3,600 rpm tandem compound double-flow reheat steam turbine generator	Unit 1-3: General Electric 3,600 rpm tandem compound double-flow reheat steam turbine generator Unit 4: Westinghouse 3,600 rpm tandem compound double-flow reheat steam turbine generator
Steam-Generator Outlet Temp (°F)	Units 1 and 2: 1,000 Units 3 and 4: 1,050	Unit 1-4: 1,000
Turbine Generator Nameplate (kVA)	Unit 1: 657,070 Unit 2: 617,900 Units 3 and 4: 724,445	Unit 1: 367,5000 Units 2 and 3: 350,000 Unit 4: N/A
Primary Fuel	Refined Coal	Bituminous Coal
	NO_x: 1,877	NO_x: 589

PARAMETER	CROSS	WINYAH
2018 Plant Emissions (tons/year)	SO_2: 2,545	SO_2: 409
	CO_2: 7,836,139	CO_2: 1,404,598
Air Quality Control Systems	Electrostatic precipitators (ESPs) and scrubbers	ESPs and scrubbers
Fuel Supply	Harvey, Enlow Fork, Bailey White Oak mines	Harvey, Enlow Fork, Bailey White Oak mines

Cross has one Foster Wheeler, one Combustion Engineering, and two Alstom coal fired boilers, which drive four General Electric (GE) steam generating turbines. Units 1, 2, 3, and 4 achieved CODs in 1995, 1983, 2007, and 2008, respectively.

Winyah has four Riley Stoker coal fired boilers, which use bituminous coal as the primary fuel. The facility's electric generating turbines include three GE turbines and a Westinghouse turbine. The units achieved CODs in 1975, 1977, 1980, and 1981.

The majority of Santee Cooper's coal supply comes from Consol Pennsylvania Coal Company (Consol) and Alliance Coal (Alliance). Santee Cooper entered into two 3 year coal supply agreements with Consol and Alliance, effective on January 2019. Consol supplies Northern Appalachian coal to the Cross and Winyah generating facilities; the coal originates in the Harvey, Enlow Fork, and Bailey mines in Western Pennsylvania. Alliance provides Illinois Basis coal to Cross and Winyah facilities; the coal originates in Hamilton County, Illinois, more specifically from White Oak Mine. Santee Cooper also has coal supply agreements from the Central Appalachian region, which has a lower sulfur content, for both generating facilities. All suppliers transport the coal into the generating facilities using 110 car trains. Santee Cooper reports that the terms of the coal supply agreement allow it to defer allocated coal deliveries from one power station to the other if desired. At the time of the Site Visit, approximately 50 percent of coal supplies were Illinois Basin; the remaining approximately 50 percent was Appalachian.

The power generated at Cross is transmitted over six 230 kV transmission lines spanning nearly 160 miles. Power generated at Winyah is transmitted through three 115 kV and four 230 kV transmission lines, spreading over 145 miles.

The water used in the Cross plant's operations comes from a manmade diversion canal between Lake Moultrie and Lake Marion, the latter of which is supplied by the Santee River. The canal is located approximately a mile away from the facility. The Winyah generating facility uses water from the North Santee River and Wadmacon Creek. The Cross and Winyah generating facilities both have on-site water treatment facilities, which allows the Winyah facility to discharge water to Turkey Creek at a higher quality than the intake. Generally, Santee Cooper does not report any issues in water quality for plant operational purposes.

Black & Veatch notes that the design of coal facilities varies geographically because of differences in regulation, permitting, and available resources. Black & Veatch considers the design and major equipment and systems of Cross and Winyah to be consistent with accepted industry practice for coal plants of their vintages in the region.

4.3.3 Operations and Maintenance

4.3.3.1 Organizational Structure

Santee Cooper's coal fired electric generating facilities represent approximately 67 percent of Santee Cooper's total available capacity, making it the largest current component of Santee Cooper's generation fleet in terms of capacity. Consequently, the operations of the coal fired electric generating facilities are overseen by two functional groups, one for the Cross plant and one for the Winyah plant. The director for each of the functional groups reports directly to the Vice President of Generation Stations.

Figure 4-2 presents Cross plant's O&M organizational chart, consisting of approximately 219 employees.

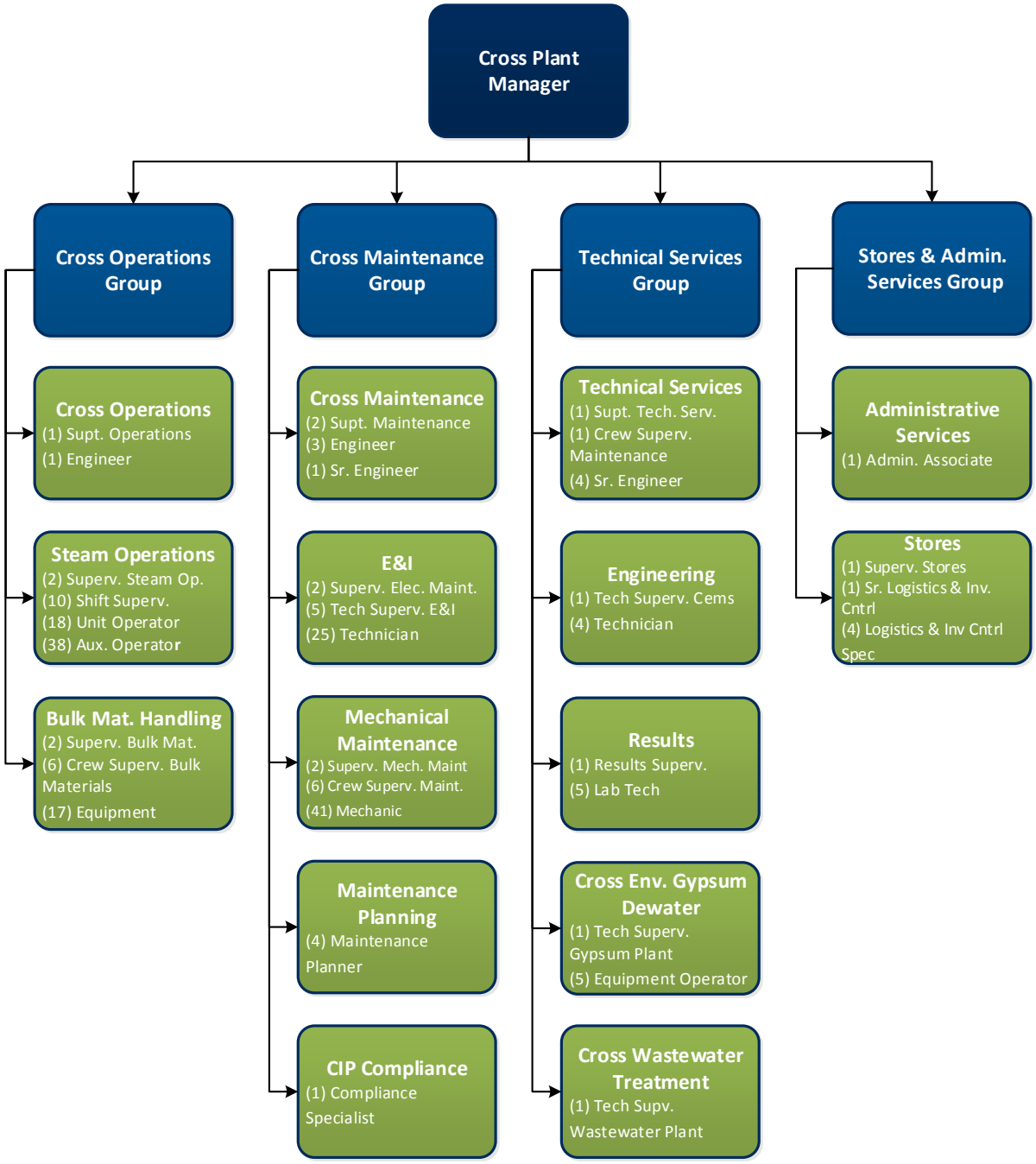


Figure 4-2 Cross Operations and Maintenance Organizational Chart

A plant manager oversees the Cross plant's four main groups: operations, maintenance, technical services, and stores and administrative services. The operations group, composed of 95 employees, is responsible for the operations and bulk material handling in the generating facility. The maintenance group, composed of 92 employees, is responsible for the maintenance procedures and repairs for all the units. The technical services group, composed of 24 employees, is responsible for providing engineering support, lab analysis, and water treatment to the plant. Finally, the stores

and administrative services group, composed of seven employees, is responsible for logistics and storage needs of the plant.

Figure 4-3 presents Winyah plant's O&M organizational chart, consisting of approximately 186 employees.

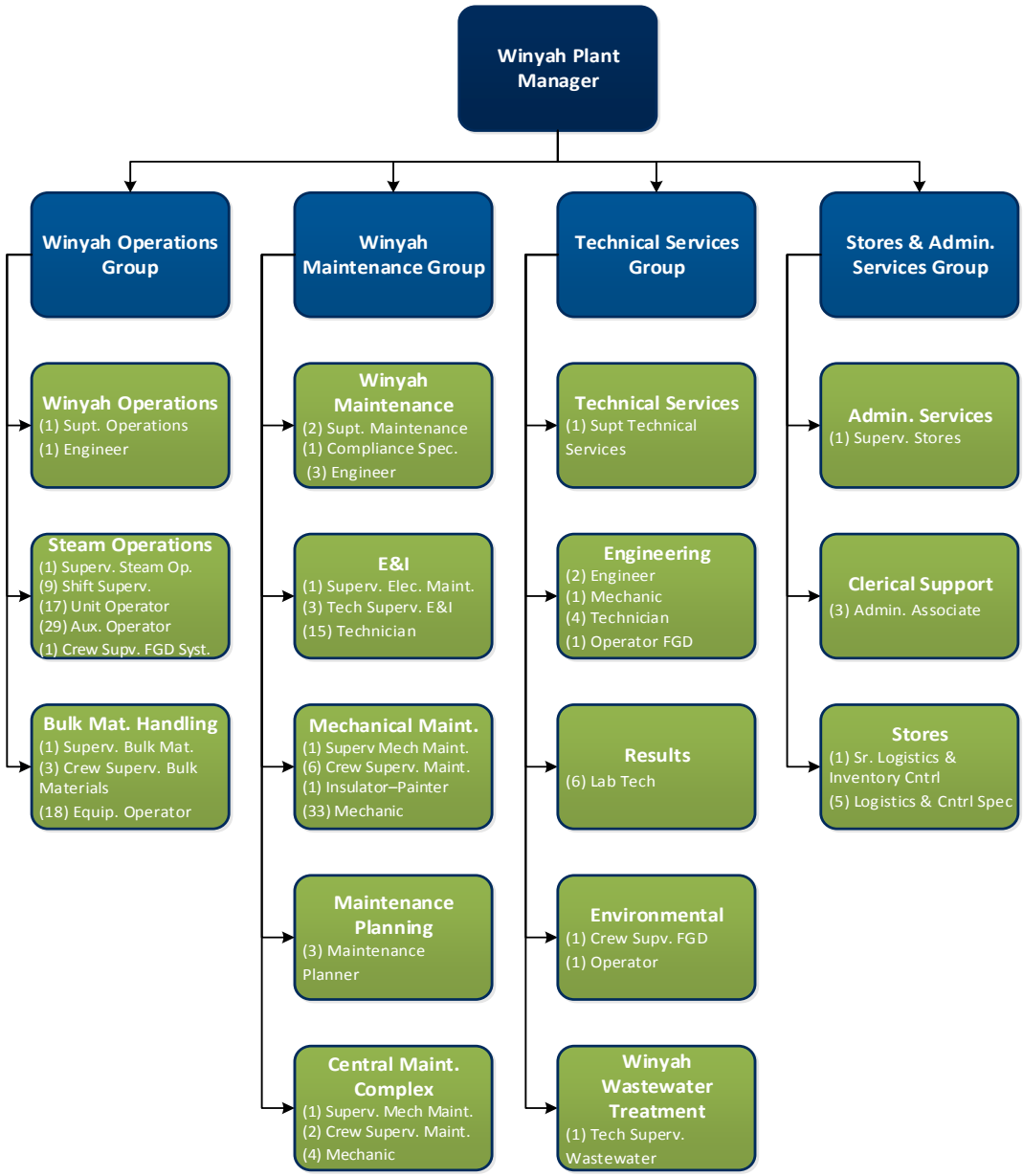


Figure 4-3 Winyah Operations and Maintenance Organizational Chart

A plant manager oversees the Winyah plant's four main groups: operations, maintenance, technical services, and stores and administrative services. The operations group, composed of 81 employees, is responsible for the operations and bulk material handling in the generating facility. The maintenance group, composed of 76 employees, is responsible for the maintenance procedures and repairs for all the units. The technical services group, composed of 18 employees, is responsible for providing engineering support, lab analysis, and water treatment to the plant. Finally, the stores

and administrative services group, composed of 10 employees, is responsible for logistics and storage needs of the plant.

Overall, Black & Veatch considers the level of O&M staffing at Cross and Winyah to be consistent with expectations for the size and design of the facilities.

4.3.3.2 O&M Plan and Procedures

Santee Cooper operates and maintains the Cross and Winyah generating facilities with its O&M groups.

Historically, every 2 years, Cross and Winyah underwent planned overhauls of 3 to 6 weeks for their respective units. During this period, the Cross and Winyah units were scheduled to have several maintenance services to repair, replace, or upgrade aging plant equipment. Maintenance services include cleaning of the unit and its main components and general maintenance and inspections to the boiler, waterwalls, turbines, and valves.

Black & Veatch reviewed a draft of Santee Cooper's planned maintenance schedule from 2020 to 2039, which is consistent with the historical planned maintenance scopes for both plants. For Cross, units 3 and 4 are expected to be serviced for 3 to 5 weeks every 24 months. All Winyah units and Cross units 1 and 2 will continue to utilize a similar outage scope, but are being moved towards operating hours-based maintenance intervals rather than regular calendar-based outages like on the baseload Cross. Black & Veatch has observed operating hours-based maintenance cycles for other, similar coal facilities and believes that this practice is reasonable.

In addition to planned overhaul, shorter planned outages are scheduled throughout each year to address other issues as they may be uncovered with the goal of avoiding, to the extent possible, unplanned forced outages of the units.

4.3.4 Site Visit Observations

During the Site Visit, two representatives from Black & Veatch visited Cross and Winyah. At each facility, Black & Veatch began with a safety briefing and a meeting with key plant O&M personnel to discuss the features and operations of the facility. Black & Veatch then performed a walkdown of each site, visually observing the following:

- Control room
- Turbine hall
- Boilers
- Coal yard
- Ash ponds/landfills

During the site tour, Black & Veatch found the facility and all major equipment to be well kept and generally organized in accordance with industry practices. Plant personnel were knowledgeable, and the staffing model is similar to comparable facilities that Black & Veatch has observed.

During the Site Visit, Santee Cooper reported approximately 1,275,000 tons of coal at Cross and 450,000 tons of coal at Winyah.. Santee Cooper is currently evaluating the coal reserve needs at each facility, and intends to manage the coal supplies down to lower levels based on operating

levels by the mid-2020. Coal is divided into different piles according to origin and sulfur content, which operators blend based on each individual unit's ability to burn higher sulfur content coal.

4.3.5 Historical Performance

This section discusses the historical performance and operating factors for the Cross and Winyah coal power plants.

The comparable industry average for the Cross units was as reported in NERC Generating Availability Data System (GADS) for coal fired fossil-steam plant units between 500 MW and 700 MW in NERC's Reliability First Corporation (RFC), Southeast Electric Reliability Council (SERC), and Florida Reliability Coordinating Council (FRCC) regions that achieved commercial operations between 1985 and 2015. Similarly, the comparable industry average for the Winyah units was as reported in NERC GADS for coal fired fossil-steam plant units between 200 MW and 400 MW in NERC's RFC, SERC, and FRCC regions that achieved commercial operations between 1970 and 1995.

The historical Equivalent Availability Factor (EAF) for Cross from 2014 through 2019 averaged 87.1 percent for Unit 1, 60.0 percent for Unit 2, 68.4 percent for Unit 3, and 83.0 percent for Unit 4, which were lower than the industry average of 86.0 percent, except for Unit 1. Cross experienced planned maintenance services, which decreased the EAF of the units during this period. In October 2017, Unit 1 did not generate because of planned outage to replace reheat tubes, which totaled 562 hours of downtime. Cross Unit 2 was mothballed and did not operate from March 2017 to November 2018. Unit 2 was also not available from March 2019 to May 2019 because of a bottom ash system conversion, which led to 2,169 hours of downtime. Planned maintenance services for Unit 3 and Unit 4 for tube modifications were performed in April 2014 and April 2019, respectively. Another scheduled outage for Unit 4 occurred in March 2015 to complete a major boiler overhaul, which resulted in 860 hours of downtime.

Similarly, the Equivalent Forced Outage Rate demand (EFORd) for Cross from 2014 through 2019 averaged 4.5 percent for Unit 1, 5.9 percent for Unit 2, 4.33 percent for Unit 3, and 9.0 percent for Unit 4, which were higher than the industry average EFORd of 3.7 percent. The high EFORd performance of Unit 4 was primarily because of the replacement of the bottom ash system, which was structurally damaged in March 2017. Unit 1 also experienced several forced outages in 2014 and 2019, primarily caused by tube leaks in the economizer and the replacement of air heater sector plates and catalysts. For Unit 3, a forced outage in June 2015 to repair the outer shell of the turbine resulted in more than 489 hours of downtime. A tube leak in the boiler of the unit was also found in April 2018, which totaled 131 hours of downtime, increasing the EFORd for this period.

The historical EAF for Winyah from 2014 through 2019 averaged 89.9 percent for Unit 1, 91.5 percent for Unit 2, 90.6 percent for Unit 3, and 89.3 percent for Unit 4, which were higher than the industry average EAF of 85.5 percent. Unit 1 experienced a planned general maintenance during March 2015, which led to a lower EAF during this period. Unit 2's lower EAF during November 2016 and November 2017 was the result of reserve shutdown, which occurs when there is n excess generation capacity to meet demand and a generating unit must be temporarily taken offline. Unit 3 experienced a regular planned maintenance outage in May 2014, which allowed general repairs throughout the plant. Similar repairs were performed in April 2016 and March 2018. For Unit 4, general unit maintenance activities were scheduled in March 2016 and 2017, which decreased the average EAF for the unit during these periods. In January 2019, Unit 4 experienced low EAF because of a planned maintenance of the ESP, which had to be replaced in June 2019, causing 450 hours of downtime during this period.

Similarly, the EFORd, for Winyah from 2014 through 2019 averaged 6.4 percent for Unit 1, 5.6 percent for Unit 2, 3.2 percent for Unit 3, and 4.7 percent for Unit 4, which were lower than the industry average EFORd of 5.6 percent, except for Unit 1, whose higher EFORd were the result of forced outages in 2015 through 2019. During this period, Unit 1 experienced several outages because of a step-up transformer failure in 2015, loss of boiler in 2018, and pump issues in 2019. When the generator failure in Unit 1 is taken into account, the average EFORd performance of all units is considered reasonable and slightly more favorable than the industry average EFORd. Unit 2 also experienced several forced outages in 2015 and 2019 because of leaks in the superheater and the replacement of the opacity monitor. The EFORd for Unit 3 was increased in March of 2015 and December 2018 because of unscheduled outages, which were the result of a pulverizer overhaul and tube leaks in the boiler waterwall. Unit 4 experienced forced outages in 2014 and 2015, which were caused by ash obstructing the east/west economizer and tube leaks in the superheater.

The monthly historical EAF and EFORd for Cross and Winyah compared to the industry averages are shown in Appendix A.

4.3.6 Retirement

Santee Cooper has announced its intention to retire Winyah in a staged fashion, beginning with Units 3 and 4 in 2023, and later retiring Units 1 and 2 in 2027.

The decommissioning of a coal power unit can take different forms.

If a single unit at a site is to be decommissioned, steps could include such items as disconnecting and disabling items as coal and water feed equipment, putting equipment into a storage mode, shutting down applicable support equipment such as dedicated cooling towers and pollution control equipment, responding to applicable permit conditions including notifications and reporting requirements, and implementing protective safety measures for the inactive equipment and facilities.

If more than one unit is decommissioned, additional steps may include removal and cleanup of coal storage and loading areas, compliant closure of water treatment and combustion ash handling systems, and shutdown of dedicated piping systems and support facilities.

A final decommissioning with removal of equipment for one or more units may involve selling surplus equipment; recycling materials as possible; full/safe demolition of unneeded buildings, stacks, rail lines, tanks, etc.; and full or partial site remediation and restoration as required.

Power plant decommissioning includes administrative responsibilities with such organizations as public utility commissions and environmental agencies.

4.3.7 Environmental Remediation

Santee Cooper has included $341 million in its 2019 Business Forecast (dated September 9, 2019) to carry out the dewatering, excavation, and disposal of its various ash ponds at Cross and Winyah, as well as the already-retired Grainger and Jefferies facilities and other environmental remediations. In an effort to evaluate the 2019 Business Forecast's budget for this line item, Black & Veatch conducted a high-level review of each ash pond's closure plan, as provided by Santee Cooper, and conducted a review and comparison of the official closure plans for the following assets: Grainger, Winyah, Cross, and Jefferies. While documentation is limited regarding the current status of pond's remediation, the following is a summary of the status for each project.

While Black & Veatch has not completed a bottom-up analysis of the reasonableness of Santee Cooper's ash pond excavation estimates, it has carried out a review of the closure plans for each of the remaining ash ponds identified above. Black & Veatch has evaluated assumed disposal costs on a per-ton basis, and reviewed the reported status of the excavation work being carried out at each of the existing ash ponds. Assuming Santee Cooper continues to follow these plans (excavation and improvement schedules are followed), Black & Veatch believes the estimates provided by Santee Cooper are reasonable.

- Grainger:

- The facility was decommissioned in 2012; both of the plant's ash ponds must be closed by December 31, 2023, with Santee Cooper working to make a good faith effort to complete the effort by end of 2020.
- All coal combustion residuals (CCR) and contact soil have been removed from ash pond 1.
- All CCR have been removed from ash pond 2 except for small amounts of ash in limited areas of the dikes, which will be removed after excavation of the pond bottom is complete. Excavation of residual soil underneath the coal ash remains.
- Santee Cooper has estimated that remaining excavation and disposal of Grainger's ash ponds will cost approximately $5.215 million in 2020, with an additional estimated $44 thousand projected to be spent between 2021 and 2024 on other restoration and remediation work.

- Winyah:

- Santee Cooper has stated that it intends to retire two of the four units in 2023, and the remaining two units in 2027.
- The Unit 2 slurry pond is officially closed through removal of CCR, and in its place is a Class 3 landfill.
- West ash pond is temporarily capped and is scheduled to close by removal by 2030. Santee Cooper has estimated that remaining closure costs are equal to approximately $28.6 million, with work expected to be carried out between 2027 and 2029.
- CCR from the A, B, and South ash ponds are expected to be provided to South Eastern Fly Ash for external sales for beneficial reuse, and directly to Holcim, Inc. and others for beneficial use as cement through 2025. A total of $20.4 million is estimated for the supply and delivery of material to Holcim, and $35.1 million South Eastern Fly Ash.
- Ash pond A is scheduled to close by 2026, with Santee Cooper estimating that $14.3 million will be spent on the excavation of the pond. Ash pond B is scheduled to close by 2025. Santee Cooper has estimated that $21.3 million will be spent, primarily between 2023 and 2024, on dewatering, excavation, and disposal. Estimated costs for disposal of CCR in Ash ponds A and B are based on tonnages that currently remain in the ponds, with an assumption that beneficial use contracts will reduce the tons going into the landfills.
- South Ash Pond is scheduled to close by 2025, and Santee Cooper has estimated that it will spend $14.9 million in 2024 and 2025 for the excavation of the pond.
- Slurry Ponds 3 and 4 are scheduled to close by 2025. Santee Cooper has estimated that it will spend $40.456 million between 2022 and 2024 to excavate and dispose of the ash included in the ponds.

- Winyah's estimates also include additional allocations for landfill construction and other beneficial reuse options.
  - Cross:
- The gypsum filtrate pond is closed via removal of CCR dikes and contact soil.
- The bottom ash pond is scheduled to close by 2025, with Santee Cooper estimating that it will spend approximately $44.9 million from 2020 to 2025 on the closure. The project has been delayed in implementing plant upgrades that will stop wastewater inflows from running into the pond; this is currently expected to be completed in 2020. Excavation work will begin following the completion of these upgrades.
  - Jefferies:
- The facility's coal fired units were retired at the end of 2012, and its oil-fired units were retired in October 2015. Jefferies has two ash ponds, A and B, as well as a small legacy pond that contains ash. Santee Cooper is planning to remove CCR from pond A and the legacy area through beneficial use, with unusable and remaining material being disposed of in 2027. Ash Pond B contains minor amounts of CCR and its excavation will begin once closure of Pond A ash is complete. Santee Cooper is planning to fully excavate the A and B ash ponds by 2030, with an estimated $28.5 million expected to be spent between 2020 and 2027.

4.4 COMBUSTION TURBINE PLANTS

4.4.1 Overview

Santee Cooper's oil and gas fueled combustion turbine plants comprise a combined cycle combustion turbine (CCCT) plant and three simple cycle combustion turbine (SCCT) plants, which collectively account for 1,136 MW of owned capacity, or approximately 21.8 percent of Santee Cooper's total available capacity. An overview of Santee Cooper's oil and gas fired combustion turbine facilities is shown in Table 4-4.

Table 4-4 Overview of Santee Cooper's Combustion Turbine Assets

FACILITY	TYPE	LOCATION	SUMMER OPERATING CAPACITY	UNITS OWNED CAPACITY	SANTEE COOPER OWNERSHIP	COD	FUEL
Rainey Generating Station CC	Combined Cycle	Anderson County, SC	460 MW	Unit 1S: 190 MW* Unit 1A: 170 MW* Unit 1B: 170 MW*	100%	Sep 2001	Primary: Natural Gas
Rainey Generating Station CT	Combustion Turbine	Anderson County, SC	517 MW	Unit 2A: 146 MW Unit 2B: 146 MW Unit 3: 75 MW Unit 4: 75 MW Unit 5: 75 MW	100%	2A: Mar 2002 2B: May 2002 3: Jan 2004 4: Jan 2004 5: Jan 2004	Primary: Natural Gas
Hilton Head CT	Combustion Turbine	Beaufort County, SC	84 MW	Unit 1: 16 MW Unit 2: 16 MW Unit 3: 52 MW	100%	1: Aug 1973 2: Aug 1974 3: Apr 1979	Primary: Distillate Fuel Oil
Myrtle Beach CT	Combustion Turbine	Horry County, SC	75 MW	Unit 1: 8 MW Unit 2: 8 MW Unit 3: 19 MW Unit 4: 19 MW Unit 5: 21 MW	100%	1: Aug 1972 2: May 1962 3: May 1962 4: Aug 1972 5: Jun 1976	Primary: Distillate Fuel Oil Secondary: Natural Gas

*Breakdown per winter operating capacity.

4.4.2 Design and Major Equipment

Table 4-5 provides an overview of the design and major equipment characteristics of Santee Cooper's oil and gas fired combustion turbine facilities.

Table 4-5 Overview of Major Santee Cooper Combustion Turbine Plants' Facility Equipment

FACILITY	PRIME MOVER	COMBUSTION TURBINE	HEAT RECOVERY STEAM GENERATOR (HRSG)	STEAM TURBINE	CT GENERATOR	ST GENERATOR
John S Rainey CC	Combined Cycle	Unit 1A: GE 7F.04 Unit 1B: GE 7F.04 Unit 1S: GE D11	NEM	GE	GE	GE
Rainey Generating Station CT	Gas Turbine	Unit 2A: GE 7F.04 Unit 2B: GE 7F.04 Unit 3: GE 7E.03 Unit 4: GE 7E.03 Unit 5: GE 7E.03	NEM	GE	GE	N/A
Hilton Head CT	Gas Turbine	Unit 1: GE MS5001-P Unit 2: GE MS5001-P Unit 3: GE 7B	N/A	N/A	GE	N/A
Myrtle Beach CT	Gas Turbine	Unit 1: GE MS5001-D Unit 2: GE MS5001-D Unit 3: GE MS5001-N Unit 4: GE MS5001-N Unit 5: Westinghouse W252-B2	N/A	N/A	GE	N/A

Black & Veatch is of the opinion that the major equipment utilized is provided by established OEMs, is suitable for the operations of the respective oil and gas fired facilities, and is similar to equipment at plants of similar type, vintage, and size.

4.4.3 Operations and Maintenance

4.4.3.1 Organizational Structure

The Rainey Generating Station functional group is responsible for the operations of the Rainey combined cycle facility and the Rainey simple cycle combustion turbine driven units of the Rainey Generating Station, which represent the majority of the of Santee Cooper's oil and gas driven combustion turbine facilities. The director of the Rainey Generating Station functional group reports directly to the Vice President of Generation Stations.

Figure 4-4 presents Rainey Generating Station's O&M organizational chart staff, consisting of approximately 38 employees. A plant manager oversees the Rainey Generation Station's three main groups: management, operations, and maintenance. The management group is composed of 2 employees, a senior engineer, and an administrative associate, who together report the plant's performance to the plant manager. The operations group, composed of 21 employees, employs unit operators, auxiliary operators, and shift supervisors who are responsible for operating the five units at Rainey Generating Station. The maintenance group, composed of 14 employees, including mechanics, logistics and control specialists, and technicians for the repair and maintenance of the components in each unit.

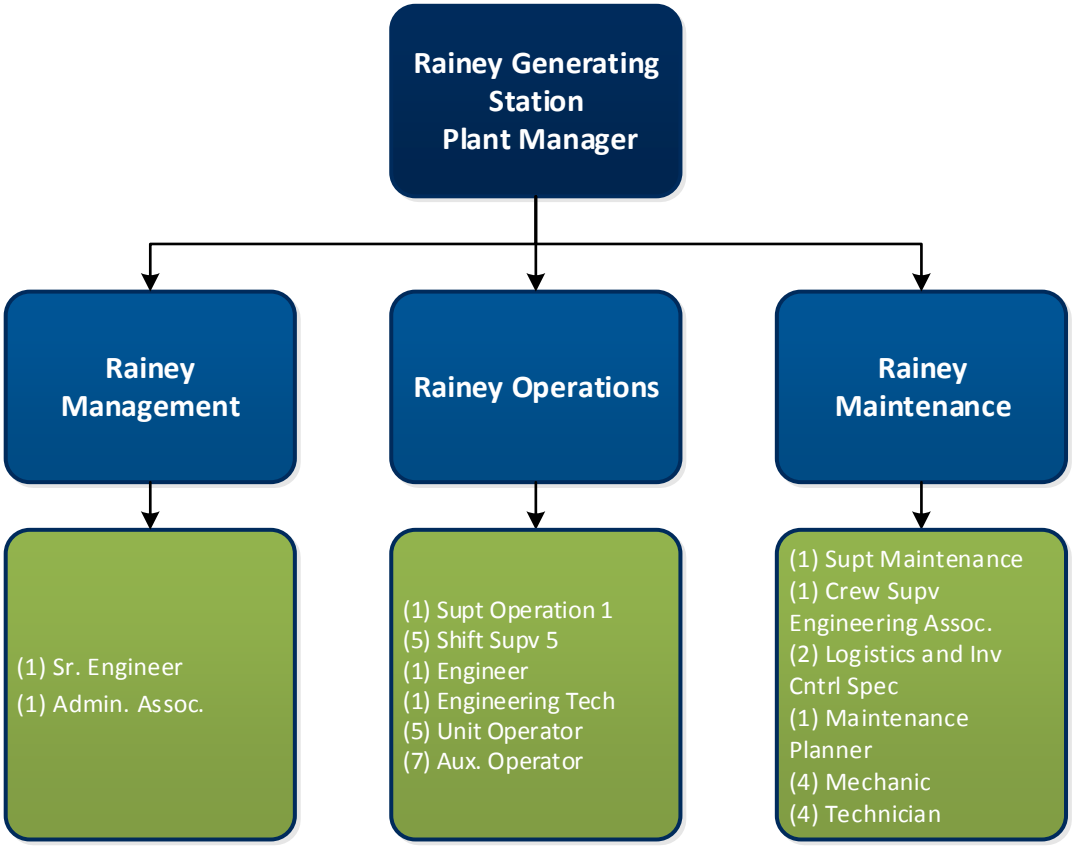


Figure 4-4 Rainey Generating Station Operations and Maintenance Organizational Chart

Overall, Black & Veatch considers the level of O&M staffing at Rainey Generating Station to be consistent with expectations for the size and design of the facility.

4.4.3.2 O&M Plan and Procedures

Santee Cooper's oil and gas driven combustion turbine facilities are operated and maintained by both the operations and maintenance groups. Rainey's maintenance group is composed of 14 staff members, who are responsible for maintenance services to all Rainey's units.

Historically, Rainey's Unit 1A, Unit 1B, and Unit 1S were overhauled for planned maintenance services every 2 years. During this 3 to 4 week period, the units received major inspections to their main equipment, and faulty components were repaired or replaced. The scheduled maintenance

services for Unit 2A, Unit 2B, Unit 3, Unit 4, and Unit 5 were consistently performed for 1 week every 12 months. The maintenance of these units is usually done in September or October of each year. Black & Veatch understands that Units 1 and 4 were overhauled in 2016, and Unit 2 was overhauled in 2015. Unit 3 was overhauled in 2017.

Black & Veatch reviewed the draft of the planned maintenance schedule for Rainey Generating Station from 2020 through 2039. The projected planned maintenance is consistent with historical services performed for each unit. Additionally, several shorter minor planned outages are scheduled throughout each year with the goal of avoiding, to the extent possible, unplanned forced outages of the units.

Table 4-6 Planned Major Maintenance Projects

FACILITY	<2018	2019	2020	2021	2022
John S Rainey CC	CT1: CT + Generator inspection, Major outage ST1S: Major inspection	CT1: Hot reheat piping inspection, attemperators inspection CT1B: High-pressure steam drum inspection	N/A	CT1: Main steam inspection	CT1: High-pressure steam piping
Rainey Generating Station	Unit 4: Generator inspection, Major outage (2016) Unit 5: Generator inspection	Unit 3: HGP/ Compressor inspection	Unit 5: Compressor inspection	Unit 4: Compressor inspection	

Overall, Black & Veatch believes that Santee Cooper's oil and gas fired units have been properly maintained and inspected and that Santee Cooper has a comprehensive and adequate long-term plan to continue operating and maintaining these units consistent with accepted industry practice.

4.4.4 Site Visit Observations

During the Site Visit, two representatives from Black & Veatch visited the Rainey and Myrtle Beach units. During the site tour, Black & Veatch found the facility and all major equipment to be well kept and generally organized in accordance with industry practices. Plant personnel were knowledgeable, and the staffing model is similar to comparable facilities that Black & Veatch has observed.

Black & Veatch understands that, as part of its business plan, Santee Cooper is evaluating the potential to expand capacity at Rainey, either through an additional steam turbine or new combined cycle blocks. From discussions with plant personnel, Black & Veatch understands that additional capacity expansion was considered when siting Rainey and noted that open space for additional generating units existed between the SSCT and CCCT unit blocks. However, expansion at Rainey would also require increase natural gas availability as well as transmission capacity to transmit power to Santee Cooper's load centers across the state. Black & Veatch understands that some incremental generation could be supported by the existing gas interconnection; however, a large CCCT would likely require upgrades such as an upstream compressor station to ensure adequate gas supplies. Additionally, transmission upgrades or transmission wheeling may be required to export approximately 500 to 1,000 MW from a CCCT to Santee Cooper's retail

customers, however Santee Cooper has not yet studied the potential transmission system upgrade needs to support this additional capacity at the time of this Report.

4.4.5 Historical Performance

This section discusses the historical performance and operating factors of Santee Cooper's oil and gas fueled combustion turbine facilities.

The comparable industry averages for the Rainey combined cycle combustion turbine components Unit 1A and Unit 1B were as reported in NERC GADS for combined cycle combustion turbine plant units between 150 MW and 200 MW in NERC's RFC, SERC, and FRCC regions that achieved commercial operations between 1995 and 2005, which usually consists of GE F-Class turbine series. Similarly, the comparable industry average for the Rainey combined cycle steam turbine components Unit 1S was as reported in NERC GADS for combined cycle steam turbine plant units between 100 MW and 300 MW in NERC's RFC, SERC, and FRCC regions that achieved commercial operations between 1970 and 1995. Furthermore, the comparable industry averages for the Rainey simple cycle Units 2A and 2B, Unit 3, Unit 4, and Unit 5 were as reported in NERC GADS for simple cycle gas turbine plant units between 70 MW and 200 MW in NERC's RFC, SERC, and FRCC regions that achieved commercial operations between 2000 and 2010, which usually include GE F-Class and E-Class turbine series. Similarly, the comparable industry average for the Hilton Head and Myrtle Beach's units were as reported in NERC GADS for aeroderivative combustion turbine plant units between 0 MW and 65 MW in NERC's RFC, SERC, and FRCC regions that achieved commercial operations between 1960 and 1980.

For Rainey Units 1A and 1B, the historical EAF from 2014 through 2019 averaged 92.8 percent for Unit 1A and 90.2 percent for Unit 1B, which were higher than the industry average of 87.0 percent. Any drops in EAF were predominantly attributed to scheduled outages, including a major inspection from April 2018 through June 2018. For Rainey Units 1A and 1B, the historical EFORd from 2014 through 2019 averaged 0.6 percent for Unit 1A and 1.0 percent for Unit 1B, which were lower than the industry average of 2.7 percent.

For Rainey Unit 1S, the historical EAF from 2014 through 2019 averaged 93.5 percent, which was higher than the industry average of 91.6 percent. Although this unit maintained a high EAF, it had a few minor outages such as the annual unit outage in May 2014, along with a general unit inspection in March 2016. The only outage that led to a shutdown was the major turbine overhaul that lasted for 1,170 hours from March to June 2018. For Rainey Unit 1S, the historical EFORd from 2014 through 2019 averaged 0.2 percent, which is lower than the industry average of 3.4 percent.

For Rainey Units 2 through 5, the historical EAF from 2014 through 2019 averaged 95.2 percent for Unit 2A, 94.5 percent for Unit 2B, 93.1 percent for Unit 3, 97.3 percent for Unit 4, and 96.8 percent for Unit 5, which were higher than the industry average of 91.4 percent. Drops in EAF were predominantly attributed to scheduled outages, including a major inspection and overhaul at Unit 2B from April to June 2019 and a hot path gas inspection at Unit 3 in June 2015. For Rainey Units 2 through 5, the historical EFORd from 2014 through 2019 averaged 1.3 percent for Unit 2A, 0.2 percent for Unit 2B, 1.6 percent for Unit 3, 1.1 percent for Unit 4, and 0.2 percent for Unit 5, which were lower than the industry average of 5.3 percent. Despite the favorable EFORd, significant forced outages included a forced outage at Unit 3 in October 2015 that lasted 1,350 hours because of a failure of a cranking motor transformer. Other forced outages in the other units were for PM2 gas valve issues in November 2018 (Unit 2A), a failed ignition exciter in October 2016 (Unit 4), and the installation of borescope plugs from April to May 2016 (Unit 5).

The historical EAF for Hilton Head from 2014 through 2019 averaged 82.6 percent for Unit 1, 63.7 percent for Unit 2, and 83.4 percent for Unit 3, which were lower than the industry average of 88.6 percent. In February 2018, a reserve shutdown that repeated itself for 2 months occurred and an outage was scheduled from May to August 2018 because of a breaker fire. The unit has not been operating since. The EFORd for Hilton Head from 2014 through 2019 averaged 3.4 percent for Unit 1, 11.7 percent for Unit 2, and 1.8 percent for Unit 3, which were lower than the industry average of 11.5 percent. A forced outage leading to a reserve shutdown occurred at Unit 2 in January 2018 for a fuel pump issue. Unit 1 and Unit 3 also had forced outages in January 2018 because of a governor control issue and turbine vibration, respectively. Finally, Unit 3 had an additional forced outage in February 2019 to fix a leaking antifreeze line in closed cooling water piping.

The historical EAF for Myrtle Beach from 2014 through 2019 averaged 90.0 percent for Unit 1, 93.8 percent for Unit 2, 89.1 percent for Unit 3, and 91.1 percent for Unit 5, which were higher than the industry average of 88.6 percent. The EFORd for Myrtle Beach from 2014 through 2019 averaged 11.3 percent for Unit 1, 5.6 percent for Unit 2, 3.0 percent for Unit 3, and 8.1 percent for Unit 5, which were lower than the industry average of 11.5 percent.

Overall, Black & Veatch considers Santee Cooper's combustion turbine driven power plant units to be operating in good condition compared to facilities of similar types and vintage.

The monthly historical EAF and EFORd of Santee Cooper's oil and gas driven combustion turbine facilities are shown in Appendix A.

4.5 RECIPROCATING ENGINES

4.5.1 Overview

Santee Cooper's reciprocating engine portfolio comprises 11 reciprocating engine facilities fueled by either landfill gas or distillate fuel oil. In total, Santee Cooper's reciprocating engine portfolio represents 27.4 MW of owned capacity, or approximately 0.5 percent of Santee Cooper's total available capacity. An overview of Santee Cooper's reciprocating engine facilities is shown in Table 4-7.

Table 4-7 Overview of Santee Cooper's Reciprocating Engine Assets

FACILITY	TYPE	LOCATION	SUMMER OPERATING CAPACITY	UNITS OWNED CAPACITY	SANTEE COOPER OWNERSHIP	COD	FUEL
Richland County Landfill	Combustion Turbine and Reciprocating Engine	Richland County, SC	8.7 MW	Unit R1: 5.5 MW Unit R2: 1.6 MW Unit R3: 1.6 MW	100%	Unit R1: Jan 2006 Unit R2 and R3: Dec 2010	Landfill Gas
Lee County Landfill	Combustion Turbine and Reciprocating Engine	Lee County, SC	11.2 MW	Unit L1: 1.9 MW Unit L2: 1.9 MW Unit L3: 1.9 MW Unit L4: 5.5 MW	100%	Unit 1-3: Jan 2005 Unit 4: Jul 2009	Landfill Gas

FACILITY	TYPE	LOCATION	SUMMER OPERATING CAPACITY	UNITS OWNED CAPACITY	SANTEE COOPER OWNERSHIP	COD	FUEL
Anderson Landfill IC	Reciprocating Engine	Anderson County, SC	3.3 MW	Unit A2: 1.6 MW Unit A3: 1.6 MW	100%	Jul 2008	Landfill Gas
Georgetown County Landfill	Reciprocating Engine	Georgetown County, SC	1.1 MW	Unit G1: 1.1 MW	100%	Jan 2010	Landfill Gas
Berkeley Green Power Project	Reciprocating Engine	Berkeley County, SC	3.2 MW	Unit B1: 1.6 MW Unit B2: 1.6 MW	100%	Feb 2011	Landfill Gas

4.5.2 Design and Major Equipment

Table 4-8 provides an overview of the design and major equipment/system characteristics of Santee Cooper's reciprocating engine facilities.

Table 4-8 Overview of Major Santee Cooper Reciprocating Engine Equipment

FACILITY	PRIME MOVER	ENGINE
Lee County Landfill	Reciprocating Engine/CT	Solar Taurus 60 GE Jenbacher J616
Richland County Landfill	Reciprocating Engine/CT	Solar Taurus 60 Caterpillar 3520C
Anderson Landfill IC	Reciprocating Engine	Caterpillar 3520C
Georgetown County Landfill	Reciprocating Engine	GE Jenbacher J320
Berkeley Green Power Project	Reciprocating Engine	Caterpillar 3520C

Black & Veatch is of the opinion that the major equipment utilized is provided by established OEMs, is suitable for the operations of the respective facilities, and is similar to equipment at plants of similar type, vintage, and size. Based on desktop review of asset condition reports, Black & Veatch believes that the reciprocating engine facilities appear to be in good operating condition for assets of their vintage and dispatch characteristics.

4.5.3 Operations and Maintenance

4.5.3.1 Organizational Structure

The HLC functional group is responsible for the operations of the hydroelectric generation assets, the landfill gas fueled reciprocating engines, and the renewable generation facilities. The director of the HLC functional group reports directly to the Vice President of Generation Stations.

Figure 4-5 presents HLC's O&M organizational chart, consisting of 37 employees. A plant manager oversees HLC's five main groups: renewable generation management, hydroelectric operations, renewable generation north, renewable generation south, and renewable generation engineering. The renewable generation management group is composed of two employees, a senior engineer, and an administrative associate, who together report the plant's performance to the plant manager. The hydroelectric operations group, composed of 13 employees, is responsible for the O&M of the hydroelectric generation assets. The renewable generation north group, composed of 10 employees, is responsible for the direct operations and maintenance of the renewable assets located in the northern part of Santee Cooper's territory. Similarly, the renewable generation south, composed of nine employees, is responsible for the direct operations and maintenance of the renewable assets located in the southern part of Santee Cooper's territory. Lastly, the renewable generation engineering, composed of two engineers, is responsible for providing engineering and technical support.

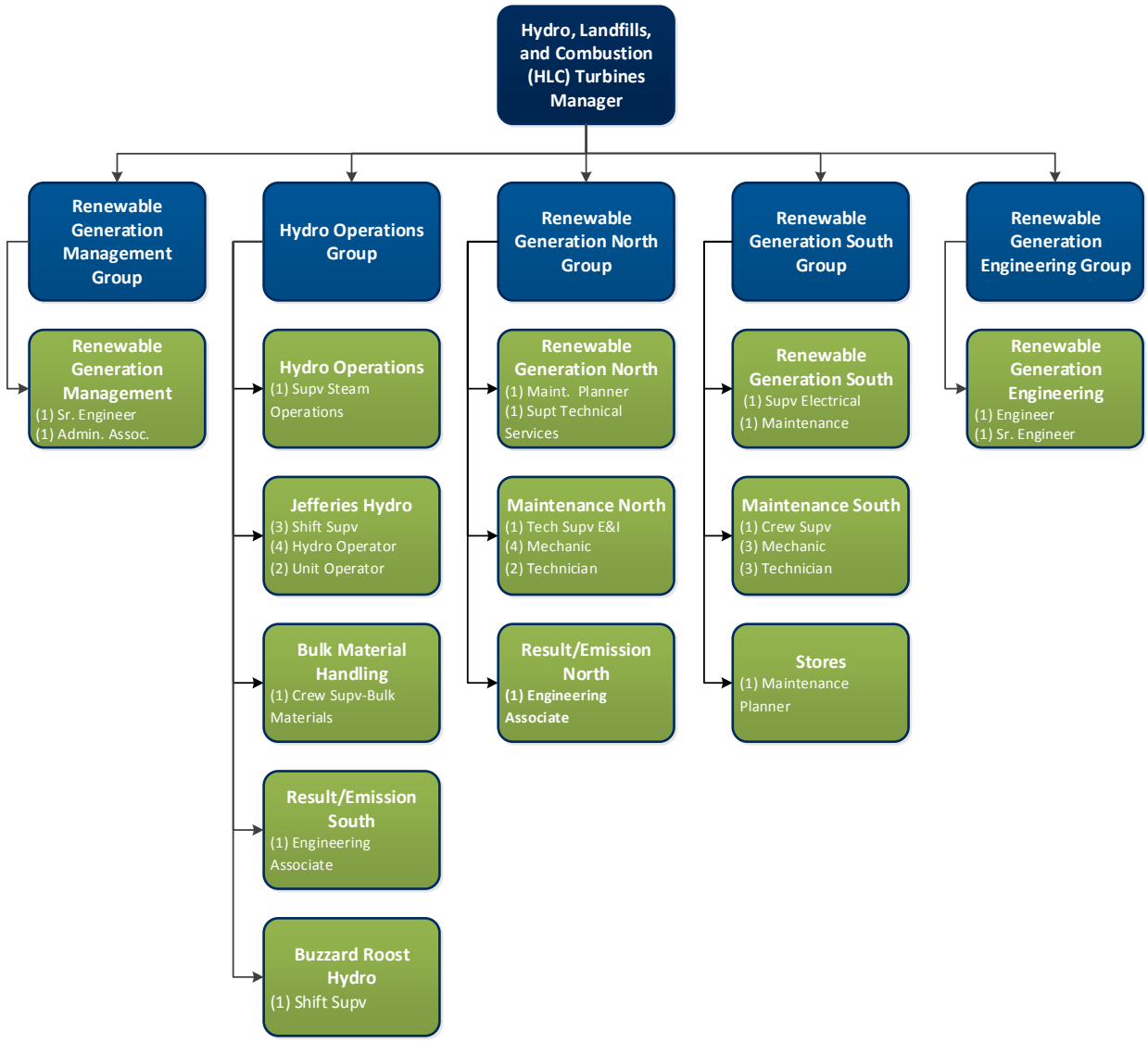


Figure 4-5 HLC Operations and Maintenance Organizational Chart

Overall, Black & Veatch considers the level of O&M staffing for the HLC functional group to be consistent with expectations for the size and design of the hydroelectric generation assets, the landfill gas fueled reciprocating engines, and the renewable generation facilities.

4.5.4 Site Visit Observations

No reciprocating engine sites were visited during the Site Visit; however, a desktop review of reciprocating engine assets was performed including condition reports as discussed above.

4.6 NUCLEAR

4.6.1 Overview

VC Summer is Santee Cooper's only operating nuclear asset. This facility consists of a single operating nuclear unit (Unit 1), which has a total generation capacity of 966 MW. Santee Cooper owns one-third of the capacity, which represents 330 MW, or approximately 6.2 percent of Santee Cooper's total available capacity. The plant is operated by Dominion Energy South Carolina. An overview of VC Summer Unit 1 is shown in Table 4-9.

Table 4-9 Overview of VC Summer Unit 1

VC SUMMER UNIT 1	
Location	Jenkinsville, SC
Summer Operating Capacity	966 MW
Santee Cooper Ownership	33.3%
Owned Capacity	322 MW
Operator	Dominion Energy South Carolina
COD	1983
Reactor License Renewal	2042
Subsequent License Renewal (SLR)	Not yet started; however, a SLR through 2062 is anticipated by Santee Cooper

In addition to Unit 1, construction was begun and ultimately canceled on additional VC Summer Nuclear Station Units 2 and 3. Construction was halted in July 2017, shortly following the bankruptcy announcement of Westinghouse Electric Co., the EPC contractor for the project. This facility, which was partially constructed at the time of cancellation, was planned to have a generation capacity of over 2,100 MW and to be located adjacent to VC Summer Unit 1. While Units 2 and 3 were originally co-developed and owned by Santee Cooper and SCG&E, SCG&E abandoned its ownership stake in the project when it was acquired by Dominion Energy, and subsequently, all equipment and partial construction assets were transferred to Santee Cooper, potentially subject to ongoing disputes with Westinghouse over the ownership of some procured equipment. Black & Veatch understands that the real estate comprising the VC Summer Units 2 and 3 site is jointly owned by Santee Cooper and Dominion. Black & Veatch also notes that on-site interconnection facilities and regional transmission upgrades designed to allow the export the 2,000 MW capacity associated with VC Summer Units 2 and 3 have already been completed, placed

in service, and are owned by Santee Cooper. Black & Veatch understands that this existing interconnection infrastructure, which appears to be adequate to export the planned natural gas generation capacity, could be utilized for other potential new generation at the VC Summer site, which is why Santee Cooper has identified it as a potential site for a new CCCT.

4.6.2 Design and Major Equipment

Table 4-10 provides an overview of the design and major equipment/system characteristics of VC Summer Unit 1.

Table 4-10 Overview of Santee Cooper's Major Facility Equipment

VC SUMMER NUCLEAR STATION	
Reactor	Pressurized Water Reactor (PWR)
Reactor Manufacturer	Westinghouse Electric Co.
Reactor Type	3 Loop PWR
Water Source	Monticello Reservoir
Primary Fuel	Uranium 235 and 238

VC Summer Unit 1 operates using a 3 loop PWR. The 3 loop PWR reactor uses uranium as its primary fuel. The nuclear steam supply system (NSSS) comprises three steam generators (high, medium, and low pressure), one pressurizer, three reactor circulating pumps, and one reactor vessel. The Monticello reservoir was built specifically for water usage for the plant and is located adjacent to the plant. The reservoir is approximately 300 acres.

4.6.3 Operations and Maintenance

4.6.3.1 Organizational Structure

VC Summer Unit 1 is operated and maintained by Dominion Energy; Santee Cooper bears a pro-rata responsibility for its share of O&M and fuel costs but is not directly responsible for providing O&M services for the facility. VC Summer Unit 1 has a staff of approximately 650 professionals, in addition to another 150 security professionals. Santee Cooper's nuclear holdings, largely consisting of coordination with Dominion Energy, are managed by the Senior Vice President and General Counsel.

4.6.3.2 O&M Plan and Procedures

VC Summer Unit 1

As is typical for a PWR nuclear facility, VC Summer Unit 1 typically operates as a baseload resource generating at its full capacity between 18 month fuel cycles with only downtime scheduled for those refueling outages. Santee Cooper reports that the plant is in good standing with the Nuclear Regulatory Commission (NRC) and the Institute of Nuclear Power Operations (INPO). The NRC measures nuclear plant performance by monitoring objective performance indicators and by conducting the NRC inspection program. Monitoring and inspection closely focus on those plant activities having the greatest impact on safety and overall risk. In addition, the NRC conducts both periodic and annual reviews of the effectiveness of each utility's programs to identify and correct

problems. Over the last four quarters, VC Summer Unit 1 has three green findings and no white, yellow, or red audit findings. A green finding is the least significant finding, which does not indicate material operational issues.

Major capital improvement projects are performed during refueling outages at 18 month intervals, and non-outage work performed between refueling outages. Typical major and minor modification work is expected for this vintage plant over the next 7 years. The planned modifications are required to meet the license extension for the plant to 2042. At the time of this report, all NRC Fukushima Orders have been fully implemented, and the plant is in compliance.

O&M activities are incorporated into a Work Management System and associated Computerized Maintenance Management System that are scheduled, reported on, and monitored in SAP. Dominion South Carolina employs a centralized approach toward asset management of the plant. Plant personnel are generally responsible for prioritizing, planning, implementing, and tracking O&M activities and initiatives. Near- and long-term planning begins at the plant level, from routine maintenance activities to major outage work. Plans are escalated through the organization via an annual budget approval process. Black & Veatch finds this approach to be well suited for VC Summer Unit 1 and consistent with other nuclear utilities.

Dominion South Carolina mitigates potential major equipment problems by maintaining long-term service agreements with OEMs. The timing of the major maintenance modifications was predicated upon observed condition, OEM recommendations, and identified operational issues with the plant.

Overall, Black & Veatch believes that VC Summer Unit 1 has been properly maintained and inspected and that Dominion South Carolina and Santee Cooper appear to have a comprehensive and adequate long-term plan to continue operating and maintaining this facility consistent with requirements of the NRC and INPO.

4.6.4 Site Visit Observations

On September 19, 2019, two representatives from Black & Veatch visited VC Summer Unit 1, as well as partial construction and equipment warehouses associated with Units 2 and 3.

VC Summer Unit 1

Black & Veatch conducted a general walkdown of VC Summer Unit 1. During the Site Visit, Black & Veatch found the facility and all major equipment to be well kept and generally well organized in accordance with industry practices. Plant personnel were knowledgeable, and the staffing model is similar to comparable facilities that Black & Veatch has observed. Safety at the plant is running a 0.11 incident rate, which is better than the industry average. Yearly dose count for employees is trending well below required NRC levels at 2 mREM/year, which is in line with Black & Veatch's expectations for PWR technology.

The plant has a 10 CFR Part 72 Independent Spent Fuel Installation (ISFSI) facility to store spent fuel. ISFSI storage campaigns are in process during scheduled refueling outages. There are no major modifications required for Unit 1 that rely on completion of Units 2 and 3.

Santee Cooper reports that the current nuclear fuel agreement is not competitive with the US nuclear market. However, operating personnel believe they will be able to take advantage of Dominion's fleet agreement for future nuclear fuel cycles, reportedly beginning after the next refueling outage, resulting in reduced costs.

The plants DTF is properly funded for the age of the plant, and at the time of this report, no known gaps have been identified. Santee Cooper reports a total net DTF obligation of $414.8 million and that the DTF is approximately halfway funded with a balance of $214.3 million as of December 31, 2018. Santee Cooper will need to accumulate the remaining funding over the balance of VC Summer Unit 1's operational life (currently approved through 2042 and expected to be extended through 2062), which Black & Veatch understands is a recoverable expense under Santee Cooper's rate base.

VC Summer Units 2 and 3

Black & Veatch toured the construction footprint associated with both Units 2 and 3, as well as material lay-down yards for commodities, such as rebar and conduit, and equipment warehouses for higher value pieces of equipment. Santee Cooper reports an estimate 2,500 pieces of equipment are considered high valued assets on-site. Overall, Santee Cooper estimates approximately 314,000 procured pieces of equipment are on-site in either installed structures, tents, warehouses, or lay-down yards; however, official documentation of on-site materials and equipment is inconclusive and largely retained by Westinghouse.

The warehouses appeared to be in good condition, and the equipment is being properly maintained. Much of the warehoused equipment is still in the shipping containers.

Black & Veatch notes that there was a lapse in documentation of maintenance for approximately a year (mid 2017 to mid 2018), while SCG&E was in the process of releasing ownership and transferring its NRC license for the material to Santee Cooper. The temperature in tent structures for high valued assets was not documented – and potentially not maintained – through the winter of 2017. Fluor Corporation (Fluor) is currently maintaining the assets for Santee Cooper, with 12 non-manual workers and 9 craft professionals on-site. Because of this lapse in maintenance and documentation, Black & Veatch believes that the general condition of the site is not acceptable for reliable resale of the procured equipment being stored at the site. To be returned to sellable condition, many high valued assets would require additional testing by their OEMs or other similarly qualified entities.

The condition of equipment observed in the lay-down yards varied. Cabling and equipment in some areas were covered in tarps but may have been covered only recently. Many commodities were exposed to the elements and showed signs of oxidation. Major equipment being stored on dunnage in the lay-down yards were observed to be leaning and inadequately supported. Both steam generators for Unit 3 are not in tent structures. They were observed to be covered in tarps and reportedly maintained in a nitrogen environment; however, this could not be confirmed.

Numerous large tent structures house significant equipment such as high pressure and low pressure rotors and integrated reactor head assemblies. While this equipment is protected from the elements, there were signs of oxidation on exposed carbon steel material.

4.6.5 Historical Performance

Figure 4-6 depicts the historical baseload availability of Santee Cooper's nuclear asset, as compared to the industry average availability factor (AF). The comparable industry average was as reported in NERC GADS for nuclear units between 500 MW and 1,500 MW in all NERC regions.

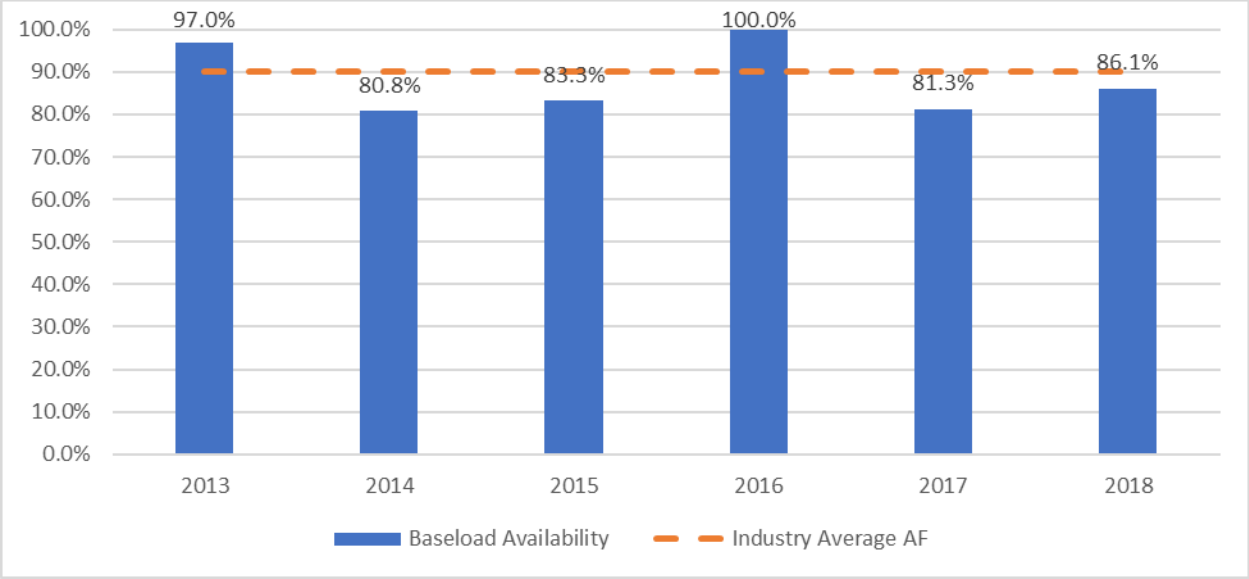


Figure 4-6 Nuclear Assets Historical and Industry Average Availability

From 2013 through 2018, the historical baseload availability of the nuclear facilities averaged 88.1 percent, which is line with industry average AF of 89.9 percent. Black & Veatch understands that the drop in availability was predominantly the results of the refueling outages occurring in spring 2014, fall 2015, spring 2017, and fall 2018. During the Site Visit, Dominion South Carolina reported that refueling outages typically last between 40 to 50 days at VC Summer Unit 1, which is higher than the industry average of approximately 35 days and the NRC standard of excellence at around 25 days. Dominion South Carolina reports that, beginning at the next planned outage in spring 2020, it plans to reduce outage time to approximately 35 days through a combination of prioritizing upgrades and modifications and utilizing more staff to perform more work in parallel. If successful, a reduction in refueling outage time would result in a higher AF for the facility.

4.6.6 Potential Sale of Unit 2 and 3 Materials and Equipment

As part of its Business Plan, Santee Cooper reportedly intends to sell some portion of the equipment and materials procured for VC Summer Units 2 and 3 to pay down a portion of its nuclear debt. In the Business Plan, Santee Cooper assumes a resale value of $425 million for this equipment, which Black & Veatch understands is based on a valuation study performed by Gibbs International, Inc. in September 2019, and discussions with Westinghouse and other parties. Additionally, Black & Veatch understands that the reported original contract value of equipment and materials on-site for VC Summer Units 2 and 3 is as follows:

- $1.5 billion in high value equipment.
- $500 million in commodities such as rebar and conduit.
- $1.0 billion in materials that have been installed, such as foundations and structural steel.

Black & Veatch has previous experience in performing an in-depth, bottoms-up valuation of the potential resale value of AP1000 nuclear units, which is the basis of this analysis, along with on-site

observations of equipment and material condition and discussions with Santee Cooper and Dominion Energy professionals regarding that equipment.

Black & Veatch estimates that Santee Cooper could potentially recoup approximately $30 to $150 million from the sale of VC Summer Units 2 and 3 equipment and materials, based on the following observations and opinions:

- Nuclear project equipment is highly specialized to the nuclear plant design, and there are currently no plans in the US market to construct additional new nuclear generating capacity, which makes reuse in the US market unlikely. Additionally, with the exception of more commodity type materials and minor equipment, it is unlikely that much of the high value equipment could be repurposed to a different technology type.
- Based on Black & Veatch's experience, many built-in components such as control room cabinets or main condensers that would have met Santee Cooper's threshold for high value based on contract value are project-specific and do not have a material resale value. Based on Black & Veatch's understanding of the bill of materials of an AP1000 unit, Black & Veatch estimates that approximately 2/3 of the "high value" components may fall into this category and, therefore, warrant scrap value.
- For high value components that may be resold and repurposed, Black & Veatch has observed resale prices ranging from $0.06 to $0.30 on the dollar, depending on variables such as market factors equipment conditions

- Black & Veatch understands that Westinghouse reports an opportunity to sell much of the Units 2 and 3 equipment to China. Black & Veatch has previously evaluated similar scenarios and has found that repurposing 60 Hz electrical equipment for a 50 Hz electrical system can be difficult and potentially cost-prohibitive when considering disassembly, repackaging, shipping, and conversion, which will negatively impact the resale value of the electrical components to China.
- The equipment and materials Black & Veatch observed on-site appeared to be in good physical condition; however, Black & Veatch understands that no official condition assessment or maintenance was performed for approximately 1 year, which would result in the need to re-test and certify much of the high value equipment for NRC or similar compliance. In addition, much of this equipment is likely or will likely be out of warranty once it is sold.
  - Considering these factors, Black & Veatch believes that the approximately $500 million in high value equipment that may be resold would have a value ranging from $30 million ($0.06 on the dollar) to $150 million ($0.30 on the dollar). Because of 60 Hz vs. 50 Hz incompatibility, Black & Veatch believes that the lower end of that range appears more reasonable for electrical equipment, while it is possible mechanical equipment may merit a premium nearer to the top end of the range.
- Considering the blend of electrical vs. mechanical equipment, as well as the customization of AP1000 mechanical components to those electrical components, as a base case Black & Veatch believes that the overall aggregate value of those high value components that may be resold will be closer to the bottom end of that range ($0.06 on the dollar).
  - As a base case assumption, Black & Veatch believes that the remaining 2/3 of high value equipment, as well as installed commodities and previously installed materials, would be valued as scrap. Black & Veatch has not included potential scrap value in the base case

estimate but believes that it would be net positive for at least some easy to move and repurpose materials such as uninstalled commodities.

- Uninstalled commodity materials such as rebar, conduit, and piping may have some residual value above scrap but would likely take time to realize value above scrap value. Nevertheless, there is potential to recoup some value in these materials that can be reused in other industries, provided it is in sellable condition, e.g., rebar that is full length, unbent, and undamaged. However, from Site Visit observations, Black & Veatch believes that much of these uninstalled commodities had been customized or suffered some damage such as rust due to outdoor storage, and accordingly, Black & Veatch believes that the majority of these materials will likely merit scrap value.

4.7 HYDROELECTRIC GENERATION PLANTS

4.7.1 Overview

Santee Cooper owns two hydroelectric generating facilities in Berkeley County, South Carolina, as summarized in Table 4-11. Additionally, Santee Cooper operates an additional hydroelectric facility, St. Stephen, which is owned by the Army Corp. In total, Santee Cooper's hydroelectric portfolio represents 142 MW of owned capacity, which is approximately 2.9 percent of Santee Cooper's total available capacity.

Table 4-11 Overview of Santee Cooper's Hydroelectric Facilities

PARAMETER	JEFFERIES HYDRO	WILSON DAM
Location	Moncks Corner, SC	Berkeley County, SC
Nameplate Capacity	140 MW	2 MW
Number of Units	5	1
Unit Capacity	Unit 1: 29 MW Unit 2: 36 MW Unit 3: 29 MW Unit 4: 36 MW Unit 6: 10 MW	Unit 1: 2 MW
Santee Cooper Ownership	100%	100%
Operator	Santee Cooper	Santee Cooper
Water Source	Lake Moultrie	Lake Marion
COD	1942	1950

4.7.2 Design and Major Equipment

Table 4-12 provides an overview of the design and major equipment/system characteristics of Santee Cooper's hydroelectric facilities.

Table 4-12 Overview of Santee Cooper's Major Facility Equipment

EQUIPMENT	MANUFACTURER AND MODEL
Jefferies Hydroelectric	
Unit 1 Turbine	Westinghouse; Propeller Type; 40,000 hp; 70 ft HD; 120 rpm
Unit 1 Generator	GE 52.4 MW, 13.8 kV, three-phase, 60 cycle
Unit 2 Turbine	Voith Hydro; Kaplan Semi-Spiral type; 40,000 hp; 71 ft head; 120 rpm
Unit 2 Generator	Voith Hydro 36.9 MW, 13.8 kV
Unit 3 Turbine	Westinghouse; Propeller Type; 40,000 hp; 70 ft HD; 120 rpm
Unit 3 Generator	GE 52.4 MW, 13.8 kV, three-phase, 60 cycle
Unit 4 Turbine	Voith Hydro; Kaplan Semi-Spiral type; 48,400 hp; 71 ft head; 120 rpm
Unit 4 Generator	Voith Hydro 36.9 MW, 13.8 kV
Unit 6 Turbine	General Electric; Kaplan-type 13,300 hp; 70 ft head; 200 rpm
Unit 6 Generator	GE 52.4 MW, 13.8 kV, three-phase, 60 cycle
Dam Length	380 ft
Dam Height	113 ft

The Jefferies hydroelectric facility consist of two Westinghouse propeller-type and four GE Kaplan semi-spiral type hydraulic turbines. The Jefferies facilities use water flowing from Lake Moultrie to Cooper River, with a maximum hydraulic capacity of 28,000 cubic feet per second. The generator turbine Units 1, 3, and 6 at Jefferies consist of single three-phase, 60 cycle GE generating units and have a maximum output of 34,000 kVA, delivering 52.4 MW each. Similarly, the generator turbine Units 2 and 4 comprise two 60 cycle Voith generating units, manufactured in 2015, which have a maximum output of 41,000 kVA and deliver 36.9 MW each. Units 2 and 4 are capable of remote start. Unit 6 provides black start capability for the facility.

Overall, Black & Veatch considers the design and major equipment utilized in Santee Cooper's hydroelectric fleet to be suitable for the operations of the respective hydroelectric facilities and similar to facilities of similar type, vintage, and size.

4.7.3 Operations and Maintenance

4.7.3.1 Organizational Structure

Hydroelectric Operations is one of the teams of the HLC functional group, which is described in Subsection 4.5.3.1 of this report.

4.7.4 Site Visit Observations

During the Site Visit, two representatives from Black & Veatch visited the Jefferies hydroelectric generating station. Black & Veatch toured the dam and spillway, boat locks, powerhouse, and switchyard. Black & Veatch also discussed hydroelectric operations with Santee Cooper's Vice President of Generation Stations, as well as O&M, performance, and environmental managers for the Jefferies site, including ongoing efforts pertaining to license renewal. Santee Cooper reported that renewal approval is expected in the near term following the identification of potential additional compliance measures around fish management as further discussed in Subsection 7.2.2.

Overall, Black & Veatch considers the facilities to be clean, well maintained, and in good operating condition for assets of their age.

4.7.5 Historical Performance

This section discusses the historical performance and operating factors for the Jefferies hydroelectric generation Units 1, 2, 3, 4, and 6. The comparable industry averages for the hydro units were as reported in NERC GADS for run-of-river hydroelectric plants between 20 MW and 50 MW in NERC's RFC, SERC and FRCC regions that achieved commercial operations between 1930 and 1960.

The historical EAF for Jefferies from 2014 through 2019 averaged 90.1 percent for Unit 1, 66.0 percent for Unit 2, 98.7 percent for Unit 3, 47.9 percent for Unit 4, and 99.5 percent for Unit 6, which were higher than the industry average EAF of 87.3 percent, except for Unit 2 and Unit 4, whose lower availabilities were the result of forced outages. Planned maintenance was also scheduled for the Jefferies units, which decreased the availability during the maintenance period. In October 2018, Unit 1 experienced a planned maintenance to clean the generator bearing and purify the oil system, which decreased the EAF for the unit. Unit 2 was not available in December 2016 because of a scheduled maintenance service for the wicked gate operating mechanism, which totaled 220 hours of downtime. Similar downtime was recorded for Unit 3 in July 2016 and April 2019 to repair the main transformer and perform maintenance services to the permanent magnet generator.

Similarly, the EFORd, for Jefferies from 2014 through 2019 averaged 0.0 percent for Unit 1, 2.1 percent for Unit 2, 0.1 percent for Unit 3, 0.2 percent for Unit 4, and 3.4 percent for Unit 6, which were lower than the industry average EFORd of 5.0 percent. The higher EFORd for Unit 2 was the result of forced outages between 2014 and 2016. The Jefferies Unit 2 did not operate from January 2014 to October 2015 because of multiple wicket gate shear pin failures and wicket gate shaft issues, which accrued more than 15,203 hours of downtime for the unit. Unit 4 was also out of service from January 2014 to October 2016 because of a head gate failure, an outage to repack the main shaft gland, and an inspection of the wicked gates. In total, the outages accumulated more than 24,495 hours of downtime in Unit 4. Unit 6 also experienced downtime during June 2018 because of a forced outage caused by fire protection line failure near the unit, which resulted in 192 hours of downtime.

Black & Veatch considers the above forced outages to have been reasonably addressed by Santee Cooper and notes that the EAF performance of the Jefferies units has improved and remained stable since the repairs were completed. Overall, Black & Veatch considers the hydroelectric facilities to be operating in good condition compared to facilities of similar types and vintage.

The monthly historical EAF and EFORd of Jefferies hydroelectric generation facilities compared to the industry averages are shown in Appendix A.

4.8 SOLAR GENERATION PLANTS

4.8.1 Overview

Santee Cooper fully owns two small solar farms producing on average 5,008 MWh of power per year, with a total capacity of 2.66 MW, which represents on average 0.1 percent of Santee Cooper's total available capacity. An overview of Santee Cooper's solar generation facilities, including major equipment manufacturer, is included in Table 4-13.

Table 4-13 Overview of Santee Cooper's Solar Generation Assets

PARAMETERS	BELL BAY SOLAR FARM	JAMISON SOLAR FARM
Location	Horry County, SC	Orangeburg County, SC
Santee Cooper Ownership	100%	100%
Owned Capacity	1.56 MW	1.1 MW
COD	2017	2019

4.8.2 Plant Design and Major Equipment

Table 4-14 provides an overview of the design and major equipment/system characteristics of Santee Cooper's solar facilities.

Table 4-14 Santee Cooper's Solar Facilities Major Equipment

PARAMETERS	BELL BAY SOLAR FARM	JAMISON SOLAR FARM
Number of Panels	5,904	4,482
Area (acres)	10.03	5.4
Installation Date	December 2017	May 2019
Module Manufacturer	Trina Solar	Not indicated
Module Type	Tallmax TSM-DE14A(II) 340W Monocrystalline	Not indicated
Racking System	Fixed-Tilt	Fixed-Tilt

Bell Bay Solar Farm, Sandee Cooper's largest solar farm (10.03 acres), is located along Highway 701, approximately 7.5 miles southwest of Conway, South Carolina. Bell Bay Solar Farm currently has 5,904 Tallmax 340 W monocrystalline modules, which generate maximum output of 1.45 MW. The panels are oriented to the southwest to provide additional generation during the peak hours of the summer when energy demand is high. The generation facility is connected to 28, 50 to 60 kW inverters to step up the current generated by the plant from dc to ac.

Jamison Solar Farm is located near Orangeburg County, South Carolina. The solar farm is composed of 4,482 solar panels across an area of 5.4 acres. Jamison Solar Farm has a maximum output capacity of 1.1 MW.

Overall, Black & Veatch considers the design and major equipment utilized in Santee Cooper's solar fleet to be suitable for the operations of the respective solar facilities and similar to facilities of comparable type and size.

4.8.3 Operations and Maintenance

4.8.3.1 Organizational Structure

Solar generation is part of the renewable team in the HLC functional group, which is described in Subsection 4.5.3.1 of this report.

5.0 Water Assets

5.1 OVERVIEW OF WATER ASSETS

Santee Cooper's water assets include two water treatment plants developed using water resources from Lake Marion and Lake Moultrie, which are used to provide wholesale product water to municipal customers. Lake Marion has a surface area of 110,000 acres and a usable capacity of 1.02 million acre-ft. Lake Marion receives most of its inflow from the Santee River. Lake Moultrie has a usable capacity of 672,000 acre-ft and a surface area of 56,500 acres, receiving its inflow from Lake Marion through a diversion canal.

Figure 5-1 Map of Lake Marion and Lake Moultrie

The Lake Moultrie Water System and Lake Marion Water System are operated by Santee Cooper and have a combined capacity of 48 mgd. The regional water systems have a combined transmission water system of 71 miles of pipeline, with an additional 75 miles planned.

Table 5-1 Overview of Santee Cooper's Water System Facilities

PARAMETER	LAKE MOULTRIE WATER TREATMENT PLANT	LAKE MARION WATER TREATMENT PLANT
Location	Moncks Corner, South Carolina	Santee, South Carolina
Capacity (mgd)	40	8
Transmission Pipeline (miles)	26	45
Operator	Santee Cooper	Santee Cooper
COD	October 1994	2008

5.1.1 Lake Moultrie Water System

The Moultrie treatment plant located in Moncks Corner, South Carolina, utilizes Lake Moultrie as its source water. The plant began operations in 1994 and is composed of an administration building, raw/finished water pumping stations, a chemical building, treatment modules, three clearwells, and a sludge management area.

The treatment facility utilizes conventional treatment (coagulation, flocculation, clarification, and filtration) with three treatment trains to treat up to 40 mgd. Water is pumped by two raw water pump stations to the facility through two 2,450 feet intake line. Water can also be stored on-site in the three clearwells with a total capacity of 10 million gallons. Table 5-2 shows an overview of the main components in the water treatment plant.

Table 5-2 Overview of Lake Moultrie Water Plant

STRUCTURE	AGE	PRINCIPAL COMPONENTS
Administration Building	24 years	Control/Instrument Panel Room Office Spaces
Raw Water Intake Lines	Line 1: 24 years Line 2: 1 year	48" Diameter Polyethylene Line 2450' in Length
Raw Water Pumping Stations	Pump Station 1: 24 years Pump Station 2: 3 years	Pump Station 1: 4 Centrifugal Pumps Pump Station 2: 4 Vertical Turbine Pumps Two 450 kW Emergency Generators
Finished Water Pumping Stations	Pump Station 1: 24 years Pump Station 2: 12 years	Pump Station 1: 4 Centrifugal Pumps Pump Station 2: Pumps w/Altitude Valves 2-2500 kW Emergency Generator
Treatment Modules	Train A: 24 years Train B: 24 years Train C: 2 years	3 Treatment Trains Vacuum Chambers 4 Green Leaf Filter Modules per Train
Chemical Feed Building	1 year	Chemical Storage tanks Injection System (Prominent) 250 kW Emergency Generator (Caterpillar)
Clearwells	Clearwell 1: 24 years Clearwell 2: 24 years Clearwell 3: 12 years	Clearwell 1: 2.5 million gallons Clearwell 2: 2.5 million gallons Clearwell 3: 5 million gallons
Sludge Management Area	24 years	2 Pond Aerators 15 Drying Beds 2 Sludge Thickeners

The transmission system consists of 26 miles of water transmission lines, 11 master meters, and a one million gallon Hydropillar elevated storage tank. The water transmission system is composed of cement lined ductile iron pipes, with diameters ranging from 24 to 48 inches. The water transmission system provides drinking water services to over 191,000 people, primarily located in the town of Moncks Corner, the cities of Goose Creek and Summerville, and Berkeley County. Figure 5-2 provides an overview of the water transmission system for Lake Marion.

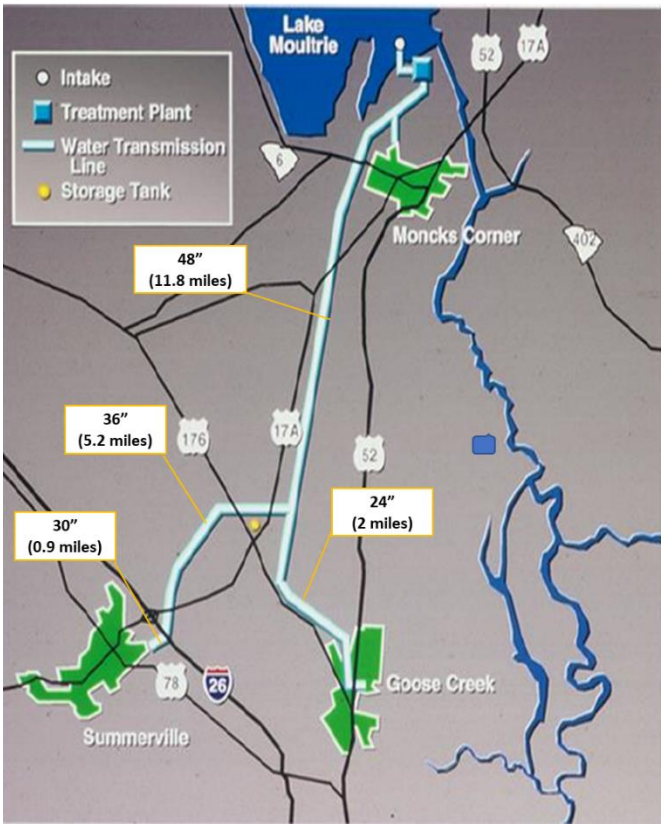


Figure 5-2 Lake Moultrie Water Transmission System

5.1.2 Lake Marion Water System

The Marion treatment plant is located in Santee, South Carolina, and utilizes Lake Marion as its source water. The water treatment plant has been in operation since 2008 and uses a membrane ultrafiltration treatment process to produce up to 8.0 mgd of treated water. The Marion treatment plant provides drinking water services to over 2,900 people in Orangeburg, Dorchester, Calhoun, and Berkeley counties as well as the town of Santee.

The Marion treatment plant is composed of an administration building, raw/finished water pumping stations, treatment modules, two clearwells, and a sludge handling area. The facility has on-site storage capabilities, with a total ground capacity of 4 million gallons of water. Table 5-3 shows an overview of the main components in the water treatment plant.

Table 5-3 Overview of Lake Marion Water Plant

STRUCTURE	AGE	SUBCOMPONENTS/CAPACITY
Administration Building	11 years	Control/Server Room Office Spaces
Raw Water Intake Lines	11 years	48" Diameter Polyethylene Line 1800' in Length
Raw Water Pumping Station	11 years	Pump Station 1: 3 Water Pumps Motor Control System
Finished Water Pumping Stations	11 years	Pump Station 1: 3 Water Pumps 1,000 kW Emergency Generator (Caterpillar)
Treatment Modules	11 years	3 – Zenon Membrane Filtration Systems 3 – Allen Bradley PLC Systems 3 – Granular Activated Carbon Chambers
Chemical Feed Building	1 year	Chemical Storage Tanks Injection System Pump Skid
Clearwells	11 years	Clearwell 1: 2 Million Gallons Clearwell 2: 2 Million Gallons
Sludge Management Area	11 years	Thickener – Clarifier and Rake Retention Pond Sludge Holding Pad

The transmission system consists of 35 miles of transmission pipeline with an additional 10 miles planned for completion by January 2020, three master meters, and a one million gallon Hydropillar elevated storage tank. The water transmission system is composed of cement lined ductile iron pipes, with diameters ranging from 12 to 36 inches. Santee Cooper plans to incorporate an additional 75 miles of transmission line to the system. An overview of the water transmission system for Lake Marion is provided on Figure 5-3.

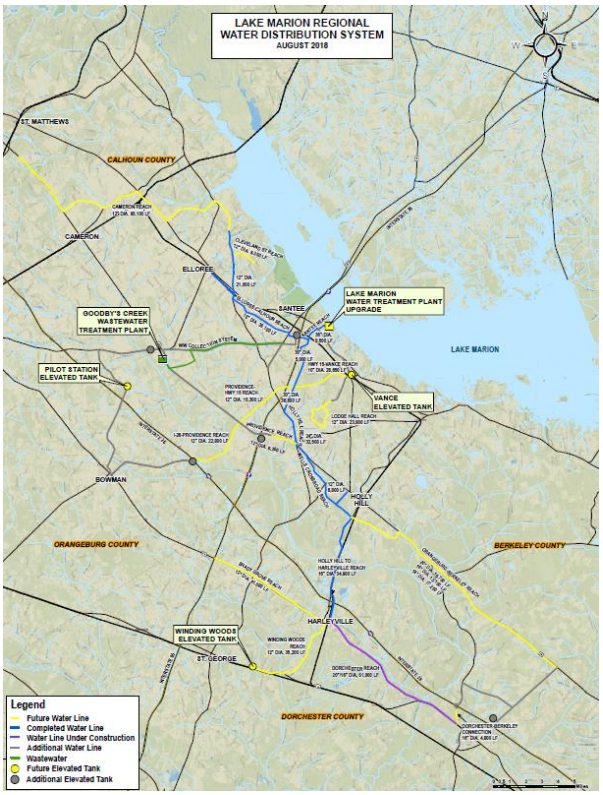


Figure 5-3 Lake Marion Water Transmission System

5.2 OPERATIONS AND MAINTENANCE

5.2.1 Organizational Structure

Management and operations of Santee Cooper's water systems are overseen by the Senior Vice President & CFO, and VP Environmental and Water Systems. This functional group, referred as Environmental Resources and Water System, employs approximately 20 employees to operate and maintain both Lake Marion and Lake Moultrie water systems.

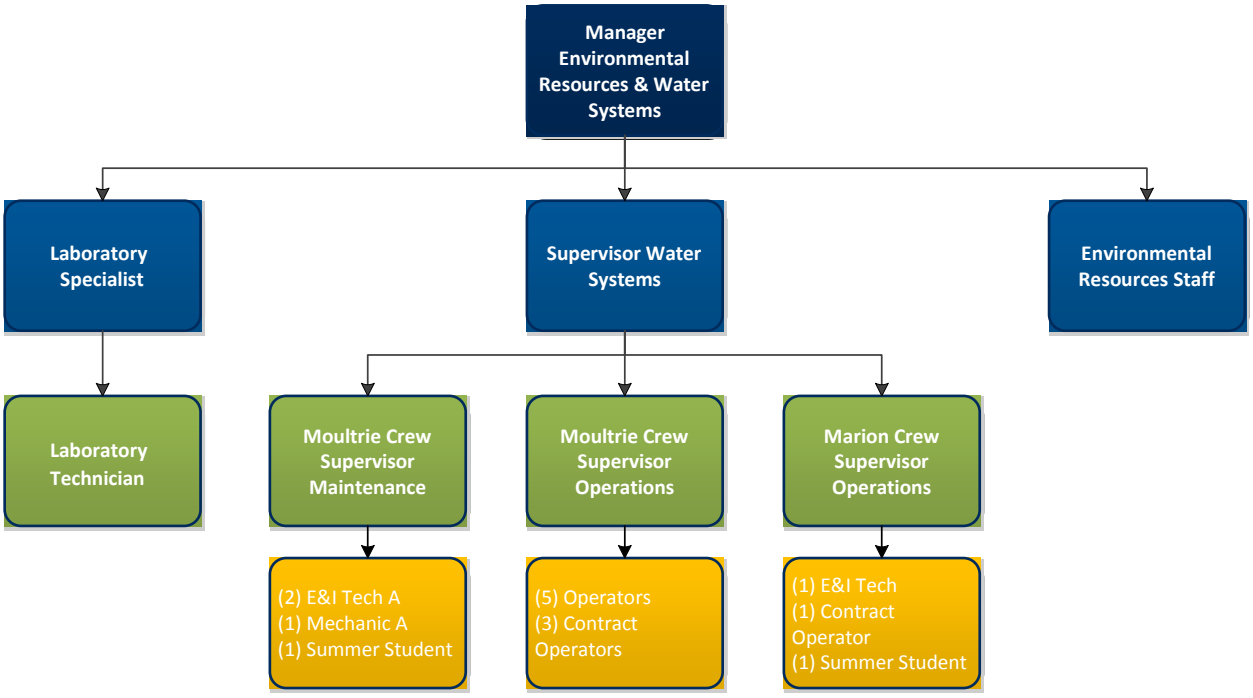


Figure 5-4 Environmental Resources and Water System Organization Chart

Figure 5-4 presents an overview organizational chart for the water systems. The VP Environmental and Water Systems supervises the Manger of Environmental Resources and Water Systems. The Environmental Resources and Water System manager supervises the environmental resources staff and the water systems group. Engineering support is provided by Santee Cooper's Environmental division, also under the VP Environmental and Water Systems. Lake Marion's water system has an operation supervisor who oversees the operations of the plant, which are performed by an E&I technician, a contract operator, and a summer student. Two additional operators are planned for the Marion system in 2020 and 2022 to keep up with the projected demands. Lake Moultrie's water system is managed by a maintenance supervisor and an operation supervisor. The maintenance of this water facility is performed by two E&I technicians, a mechanic, and a summer student. The operations of the water treatment plant are executed by five Santee Cooper operators and three contract operators.

6.0 Regional Gas Transmission

6.1 OVERVIEW OF REGIONAL TRANSMISSION SYSTEMS

The primary interstate gas pipelines that service the South Carolina market are Transcontinental (Transco), Southern Natural (SONAT), and Dominion Carolina Gas. In total, these pipeline systems deliver approximately 946 MMcf/day[2] of supply to the South Carolina market. Both Transco and SONAT have access to Gulf Coast and midcontinent gas supplies, while Transco has additional access to flow gas supplies North to South from the Marcellus/Utica supply basin, as shown on Figure 6-1.

Santee Cooper has firm transportation capacity of 80,000 Dth/day on Transco to primarily serve the Rainey power plant from the Gulf Coast to the power plant, which is located near the Georgia and South Carolina border. The primary receipt point, at Station 85, provides Santee Cooper access to traditional gas production along the Gulf Coast and midcontinent gas supplies from SCOOP/STACK, and Woodford Shales, or Northern Louisiana Haynesville Shale production.

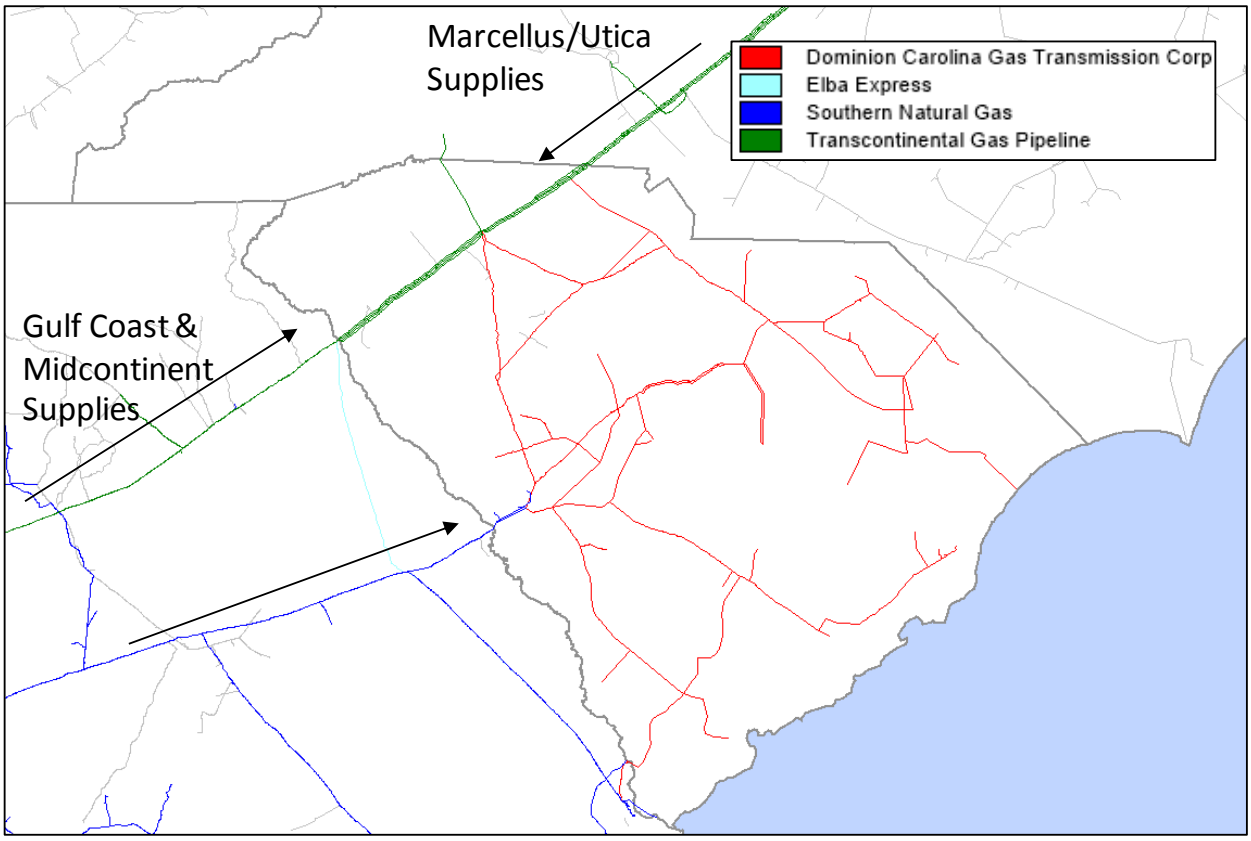
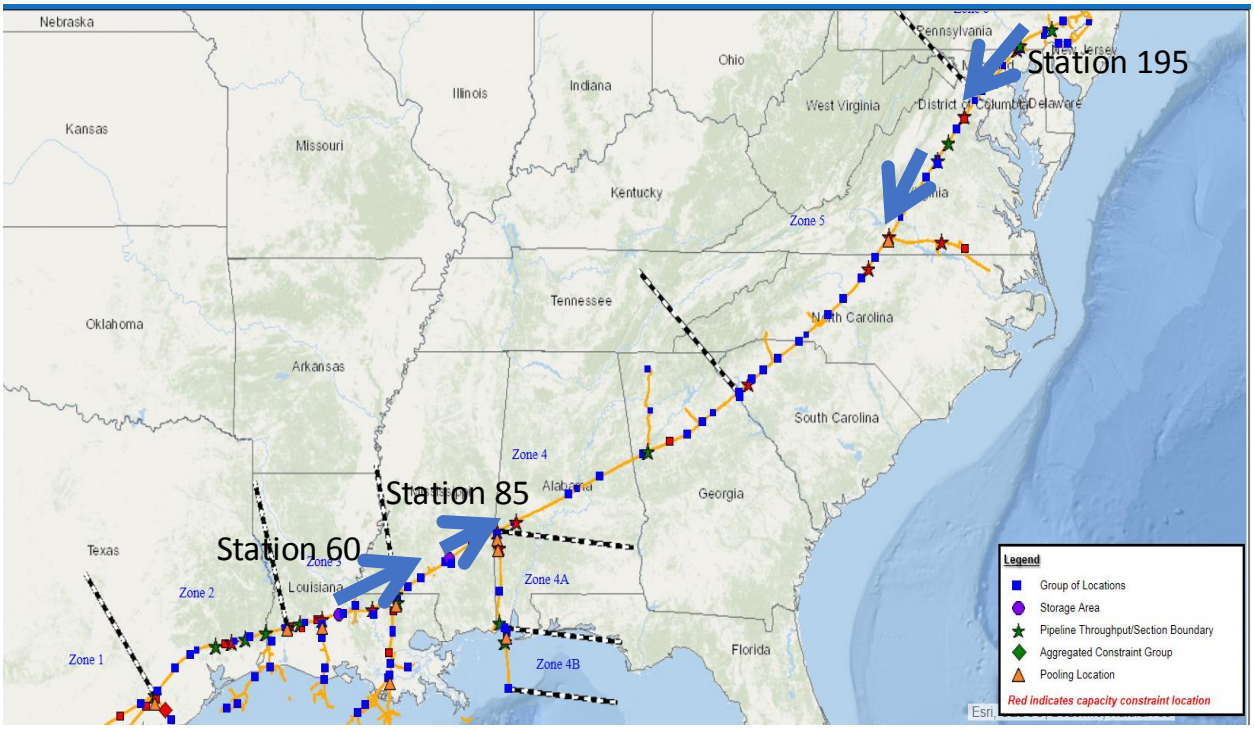


Figure 6-1 Regional Natural Gas Transmission Systems

[2] EIA South Carolina Historical Consumption by Sector (August 2018-July 2019).

6.2 REALIGNMENT OF REGIONAL PIPELINE FLOWS

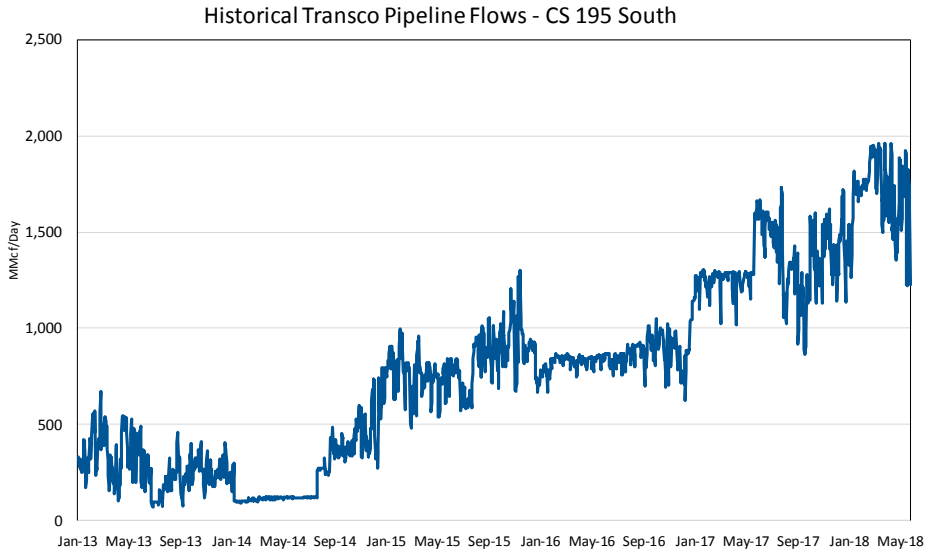
The continuing evolution of regional pipeline flows has impacted the level of service pipelines have traditionally offered to their shippers and will continue to place increased operational pressure on these pipelines. These recent historical observations are just the initial signs of fundamental market changes that are projected to impact the Gulf Coast and southeast market. Flow directions on Transco, for example, a key channel for Marcellus/Utica shale production serving the markets from New York, New Jersey, Virginia, and the Carolinas, have been constantly evolving to reflect fluctuations of demand along the pipeline. Traditionally a south to north pipeline, Transco flows have become increasingly bi-directional feeding into the Zone 4-5 southeast market area, as shown on Figure 6-2.



Source: Williams 1line

Figure 6-2 Transco System Map

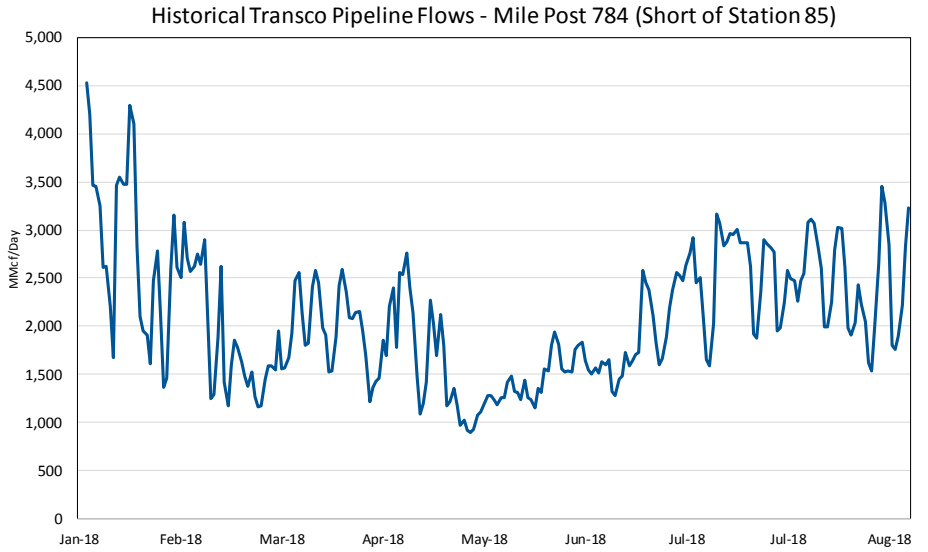
As shown on Figure 6-3, gas flowing south from the Pennsylvania-Maryland border at Compressor Station 195, now approaches 2 Bcf/d. With additional expansions coming into service in 2019 such as Atlantic Sunrise and other planned expansions (Mountain Valley, Atlantic Coast Pipelines), Black & Veatch expects north to south volumes to continue to grow.



Source: B&V Analysis, Energy Velocity

Figure 6-3 Transco Throughput at Station 195 (North to South Flows)

With significant southbound flows as described above, Transco pipeline flows at Station 60 and Mile Post 784 (proxy for Station 85) are still flowing north, as shown in Figure 6-4. These highly variable utilization factors with different flow directions have resulted in Transco issuing a first time ever designation of segments with unknown flow directions (SUD) in August 2018.



Source: B&V Analysis, Energy Velocity

Figure 6-4 Transco Throughput (Flowing Southwest to Northeast) at Mile Post 784 (Short of Station 85) Incudes Gulf Crossing and Midcontinent Express Receipts

With Atlantic Sunrise and Mountain Valley Pipelines expected to be placed into service by 2021, another 3.7 Bcf/d of gas supplies will reach Transco and flow south in the next 15 to 18 months, potentially making these SUD occurrences a new norm and flooding the Transco system with low cost gas supplies on both ends.

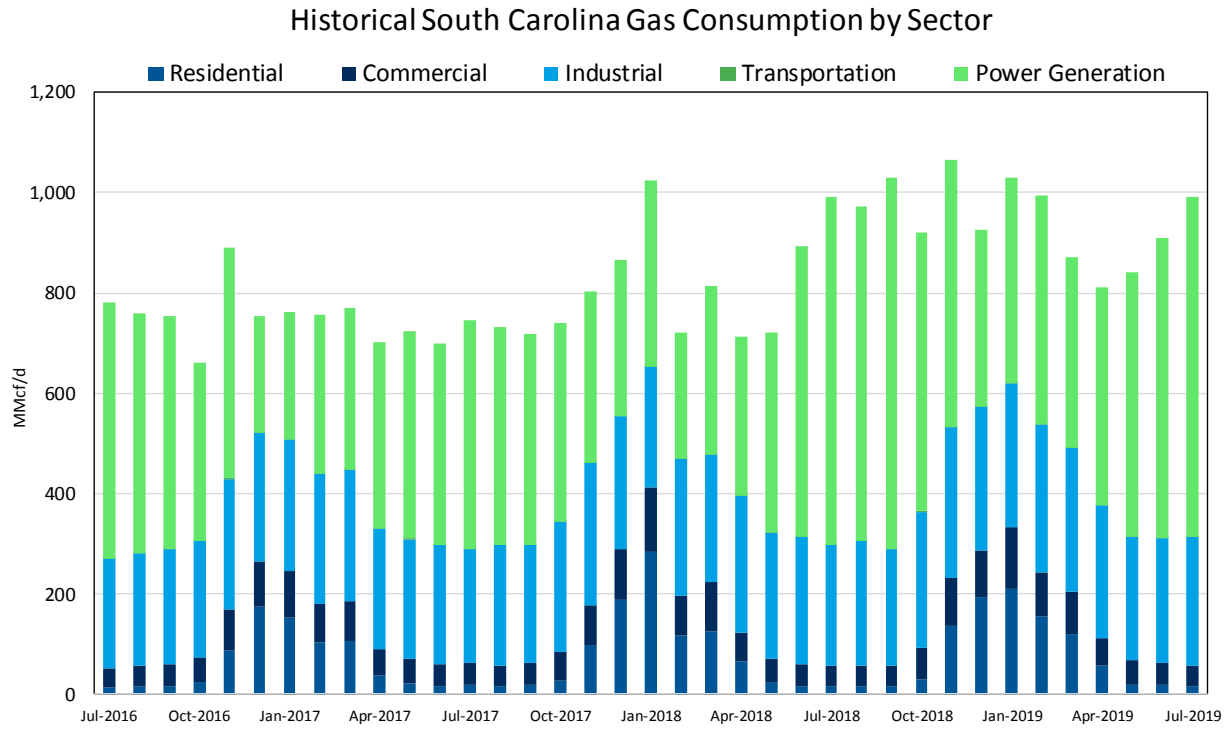


Figure 6-5 Historical Monthly Gas Consumption – South Carolina

The historical gas consumption across the service territory has steadily increased over the past 2 years, with power generations sector growth accounting for approximately 70 percent of the overall growth. Overall, the South Carolina market is winter peaking market, with heavy peak needs in late summer for power generation and early winter needs for residential and commercial demand.

The seasonal gas consumption patterns will impact the future gas transportation capacity needs in the region. Gas demand for power generation growth will impact mid to late summer demand when the gas pipeline network is less constrained, while additional peak winter needs will require incremental upstream pipeline infrastructure and delivery.

6.3 ACCESS TO INCREMENTAL GAS TRANSPORTATION AND GAS SUPPLIES

Santee Cooper's business forecast indicates a continuing shift to integrate renewables and natural gas fired generation. As part of its analysis, Santee Cooper examined several potential options to bring incremental gas supplies to several potential sites for new gas fired generation, as shown in Figure 6-6.

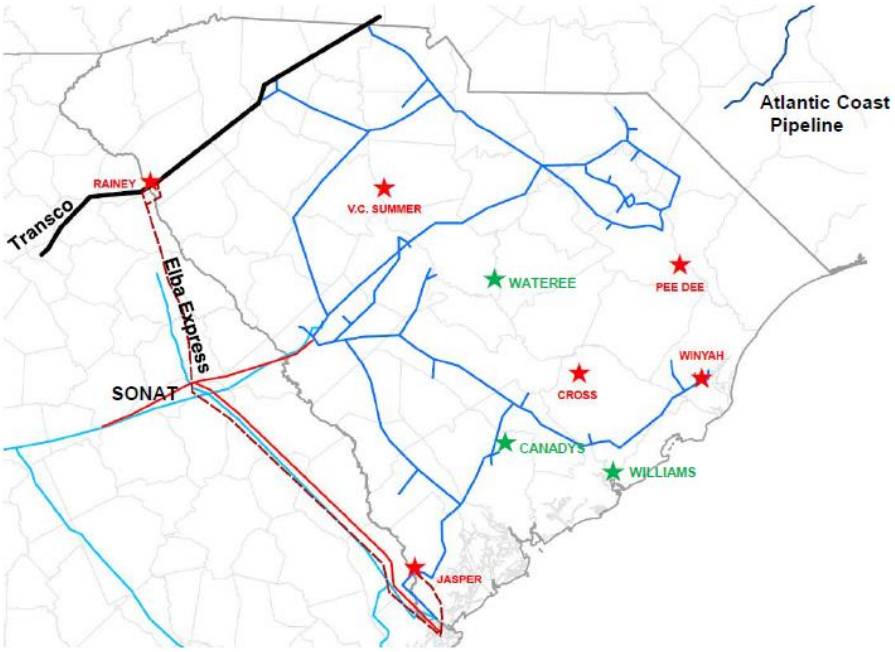


Figure 6-6 Potential Sites for Gas-Fired Generation

The primary option to serve incremental gas demand growth is the proposed ACP. While originally slated to be completed in 2019, construction was halted on ACP when the 4th US Circuit Court of Appeals invalidated the ACP's permit to cross 600 feet below a small section of the Appalachian Trail.

ACP is appealing the decision to the US Supreme Court, which will hear the case in 3Q 2019 and will make a ruling by Q2 2020. The current targeted in-service date is early 2021. If the appeal to the US Supreme Court fails, ACP management would need to seek a Congressional exemption or substantially re-route the pipeline or cancel the project entirely.

The legal issues raised in the courts examines which proper legal entity has authority to grant permission to drill under the Appalachian Trail. The Forest Service has authority over National Forests; however, the Appalachian Trail that runs through the George Washington National Forest is considered a park service land that may not allow the Forest Service to authorize pipeline drilling under the trail. If the Supreme Court upholds the 4th Circuit court decision, it could be difficult to find a new ROW for ACP that does not cross the Appalachian Trail.

Potential alternatives to ACP include Transco and SONAT, where upstream expansion could be needed to ensure firm transportation from wellhead to the delivery point at the sites considered. Black & Veatch has reviewed the capacity of these alternatives, and has not identified any inherent technical flaws. Black & Veatch estimates upstream transportation costs could be approximately

$2.00/Dth/day, with additional lateral costs to ensure adequate pressure to the power plant. The Sensitivities Case assumes interconnection to the Transco pipeline, which is approximately 70 miles from the VC Summer site assuming a portion of a new gas lateral would be built adjacent to the existing Dominion gas pipeline shown in blue in Figure 6-6 to simplify development and construction. For that length of a lateral, the approximately $200 million budget for gas interconnection shown in the Sensitivities Case would be adequate for development and construction costs up to approximately $2.9 million per mile, which Black & Veatch believes is reasonable and within the expected range for a pipeline that is sufficient to transport enough gas for up to 1,000 MW of combined cycle generation.

While Santee Cooper could purchase gas from current capacity holders on Transco, the price for gas supplies would be closer to a Transco Zone 4 market price rather than a Dominion South, Appalachian, or other comparable supply region price. Potential upgrades to the Dominion Carolina system may also be needed to serve additional gas demand growth. Given the importance of natural gas supply to Santee Cooper's Business Plan, Black & Veatch understands that Santee Cooper has modeled sensitivity cases to the Business Plan at the direction of Admin to understand the potential impact of delay or cancellation of the ACP.

Black & Veatch notes that Santee Cooper has analyzed the estimated complete costs of gas supply various sites on a levelized $/MMBtu basis assuming gas supply from the ACP as well as Transco Z4 and Z5, and Santee Cooper reports that in most favorable cases (new generation sited at Pee Dee assuming that the ACP is built and VC Summer if Transco gas it utilized instead) the levelized cost is materially similar due to higher natural gas reserve charges in the ACP case roughly breaking even with the expected additional gas infrastructure costs and hub pricing basis.

7.0 Environmental Compliance Management

Black & Veatch conducted a general review of the Santee Cooper environmental programs with a primary focus on company-wide environmental compliance and the major issues associated with the types of facilities operated by the company, including the typical environmental compliance aspects of electricity generating, transmission, and distribution, and water treatment utilities. The review was based on corporate documents provided by Santee Cooper in a virtual data room, inquiries made by Black & Veatch, and information provided in phone discussions with Company staff. Information reviewed by Black & Veatch tended to be for general assessment or confirmatory checks; the review did not include detailed review of individual facility files.

Black & Veatch's findings indicate that Santee Cooper has been maintaining general compliance with the company's environmental permits and requirements; no significant violation or ongoing litigation was identified in the review.

Santee Cooper maintains a very thorough list of environmental incidents and near misses. The list and systems that support it capture information on environmental incidents in all aspects of its operations. The list documents a generally responsible company with only a reasonably expected range of more minor incidents in the reviewed 2014 to 2019 period and no apparent major incidents.

The following subsections describe findings for different categories and aspects of the company's operations.

7.1 CORPORATE PROGRAMS

Santee Cooper maintains significant and comprehensive corporate environmental programs typical for major utilities. Examples of major components of company programs include the following:

- A company Environmental Management System (EMS) Manual dated June 2019 (with revision history back to 2005) that defines key aspects of the company compliance program.
- Compliance Audits – A series of audits completed in the 2016 to 2018 period for air, water, chemical management, and off-site waste management were reviewed as examples of corporate compliance programs and oversight of individual facilities.
- A management of change procedure is in place that defines formal environmental review for company projects.
- Compliance schedules are in place, including an EMS tracking system, that provide notifications to responsible staff for recurring tasks and other requirements.

Santee Cooper manages its environmental programs with a team of professionals who track the actions and needs for each type of environmental program (e.g., air, water, waste) and the issues of each company business area and site.

7.2 MAIN BUSINESS AREAS AND OVERVIEW OF ENVIRONMENTAL COMPLIANCE

7.2.1 Conventional Generation

Santee Cooper maintains general compliance for its generating facilities with the various facility requirements such as under the major in-place air, water, wastewater, solid waste management, and chemical management programs. The following are examples of applicable programs actively managed:

- Major source air permits.
- Water supply authorizations.
- Wastewater discharge permits.
- Management of large oil tanks.
- Landfill permits.
- Risk management plans for regulated chemicals.
- Ongoing planning associated with Clean Water Act 316b regulations for cooling water intake.
- Planning in place for closure of combustion ash ponds.

Santee Cooper's list of environmental incidents tends to include a range of incidents reasonably expected to happen at power plants, with no major incidents reported in the past 5 years reviewed by Black & Veatch. For example, Black & Veatch noted only infrequent and minimal air permit exceedance issues listed.

Documents reviewed tended to indicate that compliance programs are generally complete and in compliance. Programs are in place, including consideration of continuing operations through the planned life of the facilities, such as permitted landfill capacity for ongoing combustion ash disposal at Cross.

7.2.2 Hydroelectric Generation

The primary environmental compliance topic for Santee Cooper's hydroelectric assets is license renewal, as is typical for hydroelectric assets of this type. Key summary points for status of Santee Cooper's hydroelectric operations include the following:

- The last 30 year license for the Jefferies hydroelectric project was issued on May 9, 1979, and expired on March 31, 2006. Since that time, the project has been operating under annual license renewals. The application for a new license for a major water power project was submitted March 15, 2004.
- According to publicly available FERC files, the 2020 license renewal for the project has not yet been approved at the time of this report. Topics delaying approval include a National Marine Fisheries Service (NMFS) Biological Opinion (BO) and Modified Fishway Prescription (MFP), including recommendations from NMFS for the Atlantic sturgeon, shortnose sturgeon, and a few other species. Santee Cooper notes that the new license is still pending primarily because stakeholder discussions regarding appropriate protections, including fish passages and increased minimum water flows.

- Santee Cooper/South Carolina Public Service Authority is scheduled to issue comments on that BO and MFP by October 29, 2019.
- The estimated costs of the annual FERC license renewal for the Santee Cooper project are between $84 and $179 million, depending on final decisions and next step follow-up to the studies required.

The types of items captured in the renewal cost estimates include the following:

- Fish, eel, and sturgeon studies at Pinopolis and Santee.
- Fish passage at Pinopolis.
- Eel passage at Pinopolis and Santee.
- Sturgeon passage at Pinopolis and Santee.
- Implement turbine protection plans.
- Implement Pinopolis lock protection plan.
- Granby Dam removal.
- Increased minimum flows at Santee Dam.

Santee Cooper anticipates the FERC license renewal by early 2020.

Black & Veatch also reviewed the most recent dam safety inspections for the Santee River and Cooper River. These safety reports each consisted of the 2018 dam safety surveillance and monitoring report (DSSMR), the most recent FERC annual dam safety inspection reports, and the current owners dam safety program (ODSP). Overall, both dams were found to be in satisfactory condition and adequately maintained, with no conditions adversely affecting the safety, performance, and operational reliability of the dams.

Black & Veatch's review did not uncover any material environmental compliance incidents for the hydroelectric assets, and Documents reviewed tended to indicate that compliance programs are generally complete and in compliance. The primary environmental obligation will be the continued compliance with licensing requirements, which Santee Cooper has successfully demonstrated to-date.

7.2.3 Transmission and Distribution

The environmental programs for the electricity transmission and distribution business of Santee Cooper, including maintenance, operations, and construction activities, are covered under previously mentioned corporate EMS programs, including management of change procedures. Appropriate standard procedures appear to be in place for the business area, including such items as the following:

- Blanket utility notice of intent for construction storm water.
- Pesticide and vegetation management plan.
- Corporate avian guidance document.

Underground storage tanks for fuels/oils present at some of the company maintenance centers are managed in compliance with applicable rules. Some upgrades/replacements are pending in future

years. Documents reviewed tended to indicate that compliance programs are generally complete and in compliance.

7.2.4 Water Supply Systems

The water distribution business of Santee Cooper appears to be fully compliant with water quality requirements and up-to-date in reporting and planning. The Santee Cooper Regional Water Systems monitor and provide reports in compliance with the State Primary Drinking Water Regulations and the General National Pollutant Discharge Elimination System Permit for wastewater discharges from water treatment plants. To date, Santee Cooper reports that no notices of violations have been received.

A continuing source water manganese background level is actively managed with additional recirculation requirements and chemical additives. Both of these practices have kept the level of manganese below the recommended secondary maximum containment level.

The company maintains active awareness of pending water quality issues and potential new regulations. None of the evolving issues are known to be applicable to the Santee Cooper sources and systems at this time.

7.3 OTHER ITEMS REVIEWED

The topics in the following subsections are also pertinent for highlighting in an environmental review.

7.3.1 Ash Ponds

Santee Cooper has plans in place for complying with the relatively new federal requirements for managing coal combustion residues at its active and former coal fueled generating facilities. Santee Cooper's plans generally involve ongoing removal of accumulated ash from formerly used ash ponds. The removed ash is transported for beneficial reuse in the cement industry or will be disposed of in one of Santee Cooper's permitted ash landfills.

Costs have been summarized by Santee Cooper as an ash pond asset retirement obligation of approximately $335 million as of August 2019. Further detail and review of this cost estimate is provided in Subsection 4.3.7.

7.3.2 Remediation

The only active cleanup effort for the company is at the Hilton Head gas turbines facility. A plan for augmented passive remediation for naphthalene detected in monitoring wells is a 5 year planned effort initially targeted to end in 2020. Cost estimates were in in the $70,000 range for the original effort if determined to be adequately successful.

Santee Cooper actively tracks environmental issues at company assets, and company environmental staff are not aware of other potential remediation needs of significance associated with company operations.

7.3.3 Pending Regulations of Note

Santee Cooper actively tracks potential and pending regulations. One new rule is the US EPA Affordable Clean Energy Rule, which is potentially applicable to Cross and Winyah. Those facilities will need to develop unit-specific standards of performance within 3 years. Santee Cooper has a

planning effort in place; preliminary consultations have been held with the South Carolina Department of Health and Environmental Control.

8.0 Financial Forecast

Black & Veatch has reviewed both the Base Case 20 year financial forecast produced by Santee Cooper associated with the Business Plan with the file name "Electric – Baseline Output.xlsx", as well as the Sensitivities Case 20 year financial forecast developed by Santee Cooper at the request of Admin to reflect sensitivity analysis to key assumptions in the Business Plan, with the file name "Electric – Sensitivities Output.xlsm." As discussed previously in Section 2.6 of this Report, the Sensitivities Case assumes the following changes compared to the Baseline Case:

- The ACP will not be completed, and natural gas will instead be made available to new gas turbine generation through new lateral pipelines built by Santee Cooper to interconnect with the existing Transco pipeline.
  - Due to the absence of ACP natural gas, the assumed location for new natural gas generation has been changed. The Sensitivities Case assumes that new CCCTs will be constructed at the VC Summer Site, while the Baseline Case assumes that new CCCTs will be constructed at Pee Dee.
  - While both the Baseline Case and Sensitivities Case assume that new SCCTs will be constructed at the Winyah site, the Sensitivities Case assumes that 200 MW of SCCTs will be constructed for load balancing, while the Baseline Case assumes 100 MW.
- Natural gas commodity pricing (aside from demand charges and basis difference) is assumed to be consistent with U.S. Energy Information Administration (EIA) Annual Energy Outlook (AEO) 2019 Reference case forecast.
- The resale value of VC Summer Units 2 and 3 equipment is assumed to be zero.

Throughout the course of this technical and environmental diligence, Black & Veatch has reviewed both the Baseline Case and Sensitivities Case, and finds their underlying assumptions to be overall reasonable, and consistent aside from the differences noted above. However, due to these differences the generations dispatch and therefore costs also differ between the Baseline Case and Sensitivities case.

As noted above, the Sensitivities Case largely overlaps with the Baseline Case on the large majority of assumptions Black & Veatch reviewed, subject only to the specific changes noted above. Furthermore, Black & Veatch also separately reviewed and summarized those assumptions germane to the Baseline Case that differ from the Sensitivities Case as noted elsewhere in this report (i.e., nuclear parts salvage value, feasibility of Pee Dee site for new CCGTs, and the current state of play on ACP's progress). Therefore, this Report effectively addresses both the Baseline Case and the Sensitivities Case. The below sections summarize Black & Veatch's review and findings relating to the Sensitivities Case specifically. Black & Veatch's review focused on the technical inputs to Sensitivities Case, namely, new generation construction CAPEX; new and existing generation, transmission, and distribution OPEX and major maintenance CAPEX; and technical characteristics of generation assets.

8.1 CAPEX

8.1.1 Generation

The Sensitivities Case contains generation CAPEX associated with both the ongoing major maintenance, upgrades, and relicensing of Santee Cooper's existing generation assets, as well as construction CAPEX for new assets, as summarized in Figure 8-1.

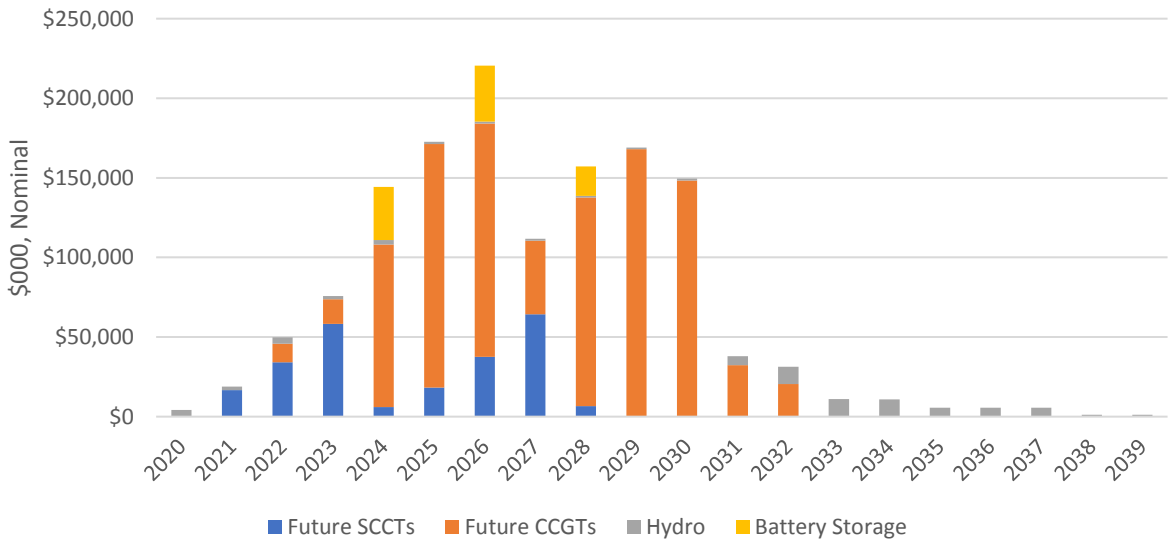


Figure 8-1 Sensitivities Case Generation CAPEX, 2020 – 2039

As shown above, the majority of generation CAPEX is attributed to CCCT and SCCT assets, which support the Business Plan's objective to increase natural gas capacity. The Sensitivities Case assumes two new CCCTs will be constructed at the VC Summer site in 2027 and 2031, each with a capacity of 549 MW. Two SCCTs, each with a capacity of 50 MW will be constructed at Winyah in 2023 along with two additional 50 MW SCCTs in 2027 to provide local reliability benefits to the transmission constrained Myrtle Beach load pocket. Total gas turbine investment is approximately $1.0 billion ($976 for CCCTs and $242 million for SCCTs in nominal dollars).

The next largest generation CAPEX expense is battery storage, totaling approximately $87.2 million in nominal dollars from 2023 through 2028, assuming five, 40 MW batteries will be built over that time.

The only generation CAPEX associated with existing generation is in the hydroelectric category, totaling $80.2 million in nominal dollars for expenses associated with relicensing and environmental compliance. Black & Veatch notes that the Sensitivities Case does also consider CAPEX for existing coal units related to environmental compliance and decommissioning, but those costs are separated out into an environmental category summarized in Subsection 8.1.3.

A summary of CAPEX assumptions for new generation assets is shown in Table 8-1.

Table 8-1 New Generation Resource CAPEX Summary - Sensitivities Case (Nominal Dollars)

RESOURCE	TECHNOLOGY	NAMEPLATE CAPACITY (MW)	CAPEX ($MM, NOMINAL)
VC Summer 549	CCCT	549	$306
VC Summer 549	CCCT	549	$308
Future CT	SCCT	100	$108
Future CT	SCCT	100	$108
Runway Solar	Solar PV	2	$3
Centerfield Cooper Solar	PPA	75	N/A
Gunsight Solar	PPA	75	N/A
1000 MW	PPA	1,000	N/A
Battery 1	Battery	40 (80 MWh)	$15
Battery 2	Battery	40 (80 MWh)	$15
Battery 3	Battery	40 (80 MWh)	$15
Battery 4	Battery	40 (80 MWh)	$15
Battery 5	Battery	40 (80 MWh)	$15

Overall, Black & Veatch finds the assumptions shown in Table 8-1 to be reasonable. Black & Veatch's key observations about these assumptions are as follows:

- The CAPEX shown for the two CCCT assets also includes another $104 million per CCCT for gas interconnection, which equals an installed cost of approximately $747/kW inclusive of gas interconnection, or approximately $557/kW for the CCCTs only. Black & Veatch finds it reasonable to assume material cost savings for these resources compared to greenfield construction given that the VC Summer site already has interconnection facilities installed, however Black & Veatch finds $557/kW to be optimistic compared to Black & Veatch's observations of other 1x1 advanced class CCCTs. As noted in Section 6.3, Black & Veatch finds the budget of $208 million for gas interconnection to be reasonable for the length of lateral pipeline required to interconnect a generator at the VC Summer site.
- The CAPEX shown for the two SCCT assets equals an installed cost of approximately $1,080/kW, which is consistent with Black & Veatch's expectations for these units. However, Black & Veatch notes that typical SCCT units are generally approximately 56 MW nominal capacity, and the 100 MW capacity shown in the Sensitivities Case appears to assume a block of two SCCTs, which would potentially realize cost savings on a $/kW basis because of synergies in balance of plant costs.
- The CAPEX shown for Runway solar equals approximately $1,500/kW, which is consistent with Black & Veatch's expectations for a small scale solar PV asset.

- The CAPEX for the battery assets equals approximately $187/kWh, which is lower than current battery installed costs Black & Veatch has observed. Black & Veatch notes that battery costs are expected to decrease, and these battery units are expected to be installed between 2024 and 2028, which would reasonably merit a lower cost than today. The $187/kWh assumed for the Sensitivities Case battery assets is on the low end of the range Black & Veatch has observed in industry literature for the time frame assumed in the Sensitivities Case and may be optimistic.

8.1.2 Transmission and Distribution

Transmission and distribution CAPEX as shown in the Sensitivities Case consists of expenses both for new transmission and distribution construction to meet load growth and system expansion needs, as well as major maintenance and replacement of existing assets. A summary of transmission and distribution CAPEX is shown on Figure 8-2.

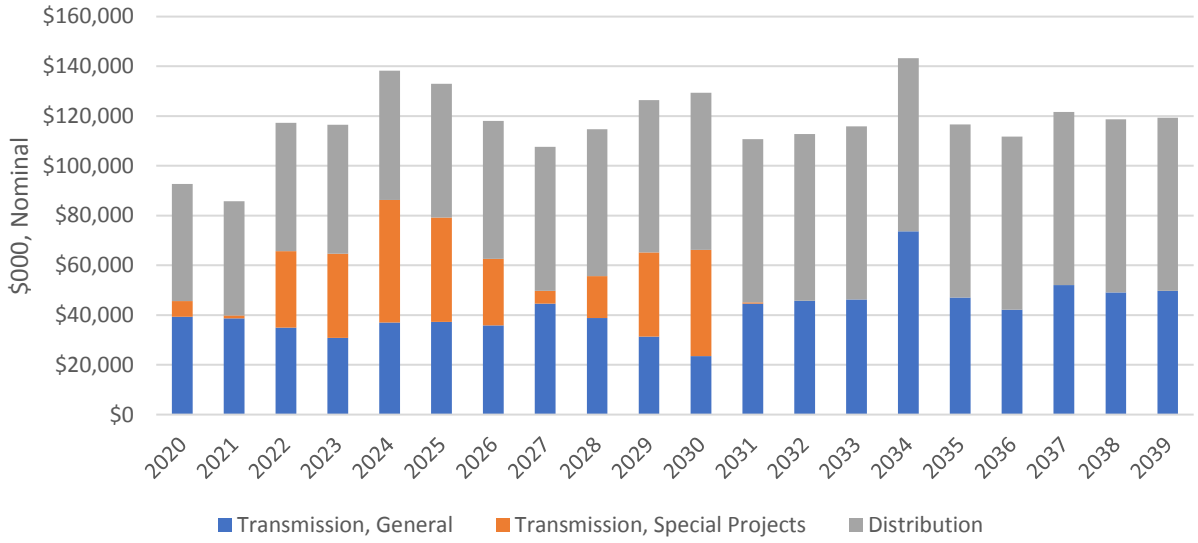


Figure 8-2 Sensitivities Case Transmission and Distribution CAPEX, 2020 – 2039

As shown above, transmission (general) and distribution expenses remain relatively consistent throughout the forecast period, averaging $42.1 million/year and $60.9 million/year in nominal dollars, respectively. Transmission (general) costs are roughly half of the 2014 to 2018 annual average; however, those historical expenses also included transmission (upgrade) CAPEX for new interconnection facilities associated with VC Summer Units 2 and 3, which Black & Veatch understands to account for approximately $20 million/year. Excluding this $20 million/year, the Sensitivities Case transmission (general) CAPEX is still lower than 2014 to 2018 values. However, given the relatively young average age of transmission assets as discussed in Section 3.1, Black & Veatch believes that the lower transmission (general) budget could be achieved and that the average budget of approximately $9,437/mile in nominal dollars for major maintenance CAPEX is within the range Black & Veatch would expect for similar transmission assets of similar vintage in the region.

In addition to transmission (general) CAPEX, the Sensitivities Case contains a total of approximately $289 million for transmission (upgrade projects) in nominal dollars. This CAPEX falls between

2020 and 2030, coinciding with Santee Cooper's new generation resources discussed in the previous section, and is intended to improve transmission capacity and allow the export of energy from those new generators.

The annual average distribution CAPEX amount of $60.9 million/year is slightly higher than the 2014 to 2018 average but is overall consistent with historical spending. Black & Veatch understands that the premium shown in the Sensitivities Case compared to 2014 to 2018 historical figures is largely driven by ongoing efforts to convert additional portions of the distribution system to underground under municipal franchise agreements under the terms and funding of the franchise conversion program ($125 million nominal investment), as well as the rollout of grid modernization efforts such as advanced metering infrastructure ($30 million nominal investment).

8.1.3 Other

Other CAPEX consists of general plant and environmental compliance, as summarized below in Figure 8-3.

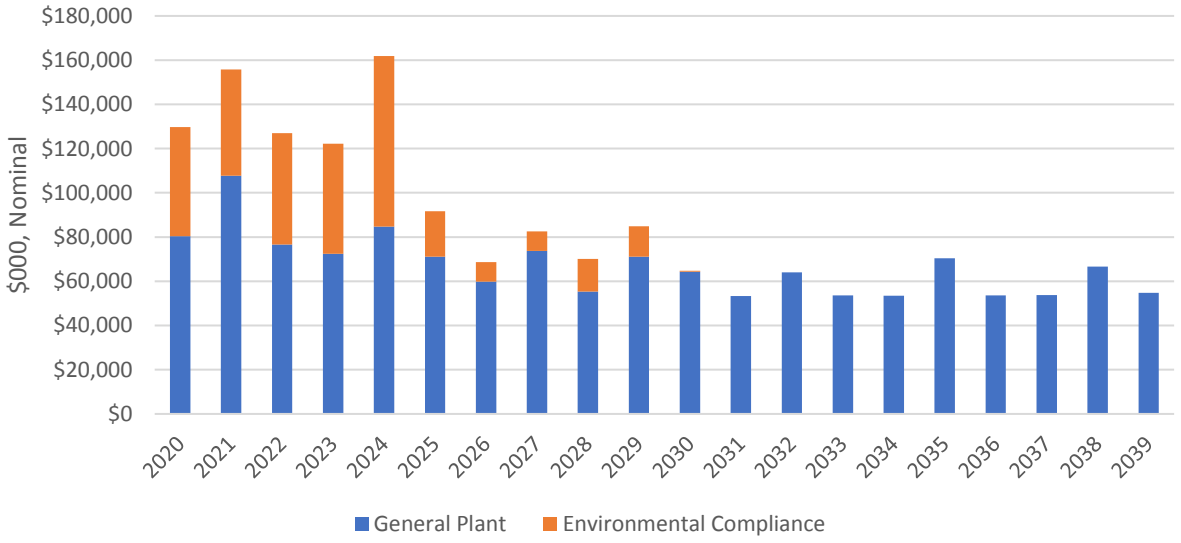


Figure 8-3 Sensitivities Case General Plant and Environmental Compliance CAPEX, 2020 to 2039

As shown above, general plant CAPEX averages approximately $67.0 million per year in nominal dollars, and generally decreases from around $100 million/year in 2020 to around $60 million/year from 2031 onward. Black & Veatch understands these costs are corporate and customer service expenses, and the decreasing trend is due to operational efficiencies, including a targeted 10 percent reduction in staffing and operational alliances with other utilities.

Environmental compliance CAPEX totals approximately $341 million in nominal dollars from 2020 through 2029 and represents remediation and decommissioning costs associated with ash pond closure at Winyah, Cross, and Jefferies, as well as constructing a solid waste landfill at Cross and Winyah. This is largely consistent with the environmental compliance plan summarized in Subsection 4.3.7, which Black & Veatch believes appears reasonable.

8.2 OPEX

8.2.1 Generation

The Sensitivities Case includes OPEX for the continued operation of existing Santee Cooper assets, new generation assets as described in Subsection 8.1.1, and power purchases, as summarized on Figure 8-4.

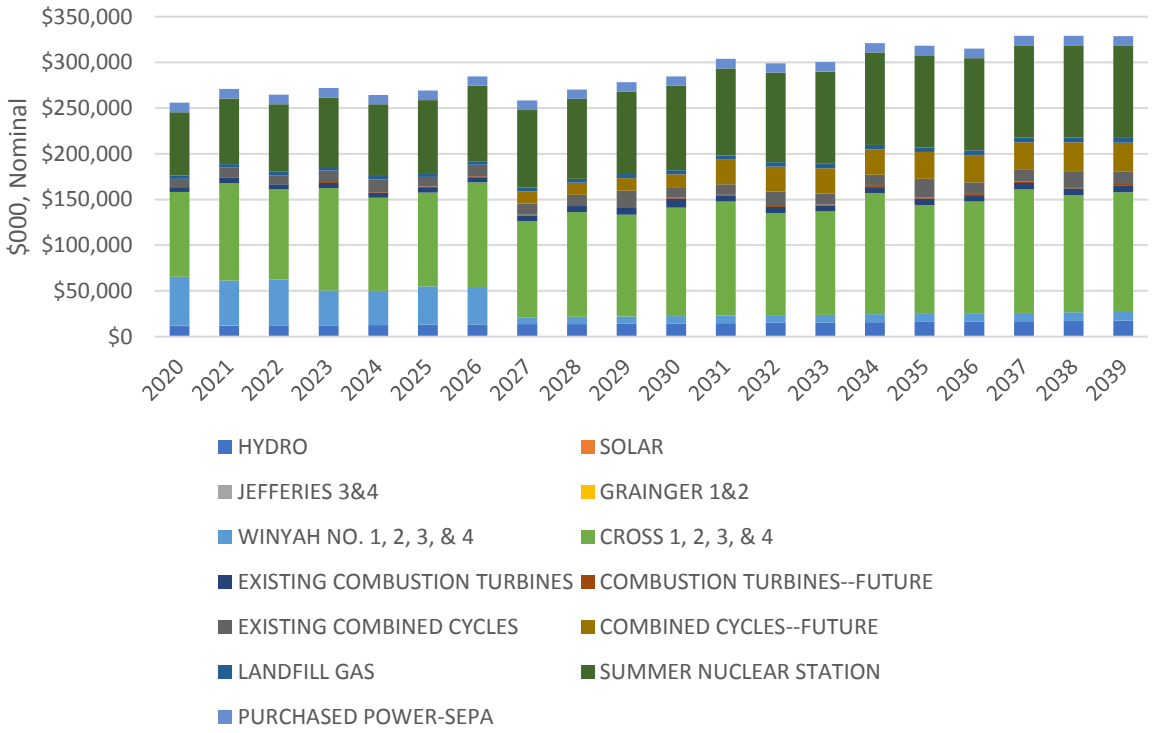


Figure 8-4 Sensitivities Case Generation OPEX, 2020 to 2039

As shown above, the overall trends of the Sensitivities Case non-fuel OPEX are consistent with the major objectives of the Business Plan, as follows:

- Coal OPEX decreases in 2027 because of the retirement of Winyah.
- Economy energy purchases are lower in 2020 compared to historical levels due to the Centerfield Cooper Solar PPA (75 MW) and Gunsight Solar PPA (75 MW). Economy purchases decrease again in favor of PPA energy in 2024, coinciding with an additional anticipated 1,000 MW of solar PPA capacity.
- Gas turbine OPEX increases notably in 2027 and again in 2031, consistent with the anticipated operation dates of the two new 549 MW CCCT units.
- Nuclear, hydroelectric, and oil peaker OPEX remain relatively consistent with historical levels throughout the Financial Forecast – Sensitivities Case, consistent with the assumption that there will be no major additions or retirements in those categories throughout the forecasted time period.

Black & Veatch also reviewed the OPEX input assumptions for new resources including fixed O&M (FOM) and variable O&M (VOM), as summarized in Table 8-2.

Table 8-2 New Generation Resource Non-Fuel OPEX Summary ($2019 Real)

RESOURCE	FOM ($/KW-YR)	VOM ($/MWH)	CONTRACT PRICE ($/MWH)
Summer 549	$4.90	$2.35	-
Summer 549	$4.90	$2.35	-
Future CT	$4.90	$6.86	-
Future CT	$4.90	$6.86	-
Runway Solar	-	N/A	-
Centerfield Cooper Solar	-	N/A	-
Gunsight Solar	-	N/A	-
1000 MW	-	N/A	-
Battery 1	$2.94	N/A	-
Battery 2	$2.94	N/A	-
Battery 3	$2.94	N/A	-
Battery 4	$2.94	N/A	-
Battery 5	$2.94	N/A	-
PPA	-	-	$25.00

Overall, Black & Veatch finds the assumptions shown in Table 8-2 to be reasonable. Black & Veatch's key observations around these assumptions are as follows:

- FOM and VOM for the SCCT and CCCT units are within the range Black & Veatch would expect for similar assets in the region.
- The FOM for the battery assets is lower than current battery FOM costs Black & Veatch has observed. Black & Veatch notes that, similar to installation costs discussed above, battery O&M costs are expected to decrease, and these battery units are expected to be installed between 2024 and 2028, which would reasonably merit a lower cost than today. The $2.94 assumed for the Sensitivities Case battery assets is on the low end of the range Black & Veatch has observed in industry literature for the time frame assumed in the Sensitivities Case and may be optimistic.
- The assumed PPA price of $25/MWh in 2019 real dollars is on the low end of the range observed at the time of this report. However, Black & Veatch notes that solar PPA prices have steadily decreased across the industry due to technological advancements and increased competition. Black & Veatch finds it reasonable to assume that solar PPA prices will continue to become more competitive, and believes that the assumed PPA price is

reasonable provided the solar asset is sited optimally on Santee Cooper or Central-owned property which can minimize interconnection and land acquisition/rent costs.

8.2.2 Transmission and Distribution

Transmission and distribution OPEX as shown in the Sensitivities Case is summarized on Figure 8-5.

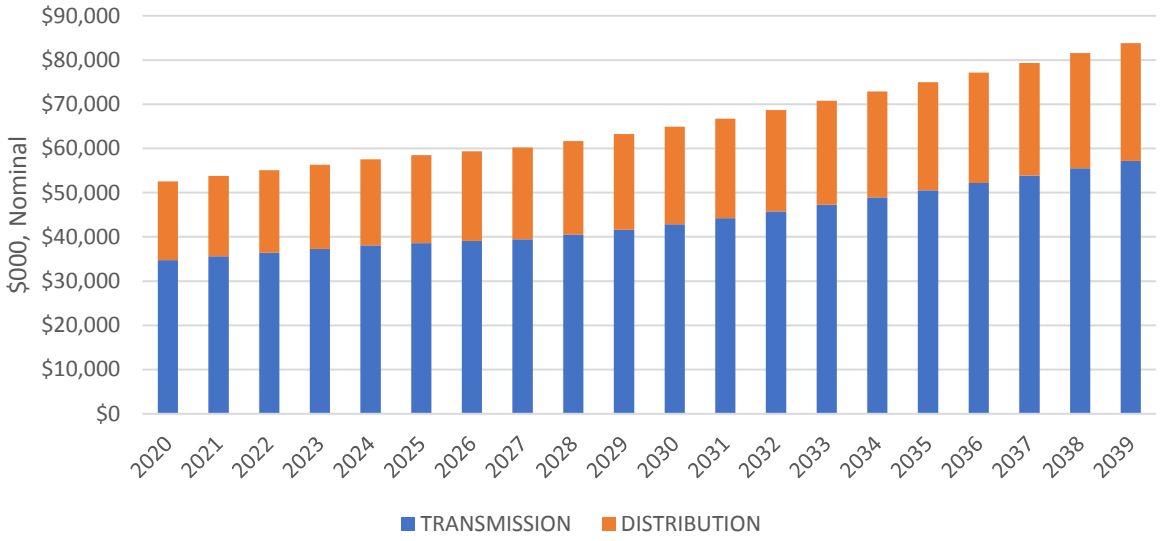


Figure 8-5 Sensitivities Case Transmission and Distribution OPEX, 2020 to 2039

Sensitivities Case transmission and distribution OPEX in 2020 is materially consistent with reported 2019 actual values, and overall OPEX for both transmission and distribution grows at approximately 2.5 percent annually in nominal dollars. Black & Veatch finds this to be reasonable, given that the Santee Cooper system will be continually growing to serve new load and interconnect new customers and given the actual 2014 to 2018 retail customer growth rate of approximately 1.9 percent.

Appendix A. Performance Graphs of Selected Units

A.1 CROSS

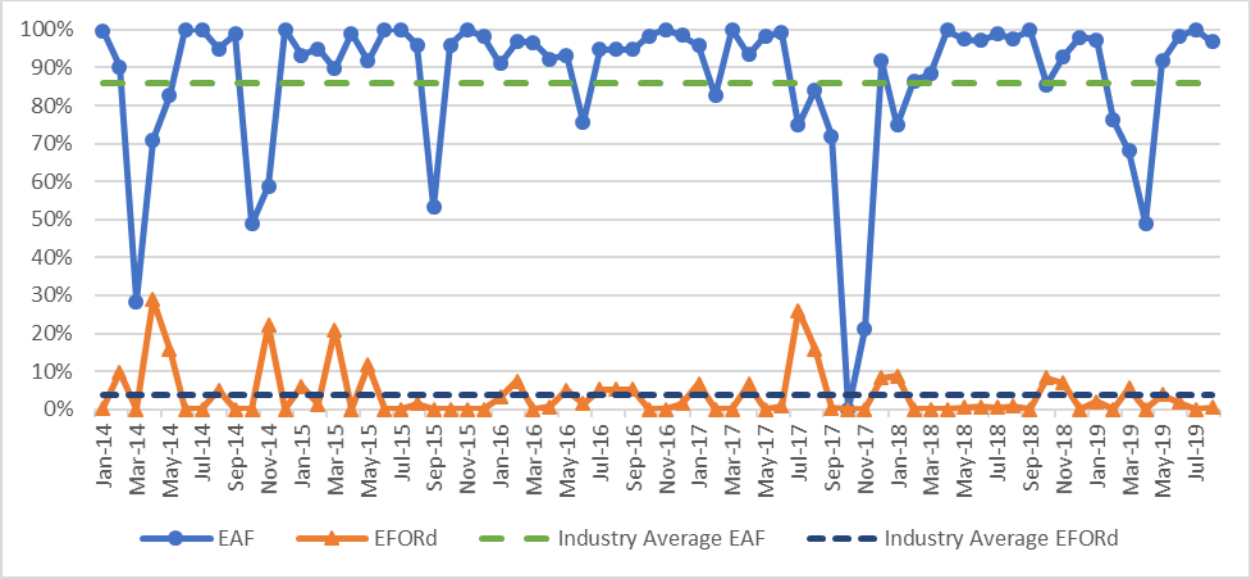


Figure A-1 Cross Unit 1 Historical and Industry Average EAF and EFORd

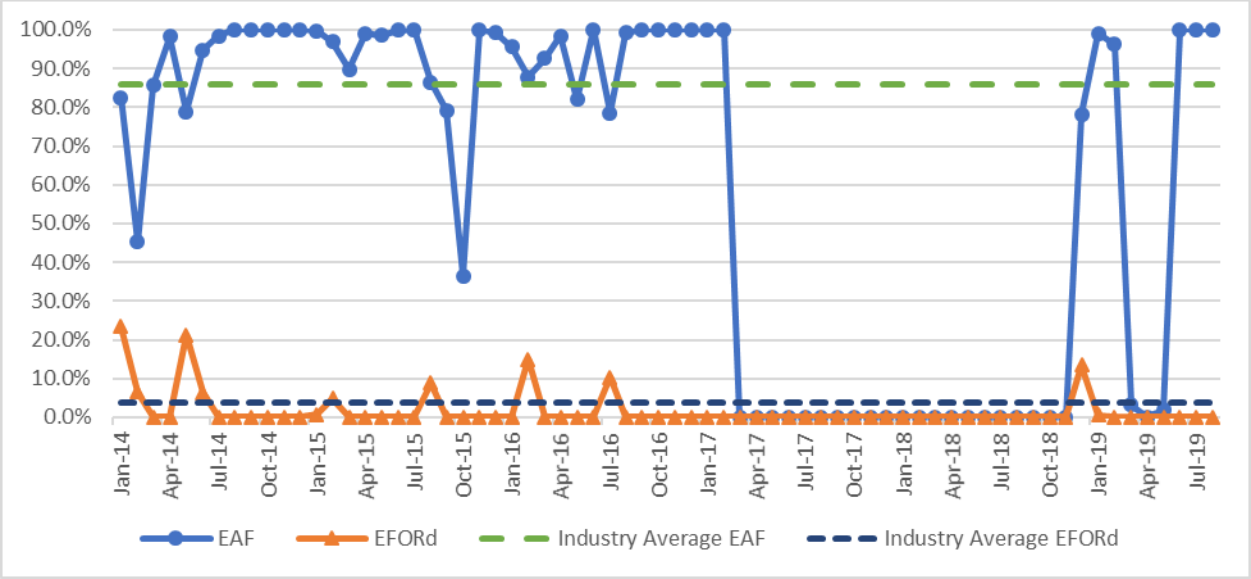


Figure A-2 Cross Unit 2 Historical and Industry Average EAF and EFORd

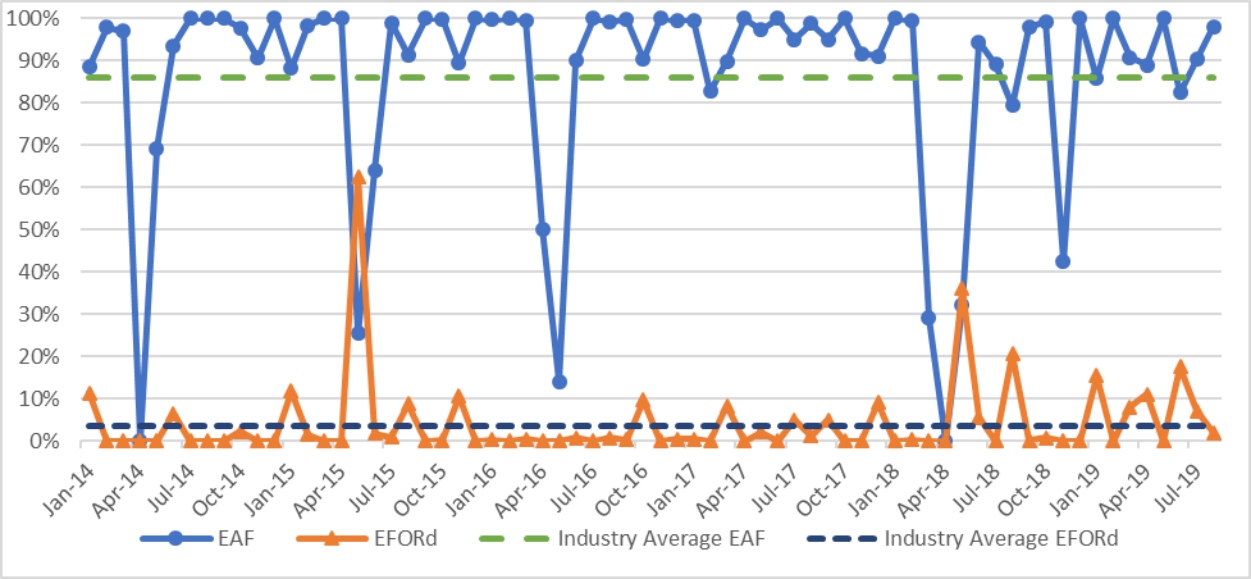


Figure A-3 Cross Unit 3 Historical and Industry Average EAF and EFORd

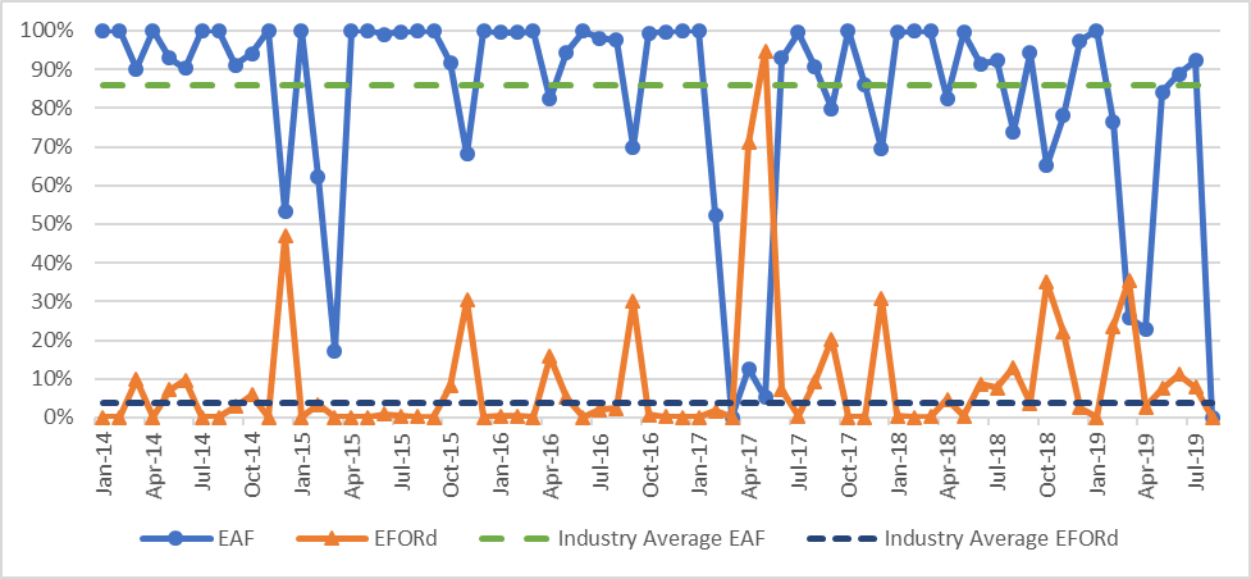


Figure A-4 Cross Unit 4 Historical and Industry Average EAF and EFORd

A.2 WINYAH

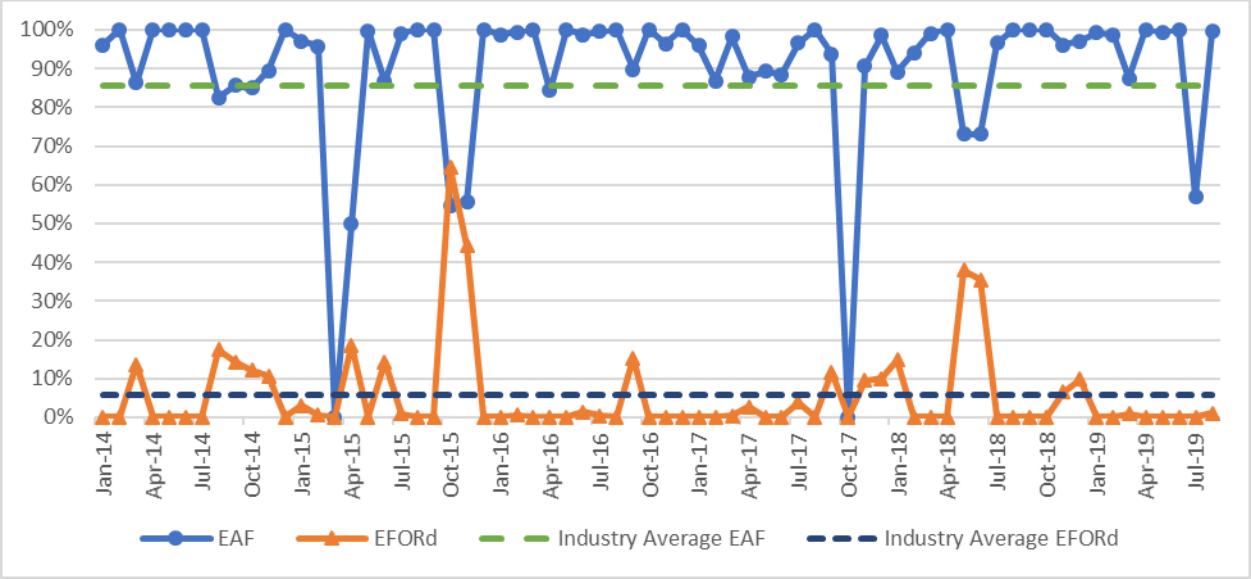


Figure A-5 Winyah Unit 1 Historical and Industry Average EAF and EFORd

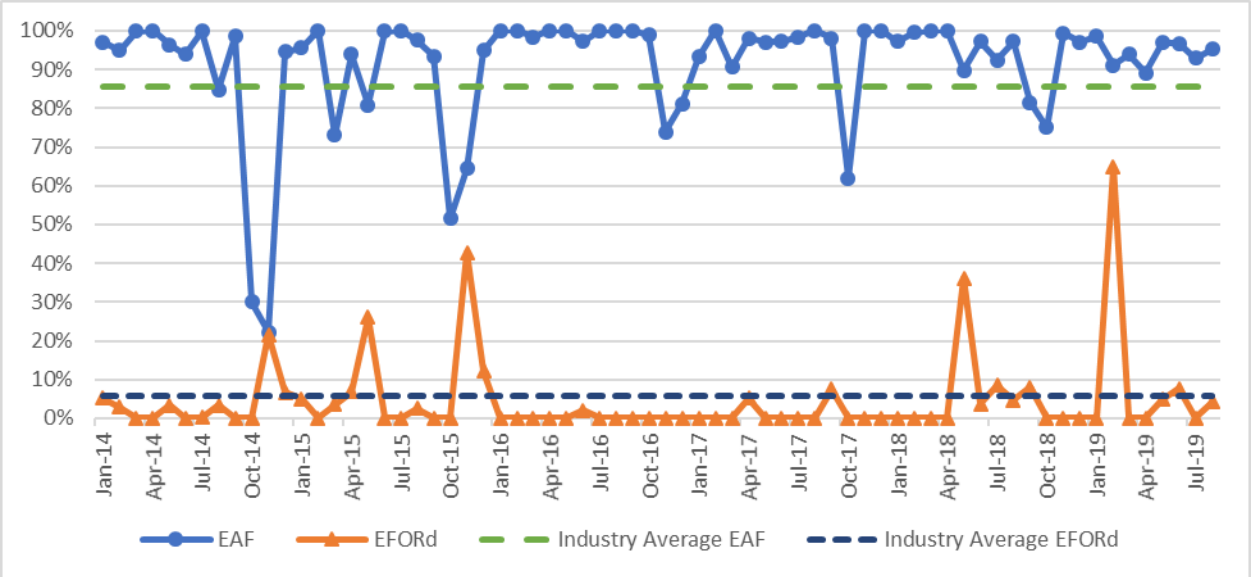


Figure A-6 Winyah Unit 2 Historical and Industry Average EAF and EFORd

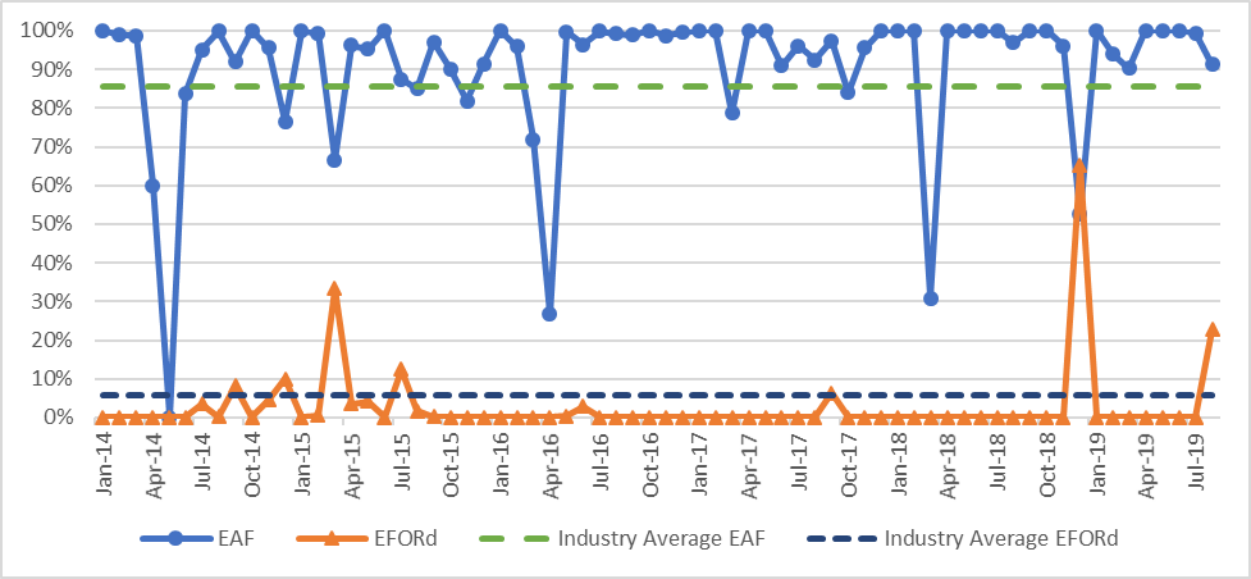


Figure A-7 Winyah Unit 3 Historical and Industry Average EAF and EFORd

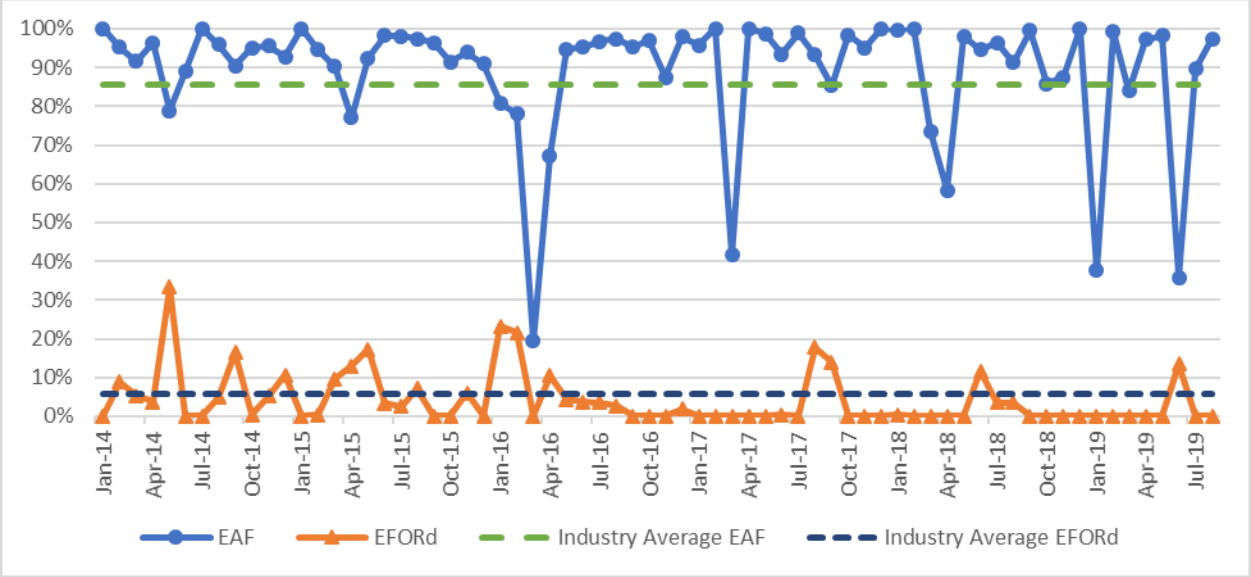


Figure A-8 Winyah Unit 4 Historical and Industry Average EAF and EFORd

A.3 RAINEY GENERATION STATION

A.3.1 Rainey Combined Cycle

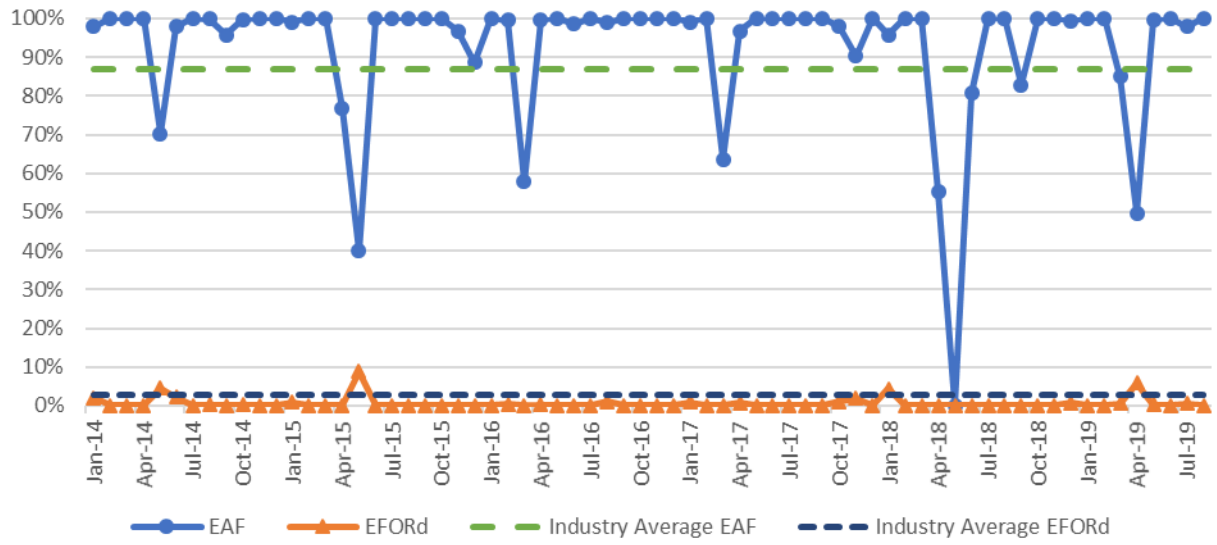


Figure A-9 Rainey Unit 1A Historical and Industry Average EAF and EFORd

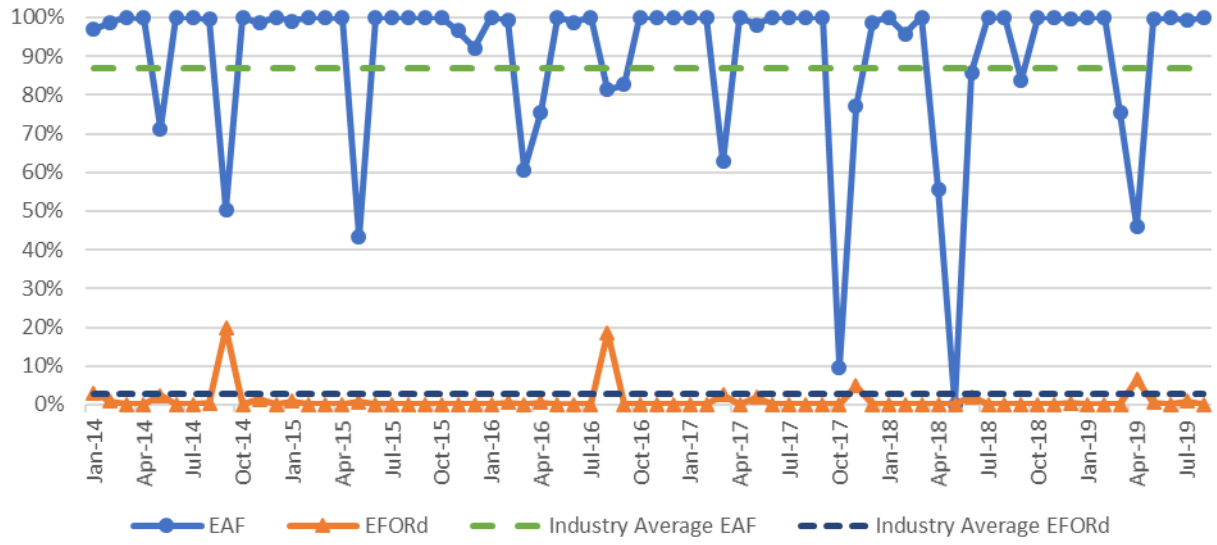


Figure A-10 Rainey Unit 1B Historical and Industry Average EAF and EFORd

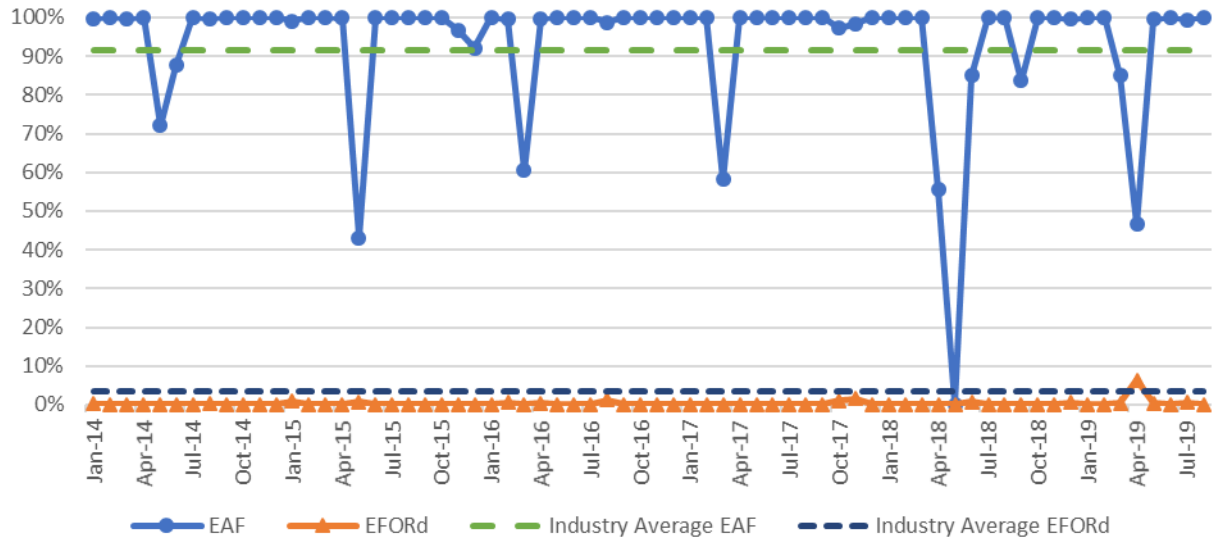


Figure A-11 Rainey Unit 1S Historical and Industry Average EAF and EFORd

A.3.2 Rainey Combustion Turbines

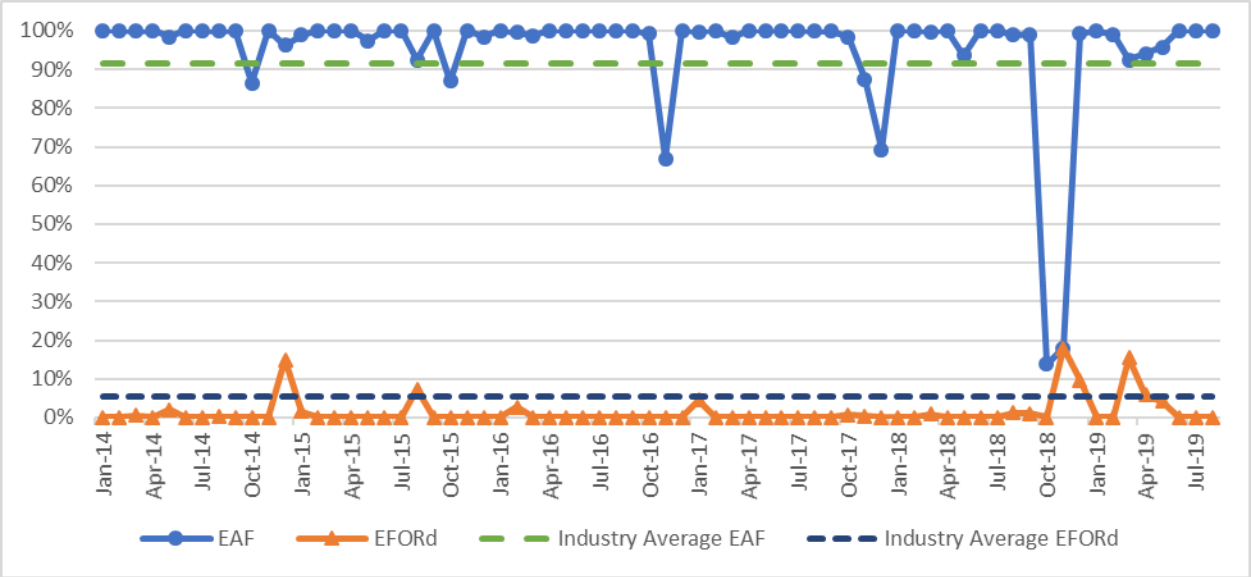


Figure A-12 Rainey Unit 2A Historical and Industry Average EAF and EFORd

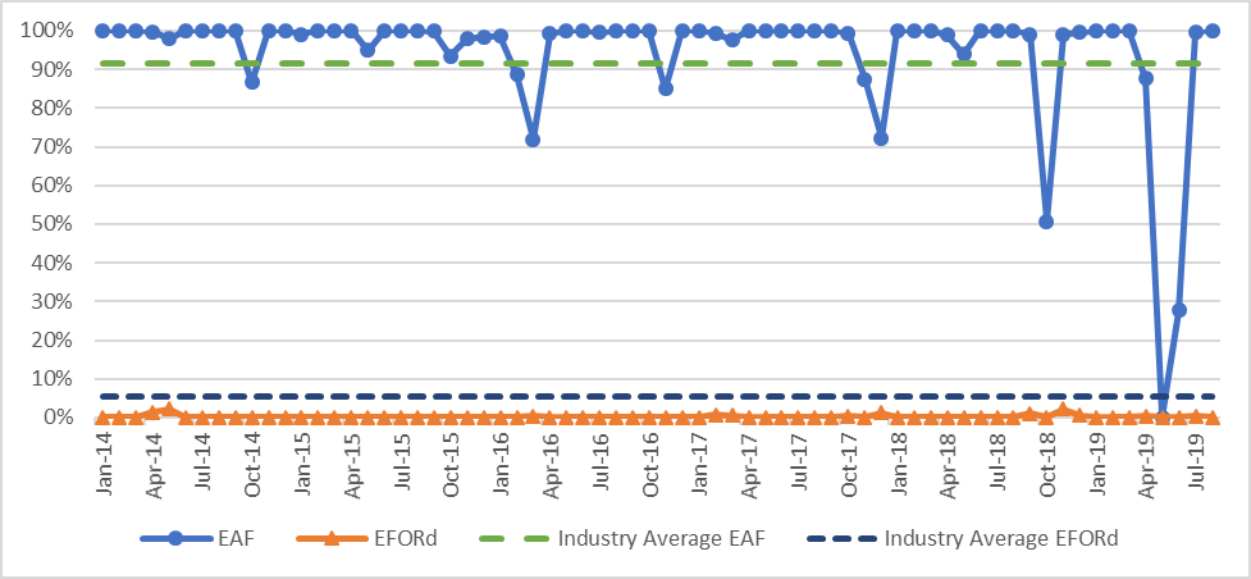


Figure A-13 Rainey Unit 2B Historical and Industry Average EAF and EFORd

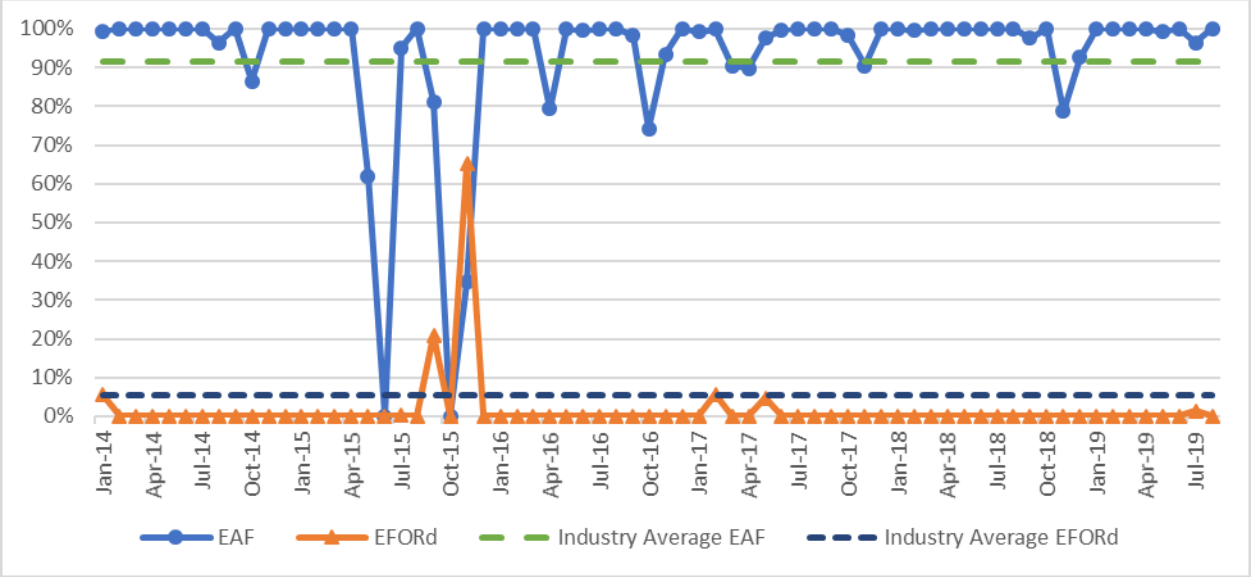


Figure A-14 Rainey Unit 3 Historical and Industry Average EAF and EFORd

Figure A-15 Rainey Unit 4 Historical and Industry Average EAF and EFORd

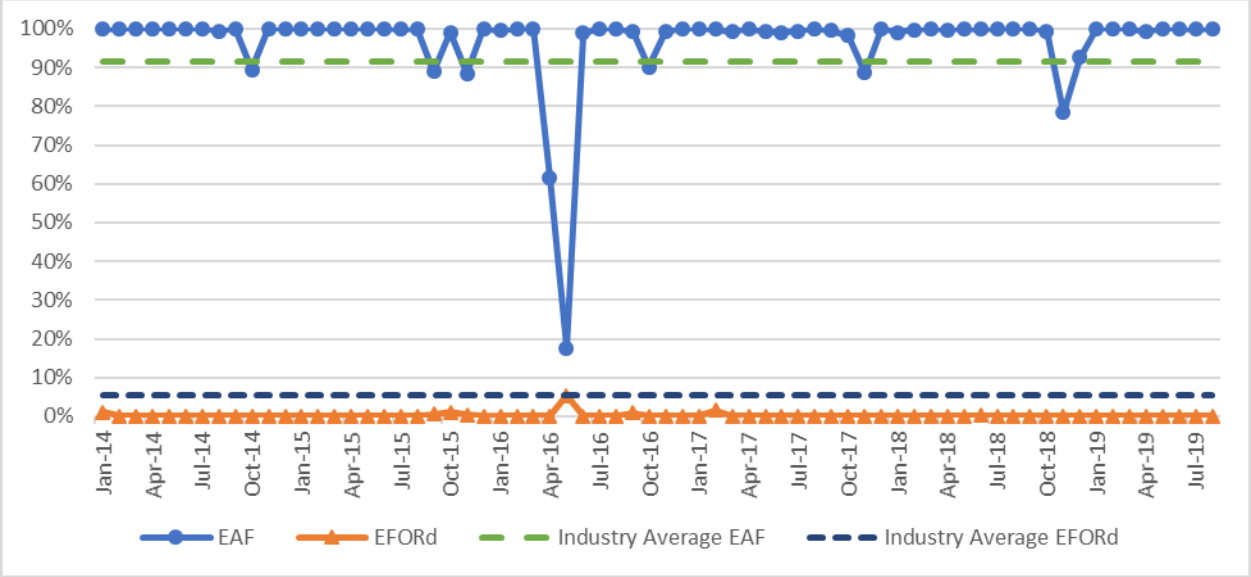


Figure A-16 Rainey Unit 5 Historical and Industry Average EAF and EFORd

A.4 HILTON HEAD

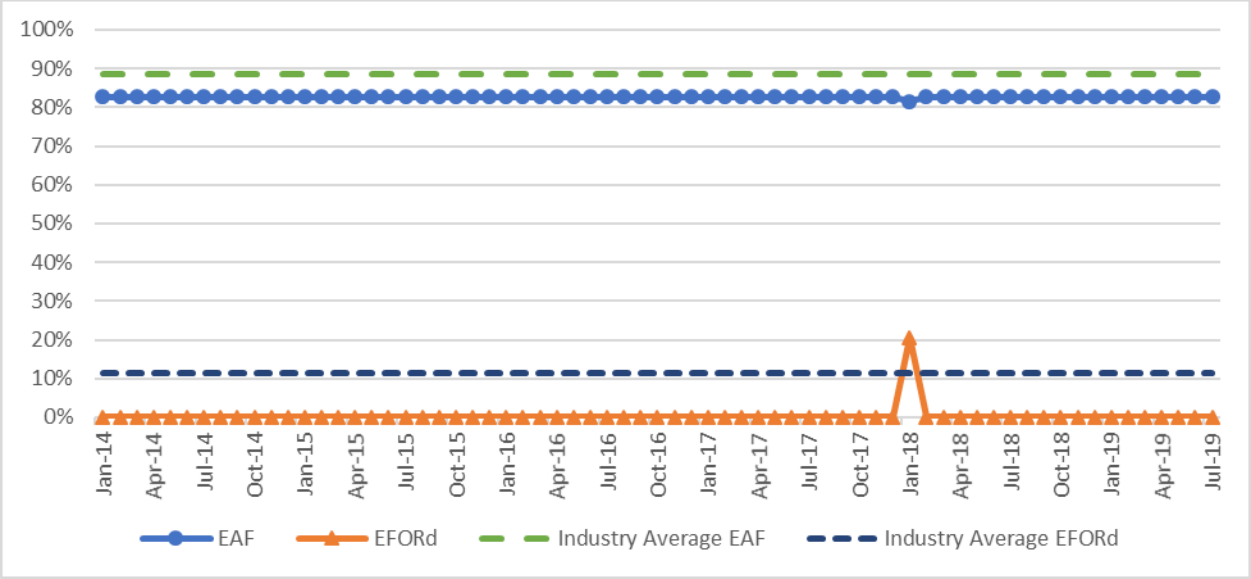


Figure A-17 Hilton Head Unit 1 Historical and Industry Average EAF and EFORd

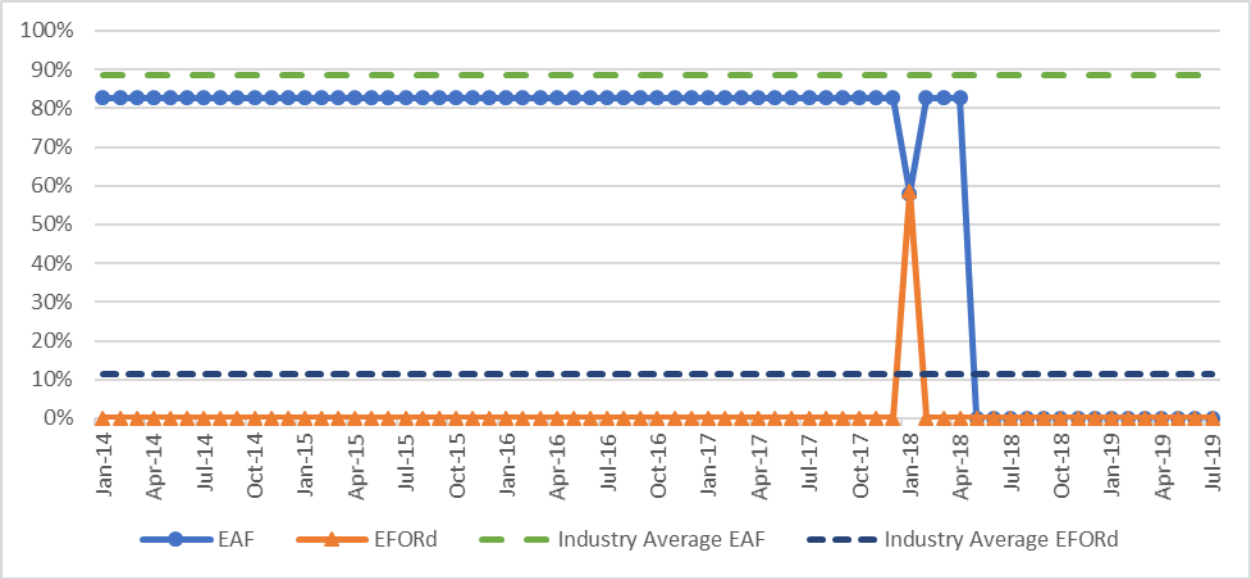


Figure A-18 Hilton Head Unit 2 Historical and Industry Average EAF and EFORd

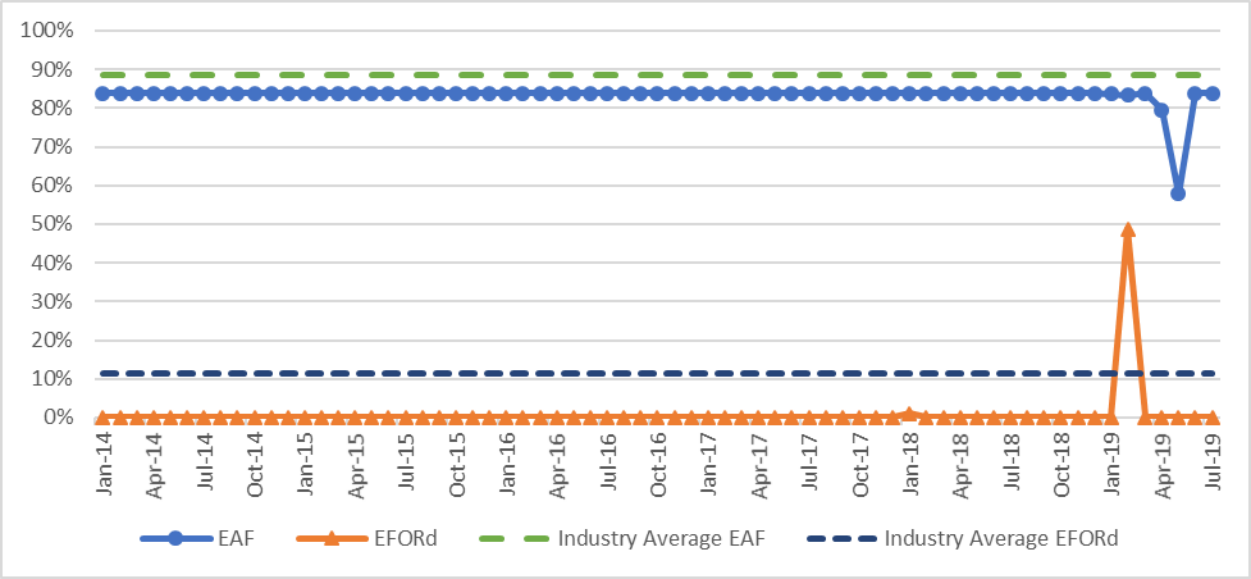


Figure A-19 Hilton Head Unit 3 Historical and Industry Average EAF and EFORd

A.5 MYRTLE BEACH

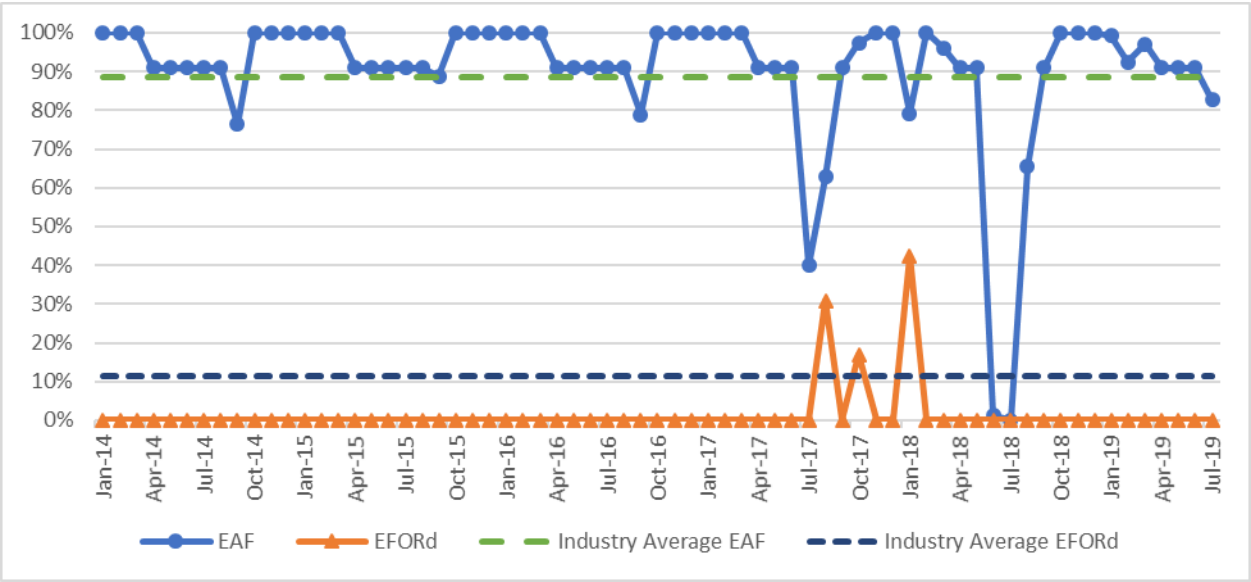


Figure A-20 Myrtle Beach Unit 1 Historical and Industry Average EAF and EFORd

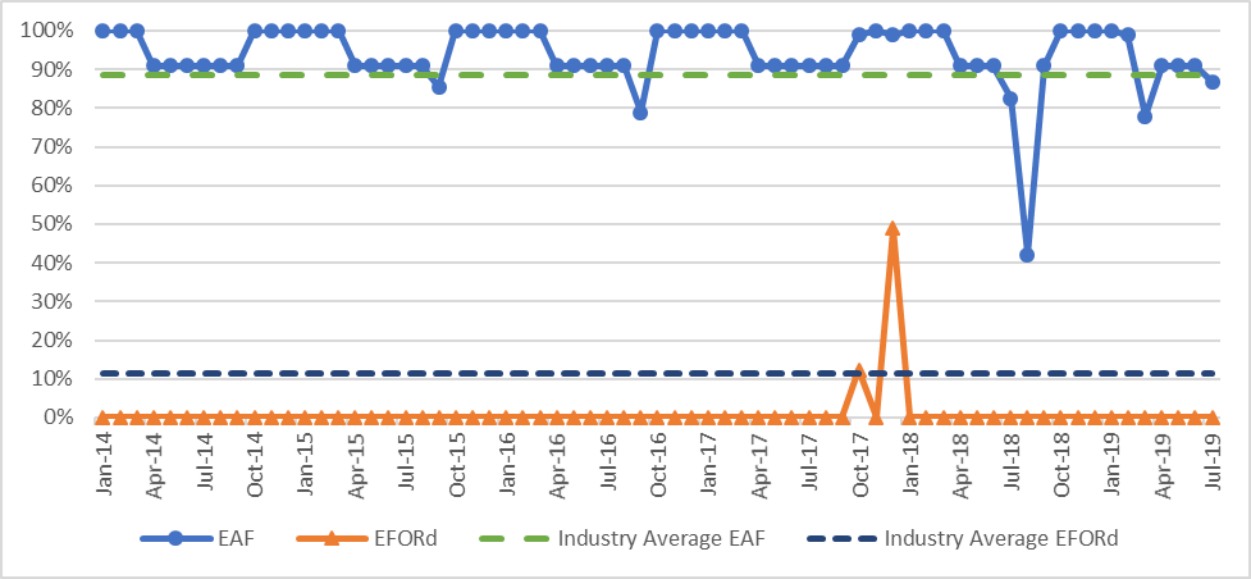


Figure A-21 Myrtle Beach Unit 2 Historical and Industry Average EAF and EFORd

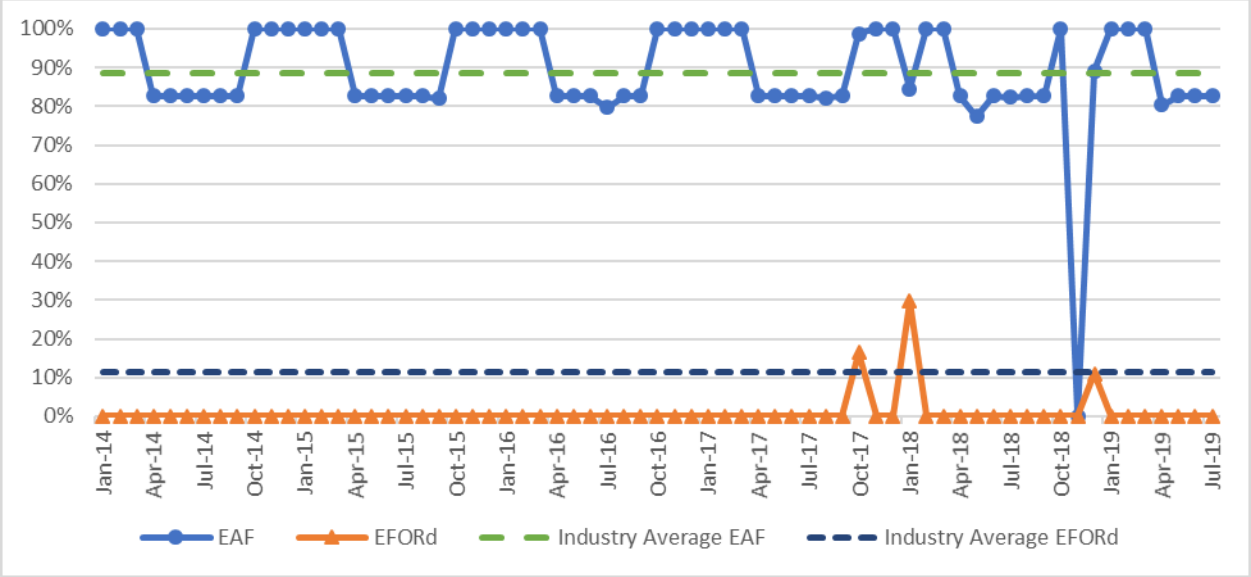


Figure A-22 Myrtle Beach Unit 3 Historical and Industry Average EAF and EFORd

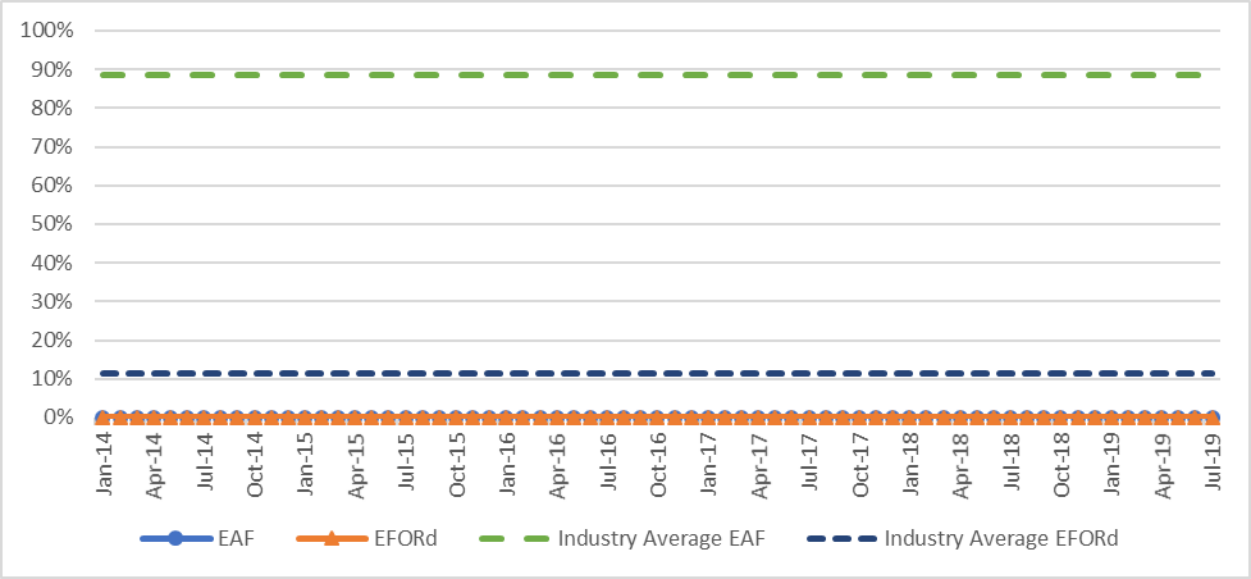


Figure A-23 Myrtle Beach Unit 4 Historical and Industry Average EAF and EFORd

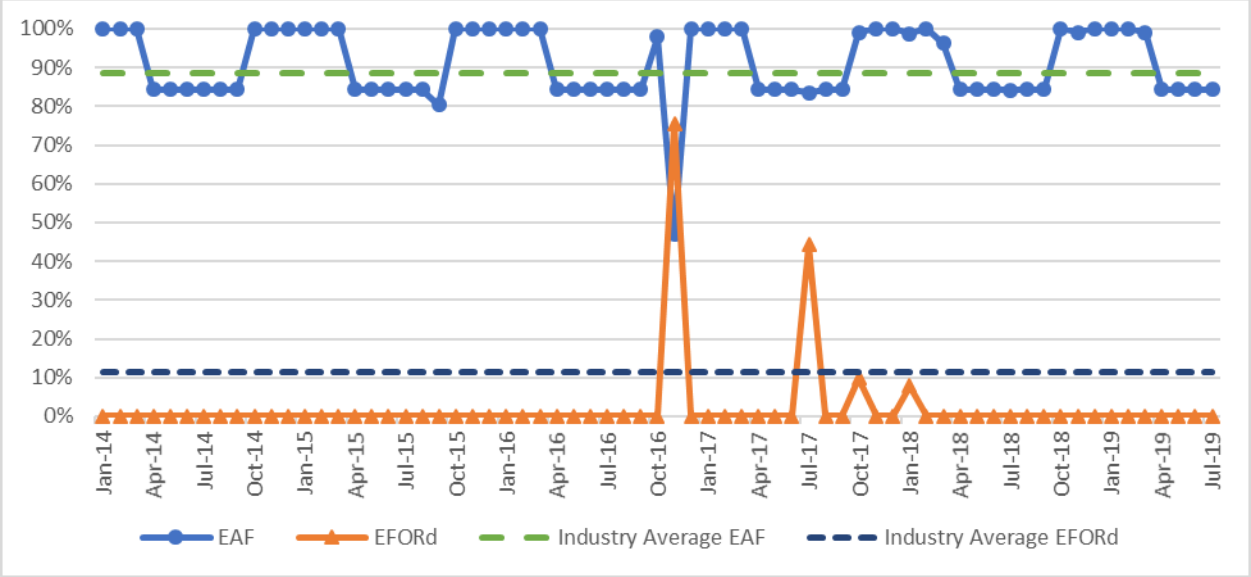


Figure A-24 Myrtle Beach Unit 5 Historical and Industry Average EAF and EFORd

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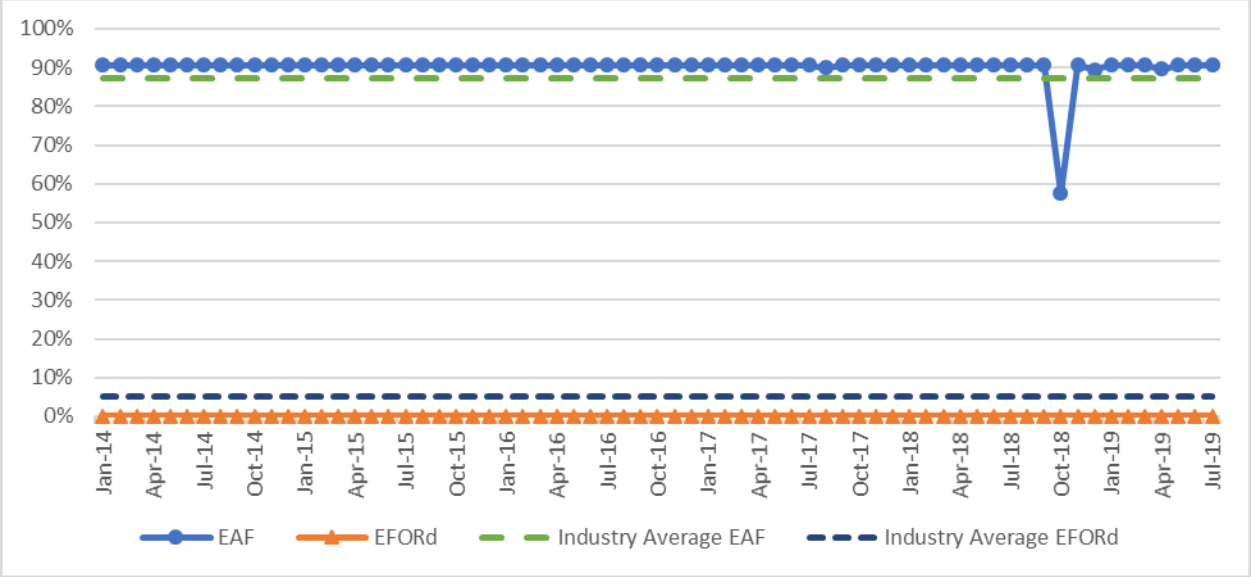

Figure A-25 Jefferies Hydro Unit 1 Historical and Industry Average EAF and EFORd

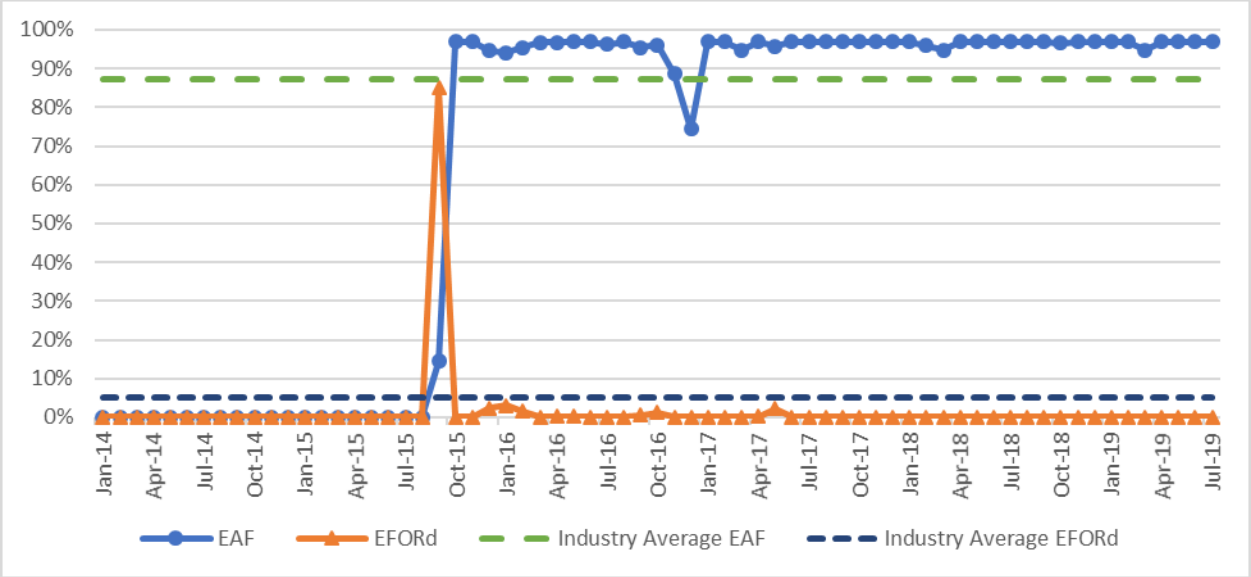

Figure A-26 Jefferies Hydro Unit 2 Historical and Industry Average EAF and EFORd

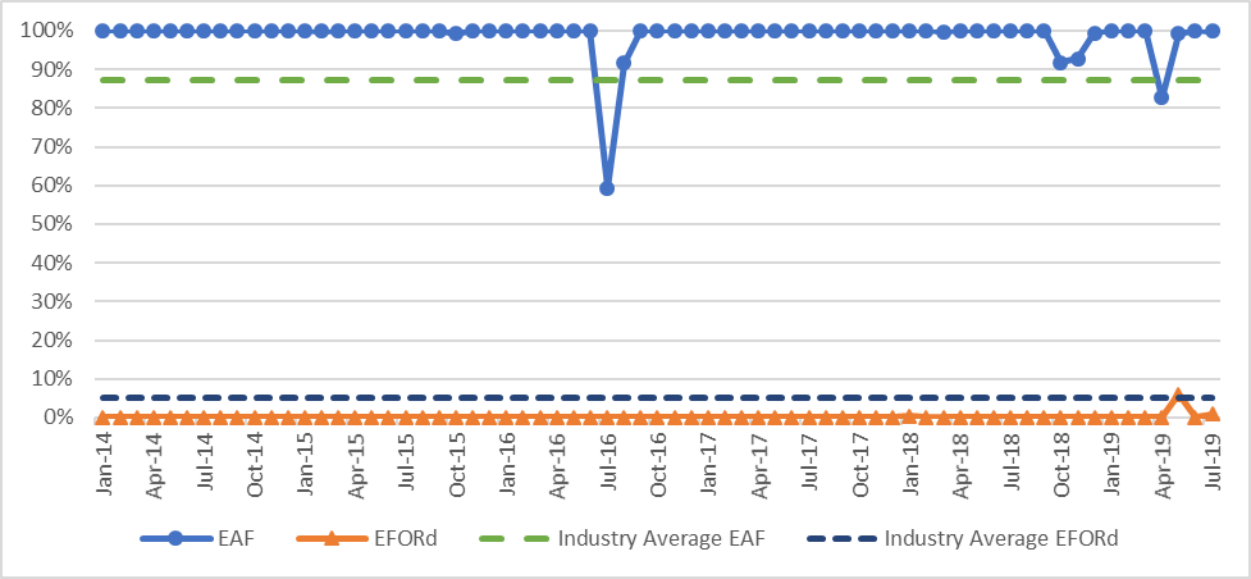

Figure A-27 Jefferies Hydro Unit 3 Historical and Industry Average EAF and EFORd

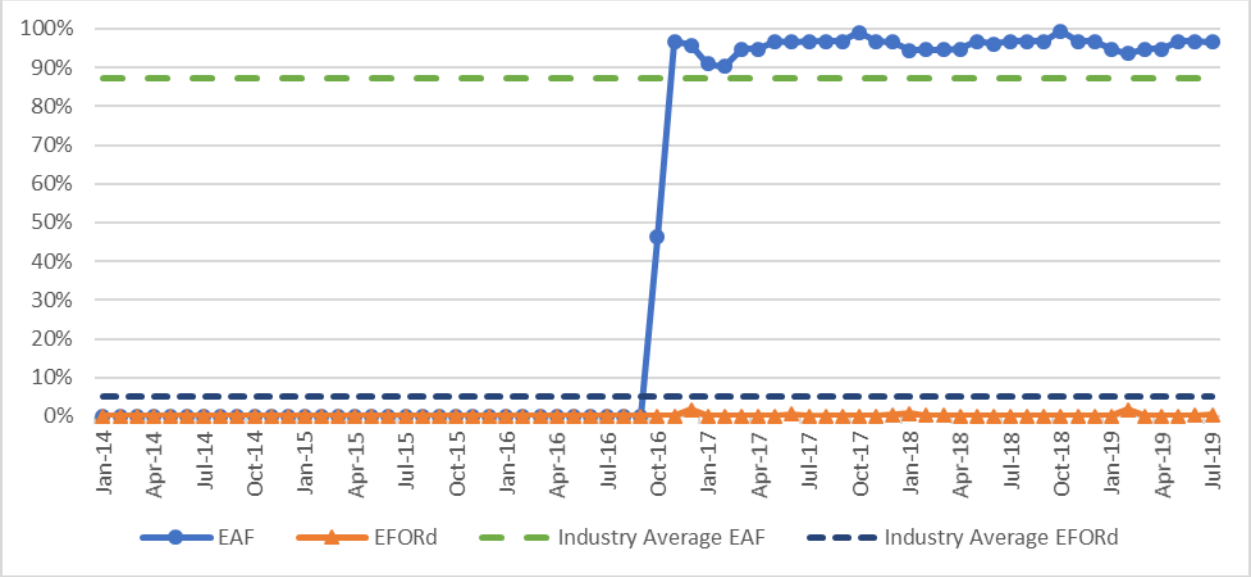

Figure A-28 Jefferies Hydro Unit 4 Historical and Industry Average EAF and EFORd

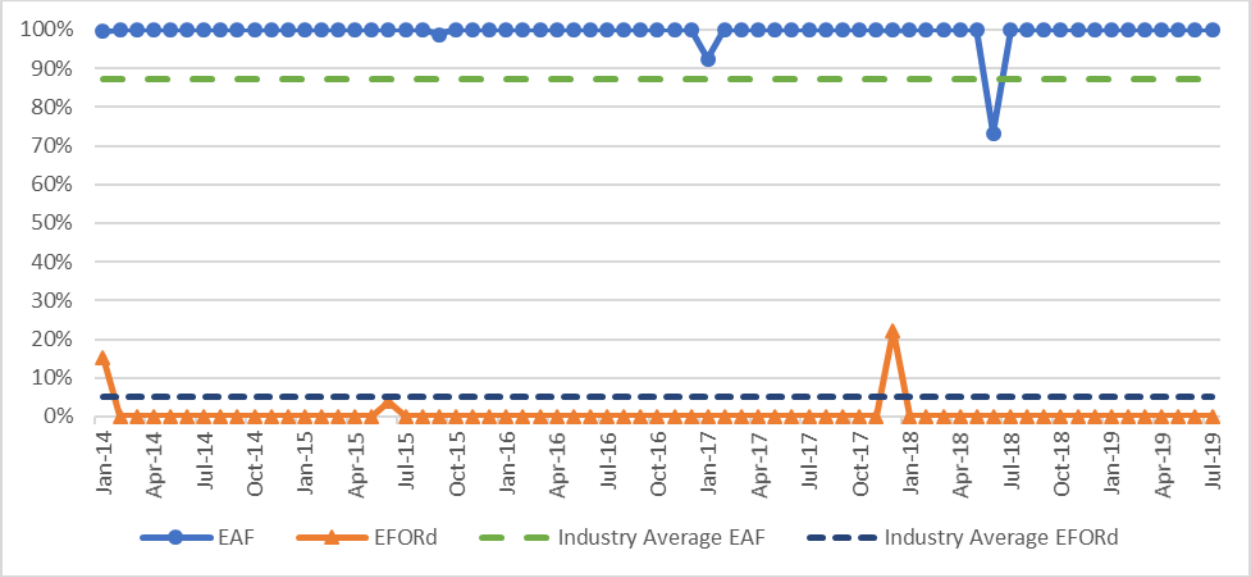

Figure A-29 Jefferies Hydro Unit 6 Historical and Industry Average EAF and EFORd