

August 30, 2019

Mr. Reece McAlister  
Executive Secretary  
Georgia Public Service Commission  
244 Washington Street, First Floor  
Atlanta, Georgia 30334-5701

RE: Georgia Power Company's Twentieth/Twenty-first Semi-Annual Construction  
Monitoring Report for Plant Vogtle Units 3 and 4; Docket No. 29849

Dear Mr. McAlister:

Enclosed for filing is Georgia Power Company's Twentieth/Twenty-first Semi-Annual Construction Monitoring Report for Plant Vogtle Units 3 and 4 pursuant to O.C.G.A. § 46-3A-7(b), Georgia Public Service Commission's ("Commission") Rule 515-3-4-.07(2)(b), and the Commission's Final Order in Docket No. 27800.

There is no trade secret information included in this Twentieth/Twenty-first Semi-Annual Report.

Should you have any questions, please call me at 404-506-3050 or Kelley Balkcom at 404-506-3044.

Sincerely,



Kyle Leach  
Vice President, Regulatory Affairs  
kcleach@southernco.com

Enclosure



## Twentieth/Twenty-first Semi-annual Vogtle Construction Monitoring Report

August 2019 • Docket No. 29849



*Aerial view of Unit 3*



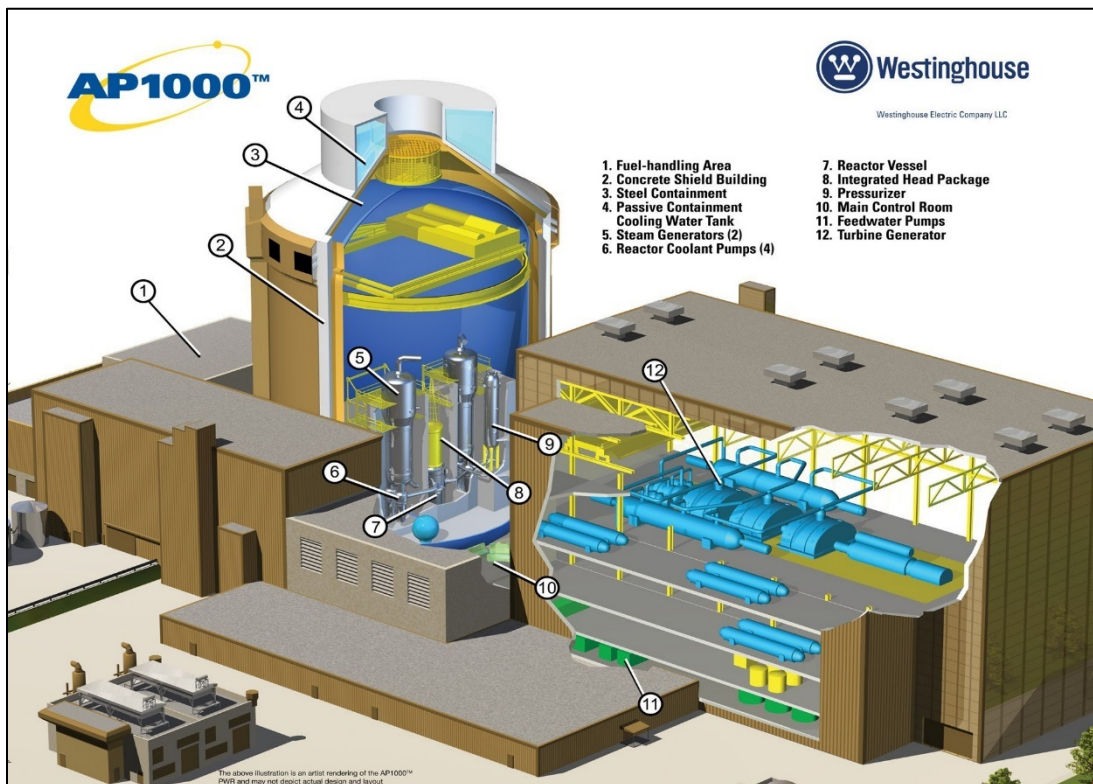
**Vogle Units 3 and 4  
Twentieth/Twenty-first Semi-annual  
Construction Monitoring Report**

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## Unit 3 Nuclear and Turbine Islands

*As of July 2019*





## EXECUTIVE SUMMARY

- **Georgia Power Company (“Georgia Power” or the “Company”) and Southern Nuclear Operating Company (“SNC”), as agent for Georgia Power, are committed to safety, quality, and compliance.**

During the reporting period of July 1, 2018 through June 30, 2019 (the “Reporting Period”), approximately 19.8 million man-hours were performed on construction, testing, and startup of Vogtle Units 3 and 4 (the “Project”). In November 2018, after more than 60 million hours, the Project experienced its first lost-time incident. The event reset the clock on lost-time incidents, a mark that began in December 2014. SNC and contractor leadership utilized the opportunity to re-emphasize the importance of and to encourage renewed focus on safety. Site leadership continues to evaluate opportunities to enhance and cultivate a culture that promotes safety first. Since that incident, approximately 15.6 million man-hours have been performed safely with no additional lost-time injuries.

SNC received no Notices of Violation and remained in favorable standing with the Nuclear Regulatory Commission (the “NRC”) as indicated by its green status under the NRC’s Construction Reactor Oversight Process (the “cROP”). The cROP was designed and implemented to ensure reactors under construction are built according to the NRC-approved design. This program allows the NRC to arrive at objective conclusions about a licensee’s effectiveness in guaranteeing construction quality, providing for predictable responses to performance issues, and clearly communicating performance assessment results to the public.

- **Georgia Power is requesting verification and approval of \$1.248 billion of capital expenditures incurred during the Reporting Period of July 1, 2018, through June 30, 2019.**

**Table 1 - 20<sup>th</sup>/21<sup>st</sup> VCM Expenditures**

*Dollars in Millions*

Original EPC & EPC Scope Change	\$ 0
Interim Payments & Liens	(10)
Site Forecast EPC	1,163
Owner’s Costs	68
Ad Valorem Tax	26
Transmission Interconnection	1
Total 20 <sup>th</sup> /21 <sup>st</sup> VCM Expenditures	<u>\$ 1,248</u>



The Company is submitting \$1.248 billion of expenditures for verification and approval in this 20<sup>th</sup>/21<sup>st</sup> VCM Report. In addition, the Company is requesting verification and approval of \$21.5 million previously spent on the Project that was part of the \$51.6 million deferred for future approval in the 19<sup>th</sup> VCM proceedings.

In June 2019, the Company, on behalf of itself and the other Owners, completed a settlement agreement with the Westinghouse estate regarding the August 2018 administrative claim filed in bankruptcy court against Westinghouse. The Company's portion of the settlement and related previously obtained refunds, totaling \$30.1 million, was applied to the Project's CWIP balance during the 19<sup>th</sup> VCM Reporting Period, but verification and approval was deferred to a later proceeding while the administrative claim was pending. Accordingly, this total is not included in the 20<sup>th</sup>/21<sup>st</sup> VCM expenditures presented for approval. The remaining amount of the Company's portion of the claim, approximately \$21.5 million, is now being presented for verification and approval in accordance with the Commission's Order related to the 19<sup>th</sup> VCM filing.

- **The Company's share of the total Project cost is projected at \$8.4 billion.**

Since the 19<sup>th</sup> VCM Report, the Company and SNC have continued to monitor and evaluate costs associated with completion of the Project, including the Project's April 2019 re-baseline of cost and schedule. As a result of these ongoing efforts, the Company's projected share of the total Project cost remains at \$8.4 billion, and the Company is not seeking approval of costs above the previously approved \$7.3 billion in this 20<sup>th</sup>/21<sup>st</sup> VCM Report.

Included in the current forecast is \$366 million of estimated contingency that remains unallocated. The Company is not requesting Commission approval of these costs in this filing but may request the Commission to evaluate expenditures allocated to contingency for rate recovery as and when appropriate.

Capital expenditures to date are \$5.189 billion after accounting for receipt of the Toshiba Parent Guaranty and the Westinghouse settlement noted above. The estimated remaining capital spend to complete the Project is approximately \$2.806 billion, excluding the contingency noted above.

- **Following the Plant Vogtle Units 3 and 4 Schedule and Cost Update filing in May 2019, the target in-service dates remain unchanged, with approved commercial operation dates of November 2021 for Unit 3 and November 2022 for Unit 4.**

Following the Plant Vogtle Units 3 and 4 Schedule and Cost Update filed with the Commission (the "May 2019 Update"), the target in-service dates remain unchanged, with approved commercial operation dates of November 2021 for Unit 3 and November 2022 for Unit 4. The comprehensive and collaborative re-baseline effort was part of the Project's ongoing review of cost and schedule intended to incorporate the most current information regarding productivity, commodity installation, system turnovers, and the ability to attract and retain craft labor.

The re-baseline effort revised the site working schedule, which continues to preserve margin to the regulatory-approved in-service dates. The Company and SNC recognize that the Project



may continue to experience challenges and that unanticipated events may require further revision to the site working schedule, capital cost forecast, and/or Project schedule.

Targeting in-service dates that are ahead of the regulatory-approved in-service dates for construction, testing, and startup activities is, and continues to be, a strategic decision by the Project to provide schedule margin against the regulatory-approved in-service dates for the Project.

- **The Project continues to achieve its major milestones to support system turnover activities.**

The Project met all major milestones in 2018 and met all first and second quarter major milestones for 2019. Milestones achieved during the Reporting Period and up to the filing of this Report include the setting of all four Reactor Coolant Pumps inside Unit 3 Containment, setting of the Unit 3 Containment Vessel Top Head, completion of Courses 7 through 16 and the Air Inlet Assemblies on the Unit 3 Shield Building, the completion of Unit 3 Initial Energization, and the start of Integrated Flush for Unit 3. Additional milestones include the setting of both Accumulator tanks, both Steam Generators, the Pressurizer inside Unit 4 Containment, and the second ring of Unit 4 Containment.

- **System turnovers from Construction to SNC Initial Test Program have begun.**

During the Reporting Period, the Project completed its first partial system turnovers from construction to testing. Fifteen turnovers have been completed to date, four of which were necessary for the recent completion of Unit 3 Initial Energization, which provided permanent off-site power necessary to perform subsequent testing. These first turnovers have provided valuable information for process improvement as the rate of system turnovers continues to increase to support future testing milestones such as Integrated Flush, Open Vessel Testing, Main Control Room readiness, and Cold Hydro Testing.

- **The Project is working diligently to mitigate risks and pressures on performance.**

Since the May 2019 Update, the Project has continued to recruit incremental craft and field leadership, while working to increase efficiency and production. The Project continues efforts to increase its weekly earnings to meet its peak earnings target of over 160,000 hours per week. In recent weeks, the Project has reached earnings levels of 150,000 hours. Close attention is being paid to electrical hours earned, which has been challenged over the past few months, but is showing improvement in both day and night shift following improved material management and implementation of mitigation plans by Bechtel. These mitigation plans include increased electrical craft staffing, adjustments to field leadership, optimized craft allocation between Unit 3 and Unit 4, and utilization of pipefitter craft workers in electrical support roles.

The Project has experienced success in its hiring efforts and substantially reduced the previously reported shortage of craft labor during the first half of 2019, largely due to aggressive recruitment efforts that included increased wages and an enhanced per diem program. While craft labor recruitment efforts are currently meeting the plan for necessary craft labor levels, productivity is still heavily dependent upon the availability of work fronts



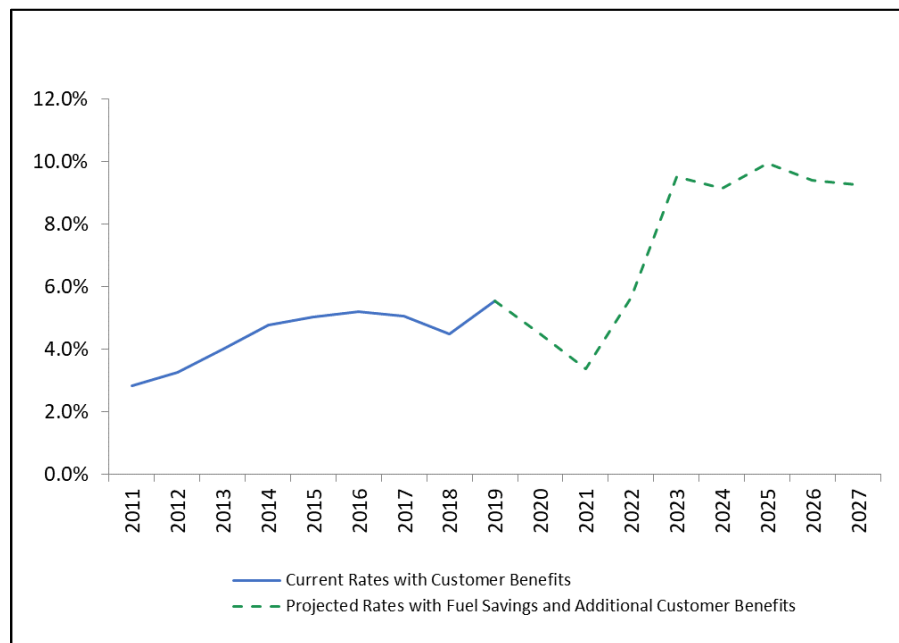
and efficient resource deployment by Bechtel. Sustained higher levels of productivity are necessary to meet the Project's aggressive site working schedule as the bulk of construction work on Unit 3 transitions from civil completion to mechanical and electrical bulk construction to system turnovers for testing.

- **Completing Vogtle Units 3 and 4 is critical to the Company's diverse energy mix and remains in the best interests of Georgia Power customers.**

Nuclear generation is vital to Georgia Power's diverse energy mix and provides an important hedge against the impact of potential carbon costs and fossil fuel cost volatility that could impact the ability to deliver reliable and economic power to customers in the decades ahead. Vogtle Units 3 and 4 will serve as an economic baseload resource to meet the electricity needs of our customers, in addition to the value that nuclear energy provides to Georgia's future considering potential environmental regulations.

Upon completion, Vogtle Units 3 and 4 will be an asset to Georgia Power, its customers, the state, and the nation for 60 or more years. The Project remains the most important infrastructure project currently underway in Georgia, providing over 8,000 construction jobs and approximately 800 permanent careers once complete. The new units will support Georgia's economic growth and provide economic benefit to current electric customers, as well as those looking to expand or relocate to the state.

- **Vogtle Units 3 and 4 peak rate impact for customers is expected to be approximately ten percent.**



*Figure A – Projected Cumulative Rate Impacts*

The projected peak rate impact to retail customers is approximately 10%, of which approximately 5.5% was in rates as of January 1, 2019. As illustrated in Figure A, beginning

in January 2020, customers will see significant savings over the next twenty-four months as a result of the Return on Equity (“ROE”) penalties established in the Commission’s Order on the 17<sup>th</sup> VCM. The peak rate impact of approximately 10% will occur when the Project is placed into service and fully included in rates, and the ROE is no longer subject to those penalties.

Consistent with previous VCM Reports, the rate impacts include customer benefits that the Company proactively pursued, including federal production tax credits and interest savings from the Department of Energy loan guarantees. The projections also include the fuel savings associated with adding additional nuclear units to the generation mix.

- **Georgia Power and the Department of Energy finalized an additional \$1.67 billion loan guarantee on March 22, 2019.**

Georgia Power’s total loan guarantee capacity with the Department of Energy is now \$5.13 billion. As a result of the additional loan guarantee capacity, Georgia Power customers are expected to save approximately \$550 million in financing costs overall, of which approximately \$400 million has been secured from draws on the original \$3.46 billion loan guarantee agreement. These savings are a result of access to lower credit spreads compared to traditional capital financing methods.



## **RESPONSES TO STIPULATED QUESTIONS**

### **1. The reasons for any additional change in the estimated costs and schedules of the units since the process began.**

Following the April 2019 schedule re-baseline, the target in-service dates remain unchanged, with approved commercial operation dates of November 2021 for Unit 3 and November 2022 for Unit 4. The re-baseline effort did revise the site working schedule, which continues to preserve margin to the regulatory-approved in-service dates.

There were no changes to the cost forecast as presented in the previous VCM filing, the details of which are provided in Table 1.1. Table 1.1 also reflects the to-date capital investment, actual-to-forecast variances, and the total financing costs during construction. Total financing costs include amounts collected and forecasted to be collected under the NCCR tariff and amounts accrued and forecasted to be accrued through AFUDC.

**Table 1.1**

Vogtle 3&4 Project  
Georgia Power Company Cost - **Subject to Commission Verification and Approval**  
Project To Date  
Through Period Ending June 30, 2019

	<u>Total Project Capital</u>			<u>Project to Date Capital</u>		
	<u>VCM 19</u>	<u>Total</u>	<u>Variance</u>	<u>Actual</u>	<u>Budget</u>	<u>Variance</u>
	<u>(\$ millions)</u>	<u>Current</u>	<u>(\$ millions)</u>	<u>To</u>	<u>To</u>	<u>(\$ millions)</u>
		<u>Forecast</u>		<u>Date</u>	<u>Date</u>	
		<u>(\$ millions)</u>	<u>(\$ millions)</u>	<u>(\$ millions)</u>	<u>(\$ millions)</u>	<u>(\$ millions)</u>
<b>Construction &amp; Capital Cost</b>						
Original EPC <sup>(1)</sup>	3,198	3,198	0	3,198	3,198	0
Interim Payments & Liens	440	440	0	430	440	(10)
Site Construction Management						
Engineering Contractor	270	249	(21)	218	206	12
Procurement	1,244	1,204	(39)	647	726	(79)
Contract Construction	2,142	2,186	44	1,036	1,153	(117)
Construction Support & Project Management	719	765	46	167	233	(65)
Total Site Construction Management	4,375	4,405	30	2,068	2,318	(249)
Owner's Costs	1,173	1,141	(32)	788	848	(60)
Ad Valorem	273	273	0	135	141	(6)
Transmission Interconnection	61	62	1	60	60	(0)
Test Fuel Offsets	(33)	(33)	0	0	0	0
	1,475	1,443	(31)	983	1,050	(67)
<b>Total Construction &amp; Capital Cost<sup>(3)</sup></b>	<b>9,488</b>	<b>9,486</b>	<b>(2)</b>	<b>6,680</b>	<b>7,006</b>	<b>(326)</b>
Toshiba Parent Guarantee, net of customer refunds	(1,493)	(1,492)	2	(1,492)	(1,493)	2
Total to be Absorbed by GPC	(694)	(694)	0	0	0	0
<b>Total Construction &amp; Capital Cost, net of Parent Guarantee and amounts to be absorbed by GPC<sup>(3)</sup></b>	<b>7,300</b>	<b>7,300</b> <sup>(2)</sup>	<b>0</b>	<b>5,189</b>	<b>5,513</b>	<b>(324)</b>
<b>Other Capital Cost</b>						
Construction Monitor	22	22	0	9	9	0

Vogtle 3&4 Project  
Georgia Power Company Financing Cost - **Recovered Pursuant to O.C.G.A. 46-2-25 (c.1), the January 3, 2017 Order Adopting Stipulation, and the VCM 17 Order**  
Project To Date  
Through Period Ending June 30, 2019

	<u>Total Project Financing</u>	<u>Project to Date Financing</u>
	<u>Total</u>	<u>Actual</u>
	<u>Current</u>	<u>To</u>
	<u>Forecast</u>	<u>To</u>
	<u>(\$ millions)</u>	<u>Date</u>
		<u>(\$ millions)</u>
		<u>(\$ millions)</u>
		<u>Variance</u>
		<u>(\$ millions)</u>
<b>Project Schedule Financing</b>		
Return on CWIP in Rate Base <sup>(4)</sup>	2,708	1,915
AFUDC - Accrued on CWIP Above Original Certified Cost	309	14
AFUDC - Accrued through Dec 2010 and Related Return	109	109
<b>Total Project Schedule Financing</b>	<b>3,126</b>	<b>2,030</b>
<b>Total Capital Cost and Financing<sup>(3)</sup></b>	<b>10,426</b>	<b>7,219</b>
		<b>7,560</b>
		<b>(341)</b>

**Footnotes:**

- Includes Original EPC contract payment milestones and EPC Scope Change.
- \$7.3 billion is the Total Construction & Capital Cost approved by Georgia Public Service Commission (Order dated January 11, 2018). Above excludes \$366 million in unspecified project contingency. Such amounts may be recommended for consideration by the GPSC as and when included in the Construction and Capital Cost
- Excludes construction monitor fees pursuant to the VCM 19 Order.
- NCCR will only be collected on the certified capital cost of \$4.418 billion per the January 3, 2017 Order Adopting Stipulation and VCM 17 Order.

Note: Details may not add to totals due to rounding.



**Table 1.2****Replacement Energy Costs and Deferred Operating Costs***Million of Dollars*

Date	VCM	Deferred Benefits		Deferred Operating Costs			Total Deferred Operating Costs	Net Cost
		Replacement Energy Cost	Deferred PTCs	O&M	Depreciation	Ad Valorem		
Total 2016		43.6	89.6	(67.0)	(41.2)	(9.3)	(117.5)	15.7
Total 2017		115.8	186.5	(130.4)	(112.3)	(23.2)	(265.9)	36.4
Total VCM 19		89.4	80.8	(64.5)	(64.0)	(12.9)	(141.4)	28.7
Jul-18	20/21	13.2	13.5	(11.3)	(10.6)	(2.1)	(24.0)	2.6
Aug-18	20/21	14.3	13.5	(11.2)	(10.6)	(2.1)	(23.9)	3.9
Sep-18	20/21	15.2	13.5	(11.3)	(10.6)	(2.1)	(24.0)	4.7
Oct-18	20/21	14.7	13.5	(11.5)	(10.6)	(2.1)	(24.2)	3.9
Nov-18	20/21	11.1	13.5	(11.4)	(10.6)	(2.1)	(24.2)	0.4
Dec-18	20/21	16.5	13.5	(10.8)	(10.6)	(2.0)	(23.4)	6.5
Jan-19	20/21	11.4	13.5	(11.5)	(10.6)	(2.4)	(24.5)	0.4
Feb-19	20/21	8.3	13.5	(11.5)	(10.6)	(1.9)	(24.1)	(2.3)
Mar-19	20/21	11.9	13.5	(11.2)	(10.6)	(2.1)	(24.0)	1.3
Apr-19	20/21	11.5	13.5	(11.6)	(10.6)	(2.1)	(24.4)	0.5
May-19	20/21	14.3	13.5	(13.2)	(10.6)	(2.1)	(26.0)	1.8
Jun-19	20/21	11.4	13.5	(13.2)	(10.6)	(2.1)	(26.0)	(1.1)
Total VCM 20/21		153.8	161.5	(139.6)	(127.5)	(25.6)	(292.7)	22.6
Total to Date		402.6	518.4	(401.5)	(345.1)	(70.9)	(817.5)	103.5

**Assumptions:**

1. Replacement Energy Cost compares the actual hourly Pool Interchange Rate (PIR) to the estimated Vogtle 3&4 average cost.
2. O&M is calculated by taking the current forecast Post COD O&M adjusted for inflation and netting with current period actual Pre COD O&M.
3. Depreciation is the current forecast post COD.
4. Ad Valorem is the current period actuals.
5. PTC's are grossed up with federal tax rate of 35% through 2017, 21% 2018 forward.

2. The status of the Company’s loan guarantee application at the DOE and to the extent that the application is granted, then the Company shall also report on the impact it has or would have on the final expected in-service cost of the units.

Table 2 – DOE Loan Guarantee		
Available	Received	Remaining
\$5.13 billion	\$3.46 billion	\$1.67 billion

On March 22, 2019, Georgia Power and the Department of Energy (the “DOE”) finalized an additional \$1.67 billion loan guarantee, increasing the total DOE loan guarantee to \$5.13 billion. Georgia Power has borrowed \$3.46 billion related to Vogtle Units 3 and 4 costs through the original Loan Guarantee Agreement and a multi-advance credit facility among Georgia Power, the DOE, and the Federal Financing Bank.

The DOE loan guarantee does not have a material impact on the in-service cost of Vogtle Units 3 and 4, but it does provide benefits to customers through access to lower credit spreads during construction and for many years beyond. Georgia Power customers are expected to save approximately \$550 million, of which approximately \$400 million has already been secured from draws against the credit facility.



### 3. The status of Quality and Compliance, Procurement, Engineering, Construction and Operational Readiness.

#### TOTAL PROJECT PERCENT COMPLETE

As of the end of June 2019, the total Project is approximately 78.8% complete. Procurement is approximately 95.9% complete, with continued electrical and mechanical commodity deliveries to support Construction and a plan to receive all remaining modules for the total Project by the end of 2019. The Initial Test Program (“ITP”)/Start-Up Testing scope is approximately 14.0% complete. Completion of the Initial Energization milestone was a significant contributor to the testing increase during the Reporting Period. As shown below, total construction, covering both Units 3 and 4, is approximately 68.6% complete. Direct construction (as shown in Figure B on page 15) is approximately 63.7% complete, which represents approximately 65% of the total construction scope. The remaining 35% of construction scope includes subcontracted scopes of work, which is approximately 77.8% complete as of June 2019.

Table 3.1 – Total Project Percent Complete	
Project Phase	June 2019 % Complete
Engineering	98.2%
Procurement	95.9%
Construction	68.6%
I&C / Cyber Security	97.7%
ITP / Start-Up Testing	14.0%
<b>Total Project</b>	<b>78.8%</b>

#### QUALITY AND COMPLIANCE

During the Reporting Period, the Company continued to provide oversight of the Project while SNC provided guidance and direction to contractors and actively addressed issues and concerns. SNC also continued quality oversight of construction, the ITP organization, and Site Operations to ensure compliance with laws, regulations, and Project licensing documents. SNC-led Quality Assurance teams monitored the safety and quality of work being conducted by Bechtel and various subcontractors through audits, field surveillances, and inspections. During the Reporting Period, Quality Assurance continued to support early and proactive identification of issues to provide an additional level of assurance for quality control in construction.

Quality control acceptance rates remained at acceptable levels during the Reporting Period, with Unit 3 and Unit 4 averaging acceptance rates of 99.5% and 99.4%, respectively, which are in line with historical figures. Deviations from the design specifications were dispositioned and repaired as appropriate.

## ENGINEERING

During the Reporting Period, the Engineering organization continued to support construction as the Project began its transition to testing. Task Engineering and ITP Support teams were established to assist this transition. Task Engineering actively supports the transition from construction to ITP by ensuring all engineering documentation is completed and ready for system turnover. The ITP Support team provides assistance for engineering issues during testing that require a determination from Westinghouse and other vendors. This function was fundamental to the completion of all tests required to achieve Unit 3 Initial Energization, which was the first major testing milestone for the Project.

The Engineering organization also increased their engagement with the American Society of Mechanical Engineers (“ASME”) Nuclear Component Stamp (“N-Stamp”) Team with additional dedicated on-site Engineering personnel. The NRC utilizes the ASME N-Stamp to ensure safety-related piping systems, pumps, and other equipment meet the quality requirements set forth under the ASME Boiler and Pressure Vessel Code. The Engineering organization aided the ASME N-Stamp team through development of an efficient and simplified ASME approval process, metrics, and work package closure. The Project obtained its first ASME N-Stamp approval in June 2019. Through this effort, the team was able to gather valuable lessons learned that will be applied in future approvals. The Engineering organization is also supporting the completion of the Containment Vessel Design report, which will provide the results of various stress and buckling analyses that consider the final attachment loading on the containment vessel and the vessel structural design. Completion of this report supports the release of the Containment Vessel to the ITP organization and allows for performance of the Containment Vessel Structural Integrity Test.

The Unit 3 and Unit 4 security perimeter designs were completed during the Reporting Period, which include security fencing surrounding the Site and the Intrusion Detection System. The Security Computer, which provides a centralized control system for the physical protection program at the plant, is undergoing factory acceptance testing with installation beginning in the next Reporting Period.

As Unit 3 continues to turn over systems and components for testing, the Engineering organization has begun efforts to prepare for fuel load and commercial operation. During the Reporting Period, Engineering continued to develop processes and programs for fuel load and plant operation, as required by NRC regulations. Some of these programs have and will be used to support construction and testing, including pre-service inspection, equipment qualification, and the Containment Leak Rate Test Program. Engineering also made progress to establish the Project’s readiness to accept fuel with trained reactor engineering inspectors and fuel receipt processes in place. The first order of nuclear fuel was placed in July 2019, a major milestone in the Project’s path to operation.

## PROCUREMENT

During the Reporting Period, SNC continued management of major equipment and commodity fabrication at its international and domestic vendors. The “Min/Max” system has matured over the Reporting Period, making certain that frequently used commodity materials are kept in stock to support construction needs. Select plant materials in storage, including pipe spools, are being actively tracked with Radio-Frequency Identification tags. This approach facilitates movement of equipment for inventory accuracy and reduction of delivery time to construction staging work areas.

Recent major equipment deliveries include: all Shield Building material for both units; Unit 4 Fuel Handling Machine; Unit 3 Cask Crane; security system equipment including all Ballistic Resistant Enclosure towers; the remainder of electrical and safety-related piping penetrations; and Unit 3 safety-related batteries and associated safety-related Uninterruptible Power Supply system equipment. Table 3.2 shows the status of major equipment items.

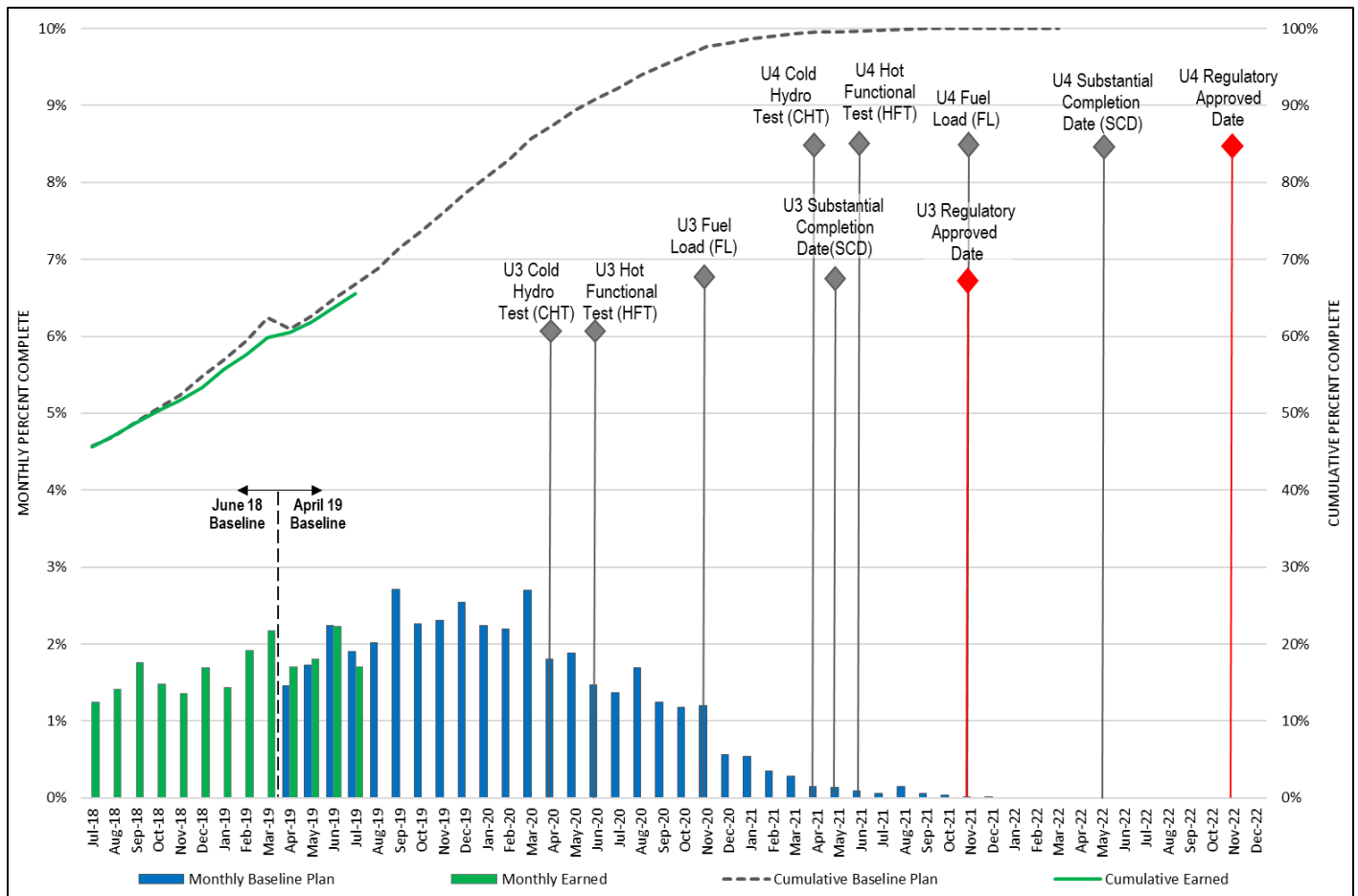
During the next Reporting Period, procurement will continue with expected delivery of the last mechanical modules, remaining ASME piping and valves, all safety-related cable, radiation protection and chemistry equipment, hatches and hoists, and the Unit 3 Security Computer.

Table 3.2 – Major Equipment Status		
Component	Unit 3 Status	Unit 4 Status
Accumulator Tanks	Installed	Installed
Core Makeup Tanks	Installed	Installed
Deaerators	Installed	Installed
Diesel Generators	Installed	Installed
Integrated Head Package	In Progress	On-site
Main Step-up Transformers	Installed	Installed
Main Turbine Generator	Installed	Installed
Moisture Separator Reheater	Installed	Installed
Passive Residual Heat Removal Heat Exchanger	Installed	Installed
Polar Crane	Installed	On-site
Pressurizer	Installed	Installed
Reactor Coolant Loop Piping	Installed	Installed
Reactor Coolant Pumps	Installed	On-site
Reactor Vessel	Installed	Installed
Reactor Vessel Internals	Installed	On-site
Reserve Auxiliary Transformers	Installed	Installed
Squib Valves 8”	On-site	On-site
Squib Valves 14”	On-site	On-site
Steam Generators	Installed	Installed



## PROJECT PERFORMANCE

### Direct Construction Percent Complete – Total Project



*Figure B – April 2019 Baseline, Direct Construction Percent Complete – Total Project*

Direct construction continues to work toward the accelerated site working schedule as set forth following the April 2019 schedule re-baseline effort. Direct construction work represents the Bechtel scope of work on the Project and includes Units 3 and 4 power blocks and certain Balance of Plant areas. Direct construction does not include certain subcontracted scopes of work (e.g., cooling towers, Raw Water Intake Structure, and permanent buildings) or the indirect labor necessary to support construction (e.g., labor to construct temporary construction facilities, scaffolding, material handling, housekeeping, warehousing support, and training). As shown in Figure B above, the direct construction cumulative baseline plan was reset in April to the cumulative percent earned prior to the schedule re-baseline implementation, resulting in a slight decrease to the plan. The forward-looking projections are subject to change pending project performance, engineering changes, resequencing of activities, potential lessons learned from the Chinese AP1000 projects, and construction of Unit 3.

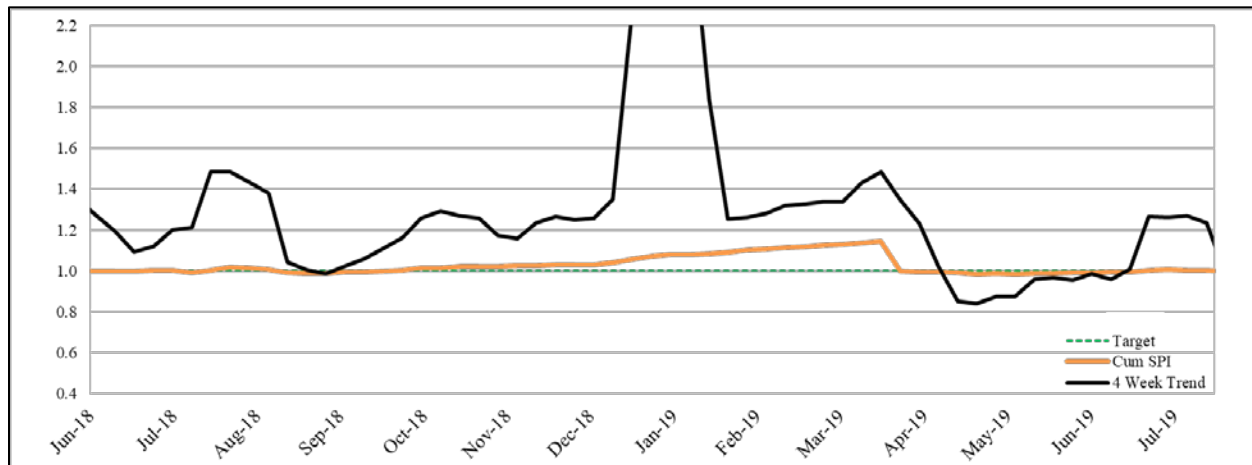
## **Construction Schedule Performance**

The Schedule Performance Index (“SPI”) is a measure of how efficiently the Project is progressing compared to the Project Baseline schedule:

$$SPI = \frac{\text{hours planned}}{\text{hours earned}}$$

If the SPI is above 1.0, the Project is earning fewer hours than planned in the schedule during a given time. If SPI is less than 1.0, the Project is earning more hours than planned during a given time. The Project is currently running a cumulative direct construction SPI of approximately 1.08. During the Reporting Period, the Project experienced challenges due to craft staffing levels in 2018, productivity, and adverse weather in October 2018.

The Project further enhanced craft labor incentives in November 2018 to attract and retain adequate staffing levels. Several mitigation strategies were implemented to address Project performance trends through increased craft supervision and oversight. As the number of planned hours per month continues to increase, the Project has increased night shift craft staffing and field non-manual support to meet the schedule demands. Increased night shift will also help alleviate congestion within the construction area during the day. The use of additional modularization in Unit 4 has also been employed to maintain the SPI near the target. Construction has applied lessons learned from Unit 3 by building small room modules in parallel to bulk civil work being performed. This allows Unit 4 to set room modules in one activity and complete areas more efficiently than in Unit 3.



*Figure C – Direct Construction Schedule Performance Index*

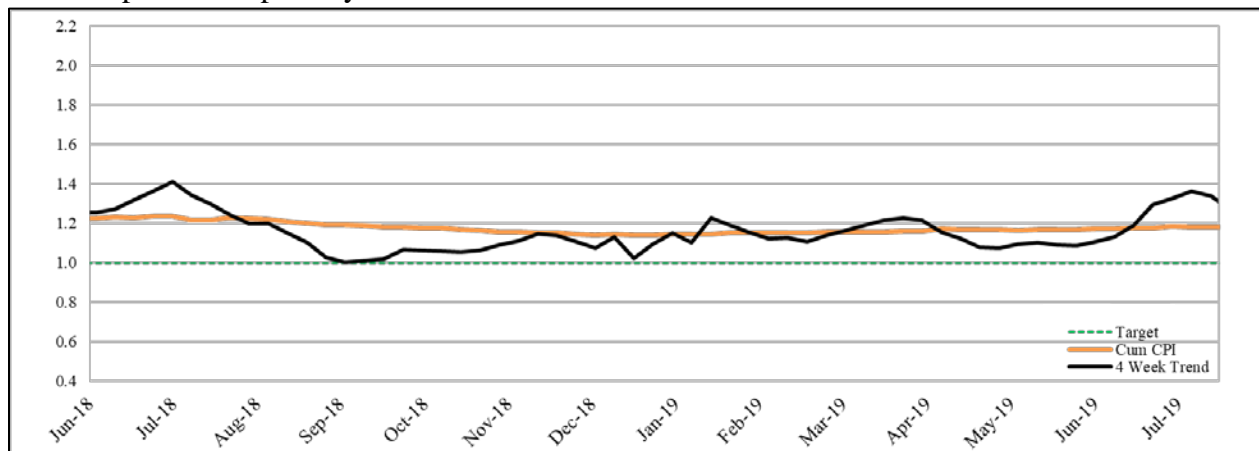
## Construction Cost Performance

The Cost Performance Index (“CPI”) is a measure of the cost efficiency of direct construction resources expressed as a ratio of earned value to actual cost:

$$CPI = \frac{\text{hours spent}}{\text{hours earned}}$$

If the CPI is above 1.0, the Project is spending more hours than planned to complete a task. If CPI is less than 1.0, the Project is spending fewer hours than planned to complete a task.

The Project is currently running a cumulative direct construction CPI of 1.18. Through efforts to decrease absenteeism, improve craft utilization, and increase the backlog of construction work packages, the Project has continued to improve productivity. This improvement is evidenced by a relatively stable CPI while staffing and earnings increased significantly throughout the Reporting Period. Additional initiatives aiming to increase productivity include creation of dedicated crane and scaffold coordinators to increase usage effectiveness. Task Managers have been established to provide focus and oversight of critical work fronts such as the Main Control Room. While the focus remains on the bulk construction activities, system completion crews were created to focus on construction and installation of remaining system commodities for near-term system turnovers. These near-term system turnovers and efforts to increase craft staffing may impact future CPI as work scopes to complete systems become narrower.



*Figure D – Direct Construction Cost Performance Index*



### Critical Path – Unit 3

Bechtel and SNC have identified that the primary critical path runs through electrical construction in Containment for Integrated Flush and Open Vessel Testing, followed by a series of testing, fuel load, power ascension, and declaration of commercial operations.

Inside Containment, the Critical Path follows the installation of conduit supports, conduit, and cable to support the turnover of the Passive Core Cooling (“PXS”) system to the Southern Nuclear ITP organization. Once complete, a series of preoperational tests will be required for equipment supporting the following systems: PXS; Normal Residual Heat Removal; and Spent Fuel Pool Cooling systems. Reactor Vessel Internals and the Integrated Head Package will then be installed to support Cold Hydro Testing. This will be followed by the Integrated Leak Rate Test, Hot Functional Testing, fuel load, power ascension, and declaration of commercial operation. The projected in-service date for Unit 3 is currently scheduled ahead of the regulatory-approved in-service date of November 2021.

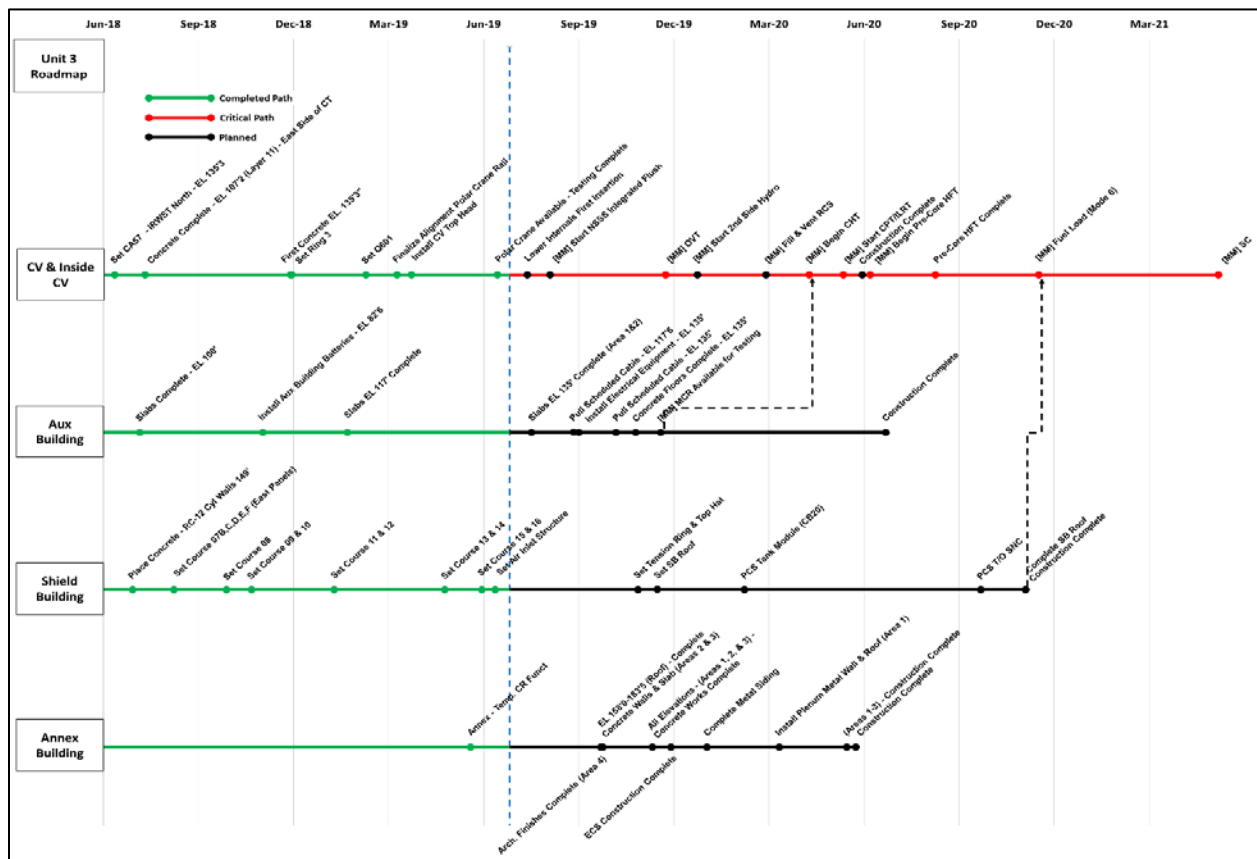
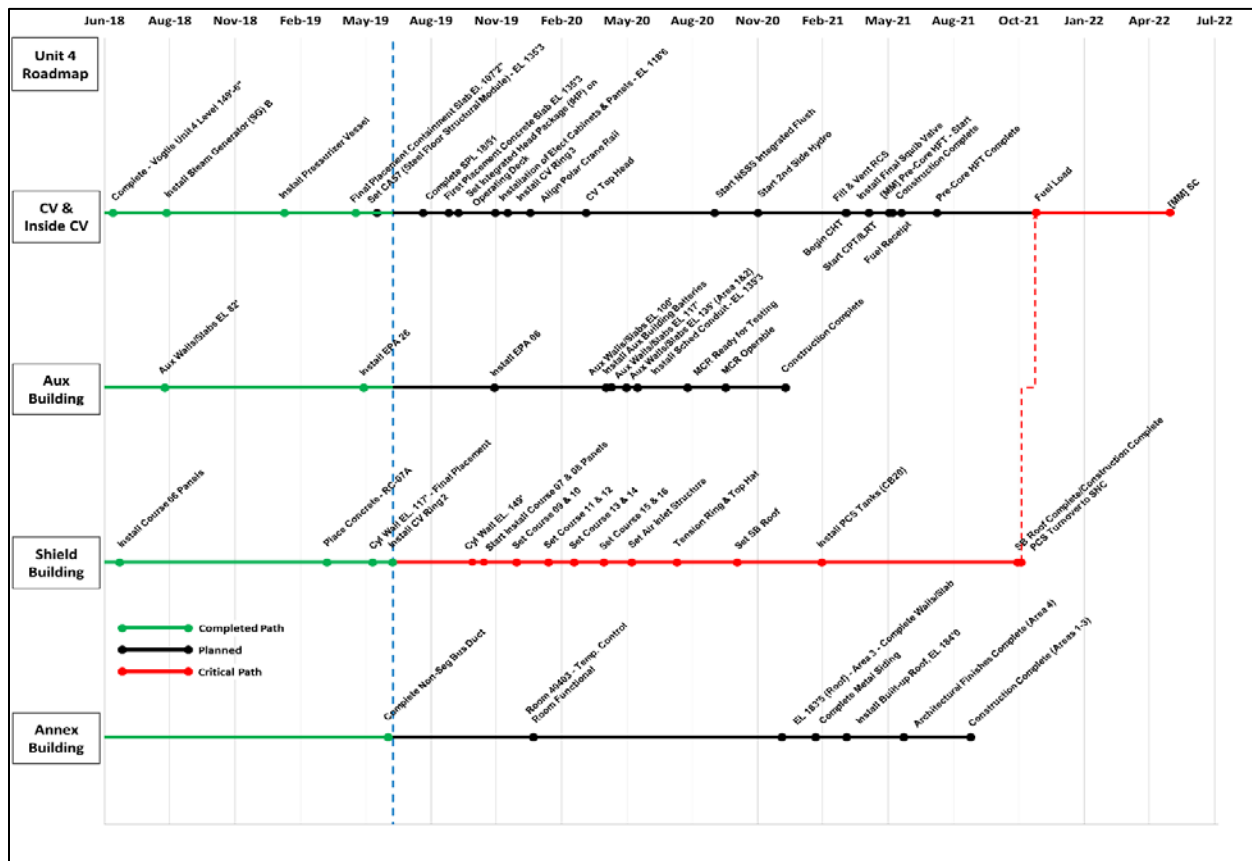


Figure E – Unit 3 Critical Path

## Critical Path – Unit 4

Bechtel and SNC have identified that the primary critical path in the site working schedule for Unit 4 runs through construction of the Shield Building walls, installation of the Shield Building roof and Passive Containment Cooling System (“PCS”) tanks, fuel load, power ascension, and then declaration of commercial operations.

Following the setting of the second Containment Vessel ring during the Reporting Period, the Unit 4 Critical Path continues through the final reinforced concrete placements at elevation 149 feet and 6 inches to placement of Shield Building panel courses seven through sixteen. After the final course installation, the air inlet structure, tension ring, Shield Building roof, and PCS Passive Containment Cooling Water Storage Tank will be placed. After completion of the Unit 4 Shield Building and PCS system turnover to Southern Nuclear, Unit 4 will then follow a Critical Path similar to Unit 3. The projected in-service date for Unit 4 is currently scheduled ahead of the regulatory-approved in-service date of November 2022.



## **Project Milestones**

In 2018, the Project selected fifteen milestones as goals for the year and achieved all either ahead of or on schedule. These milestones included both Unit 3 and Unit 4 construction, engineering, operational readiness, and licensing activities that are critical to the Project. Some of the major milestones achieved last year included setting the Unit 4 Reactor Vessel and Steam Generator B, completing the last Unit 3 Shield Building reinforced concrete wall placement, setting the Main Control Room roof for Unit 3, design completions for the site-specific engineering and Nuclear Island electrical raceway design optimization, and meeting the direct construction percent complete goals of greater than 62% and 44% for Unit 3 and Unit 4, respectively.

<b>Table 3.3 – 2018 Milestones</b>		
<b>Milestone</b>	<b>Target Date</b>	<b>Actual</b>
Set Unit 4 Reactor Vessel	1 <sup>st</sup> Quarter	March 2018
Achieve 90 percent pass rate on NRC initial license exam	1 <sup>st</sup> Quarter	March 2018
Integrated System Validation (“ISV”) retest complete	1 <sup>st</sup> Quarter	March 2018
Operations accreditation renewal	2 <sup>nd</sup> Quarter	April 2018
Unit 3 Shield Building reinforced concrete placement RC-12	2 <sup>nd</sup> Quarter	June 2018
Set Unit 4 Steam Generator B	3 <sup>rd</sup> Quarter	August 2018
Delivery of Unit 3 CYS hardware and software	3 <sup>rd</sup> Quarter	July 2018
Establish Southern-controlled technology platform for site	3 <sup>rd</sup> Quarter	July 2018
Design complete for site-specific engineering and NI electrical raceway design optimization	3 <sup>rd</sup> Quarter	July 2018
Set Unit 4 generator stator	4 <sup>th</sup> Quarter	June 2018
Unit 3 direct construction percent complete > 62	4 <sup>th</sup> Quarter	December 2018
Unit 4 direct construction percent complete > 44	4 <sup>th</sup> Quarter	December 2018
Unit 3 Main Control Room roof complete CA51	4 <sup>th</sup> Quarter	November 2018
ITAAC – 34 ICNS and 297 UINs submitted	4 <sup>th</sup> Quarter	November 2018
Complete Initial Test Program component test procedures	4 <sup>th</sup> Quarter	August 2018



The Project selected the fifteen milestones listed below as goals for 2019. The Project identified additional production goals for the year, including the Unit 3 Main Control Room ready for Pre-Operational Testing in November 2019. Project direct construction completion goals were set at 90%, 65%, and 80% for Unit 3, Unit 4, and Balance of Plant, respectively. The Company will continue to update the status of these milestones throughout the VCM 20/21 proceedings.

<b>Table 3.4 – 2019 Milestones</b>		
<b>Milestone</b>	<b>Target Date</b>	<b>Actual</b>
Set Unit 4 Pressurizer	1 <sup>st</sup> Quarter	January 2019
Complete Site-Specific Security Perimeter Design	1 <sup>st</sup> Quarter	December 2018
Set Unit 3 Containment Vessel Top Head	1 <sup>st</sup> Quarter	March 2019
Credit previously completed first plant and first three plant tests	1 <sup>st</sup> Quarter	January 2019
Complete Unit 3 Initial Energization	2 <sup>nd</sup> Quarter	May 2019
Complete concrete placement for maintenance deck in Unit 4 containment	2 <sup>nd</sup> Quarter	May 2019
Complete and turnover Raw Water Intake Structure (RWIS) and Cooling Water Intake Structure (CWIS)	2 <sup>nd</sup> Quarter	April 2019 (CWIS) August 2019 (RWIS)
Receive accreditation renewal of maintenance and technical training program	3 <sup>rd</sup> Quarter	July 2019
All modules delivered to Site	3 <sup>rd</sup> Quarter	
Complete first Integrated System Flush	3 <sup>rd</sup> Quarter	August 2019
Complete first Pre-Operational Test	3 <sup>rd</sup> Quarter	
Conduct first Emergency Response organization drill	4 <sup>th</sup> Quarter	
Set Unit 4 Integrated Head Package on stand	4 <sup>th</sup> Quarter	
All WEC auxiliary equipment and WECTEC mechanical equipment delivered	4 <sup>th</sup> Quarter	
Submit 63 ITAAC Closure Notifications and 145 Uncompleted ITAAC Notifications per schedule	4 <sup>th</sup> Quarter	

## PROJECT RISK

The risk management program is essential to proactive identification of risks, and where appropriate, implementation of mitigation strategies. With Company oversight, SNC actively manages risk on the Project, with continued focus on schedule adherence, construction productivity, subcontracts management, and ITP, each of which are areas that could have a significant impact on the Project if unmitigated. With continued focus on these areas and the significance of the potential impacts, the Project is also executing established mitigation plans to reduce the likelihood of occurrence and/or impacts.

Risk events are identified in consultation with Project subject matter experts, during challenge sessions, and observations from the Chinese AP1000 units, lessons learned from construction and testing on the Project, and cross-functional discussions with both Bechtel and Westinghouse. The Project risk register considers threats and opportunities that are routinely monitored until the event is realized or retired. The Project risk register is a living document that quantifies the potential impact of a risk event and includes mitigation plans designed to minimize the impact to the Project should the risk event be realized. The Project risk register is provided monthly as an update to data request STF-142-4 in the Company's Monthly Status Reports. Below is a discussion of Project risks and strategies that the Company is undertaking to mitigate their potential impacts:

- *The risk that even with sufficiently qualified resources available, construction is unable to meet the current schedule.*

This risk has been identified as a Project execution risk and it will continue throughout the life of the Project. Broadly stated, an execution risk is the risk that the Project is unable to execute with resources accounted for by the current projections, such as the inability to reach forecasted production targets. Current challenges surrounding this risk are in meeting required electrical progress in the Containment and Auxiliary Buildings. However, the Project has been able to increase electrical earnings to more than double previous levels through focused mitigation activities.

Project management and Bechtel regularly monitor and discuss this risk through production scorecards, the Integrated Project Schedule, and other resources at their disposal. In addition to monitoring progress, the Project has instituted efforts to clear roadblocks with potential to hamper productivity. These efforts include the utilization of night shifts, increased field leadership, and implementation of programs to identify inefficiencies in advance of the work to avoid impacts to performance. Additionally, Bechtel and SNC continue to improve schedule fidelity by breaking down level of effort activities into more discrete scopes as system turnovers continue.

Over the Reporting Period, Project performance moved in a positive direction with earned hours hitting highs not yet seen on the Project to date. In addition to increased hour earnings, the rate of system turnovers continues to increase with fifteen systems or partial systems turned over to support Initial Energization and the start of Integrated Flush.

- *The risk that additional subcontract scope is identified after the award of all subcontract scopes.*

As with any large and complex construction project, the identification and definition of subcontractor scope is vital to the successful completion of the Project. Efforts to refine subcontract scopes have been completed, but potential remains for additional scope to be identified in the future. Additional scope could result from unidentified constructability concerns, increases in commodity estimates, regulatory requirement changes, engineering design changes, or rework of previously completed work.

During the Reporting Period, subcontract estimates continued to be assessed and validated to provide additional clarity on the work to be completed. This effort facilitated the establishment of additional subcontractor performance metrics to enhance the Company's ability to monitor work being performed in the field. Additionally, a shift in focus from bid evaluation assessments to contract management for awarded contracts ensures subcontractors are fulfilling their contractual obligations.

- *The risk that the Project is unable to effectively manage subcontracted scopes of work.*

Since the Project has now assigned most of the subcontracted scopes of work, management of the subcontractors is critical to maintain momentum. It is important that the Project continues to monitor productivity and progress of the subcontracted scopes of work because of the potential negative cost impacts caused by poor performance. To reduce those potential impacts, SNC Project Controls has worked with Bechtel, Westinghouse, and the SNC Engineering organization to independently validate quantity take-offs and scopes for each contract. The Project has also developed metrics to monitor individual contract performance and has established a regular cadence with the construction contractor to understand and manage those contracts not performing to standards.

- *The risk that construction is unable to maintain or improve performance.*

This risk has been identified as a Project execution risk that may be realized if CPI increases throughout the life of the Project. It is important that the Project be able to increase the number of hours earned relative to the number of hours spent to reduce the impact of negative cost performance.

The Company is focused on initiatives to increase earned hours. Several of these initiatives were mentioned previously in the description of construction schedule performance risk, including implementation of programs to increase work package backlogs and construction process improvements. Effective implementation of these initiatives should improve schedule performance and increase earnings. In addition to these activities, the Company and Bechtel have commissioned productivity studies focused on underperforming areas, which will help enhance existing initiatives and mitigations to improve Project performance.

- *The risk that the Project cannot sustain long-term system turnover and testing to support regulatory-approved in-service dates.*

As a result of the April schedule re-baseline, the ITP organization developed a detailed, resource-loaded testing schedule for Unit 3 to support testing and system turnover milestones up to fuel load. Recent successes in the Initial Energization and Integrated Flush milestones are indicative of the preparedness of the ITP organization to execute testing. However, long-term testing sustainability remains a risk as the schedule requires an increase in system turnovers during the next six months.

To reduce any potential negative impacts of the upcoming turnover schedule, the ITP organization continues to evaluate resources and materials necessary to support the increase in testing and incorporate lessons learned from previous system tests on the Project and at the Chinese AP1000 projects. The ITP organization continues to work with construction for early access to equipment prior to system turnover to perform testing for early identification of issues and minimize potential schedule impacts.

## **PROJECT COST CONTINGENCY**

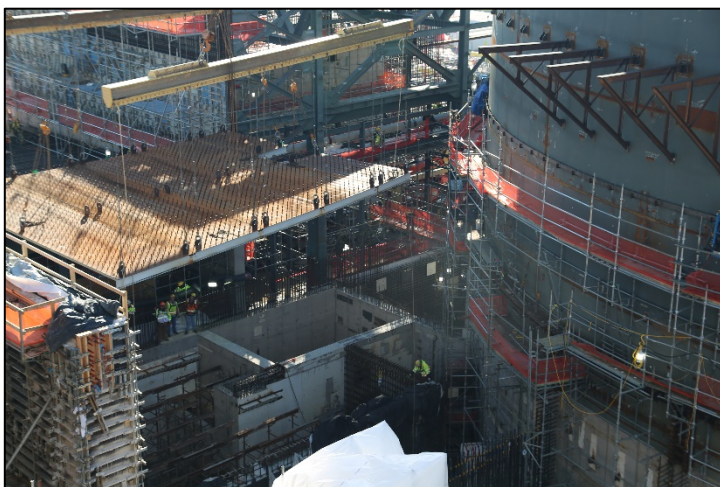
The cost contingency estimate established in the 19<sup>th</sup> VCM of \$366 million is unchanged, and there have been no allocations of this contingency during the Reporting Period. It is the Company's expectation that some portion of the cost contingency will likely be utilized in the months ahead. Georgia Power may request the Commission to evaluate such costs for rate recovery as and when appropriate.



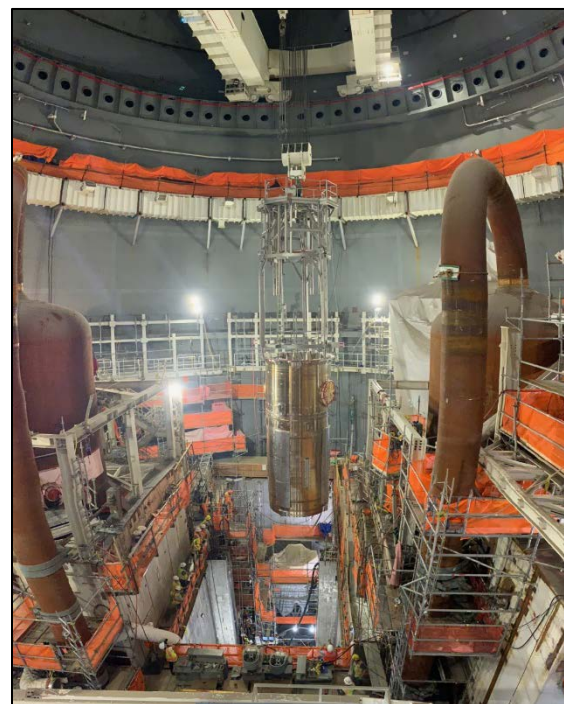
## CONSTRUCTION

### Unit 3 Nuclear Island

Construction on the Unit 3 Nuclear Island continued with a considerable number of major accomplishments during the Reporting Period, including setting of the third Containment ring and the Containment Vessel Top Head. Placement of several pieces of major equipment also occurred, including all four Reactor Coolant Pumps, Core Makeup Tank A, both RNS Heat Exchangers, the Reactor Vessel Lower Internals, and the Polar Crane. Installation of structural steel inside Containment, including steel platforms and stairwells to support concrete placement activities at elevation 135 feet for the Operating Deck



*Unit 3 Main Control Room ceiling module placement*



*Initial insertion of the Reactor Vessel internals inside Unit 3 Containment*

have been completed. Concrete was placed over the In-Containment Refueling Water Storage Tank ("IRWST"), facilitating the setting of the Integrated Head Package inside Containment. The remaining Shield Building panel courses 8 through 16 and the Air Inlet panels were installed, bringing the Shield Building to elevation 266 feet 4 inches. Additionally, work continues on welding the tension ring and structural modules in preparation for the placement of the roof structure.

Construction of the north side of the Auxiliary Building has progressed with both the floor and roof modules being set at elevation 117 feet and 6 inches and elevation 135 feet and 3 inches, respectively. Substantial work has also been completed on the steel and concrete that form the remaining walls and the north Auxiliary Building roof at elevation 155 feet and 6 inches. The south side of the Auxiliary Building has also shown significant progress. Several wall and floor concrete placements inside and around the Spent Fuel area were completed to

form the Spent Fuel Pool, New Fuel Storage Pit, Cask Loading Pit, and Cask Washdown Pit. Throughout the Auxiliary Building, system commodities such as small-bore piping, conduit, and cable continue to be installed in order to support the upcoming system turnovers required for the Integrated Flush and Open Vessel Testing.



*Setting of Polar Crane inside Unit 3 Containment*

During the next Reporting Period, work inside Containment will continue to focus on installation of piping, cable, and equipment at all elevations in support of system turnovers. Work will also continue toward completion of all stairs and platform modules above the Operating Deck. In the Auxiliary Building, the placement of steel and concrete will continue toward the roof elevation on the north side. This step supports outfitting the Main Control Room to make it available for testing by the end of 2019. The Auxiliary Building will also see the installation of the main steam piping at elevation 117 feet and 6 inches and safety-related equipment, such as the batteries for the Class 1E DC and Uninterruptible Power Supply System (“EDS”). During the next Reporting Period, the Shield Building will also see the setting of the tension ring and roof.

The following additional activities have occurred since the last VCM Report:

- Installation of SPL-18, Maintenance Floor Mezzanine Structural Steel;
- Installation of SPL-51, Operating Floor Structural Steel;
- Main steam piping from the Steam Generator to Containment penetrations;
- Set KB36, PCS Pump & Valve Module;
- Set the Automatic Depressurization System (“ADS”) Q601 platform module and associated piping;
- Installed IRWST recirculation screen at elevation 103 feet;
- Installed Reactor Upper and Lower Internal Support Stands and staged Reactor Vessel Internals;
- Installed pump casing and internals for RNS Pumps A & B;

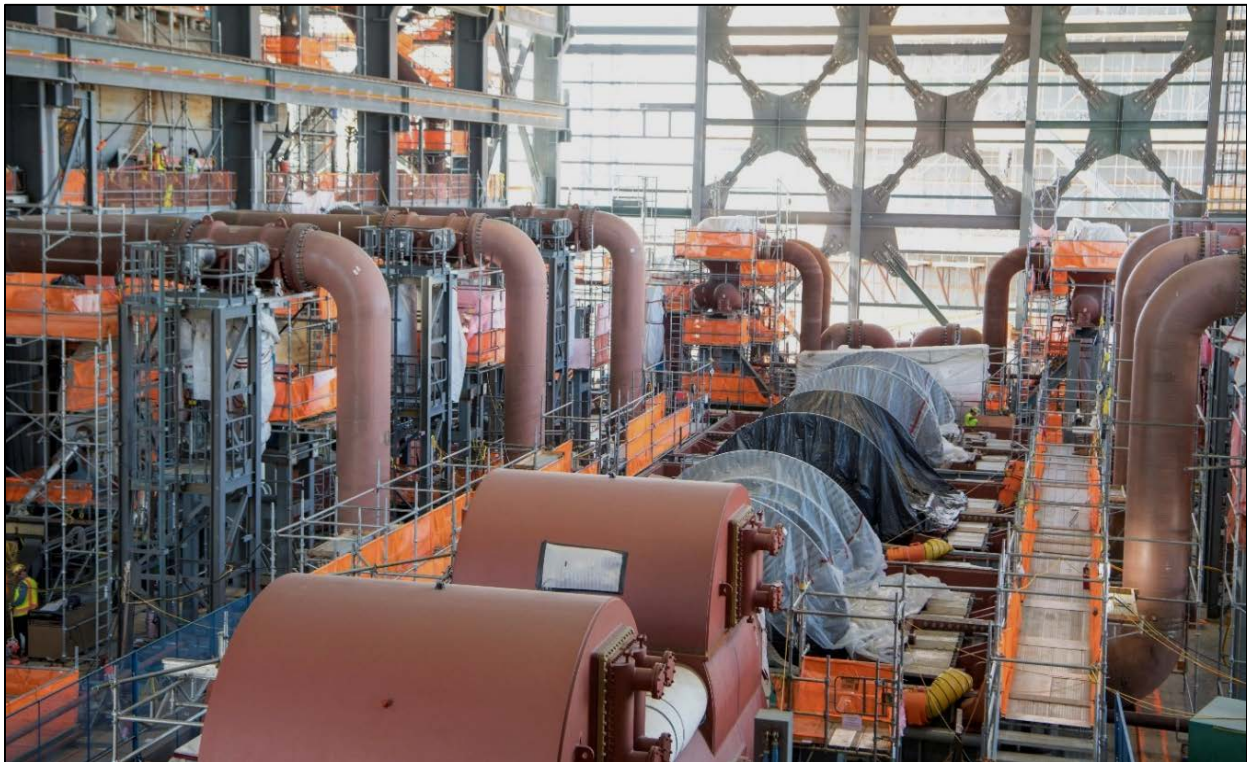


- Set CA31, Reactor Vessel Cavity Steel Floor, at elevation 107 feet 2 inches;
- Installed Auxiliary Building Nonradioactive Ventilation System (“VXS”) air handling units A/B in room 12306 at elevation 109 feet; and
- Completed Polar Crane installation and testing.

### **Unit 3 Turbine Building**

Civil work for the Turbine Building continued with the completion of the structural steel roof trusses and concrete roof and completion of the First Bay concrete structure to elevation 168 feet 3 inches. Due to civil construction being largely complete, the majority of Turbine Building activities involved equipment and bulk commodity installation. Components that support the flow of main steam from the Steam Generators were installed for systems such as the Main Turbine, Main Steam, Heater Drain, Main and Startup Feedwater, Main Turbine Control and Diagnostics, Main Turbine and Generator Lube Oil, and the Hydrogen Seal Oil System.

Assembly of the turbine continued with the setting of the low-pressure turbine stationary fixed blades and outer casings in support of turbine alignment, and then the subsequent setting of the generator rotor and low-pressure turbine rotors. Installation of switchgear control panels, electrical distribution panels, and load centers also occurred during the Reporting Period. This work led to the partial system turnover of the Main AC Power System (“ECS”) medium and low voltage distribution equipment for the Annex and Turbine Building. Testing and commissioning of this equipment directly supported Initial Energization.



*Unit 3 Turbine Building*

In the next Reporting Period, large-bore and small-bore piping for the Main and Startup Feedwater, Condensate, and Main Steam Systems will continue to be installed to tie the steam systems together. Electrical commodity installation will also progress, allowing for permanent power to be supplied to mechanical loads for testing. Turbine assembly will continue with the installation of the high-pressure turbine rotor and final alignment of the turbine. The remaining civil work for the Turbine Building and First Bay, such as the Turbine Building siding panels, will also be nearing completion.

### **Unit 3 Annex Building**

During the Reporting Period, structural steel columns were erected at elevation 135 feet in Area 3, and several concrete walls were placed at various elevations up to 169 feet in Area 2. In Area 4, the concrete roof slab at elevation 121 feet 6 inches was also placed. The Annex Building had several major pieces of equipment installed including ECS switchgear control panels, Plant Security Cabinets, and the Demineralizer Water Storage Degasification Catalytic Oxidation Reduction System Resin Vessel. Cable trays, cables, and conduit continued to be installed during the Reporting Period to support the turnover of the four partial electrical systems that supported Unit 3 Initial Energization.



*Server room in Unit 3 Annex Building*

During the next Reporting Period, placement of structural steel in Areas 1-3 at all elevations is expected to be completed. Civil work in the Annex Building will include installation of the roof in Area 1. Electrical commodity installation will continue to be a focus to support installation and testing of several Plant Control System (“PLS”) digital panels throughout the building.

The following additional activities have occurred since the last VCM Report:

- Concrete floor slab placements at elevation 135 feet in Area 1, elevation 150 feet and 3 inches in Area 2, elevation 158 feet Area 3, and the roof elevation in Area 4 at 121 feet and 6 inches;
- Concrete wall placements at various elevations up to 155 feet and 9 inches in Area 1, 169 feet in Areas 2 and 3, and up to elevation 183 feet in Area 4;
- Set motor control centers in Area 1 at elevation 135 feet and 3 inches;
- Installed all PLS panels in Area 1 at elevation 135 feet and 3 inches;
- Plant Security System construction complete in Areas 1-3 at all elevations;



- Install Annex Building 120/208 Volts AC Power Panel and Transformer at elevation 117 feet;
- Non-Class 1E DC and EDS partial system EDS-1 and EDS-2 construction turnover to testing; and
- ECS-1, Main AC Power Partial turnover to testing complete.

#### **Unit 4 Nuclear Island**

Major accomplishments in the construction of the Unit 4 Containment during the Reporting Period include the setting of both Steam Generators, both Accumulator Tanks, both Core Makeup Tanks, Pressurizer, and the final hot leg reactor coolant loop piping in the West Steam Generator cubicle. Civil and structural lessons learned from Unit 3 facilitated the successful placement of several steel floor modules, concrete walls, and concrete floors throughout Containment at various elevations up to 135 feet 3 inches. The first structural steel for the Maintenance Mezzanine Floor and Operating Deck was also placed.

The Shield Building has also seen significant progress, with the placement of all but one of the reinforced concrete sections up to 135 feet and 3 inches. The Unit 4 Auxiliary Building has also



*Steam Generator being set inside Unit 4 Containment*

gained valuable lessons learned from Unit 3, leading to the completion of several milestones. All floor modules, pre-cast panels, and fin floors in both Areas 1 and 2 have been set at elevation 117 feet and 6 inches. Once complete, these areas will support the Main Control Room and the main steam piping connecting Containment to the Turbine Building.

In the next Reporting Period, the Unit 4 Reactor Coolant Pump installation will begin, and the last Containment Vessel Ring will be set. It is also expected that the Operating Deck at elevation 135 feet in Containment will be placed. Construction on the north side of the Auxiliary Building and the Shield Building will also continue with concrete floor placements from elevation 100 feet to 117 feet and 6 inches expected to be completed and placements of all sections up to elevation 149 feet and 6 inches.

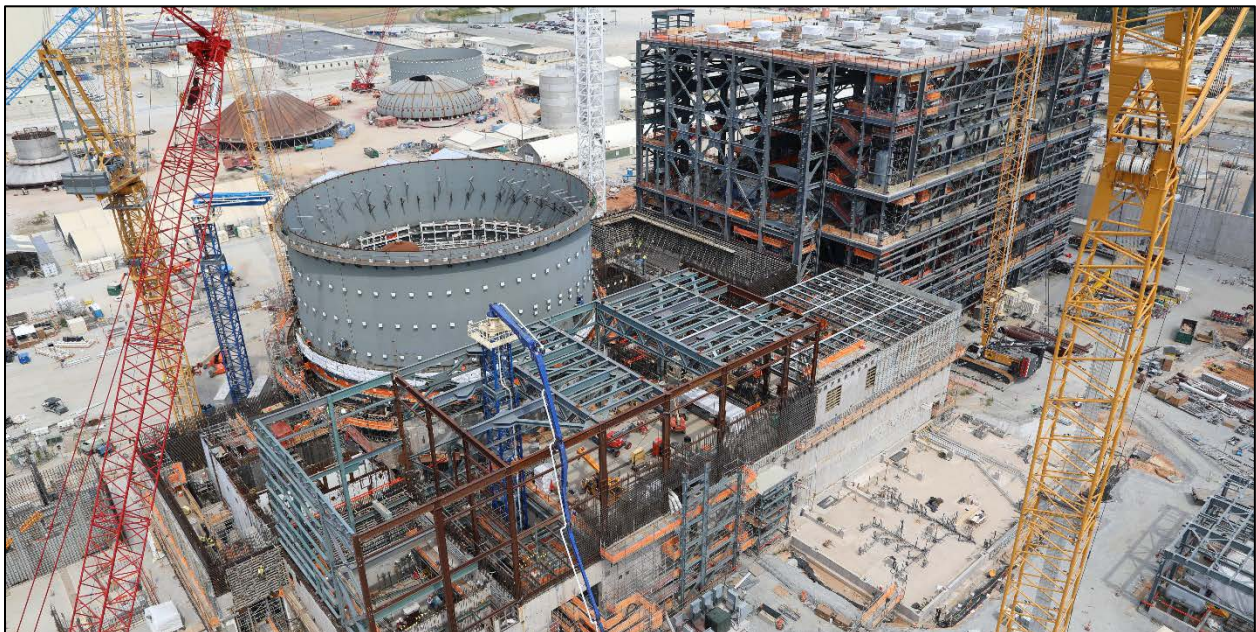


The following additional activities have occurred since the last VCM Report:

- Set KB38, Liquid Radwaste System Monitor Pump B Module;
- Installed Chemical and Volume Control (“CVS”) Makeup Pumps A & B;
- Installed Spent Fuel Pool Heat Exchanger A;
- Set mechanical module R216 in room 12271 area 5 at elevation 82 feet 6 inches;
- Installed KQ22/KQ23, Lower and Upper CVS Module;
- Various floor placements up to elevation 117 feet and 6 inches in Area 1, 2 and 3;
- Concrete placement IRWST floor to elevation 103 feet and pressurizer floor to elevation 107 feet 2 inches;
- Concrete placement inside CA01 module walls and pressurizer compartment walls to elevation 160 feet; and
- Set the lower Personnel Air Lock.

#### **Unit 4 Turbine Island**

Construction of the Unit 4 Turbine Building continues to make significant progress with several concrete floor slab placements at elevations 170 feet and 196 feet, allowing for main turbine installation progress that included setting the turbine mid-standard, the high-pressure turbine lower casing, and all three low pressure turbine inner casings. During the Reporting Period, the Unit 4 Turbine Building also saw the placement of all three roof sections as well as both Stargate assemblies. Additionally, the 220-/25-ton bridge crane and the 15-ton secondary bridge crane were both set. The installation of these cranes allows construction to move and install large commodities on the Turbine Deck. Throughout the Reporting Period, several major equipment installations occurred including the first and second stage feedwater heaters in the condensers and the gland steam condenser.



*Aerial view of Unit 4*

During the next Reporting Period, civil work will continue in the Turbine Building with the completion of all steel installations. Piping for the Moisture Separator Reheaters and Main Steam System will be installed, and work will continue on the High- and Low-Pressure Turbines, as well as installation of the Main Generator internals. Large bore pipe will also continue to be installed to make way for cable trays necessary for Initial Energization which will occur towards the middle of next year.

#### **Unit 4 Annex Building**

Work on the Unit 4 Annex Building consisted of civil and structural work, with the first roof truss being set at the end of 2018. Several concrete wall and floor placements have been completed throughout all areas of the Annex Building. Construction of the Unit 4 Annex Building has greatly benefitted from lessons learned on Unit 3 with regard to construction sequences for the setting of walls and floors and efficiencies in system and equipment turnovers. During the next Reporting Period, concrete placements and structural steel will continue to be installed to form the various rooms in the Annex Building. The EDS battery racks and batteries will also be installed, supporting Initial Energization for Unit 4.

#### **Balance of Plant**

The Circulating Water System (“CWS”) pumps and motors in the Cooling Tower Basin for Unit 3 were installed during the Reporting Period. Significant progress was also made with the completion of the Cooling Water Intake Structure (“CWIS”) and all underground CWS piping.



*Raw Water Intake Structure*

The Unit 3 CWIS was turned over from construction to testing in April 2019. Work continues on the Unit 4 Cooling Water Intake Structure and the remaining 120 inch underground concrete pipe installation. The Unit 3 Service Water System (“SWS”) Cooling Tower basin foundation and walls were completed during the Reporting Period. Work will continue to construct the SWS Cooling Towers for Unit 3 and complete the foundation and walls for Unit 4. The Diesel Generator Buildings for both Units saw considerable progress with the placement of both concrete basemats, all four diesel generators, and a large amount of structural steel and system commodities in Unit 3. During the Reporting Period, Unit 3 and Unit 4 Raw Water System (“RWS”) pumps were installed at the Raw Water Intake Structure. Dredging and excavating of the river at the Intake Structure has been completed, and construction turnover occurred in August 2019.

### **Subcontracts**

During the Reporting Period, SNC and Bechtel continued to negotiate long-term subcontracts for new and existing work scopes that replace the bridge agreements signed during the Interim Assessment Agreement period. SNC and Bechtel also performed the subcontract alignment process per the Construction Completion Agreement to evaluate any subcontract adjustments to target construction cost, target completion dates, and the responsible company for subcontract management. As of July 2019, 38 of the 44 Bechtel-managed and 13 of the 18 SNC-managed subcontracts have been awarded. The remainder of subcontracts have been estimated or are currently in the bid process.

To promote successful completion of the subcontractor scope, SNC and Bechtel have implemented measures to improve management and visibility into subcontractor performance. During the 2019 re-baseline effort, subcontractor schedules were re-evaluated to confirm that activity granularity and durations were appropriate and to ensure the activities were logically tied in the Integrated Project Schedule. The assessment has also allowed the Project to track subcontractor completion by earnable hours, increasing certainty of the to-go scope and improving visibility of cost and performance. The subcontract management team has also established subcontractor tools and metrics to centralize applicable cost data. This process aids in early identification of risks and potential scope growth and provides a real time view into the Estimate at Completion and Estimate to Complete. SNC and Bechtel have also implemented the use of war rooms. In these meetings, subcontractors and Bechtel leadership meet to work through any coordination challenges to ensure open work fronts are available for subcontractors on site. The alignment between Bechtel and subcontractors will be essential as the Project continues to install commodities and turn over systems for testing.



## **TURNOVER AND TESTING**

### **Construction Turnover to Testing**

With the first power block partial system turnovers occurring in the Reporting Period, the Project has been able to gather valuable lessons learned to aid future turnovers. A Testing & Completions organization comprised of SNC and Bechtel personnel was created at the beginning of the Reporting Period to allow for turnover from construction to ITP with greater speed, efficiency, and capability. The Testing & Completions organization is utilizing a major test milestone roadmap to prioritize and sequence work appropriately. This roadmap includes testing milestones such as Initial Energization, Integrated Flush, Open Vessel Testing, Cold Hydro, Hot Functional Testing, and Integrated Leak Rate Testing. This team's goal is to ensure the Project is aligned on organizational structure, process, and schedule integration during construction completion. The Project has successfully turned over fifteen partial systems to the ITP organization, including systems required to achieve the Initial Energization and Integrated Flush milestones for Unit 3.

To successfully execute construction turnovers to the ITP organization, SNC and Bechtel developed an aligned process that incorporated lessons learned from the initial partial system turnovers. This process provides guidance that accounts for potential challenges to system completions and prescribes flexible mitigating options to better ensure success in initial testing. Metrics have also been developed to give the Project better insight into the current status of each system turnover. The Testing & Completions organization facilitates System Readiness Review meetings, where members of each major functional area involved in the turnover attend to discuss the status and path to completion. To identify future opportunities for improvement, challenge meetings are held after turnovers to determine if and how the process should evolve to help support further progress towards commercial operation.

The Testing & Completions organization includes the Construction Testing and Flushing team. This group is responsible for hydrostatic testing and flushing for the plant, excluding major ITP evolutions such as Integrated Flush, Cold Hydro, and the Secondary Hydro. During the Reporting Period, the team completed four pressure tests on various systems. In Unit 3, the team also successfully completed flushing of the temporary header to be used as the primary source of flush water, flushing of portions of the well water system, and hydrolasing of main steam piping.

### **Initial Test Program**

During the Reporting Period, ITP transitioned under the Testing and Turnover organization to facilitate collaboration between construction and ITP, which is expected to improve efficiency of construction to testing turnovers. The Site also established a Testing Control Center ("TCC") to assist with resolution of issues discovered during system and component testing and to facilitate the Operations "Lock Out-Tag Out" program. The TCC has the personnel necessary to communicate and respond urgently to testing issues and remove barriers that affect testing preparation and execution. To ensure ITP is ready for each major testing milestone, milestone managers have been assigned to coordinate all activities for a specific milestone. These individuals work with all organizations on site to help oversee that work progresses as scheduled from construction to the milestone completion.

The ITP organization continues to develop final procedures for the testing program, as well as confirming necessary labor and materials. All Component Test procedures were completed ahead of schedule in 2018, and all but one pre-operational test procedure have been completed. During the Reporting Period, ITP utilized the on-site plant simulator to help develop and validate testing procedures. By simulating each procedure step, ITP personnel can confirm that the procedure meets all the test requirements. The ITP organization has also utilized the Instrumentation and Controls Engineering Test Environment located on-site to perform software validation and to allow maintenance training on digital cabinets. This will increase the overall readiness of the ITP digital testing program.

As part of the 2019 schedule re-baseline effort, ITP and Bechtel reviewed the schedule logic connecting construction system completion to system testing. The ITP organization also built a detailed, resource-loaded testing schedule for Unit 3 to support testing and system turnover milestones up to fuel load. Operational and testing experience from China was utilized to develop the testing activities and activity durations during this effort. The updated working schedule for Unit 4 includes a twelve-month lag to the Unit 3 schedule and follows a similar construction, testing, and startup plan to that of Unit 3.

The ITP organization is responsible for three major 2019 Project milestones: Unit 3 Initial Energization; Unit 3 Integrated Flush; and start of Open Vessel Testing. Once completed, these tests will further progress Unit 3 towards commercial operation.



*Unit 3 Reserve Auxiliary Transformers for Initial Energization*

### **Unit 3 Initial Energization**

The first partial system turnovers from construction to testing occurred during the Reporting Period and included portions of three major plant electrical systems: Non-Class 1E Direct Current and



EDS; Main Alternating Current Power (“ECS”); and Main Generation (“ZAS”). These system turnovers were required to complete Initial Energization for Unit 3, a 2019 Project milestone. This evolution involved energization of the Unit 3 Reserve Auxiliary Transformers (“RATs”) to provide the initial supply of off-site power to the plant’s electrical distribution system needed for testing. Until this milestone, any permanent plant equipment was energized using temporary power. Permanent power is necessary to perform subsequent testing on downstream individual electrical components such as battery chargers, switchgear, and motors. Permanent power is also needed to operate support systems for future testing in areas such as compressed air, cooling water, and digital controls.

To achieve Initial Energization, personnel from the ITP organization completed a series of de-energized and energized tests on the Non-Class 1E batteries, the Non-Class 1E battery charger, medium voltage switchgear, load centers, and the RATs. All tests were completed safely and met the test requirements. To accomplish the Initial Energization milestone completion date ahead of schedule, ITP and construction utilized a Partial Release to Test process to test specific components within a system prior to the construction turnover. Technical personnel within ITP perform evaluations prior to the testing to ensure appropriate safety measures are in place to reduce the risk of damage to critical equipment. Through this process, ITP has gained access to installed equipment before system turnover to identify and correct any potential issues. This process was essential to testing and energizing the RATs, which experienced some commissioning challenges during initial testing.

Unit 3 Initial Energization was the first major Project milestone that required both the construction and ITP organizations to collaborate to achieve a single milestone. Although there were challenges during the earlier partial system turnovers, valuable lessons learned were applied in subsequent turnovers and testing, thereby enabling the Project to achieve Initial Energization ahead of the planned schedule. Following energization with permanent power, the Project was able to begin Integrated Flush.

### **Unit 3 Integrated Flush**

In order to clean and remove any foreign material that could impact the operation of equipment, all system piping and mechanical components that feed into the reactor vessel or reactor coolant loops will be flushed. This will be accomplished using permanent plant pumps and clean water, in addition to hydrolasing, air flushing, and some hand cleaning. Integrated flushing ensures that systems can be tested without concern of damage from debris and to satisfy the cleanliness and chemistry requirements necessary to operate the systems per design. The main five systems included in Integrated Flush are the Reactor Coolant, Passive Core Cooling, Chemical and Volume Control, Normal Residual Heat Removal, and the Spent Fuel Pool Cooling Systems. During the Reporting Period, the Project turned over the first three partial systems required for Integrated Flush. These three systems provide the digital controls necessary to provide monitoring and control of plant equipment during Integrated Flush and subsequent testing.

A temporary flush header has been installed to provide clean water for flushing. Water will be cleaned and filtered on site by temporary equipment, stored in the permanent Unit 3 fire water

tanks, and then pumped through the temporary flush header as necessary. Several modifications are required to ensure all flush paths are available. The ITP organization has worked in conjunction with construction to perform as many modifications as possible during construction installation, thereby allowing ITP more time to complete the required flushing.

During the Reporting Period, a Temporary Control Room was established. Until the Main Control Room is operational, ITP will use this temporary station to provide remote monitoring, data collection, and control of equipment. The ITP organization also supported testing and commissioning of the Unit 3 Polar Crane, which is being utilized to move and install equipment inside Containment. The Polar Crane directly supports Construction and installation of the remaining piping and equipment required to complete Integrated Flush. The first integrated flush began on August 5, 2019.



*Unit 3 Spent Fuel Pool Cooling System spray header flush*

### **Unit 3 Open Vessel Testing**

Open Vessel Testing (“OVT”) will begin in the next reporting period. All systems turned over for Integrated Flush will be required to complete this milestone. OVT includes flow measurement, pump performance, line resistance, and tank mapping testing for the major systems flushed during Integrated Flush. Measurements obtained during OVT ensure that safety and defense-in-depth systems and components function properly to support Pre-Operational testing, as well as meeting the design requirements for protection of the plant and public during normal and emergency operating conditions. The start of Unit 3 Open Vessel Testing is expected to occur at the end of the next Reporting Period.

## **SITE OPERATIONS**

### **Digital Instrumentation & Controls (“I&C”)**

During the Reporting Period, the Digital I&C and Maintenance organizations supported the update of the I&C hardware in digital cabinets for the Plant Control System (“PLS”). These changes are required to ensure PLS aligns with plant design changes made through optimization efforts, China lessons learned, and other engineering design updates. Digital I&C has also been supporting the ITP organization in digital I&C testing, specifically Data Display and Processing System (“DDS”) and PLS in connection with Integrated Flush milestone.

Digital I&C has successfully worked with Westinghouse to perform interface testing between the Cyber Security Monitoring System (“CYS”) and the DDS. This testing will ensure the two systems successfully work together to protect the facility from any potential cyber-attacks. The CYS has been completed and shipped to the Site for installation. During the next reporting period, Digital I&C will continue to work with the ITP organization to complete control systems testing in support of the Integrated Flush, Pre-Operational Open Vessel Testing, and Main Control Room Ready for Testing milestones.

### **Cyber Security**

Throughout the Reporting Period the Cyber Security organization continued to make significant progress toward the completion of the Cyber Security program, including the delivery of the Unit 3 and Unit 4 Cyber Security System software. Cyber Security is working to their schedule to perform vulnerability assessments of digital equipment and developing implementation procedures for cyber security controls. The organization also developed a strategy for phased implementation of cyber security requirements that support the transition from construction through to operations. Cyber Security has also continued to maintain a constructive relationship with the NRC to support successful implementation of the Cyber Security Program and the NRC’s planned inspection in early 2020.

### **Licensing**

Site and Corporate Licensing provide continuous support to construction, operations, and engineering to ensure the Project’s compliance with regulatory requirements. During the Reporting Period, SNC received approval for a License Amendment Request (“LAR”) that allows changes to Tier 2\* material in the licensing documents without prior NRC approval, provided that the Tier 2\* material meets criteria included as a license condition. Approval of this LAR has already reduced schedule impacts from potential Tier 2\* design changes.

During the Reporting Period, Licensing facilitated the approval of a Preliminary Amendment Request (“PAR”) that revised administrative aspects of ITP as described in licensing documents. Specifically, these changes included the removal of component testing as a phase of ITP to allow component tests to be completed before full jurisdictional turnover from construction. This change in turn allows for early detection of issues on various components. Licensing utilized the NRC’s PAR process to avoid significant loss of efficiency related to component testing. The associated LAR was also submitted in August 2018 and was subsequently approved in February 2019.

Additionally, a joint effort between the ITP and Operations organizations is underway to remove certain First Plant Only/First Three Plants Only tests from the Vogtle Units 3 and 4 scope, based on the successful outcome of tests conducted at the AP1000 nuclear plants constructed in China. The first LAR containing three First of A Kind Tests (“FOAK”) was submitted to the NRC on August 3, 2018 and approved on January 22, 2019. The remaining LARs were submitted in April 2019 and June 2019, respectively. Once reviewed and approved by the NRC, these LARs will reduce critical path impact during testing while having no impact on plant safety or performance.

### **Inspection, Test, Analyses, and Acceptance Criteria Organization (“ITAAC”)**

The ITAAC organization met the 2018 ITAAC milestone with the submittal of 34 ITAAC Closure Notifications (“ICNs”) and 154 Uncompleted ITAAC Notifications (“UINs”). After the schedule re-baseline in April 2019, the ITAAC organization set a milestone of submitting 63 ICNs and the remaining 145 UINs in 2019 and is on track to meet the milestones. In addition, the ITAAC organization, in conjunction with Licensing, has continued to work with the NRC to reduce and streamline the ITAAC process. SNC, working collaboratively with the NRC, has been able to consolidate multiple ITAACs, reducing the number of ITAAC submittals from 875 per unit to approximately 450 per unit currently. This consolidation will allow for streamlined and efficient approval of ITAACs with no reduction in ITAAC criteria that is being met by the licensee.

### **Operations and Maintenance**

The Operations organization continues to focus on obtaining the required number of licensed operators to support Unit 3 and Unit 4 fuel load. As of the end of the Reporting Period, 62 operators have passed the NRC exam. The fourth Initial Licensing Training class, which began in June 2018 and includes 21 operators, is expected to be completed in early 2020. The Project currently has enough licensed operators to support Unit 3 fuel load. In addition, SNC received a “Maintenance and Technical Training program” renewal for another six years from the Institute of Nuclear Power Operations (“INPO”) following the Accreditation Team Visit in April 2019.

To assist critical work within construction and ITP, the Operations organization has loaned several Operations personnel for support. These individuals will use their knowledge of the AP1000 design to provide additional assurance that the plant is built as designed. Operations personnel are also being utilized to develop test procedures for ITP and running the tests according to the schedule. Maintenance personnel are also supporting ITP for Initial Energization activities and upcoming Integrated Flush. Trained maintenance technicians, at the direction of ITP Test Engineers, are validating component functionality to ensure equipment can be safely energized and function as part of the plant electrical system.

In preparation for the transition to operations, the Operations organization continues to work with Westinghouse to review, approve, and localize Emergency Planning procedures. The organization has established a turnover and acceptance process to systematically take over plant ownership, which is managed by the Project’s Operations, Maintenance and Engineering organizations as an integrated turnover acceptance team. SNC operators continue to perform monitoring activities across the construction site while the Maintenance organization is engaged in the preservation of



installed equipment not yet turned over for testing. Utilizing the Maintenance group to preserve equipment minimizes equipment failure prior to operation.

### **Integration of the Four Unit Site**

During the Reporting Period, site integration continued in the area between Vogtle Unit 2 and Unit 3, specifically on Emergency Communications and Security Systems. Security perimeter installation to add Unit 3 to the Protected Area is ongoing with substantial progress being made along the northern perimeter.

The Communications Support Center (“CSC”) has been completed and turned over to SNC. Completion of the CSC includes turnover of the Technical Support Center and Central Alarm Station building. The CSC is critical for conducting the first Emergency Response Organization drill, which is required to load fuel.



*Plant Vogtle Units 1-4*

#### **4. An updated comparison of the economics of the certified project to other capacity options.**

The economic analysis performed for this Report has relied on the same core methodologies used in all previous economic evaluations conducted in Docket Nos. 27800 and 29849. The economic evaluation presented in this Report includes updates to all major underlying planning assumptions, including fuel forecasts, load forecasts, and new generation technology costs.

The analysis provided incorporates the regulatory-approved in-service dates of November 2021 for Unit 3 and November 2022 for Unit 4. The economic analysis reflects recovery of \$7.3 billion, which is currently the forecast approved by the Commission. Pre-in-service O&M, post-in-service O&M, post-in-service ongoing capital, Ad Valorem taxes, marginal cost of capital, and nuclear fuel have been updated and are consistent with the revised cost forecast. Return on equity assumptions during construction are consistent with the January 3, 2017 Order Adopting Stipulation as adjusted by the 17<sup>th</sup> VCM Order issued on January 11, 2018. In terms of nominal dollars, decommissioning costs, spent fuel storage costs, and spare parts average balances have not changed. The average summer net output has been updated based on the results of the Vogtle 3 & 4 Power Output Assessment, which was filed as an update to STF-132-19 in the Company's May 2019 Monthly Status Report. In addition, the projected outage schedule has been revised.

The results presented in Table 4.1 reflect receipt of 100% of PTCs. Regarding the DOE loan guarantees, the results presented incorporate the marginal impacts of the original \$3.46 billion loan guarantee as well as the additional DOE loan guarantee of \$1.67 billion that closed on March 22, 2019. Since the Toshiba Parent Guaranty payment has been received in full, its impact is not accounted for in this forward-looking analysis.

The analyses provided do not include any potential cancellation fees or any fully-committed construction costs that would be unavoidable in the event the Project is cancelled. Given the advancement of the Project since the Cancellation Estimate was completed in support of the 17<sup>th</sup> VCM, those cancellation costs have been removed from the current economic analyses. Since the results of the current economic analyses reflect significant savings to customers across a wide range of possible future fuel and carbon prices, an updated cancellation assessment is not warranted at this time.



**Table 4.1:**

**Relative Savings of the Project versus CC as of February 1, 2020**  
**November 2021 / November 2022 In-service**  
**“Incremental Cost to Complete”**

(In 2021 Dollars)

(Net present value of lifetime costs of CC minus the Project)

Fuel \ CO <sub>2</sub>	\$0 CO <sub>2</sub>	\$10 CO <sub>2</sub>	\$20 CO <sub>2</sub>
High	\$3,714,000,000	\$4,613,000,000	\$5,834,000,000
Moderate	\$1,675,000,000	\$2,739,000,000	\$3,776,000,000
Low	(\$134,000,000)	\$889,000,000	\$1,798,000,000

Positive number means the Project is less costly than the gas-fired CC alternative.

The weighted average expected value of the relative savings for completion of the Project as compared to the gas-fired CC alternative is \$2.8 billion based on the results provided in Table 4.1.

**Economic Analysis Conclusion / Summary of Results**

In summary, analysis utilizing the Company’s current schedule and cost forecast indicates that completing the Project is the best cost option for our customers.

5. **The Company will be under a continuing obligation to supplement its response to PIA Staff DR STF-TN-1-2 by ensuring that the financing data reflected in the schedules attached to that DR response reflect the most current and updated information at the time of each semi-annual monitoring report. In addition, the Company will provide the most current information shared with each of the Rating Agencies.**

Simultaneous with this filing, the Company has filed supplemental PIA Staff DR STF-TN-1-2 and has included in that filing the most current information shared with each of the Rating Agencies.

# Vogtle 3&4 - Construction, July 28, 2019

