**Reasonableness and Prudence Report**

**Public Disclosure**

**Vogtle Nuclear Power Plants**

**Unit 3 and 4**

**Docket No. 29849**

**Prepared By**

Vogtle Monitoring Group (VMG)

**ON BEHALF OF THE**

**GEORGIA PUBLIC SERVICE COMMISSION**

**PUBLIC INTEREST ADVOCACY STAFF**

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**ACRONYMS/ DEFINITION OF TERMS**

**ANSI 748:** American National Standards Institute Standard 748, Titled “Earned Value Management Systems”, provides 32 guidelines/ intended practices which, when followed, supports an objective means of planning, measuring, and reporting project cost and schedule status and project performance. Initially issued through ANSI, further updates/ revisions to the ANSI standard have been developed by PMI (Project Management Institute).

**Capital Construction Cost:** There are two varieties of this cost, as follows:

* Total Project Cost (TPC): This is the total Capital Construction Cost which is shared among all the Co-owners, and it excludes Company specific non-shared costs such as financing, ad valorem, and replacement energy costs. At the time of the Commission’s January 2018 Order VCM 17, this was $ 17.1 billion. VMG’s efforts have focused on providing an independent assessment of the Project to finish within this $ 17.1 billion figure and by the Commission Approved CODs of November 2021/ November 2022.
* Georgia Power Company Capital Construction Cost: This is *45.7% of the owner shared Total Project Cost (TPC), plus the Georgia Power Company specific project charges* such as ad valorem costs and replacement energy costs. *With the Commission’s January 2018 Order, VCM 17, the Commission approved continuation of the Project subject to a GPC Capital Construction Cost of $ 7.3 B, and regulatory approved CODs of November 2021/ November 2022, respectively for Unit 3 (U-3) and Unit 4 (U-4).* *Table ES-1 within the Executive Summary, which is repeated in Section 1 of the report, shows the relationship of the GPC Capital Construction Cost to the Total Project Cost (TPC*).

The following acronyms will be used throughout this report:

**COD:** Commercial Operation Date. The date at which the power plant is capable of dispatching power on demand.

**Company (the) or GPC:** Refers to Georgia Power Company.

**IEEE-384:** Institute of Electrical and Electronics Engineers Standard titled “Standard Criteria for Independence of Class 1E Equipment and Circuits”, describes (a) the independence requirements of the circuits and equipment comprising or associated with Class 1E systems, and (b) criteria for the independence that can be achieved by physical separation and electrical isolation of circuits and equipment that are redundant.

**ITAAC:** Inspections, Tests, Analyses, and Acceptance Criteria are items identified in the combined license which when verified as complete via the Nuclear Regulatory Commission’s issuance of a 103.g., letter satisfies a pre-requisite requirement for loading of nuclear fuel.

**EVMS:** Earned Value Management System, Southern Nuclear Company’s overall system which utilizes Primavera Software and other data-based systems to assist SNC Management in project planning and status reporting.

**GPC-ND:** Georgia Power Company Nuclear Development; a group within GPC responsible for providing an “in-house” independent reporting of project progress.

**GPSC:** Georgia Public Service Commission; also referred to as the “Commission”.

**MPR:** Monthly Project Review, a monthly review of Project progress which is provided by Southern Nuclear Company to the Project Co-Owners.

**NCCR:** Nuclear Construction Cost Recovery tariff provides a regulatory approved means for charging customers during the construction effort for financing costs thereby reducing the compounding impact of these costs up to the point of Commercial Operations.

**NRC:** Nuclear Regulatory Commission, responsible to the public for assuring the safety of US Nuclear Power Plants through review and approval of license applications and oversight of plant construction and operations.

**Project:** Vogtle Units 3 and 4 and Common Facilities.

**RAS:** Risk Adjusted Schedule, developed by GPC-ND halfway through the project, and factors in risks not accounted for in the aggressive SNC Site Work Plan to come up with a risk adjusted forecast schedule.

**SCo:** Southern Company, the parent company of GPC and Southern Nuclear Company (SNC).

**SNC:** Southern Nuclear Company, a subsidiary of Southern Company, responsible for the operation of the SNC fleet of nuclear power plants (including Vogtle 3 & 4 for a total of 8 Nuclear Power Plants).

**PIA Staff:** Commission Public Interest Advocacy Staff

**SWP:** Site Work Plan represents the aggressive SNC plan for accomplishing work and at times has been referred to by SNC as a “strategic plan”.

**TPC:** Total Project Cost and is the 100% equity shared cost of the project.

**U-3:** Vogtle, Unit 3.

**U-4:** Vogtle, Unit 4.

**VCM:** Vogtle Construction Monitoring refers to the process through which the company generates a report of Project progress on a semi-annual basis, and this report of progress together with the PIA Staff and its consultants’ testimonies serve as the basis for these entities and intervenors to participate in each of the associated VCM hearings.

**VPMB:** Vogtle Project Management Board, a GPC-ND managed effort which provides an independent monthly update of project progress to the Co-owners.

**WEC:** Westinghouse Electric Company, the company that had a fixed/firm price EPC (Engineer, Procure and Construct) contract with Georgia Power Company and the Co-owners until it was forced into declaring bankruptcy in March 2017. After bankruptcy, its role was reduced to providing Nuclear Steam Supply System (NSSS) related engineering and design services and being the design authority (for the remainder of construction) for the Nuclear Island related systems, structures, and components (SSC’s).

**EXECUTIVE SUMMARY**

1. **Background**

This report focuses on Vogtle 3 & 4 Project issues of reasonableness and prudency developed by the Vogtle Monitoring Group (VMG) covering the period starting in April 2017 to the present. Although VMG was not contracted as an independent monitor until April 2018, based on its personnel’s prior experiences in reviewing dual unit AP 1000 project costs and schedules, some input of events occurring prior to April 2018 which VMG believestobe relevant to its role on the Vogtle Unit 3 and Unit Project (Project) have been included in this report. These inputs are limited primarily to Dual Unit AP 1000 Project Cost and Schedule estimates (for which there were 7 originally proposed projects, or 14 units total), and the increased cost risks for the Project which were associated with the stoppage of all nuclear builds but the Project, and WEC having declared bankruptcy in March 2017. Further, these inputs were simply used as a basis for assessing the VCM 17 Order Regulatory Approved GPC Capital Construction Cost of $ 7.3 billion which represents the Company’s 45.7% equity share of the Project costs plus non-shared GPC costs and is highly correlated to the 100% equity shared Capital Construction Cost (TPC) of $ 17.1 billion. This report does not address issues of prudency prior to the Commission Order in VCM 17. Lastly, VMG’s focus was and continues to be on the 100% shareable TPC of $ 17.1 billion and therefore this report does not address the Company’s non-shareable costs[[1]](#footnote-2).

1. **Status of Project When VMG Was Contracted in April 2018**

WEC declared bankruptcy in March 2017, at which point SNC took over Management of the Project. By April 2018, a cost to complete the Project had been developed, and with the Company’s 45.7 % equity share of the Project, plus non-shareable Company costs a *total GPC Capital Construction Cost that was deemed reasonable at Project completion was established by the Commission as $ 7.3 B.* The total Capital Construction Cost includes all Project costs except for financing costs (i.e., *the NCCR Tariff costs and accrued but not yet collected Allowance for Funds Used During Construction (AFUDC) Costs).* *Per the Commission Order VCM 17, the $ 7.3 billion then relates to the 100% equity shared cost of $ 17.1 billion, the latter of which, together with the VCM Order 17 Commission Approved CODs of November 2021 (for U-3) and November 2022 (for U-4), is what the SNC has been reporting and upon which VMG’s efforts have been focused.* This cost and CODs are also often referred to as the Commission Approved Cost and Dates. A further breakdown of the relationship between the $ 7.3 B and $ 17.1 B as was established with the Commission’s January 2018 VCM Order 17 and as “reprojected” by the Company in VCM 19 is provided in Table ES-1 on the next page.

|  |  |  |  |
| --- | --- | --- | --- |
| **Table ES-1 - Vogtle 3 & 4 Forecasted Capital Construction Cost per GPSC Order VCM 17 dated January 2018 then Reprojected in VCM 19** | | | |
| **Cost Categories** | **TPC @ 100% Equity** | **Company Portion @ 45.7%** | **Remarks** |
| Total Shareable Cost | $17.104B | $7.816B | Includes Construction Contingency (TPC @ $.800B w/GPC Portion @ $.366B) |
| Non-Shareable Cost |  |  |  |
| Owners Costs |  | $.082B |  |
| Ad Valorem Tax |  | $.273B |  |
| Toshiba Refund |  | $.188B |  |
| Absorbed by GPC |  | ($.694B) | Write Off |
| Construction Contingency |  | ($.366B) | Write off, but reserved right to bring back to the Commission |
| Total GPC Capital Construction Cost |  | $7.300B | With the above adjustments, the $ 7.3 B specified in the Commission’s Order VCM 17 did not change |

1. **VMG Independent Monitoring Efforts**

During SNC’s management of the Project following VCM Order 17 in January 2018, VMG has provided semi-annual reports of its independent monitoring efforts that supported the PIA Staff at the semi-annual VCM reviews. VMG first provided separate written testimony in November 2018 (in support of VCM 19 covering the period July 2018 through December 2018), followed by appearances of VMG’s Donald Grace, P.E., at the VCM hearings. A summary of the written testimonies and subsequent hearings at which Mr. Grace represented VMG in its Independent Monitoring Role is provided in Table ES-2.

|  |  |  |  |
| --- | --- | --- | --- |
| **Table ES-2 - VMG Support of PIA Staff** | | | |
| **VCM Number** | **Project Period of Performance** | **Date of Written Testimony (see note 2)** | **Date of Hearing (see note 2)** |
|  |
| 19 | Jan 2018 – June 2018 | Nov 30, 2018 (see note 1) |  |  |
| 20/21 | July 2018 – June 2019 | 22-Nov-19 | 10-Dec-19 |  |
| 22 | July 2019 – Dec 2019 | 5-Jun-20 | 25-Jun-20 |  |
| 23 | Jan 2020 – June 2020 | 24-Nov-20 | 15-Dec-20 |  |
| 24 | July 2020 – Dec 2020 | 7-Jun-21 | 24-Jun-20 |  |
| 25 | Jan 2021 – June 2021 | 1-Dec-21 | 16-Dec-21 |  |
| 26 | July 2021 – Dec 2021 | 17-Jun-21 | 12-Jul-22 |  |
| 27 | Jan 2022 – June 2022 | see note 3 | see note 3 |  |
| **Notes to Table ES-2** | | | |  |
| 1. Prior to the VCM 19 written testimony, VMG reviewed the Project, and based on its prior reviews of AP 1000 dual unit projects, quickly concluded in the June 2018 timeframe that the $ 17.1 B appeared to represent a reasonable/ achievable TPC forecast at completion. However, the schedule for the CODs would more likely stretch out, which if they included some schedule contingency, would have been roughly March 2023 for U-3 and March 2024 for U-4. For the analysis and referenced documents which led to this conclusion, refer to Section 1 of this report. | | | |  |
| 2. Although the period of performance dates associated with each VCM are roughly 5 to 6 months prior to the written testimony and hearing dates, the testimonies and hearings included significant updates of Project progress that incurred in this latter 5-to-6-month period. | | | |  |
| 3. Separate VMG testimony was not provided and VMG did not appear at a hearing. Rather, VMG input was provided to PIA Staff. The same was true for VCM 28. | | | |  |

1. **Current Project Status and the Proposed Stipulation:**

The U-3 COD occurred on July 31, 2023, and the Risk Adjusted Schedule Date for U-4 achieving COD is now March 2024. With the start of U-4 Fuel Load having occurred in August 2023, the Company and Staff have achieved a negotiated stipulated agreement to which several of the intervenor groups have also agreed to accept. VMG comments regarding the Stipulation are provided as follows.

1. Capital Construction Cost to be Included in the Company’s Rate Base: Paragraph 1 of the Stipulation states that the parties agree that $ 7.562 billion is a reasonable and prudent total GPC capital construction cost to be included in rate base. It also includes many provisions related to financing costs.

VMG Observations of Reasonable and Prudent Company Capital Construction Cost: Project costs can only be placed into rate base if those costs are found by the Commission to be reasonable and prudent. Both standards must be met.

Reasonableness of Final Capital Construction Cost: For reasons as are provided in the report that follows, there are many actions or inactions of SNC’s Project planning, execution, monitoring, and reporting that VMG would not deem prudent. However, and *based on prior experience with AP 1000 Dual Unit Projects, VMG did provide a high-level review of the $ 17.1 billion TPC figure. Based on that review VMG concluded that (a) the risks at the point of the Commission VCM Order 17 were very difficult if not impossible to accurately quantify, but (b) $ 17.1 billion represented a roughly 50% increase in the TPC from when it was being executed as a WEC managed EPC contract, therefore (c) $ 17.1 represented a sufficient initial “should cost estimate” for purposes of deciding whether or not to proceed with the project and within this context would also consider it to be “reasonable.”.*  And, more importantly, the corresponding GPC Capital Construction Cost of $ 7.3 billion was the basis upon which the Commission approved proceeding with the Project. Finally, given that the now negotiated figure of $ 7.562 billion is largely reflective of the previously established $ 7.3 billion (with the major portion of the increase attributed to COVID), in applying this standard, VMG would agree that $ 7.562 is reasonable.[[2]](#footnote-3)

Final Capital Construction Cost vis a vis Competitive Alternatives: As is discussed in further detail in Section 1 of this report, an equivalent Combined Cycle Gas Turbine (CCGT) Project would have been much more cost competitive on a life cycle basis, and when applying the reasonableness standard, the $ 7.562 billion would not appear to be reasonable[[3]](#footnote-4). However, the continued justification of the Project at many of the VCMs was based on an analysis of the incremental costs to finish the Project when compared to the total cost of a not yet started CCGT Project.

VMG Observations of Reasonable Financing Costs: The proposed Stipulation makes numerous references to the NCCR Tariff Collections made and to be made by the Company’s customers, and to the still accruing AFUDC costs. VMG offers the following observations on the actual schedule vs. the VCM 17 forecast November 2021/ November 2022 CODs since construction duration is one primary factor that determines actual financing costs.

1. As indicated in the first note to Table ES-2, VMG’s June 2018 timeframe opinion was that the November 2021/ November 2022 dates were never achievable, and that dates of March 2023 and March 2024 would have been more reasonable. As discussed in Section 2, in VMG’s opinion many imprudent management practices followed that resulted in TPC growth of roughly $ 4 billion more than the $ 17.1 billion, and a U-3 COD which was 20 months later than November 2021, and if the U-4 Risk Adjusted (RAS) COD of March 2024 is met that COD will be 16 months later than November 2022.
2. In the body of this report VMG provides observations regarding deficient schedule forecast dates that could not have been achieved (ref: Sections 2 and 3). Other sections of the report also highlight what VMG observed as being an “over-reporting of Project progress” (ref: sections 2 and 3) and having an Earned Value Management System that was deficient when viewed in terms of its lack of compliance with the 32 Guidelines of the EVMS Industry Standard (ANSI-748; Earned Value Management Systems, reference Section 3).
3. In light of the preceding and given the Regulatory Approved CODs of November 2021 and November 2022 having served as a basis for approving continuation of the Project, VMG believes that the Company should be held accountable for financing costs associated with not having met those dates, and an assumed funding profile that totals the agreed to GPC Capital Construction Cost of $ 7.562 billion. With respect to what CODs to assume for this funding profile, VMG suggests slipping the November 2021/ November 2022 dates by 4 months to March 2022/ March 2023, which would then account for the maximum schedule slips which the Company has estimated for the non-controllable impact that COVID has had on the schedule.

1. Although VMG is not a subject expert as it relates to financing costs, VMG has simply provided the above observations regarding these schedule management and schedule reporting issues so that the PIA Staff together with J. Kennedy & Associates will determine how to address these issues and the extent to which the proposed Stipulation is reasonable in its handling of Financing Costs.
2. Summary Observations Regarding “Reasonable and Prudent”:VMG has limited its use of the terms reasonable and prudence to the recommended position of accepting the proposed $7.562 billion GPC capital and construction cost. This is because in VMG’s opinion much of the Project was managed imprudently. Our position in this regard is well documented in all our written testimonies and in our participation in the hearings. However, given that the Company has agreed to the VCM 17 Order $7.3 billion of Capital Construction Cost (adjusted primarily for COVID to $ 7.562 billion), VMG’s position is that it is not necessary to identify specific actions as imprudent and that the current stipulation represents a reasonable settlement as it relates to GPC’s allowed Capital Construction Cost.

With respect to how the stipulation handles financing costs, ever since VMG’s engagement as an independent monitor in April 2018 we have continuously expressed our professional judgment that the Commission Approved CODs of November 2021/ November 2022 were not achievable. VMG suggests that financing costs should be based on a funding profile that in total equals a GPC Capital Construction Cost of $ 7.562 billion, established over a period of time that reflects incorporating the schedule delays of 4 months due to COVID (i.e., CODs of March 2022/ March 2023, for U-3 and U-4, respectively).

1. **VMG Summary**

As a summary of its contracted efforts, VMG provides the following:

1. VMG is prepared to independently judge and – as may be necessary -- to refute Company claims that GPC Capital Construction Costs greater $ 7.3 billion should be recoverable through rates, and the basis of VMG’s arguments are reflected in the body of the report which follows and all VMG’s documented written and oral testimonies.
2. Given that the Company has agreed to only seek recovery of its Capital Construction Costs represented by the $ 7.3 billion (adjusted primarily for the impacts of COVID), VMG believes that the proposed Stipulation of $ 7.562 billion represents a fair and reasonable settlement.
3. With respect to how the proposed stipulation addresses financing costs, VMG has provided its observations regarding the schedule to the PIA Staff and J. Kennedy & Associates so that they can use this input in their pursuit of this subject area.
4. **PROJECT COST AND SCHEDULE ESTIMATE**

**AT PROJECT COMPLETION (as forecast at VCM 17 then VCM 19)**

**1.1 Project Background**: The background which follows occurred prior to and during the first few months of VMG’s April 2018 engagement on the Project and serves as an important bridge to understanding (a) status of the Project immediately following the WEC bankruptcy in March 2017, (b) the additional risks that occurred with the Project going forward, and (c) how SNC chose to respond to these increased risks and continue the Project. This discussion is also important to show how SNC continued to underestimate and not account for these risks going forward. More specifically, it also addresses why the VCM 17 Regulatory Approved CODs of November 2021 and November 2022, for U-3 and U-4, respectively, were never achievable. In later sections of this report, it will be shown how the Company continued to over report progress and underestimate both the cost and schedule. Section 2 discusses how SNC continued deferring planned work and instead focused on the reported start of an intermediate milestone and how this and other practices led to their continued over-reporting of progress, while still working towards a schedule that was never achievable. This resulted in the Project costing much more than the $7.3 billion and taking much longer than the Regulatory Approved CODs of November 2021/ 2022,[[4]](#footnote-5) which the Company had committed to in VCM 17.

Within this context, **$ 7**.3 billion represents the Company’s 45.7 % share of the Total Project Costs (TPC) plus the non-shared GPC Project Costs. The correlation between the $ 7.3 billion and $ 17.1 billion figures was provided within the Executive Summary as Table ES-1 and is repeated below as Table 1-1 on the next page. Also, the $ 7.3 billion figure, to avoid confusion with the TPC of $ 17.1 billion, will be referred to as the GPC Capital Construction Cost.

Of note from Table 1.1 is that between VCM 17 and VCM 19 the Company revised its cost estimate upward but to “maintain project momentum”[[5]](#footnote-6) had agreed not to seek recovery of $ 0.694 billion. Therefore, there is $ 0.694 billion of actual Project costs which are not accruing toward the $ 7.3 billion. Also, in the Company’s VCM 19 Reprojection of the cost estimate, it eliminated the GPC portion of Construction Contingency of $ 0.366 billion from Table 1.1,but stated in the footnotes to the Table that the $ 0.366 billion is being reserved for future consideration by the Commission.

|  |  |  |  |
| --- | --- | --- | --- |
| **Table 1.1-1; Vogtle 3 & 4 Forecasted Capital Construction Costs per GPSC Order VCM 17 (dated January 2018) then Reprojected in VCM 19** | | | |
| Cost Categories | TPC @ 100% Equity | GPC @ 45.7% | Remarks |
| Total Shareable Costs | $17.104 B | $ 7.816   B | Includes Construction Contingencies (TPC @ $ .800 B, W/GPC portion @ $ .366 B) |
| Non-Shareable GPC Costs |  |  |  |
| Owners Costs |  | $ 1,173 B |  |
| Ad Valorem Tax |  | $ .273 B |  |
| Toshiba Refund |  | $ (1,493 B) |  |
| Absorbed by GPC |  | ($ .694 B) | Write off |
| Deduct GPC Portion of Construction Contingency |  | ($ .366 B) | Write off, but reserved to bring back to the commission |
| Total GPC Capital Construction Cost |  | $ 7.300 B | With the above adjustments, the $ 7.3 B specified in the Commission’s Order VCM dated January 2018 did not change. |

Going back to the inception of the Project, during the period of roughly 2006 – 2012 there was talk of a “Nuclear Renaissance”, and it was during this period in 2008 that an EPC contract was negotiated between the Co-Owners and the EPC Contractor (WEC). The initial total Project Cost (100% equity shared cost, i.e., TPC) was forecast at roughly $ 10 billion with CODs forecast for April 2016/ April 2017 (for U-3 and U-4, respectively). Further, considering a fixed/firm price EPC contract, the risk for Project over-runs was borne primarily by the Consortium.

What is important is that during the time of 2007 – 2009 license applications were submitted to the NRC for seven new dual unit AP 1000 plants (which accounts 14 total new plants), the costs of which were being based on numerous “bases of estimate” assumptions which had been used in developing the cost estimates. Starting in 2013, however, License Applications started being suspended or withdrawn, and by the time WEC went bankrupt in March 2017, followed by the cancellation of the VC Sumer project in July 2017, the Vogtle Project was the only remaining dual unit AP 1000 project. The spreading of costs (be it engineering, development and maintenance/ operation of the modular facility, and other elements of cost) which were assumed in the initial development of cost and schedule estimates by WEC was no longer achievable. Other bases of estimate assumptions included having a qualified nuclear work force; however, with the drop in AP 1000 projects, together with the stoppage of another 14 new US Reactor Plants (of different designs), that assumption also went by the boards, and the cost and schedule risks had increased dramatically. And compounding the problem was mismanagement by WEC (e.g., with an impeding bankruptcy, it is reasonable to assume that still in process engineering efforts were slowed or curtailed, quality records were lacking, components installed early in the plants or sitting in the warehouse were not being properly maintained, etc.)

**1.2. Cost Estimates for New AP1000 Dual Unit Sites:** Several VMG personnel participated in efforts to independently validate cost and schedule estimates for 3 dual unit AP 1000 sites (i.e., William Lee, Turkey Point, and VC Summer). In addition, both Southern Company and Bechtel participated in efforts to evaluate the cost and schedule of AP 1000 dual unit sites. The “basis of estimate” assumptions used in developing these cost and schedule estimates included the five items listed below, but certainly did not account for the increased costs per plant due to stopping of all the other AP 1000 projects and all of the other risks that came with the WEC bankruptcy.

1. Changing the process for the licensing of new plants to provide greater certainty in the process and to avoid “mid-stream” design and construction changes.
2. Simplifying the design to rely on “natural forces” such as gravity for safety systems and thereby decreasing the number of “active components” (such as large pumps and valves and associated “safety grade” power supplies).
3. Taking a more “modular approach” to design and construction where much of the construction would be done in a production line factory and thereby achieve greater construction efficiencies and better, more consistent quality.
4. Utilizing state of the art computer aided design techniques to help in the planning and execution of the construction effort and improving the maintainability of the plants once they are operational.
5. It was assumed that with the employment opportunities that this would provide, greater numbers of people would become qualified to work in the demanding nuclear environment.

1.2.1 Cost Estimate Exclusive of Financing: VMG personnel, through past and current efforts, have reviewed the cost estimates for Vogtle, and 3 other dual unit AP 1000 sites and has found the cost estimates to be relatively consistent. This is demonstrated by the cost estimates provided in Table 1.2-1 below, titled “Cost Estimates of dual unit AP 1000 Plants.”

|  |  |  |  |
| --- | --- | --- | --- |
| **Table 1.2-1, Cost Estimates (excluding financing) of AP 1000 Dual Unit Sites** | | | |
| Site | Cost Estimate | Assumed CODs | Cost Escalated / De-escalated to 2021/2022 CODs |
| [[6]](#footnote-7)William Lee[[7]](#footnote-8) | $ 9.56 B | 2016 / 2018 | $ 11.1 B |
| Turkey Point | $ 12.00 B | 2022 / 2023 | $ 11.6 B |
| VC Summer | $ 9.80 B | 2016 / 2018 | $ 11.4 B |

From Table 1.2-1 the cost estimates are relatively consistent, and they all fall $ 5.5 billion or more below $ 17.1 billion, which then represents a nearly 50% increase of the TPC. Further, it is reasonable to conclude that this roughly 50% increase of the TPC was sufficient to cover the increased risks associated with the WEC’s prior mismanagement. More noteworthy among these increased risks was the modular facility had been abandoned, attracting qualified numbers of required construction craft would be more challenging, ensuring proper maintenance and documentation of warehoused materials would present more challenges, obtaining necessary spares would be more challenging due to a less reliable nuclear qualified supply chain, as would ensuring complete quality control documentation for all aspects of the Project. SNC and the Company and the Co-owners, when considering the remaining “to go” work and the increased risks apparently considered a TPC of $ 17.1 billion at Project completion would be sufficient.[[8]](#footnote-9)

Also worthy of note is the following:

* As an effort to support validation of the $ 17.1 billion TPC (i.e., and therefore the GPC Capital Construction Cost of $ 7.3 billion), the Company, per direction of the Commission via the VCM 17 Order to “verify quantities”, did so verify as part of VCM 18 and the April 2019 rebaselining.
* Per VCM 19, the Company developed a “reprojection of the cost” wherein it agreed to absorb $0.694 billion worth of costs (which are incurred costs, but do not accrue to the GPC Capital Construction Cost of $ 7.3 billion); and wrote off an additional $366 million contingency which the Company reserved the right to come back to the Commission to request approval at an appropriate time.

1.2.2 Cost Estimate Inclusive of Financing: Given that financing costs are highly dependent on the schedule, one must then assess the credibility of the SNC’s CODs approved by the Commission.

**1.3 Schedule Forecasts for Vogtle:** VMG**’s** initial review of the Vogtle schedule in the spring of 2018 quickly concluded that at best (i.e., with little to no schedule contingency) the CODs would likely be a year or more later than the Commission Approved CODs of November 2021/ 2022. This review was conducted over a limited time period of roughly 3 months and was based on the very limited and questionable information that was available at that time (for example, it included a review of only the Site Work Plan). To further illustrate, at this time the April 2018 re-baselined schedule was still being developed. A summary table from VMG’s initial analysis has been reproduced as Table 1.3-1 below.

**Table 1.3-1, Summary of CPT’s Preliminary (June 2018) Review of the Project Schedule.**

**(AS COPY/ PASTED (through note 2) FROM THAT REVIEW)**

|  |  |  |  |
| --- | --- | --- | --- |
| Commercial Operations Dates (COD’s) | COD’s  Per Commission Order 17 (Approved Dates) | Per + 23 “Target Schedule” (i.e., Order 17, less 6 months “Schedule Contingency”) | CPT’s **Preliminary** View  (Current Estimate with No Schedule Contingency and  includes 15–19-month slip from Site Work Plan Targets) |
| Unit 3 COD | Nov 2021 | May 2021 | Aug 2022 – Dec 2022 |
| Unit 4 COD | Nov 2022 | May 2022 | Aug 2023 – Dec 2023 |
| NOTE 1: As indicated previously, CPT focused its analysis on the +23 Target Schedule and assessed probable delays in that schedule of 15 to 19 months. | | | |
| NOTE 2: **CPT’s “Preliminary View” as shown above has no schedule contingency.** Further, First-of-a-Kind (FOAK) projects normally have “unexpected/ currently unknown” issues that arise to further delay the schedule. Industry refers to these as “known/ unknowns”. CPT’s “Preliminary View”, therefore, represents our Rough Order of Magnitude (ROM) estimate of the forecast schedule ranges based on “what is known” in terms of risks and their potential impacts but does not account for “known/ unknowns” and may therefore be a somewhat optimistic early schedule range. | | | |
| Above is from VMG June 2018 review of Company’s incomplete IPS, while notes 3, 4, and 5 on the next page have been subsequently added. | | | |
| NOTE 3: Shortly after being engaged as “CPT”, the Company changed to “VMG” with the key personnel reconstituted within VMG. | | | |
| NOTE 4: Assuming a schedule contingency of 6 to 8 months applied to the “Preliminary Review” early dates would slip these dates to February 2023 – April 2023 (U-3) and February – April 2024 (U-4). | | | |
| NOTE 5: Also, as is demonstrated in Section 3 of this report, the “Basis of Estimate” (BOE) upon which the subsequent April 2019 Baseline was developed was unrealistic and could not be counted on to provide reliable forecasts of the ever-changing forecast TPC Estimate at Completion (TPC EAC) and CODs. | | | |

Another way VMG looked at the schedule was to assume a level of schedule contingency within each of the major construction activities versus adding a larger contingency to the entire effort. In doing this the delays of the following activities were estimated and used as an alternative means of analyzing the forecast CODs. The results of this analysis of the efforts are indicated below and yield a similar result as was derived from the approach shown in table 1.3-1.

* Bulk Mechanical Installations: Were already 2 months behind the overly aggressive/ non-achievable plans.
* Bulk Electrical Installations: Were already 2 months behind the overly aggressive/ non-achievable plans. Also note that to a certain extent, these installations must follow the mechanical installations, and as such another time lag of 2 months should be added from Mechanical Bulk Completion to electrical and Instrumentation and Controls (I&C) completion (resulting in an additional 4-month delay).
* Over-all Bulk Installations: Were already 4 months behind the overly aggressive/ non-achievable plans; plus, VMG forecasted another 3months were needed (for a total of **7** months) to complete bulk installation of piping plus others as well, with these extended time periods also based on actual vs planned rates of installation.
* System Turnovers to ITP: VMG forecasted another 5 months would be required (due to the delayed completion of work and testing that must be done before system turnovers can start, and the actual vs planned rate of turnovers).
* Although not a First of a Kind (FOAK) Project from a technological standpoint (note: Westinghouse Pressurized Water Reactors have been deployed for roughly 70 years), since this is a significantly different design and approach to construction, the “benchmark” time period of 12 months from the start of Hot Functional Testing (HFT) to COD should (at a minimum for U-3) be increased from 12 months to 16 months, i.e., a delay of another 4months.

In total, therefore, when adding these delays, the cumulative effect is a delay of 22months (from the SWP assumed COD of May 2021 for U-3, and May 2022 for U-4), which when added to these dates results in a forecast COD of March 2023 for U-3 and March 2024 for U-4.

**1.4**. **Company Commitment to the Regulatory Approved Cost and Schedule:** The Company and Co-owners decided to go forward, and in doing so, GPC committed to a Capital Construction Cost of $ 7.3 billion (which corresponded to a TPC of $ 17.1 billion) and Commission Approved CODs of November 2021/ November 2022. Further, with the April 2019 re-baselining of the Project (and 2 years after having taken over the Project), they reported having verified the “to go” construction quantities and continued with their commitment to meet the Capital Construction Cost of $ 7.3 billion and November 2021/ November 2022 CODs. **This, plus the fact that $ 7.3 billion and November 2021/ November 2022 CODs was the basis for the Commission to approve continuation of the Project, the Company needs to be held to a high degree of accountability for their actual performance versus these commitments.** **In effect, one could view this cost and schedule as a “non-binding contract” between the Commission and the Company.**

**1.5 Deficient Schedule and Cost Forecasting:** After having taken over the Project in April 2017, SNC kept using unrealistic assumptions that served as the Basis of Schedule Estimates for their re-baselined schedules.[[9]](#footnote-10) Shortly after each re-baselining of the schedule they fell further behind and therefore took increasingly imprudent measures to try and improve. These imprudent measures included (a) prematurely switched from bulk commodity installations into a piecemeal approach to meet intermediate milestones that create the perception that the Project was on or near schedule and was supporting the Integrated Test Program (ITP), (b) increased staffing beyond efficient levels, (c) deferred quality control required inspections, while taking credit for completed work, which upon subsequent inspections was also found to be deficient and required rework, (d) divided systems into numerous subsystems and then (e) took “technical exceptions” within these sub-systems again to support testing work to be performed by the ITP group. Although some degree of taking these actions in some cases may be warranted, the extent to which they were used was excessive which then both served to defer originally scheduled work and created additional “emergent rework” resulting in a bow wave of an ever-increased future work. This only served to further complicate the planning and execution of the remaining work and resulted in an enormous amount of unpredictable rework and further costs increases (to where the forecast TPC is now roughly $ 4 billion greater than the $ 17.1 billion)[[10]](#footnote-11). At the same time, their reporting of progress tended to cloud awareness of the problems in that they continued to talk in terms of having “schedule margin” between the dates of the unrealistic Site Work Plan and the November 2021/ 2022 dates (ref: Section 3). Section 2 of this report (Imprudent Management Practices) provides a more detailed discussion of the imprudent management practices SNC implemented to shorten the schedule but instead negatively impacted both the cost and schedule. Section 3 provides greater detail regarding the inadequacies of the Project reporting practices and includes a discussion of the approach to risk management and establishing contingencies. Following that, Section 4 provides an integrated time phased discussion of the various phases of the U-3 portion of the Project and a macro analysis of the $4 billion increase in the TPC and the actual 20-month (U-3) and forecast 16-month (U-4) slips of the Commission Approved November 2021/ November 2022 CODs.[[11]](#footnote-12)

**2. IMPRUDENT MANAGEMENT PRACTICES**

VMG has concluded that when taken collectively these practices can be shown to account for nearly all (i.e., all but COVID related impacts) of TPC expenditures more than what VMG considers having been a realistic TPC of $ 17.1 billion.[[12]](#footnote-13),[[13]](#footnote-14) Before discussing each of these practices, VMG believes it is important to review what may have led SNC to pursue them. Finally, the reporting that follows applies to the entirety of the U-3 effort and partially to the U-4 effort. For U-4, many of the imprudent practices were corrected, which has then led to a more effective execution of the remainder of the Project and more credible reporting of the U-4 progress.

**2.1 Root Cause that Led to Imprudent Management Practices, i.e., The pursuit at all costs to meet Unrealistic Schedules and more precisely unachievable intermediate milestone schedules:** The primary “root cause” contributor to the imprudent management practices stems from the Company having established CODs that could never be met. One must therefore ask why the Company continuously set unrealistic schedules after taking over the Project.

The need for having realistic project schedules is stressed by the Institute of Nuclear Power Operations (INPO) in their “Principles for Excellence in Nuclear Power Construction” where Principle number 4. states the following:

Schedules are Realistic and Understood: Effective project controls and detailed planning are key factors in the success of any large construction project. Unrealistic, uncoordinated, or obsolete schedules or insufficient resources can have a negative effect on construction quality and personnel safety, especially when inappropriate actions are taken to accelerate construction or reduce cost.

After the WEC bankruptcy, it quickly became apparent that the Project was continuing to fall behind schedule, and this led to a series of imprudent practices, all of which were made to improve the schedule; but in reality, only served to increase the TPC and schedule well beyond what they would have been had they simply followed industry standards.

* 1. Imprudent Management Practices: Based on Bechtel’s reporting of cost and schedule performance it was always clear that production was not meeting plan, and instead of realistically addressing the root causes of the problem staff was often added to make up for lost production, which only further exacerbated production efficiency.In addition, and instead of following a disciplined approach to completing originally planned work, and by attempting to prematurely force pieces of construction work over to ITP in response to ITP’s wanting to get an earlier start on testing activities (for example, through the “Partial Release for Test” process), this only served to further change original plans and complicate and inhibit the efficient execution of work. For further details on this, refer to section 3 titled “Deficient Project Planning, Risk and Contingency Management, and Reporting.”

A further and more detailed discussion of imprudent management practices that were followed is provided below in terms of four categories, as follows:

1. Deferral of planned work: This was done largely to accelerate the turnover of completed construction work to the Integrated Test Program (ITP) group for purposes of ITP getting an earlier start on its testing activities.[[14]](#footnote-15) By pulling testing into the construction window earlier than standard practices would dictate, then theoretically one could shorten the overall schedule to achieving COD. This had the opposite effect by duplicating work efforts and incurring unnecessary additional cost. Examples of this include prematurely switching from construction of bulks to individual components. As a more detailed example, instead of doing bulk cable pulls, an individual cable would be pulled to a specific component to support the test of that component. However, when the remainder of the cables were pulled, often there was damage caused to the original cable, penetration seals had to be breached, cable tray had to be re-worked, thus necessitating additional work. In addition, given the number of non-compliances with IEEE-384 (see 3. Below), that also necessitated additional electrical work, which in total was a major contributor to the time duration from the start of HFT to the start of Fuel Load taking 18 months (vs the industry benchmark of 6 months). Additional practices of deferring work include: (a) breaking systems down into sub-systems and focusing on the completion of certain partial systems or components at the cost of delaying others, (b) doing “Partial Releases for Test” of a sub-system, again to “accelerate the start of testing,” and (c) releasing scopes of work to ITP, but within ITP’s scope of work taking “technical exceptions” to what is to be done.[[15]](#footnote-16) Although some of these practices could in some cases be justified, the extent to which this was used and given the “rework” required by not complying with IEEE-384, greatly complicated the planning and execution of the remaining work.
2. Deferral of Inspections: Quality Control required inspections of work for which construction was reported to be complete were not performed yet credit was taken for completion of the inspection work. Subsequently, to support (a) final turnover of a system, and/or (b) turnover of an area and/or (c) documented completion of an ITAAC – errors in construction were discovered. This occurred very late in the Project, and many the errors were the result of not meeting the separation requirements of IEEE-384. To further illustrate the magnitude of this problem, per the March 2022 MPR the Company reported that the number of incomplete electrical inspection reports required to support the ITAAC completion notice (which would then lead to NRC review/ approval and issuance of the 103.g. letter) had increased from roughly 20,000 to over 25,000. Further, because of poor construction revealed by the completion of these required inspections, this created a large volume of emergent corrective work which was then very disruptive to the further planning and execution of the Project and greatly increased the TPC and slipped the CODs. As an example, the US Nuclear Plant “benchmark” time from the start of Hot Functional Testing (HFT) to the start of Fuel Load is typically 6 months, yet for U-3 this duration was 18 months.
3. Increasing Staff Without a Sufficient Work Backlog: The Project needed to have enough backlog of work (i.e., work packages which are ready to turn over to construction) to keep craft productively engaged. The goal was to have a 13-week backlog of work, however SNC could only achieve a 3-to-6-week backlog. Despite never having achieved the 13-week backlog goal, the Project kept increasing manpower to “catch up” to the schedule. This practice to increase craft levels without sufficient backlog then resulted in thousands of idle work hours by the craft as was evident by walking the site down anytime and any day of the week and by the poor cost performance indices
4. Inadequate Recognition of Risks and Not Implementing Plans for Mitigating: The most significant of these was not recognizing the complexity of IEEE-384, and the need to properly train and qualify engineers, construction supervision and craft, Field Engineers, and Quality Control personnel well ahead of the construction work. In addition, although VMG has not reviewed in detail, it appears that much more effort could have been invested in completing the detail design of electrical raceways prior to the start of construction.[[16]](#footnote-17), [[17]](#footnote-18)As another example, attracting sufficient numbers of qualified craft was always recognized as a challenge yet efforts to achieve planned levels were always delayed and (as was the case with IEEE-384) their qualifications were questionable.
5. Inadequate Controls and Project Reporting: The Project never did establish what the Industry Standard ANSI 748 (titled Earned Value Management Systems Intent Guide) states with respect to having a “Resource Loaded Integrated Project Schedule”. The IPS that they did have (i.e., the Site Working Plan) had “budgeted values” which were only tied to the very high summary level activities of the schedule, and even if they had been tied to more detailed schedule activities the SWP schedules were so unrealistic that it still would have been difficult to effectively use the Project EVMS (even in its “partial use” mode). As an example of this latter point, over the 13-month period of January 1, 2021, through February 28, 2022, over $ 2.6 billion was spent, yet 13 months later the Estimate to Complete (ETC) the Project had grown an additional $ 0.2 billion. In other words, the impact of the “ever emerging and difficult to define rework” was that over this period a lot of money was spent yet the overall progress of the project was negative.

Further details on the inadequacies of the project controls and reporting system are provided in Section 3, and a chronological macro-analysis of the cost and schedule impacts of the imprudent practices is provided in Section 4.

**3. DEFICIENT PROJECT PLANNING, REPORTING, AND**

**RISK ANALYSES / CONTINGENCY MANAGEMENT**

This section of the report deals with Project planning and reporting and will start with a major ANSI 748 (EVMS Guidelines) requirement which the Project has never met, i.e., having a “resource loaded Integrated Project Schedule” (IPS). This requirement serves as an underlying basis upon which to create a meaningful and reliable system for planning, executing, and reporting on the status of the Project, and without it the EVMS and IPS cannot be considered reliable.

**3.1 Major Deficiencies of EVMS and Integrated Project Schedule (IPS):** The software used for planning and reporting the status of the planned project activities is state of the art and is known as Primavera. It is the software of choice for many large projects such as Vogtle 3 & 4. Its advantages are largely that it provides the platform to plan, to earn against the plan and to load actuals against the earn at cost account levels such that it generates progress reports whereby cost and schedule variances are reported automatically in a consistent manner. Assigned Cost Account Managers can then be held accountable for performance, and the system can be used as a consistent and reliable means for reporting the status of a Project. Based on Project performance to date, and the cost and schedule risks going forward, it then also provides a reliable forecasting tool to better estimate the Project completion date and the estimated actual cost when completed.

With respect to being “resource loaded”, this means that most of the activities within the IPS have “budgeted values” associated with them. Further, the sum of the activity based “budgeted values” then equals the “total planned value” for the project work. In the case of the Project, the budgeted value of the activities are all the activities as represented by the “Site Working Plan”. In addition to the budgeted values of the SWP, the Project TPC EAC then also includes contingency dollars which theoretically are based on a Company assessment of the probability and potential cost impact of various risk events that are not included in the SWP.

SNC chose to load resources only for construction craft into the IPS; and, the IPS has no resources in it for Engineering, Procurement, SNC Labor, Field Non-Manuals, Field Distributable and ITP. Even for construction craft, SNC was selective and only resource loaded craft hours at very high levels in the IPS where it did not utilize the Primavera based IPS to earn against these tasks. Instead, and again for craft hours only, systems apart from Primavera such as excel spreadsheets were utilized to measure and report performance in hours.

For the Project, a primary project status reporting tool that was used is the QURR (Quantity and Unit Rate Report). The QURR, developed and maintained by Bechtel, identifies quantities (e.g., cu ft of concrete, feet of cable, etc.) to be constructed and reports on planned quantities, actual quantities, and actual effort expended. Variances are calculated (both Cost Performance Indices, and Schedule Performance Indices) based on actual, planned, and completed efforts (all expressed in man-hours). The variance reports cover both the most recently completed period (i.e., a week), and cumulatively to date, and by various topical areas (e.g., by type of material, by building, etc.).

Although the QURR is a beneficial tool, at the time of the April 2019 Baseline it represented only about 30% of the TPC. In addition, instead of utilizing Primavera as the tool for generating reports, numerous reports were generated “offline” via a combination of excel spreadsheets and other tools.

When properly resource loaded, the software provides meaningful and consistent means of calculating the project percent complete plus revised cost estimates at completion and revised forecast completion dates. Also, when resource loaded (i.e., preferably with dollars), there should be a relatively close correlation between the reported project percent complete and the percent of the Estimated Cost at Completion. However, this correlation never existed, and is because with each re-baselining of the Project, the Company’s reporting of percent complete was not baselined correctly as EVMS guidelines dictate. That is, with each re-baselining, one sets the past Budgeted Cost of Work Scheduled = to the Budgeted Cost of Work Performed = to the Actual Cost of Work Performed (BCWS = BCWP= ACWP). At the point of re-baselining, therefore, actual costs as a percentage of the EAC would represent the project percent complete. That this was not done with the April 2019 re-baselining as demonstrated by Table 3.1-1, below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Table 3.1.-1; Total Project Cost Based Project % Complete, vs Company Reported % Complete At Validated April 2019 Baseline** | | | | | |
| Data Source | (a) Forecast EAC | (b) ETC (April 2019 to Finish) | (c) Prior Actuals (a-b) | ANSI 748 Cost Based % Complete (c/a) | Company Reported % Complete |
| April 29, 2019, VPMB | $ 17.1 B | $ 7.2 B | $ 9.9 B | 57.89% | 77% |

What this data demonstrates is that the “off-line” means of project reporting is highly subject to manipulation and errors. And the means for correcting this deficiency starts with having a “resource loaded IPS” which represents the entire scope of work and the TPC. It would be preferably in dollars, but hours if properly budgeted would also suffice. Rather, this is something that the Project has never had, and instead scope and resources are integrated only at the highest levels, and certainly not at the lower-working-level Cost Accounts, and within Primavera there is no reporting of either cost variances, schedule variances, or a revised forecast of the EAC and completion date.

To further demonstrate the inadequacy of their Project reporting not being in accordance with EVMS principles, Table 3.1-2 below shows how with having spent considerable money (roughly $ 2.4 billion), and with no decrease in the ETC (i.e., the Project was not making any positive progress), yet the percent complete for various categories and the Project as a whole increased dramatically.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 3.1-2; Company Reporting of % Complete** | | | | | | | |
| Data Sources; VPMB | | Reported Percent Complete | | | Co Fcst TPC/ EAC | Company ETC Forecast | |
| Dated | Data Date | Engineering | Construction | Total Project | $ 's | Fm \_\_to end |
| 24-Feb-21 | Jan-21 | 100% | 89.60% | 90.90% | $ 17.8 B | $ 2.7 B | Feb-21 |
| 31-Mar-22 | Jan-22 | 100% | 96.90% | 96.10% | $ 20.5 B | $ 2.7 B | Feb-22 |
| **Continued spending (roughly $ 2.4 billion) and no concurrent decrease in the Estimate to Complete (i.e., no progress), yet the reported Total Project % Complete Increased dramatically.** | | | | | | | |

Risk and Contingencies are discussed later in this section, but some discussion related to what has just been presented is warranted at this point and follows.

As actual costs continued to grow and exceed planned costs, on an after the fact basis funds were simply taken out of unallocated contingency and added to the existing budgets and as contingency was drawn down it was periodically restored. In a disciplined project controls system, contingency is only to be used for “added scope” and budgeted before it is spent, and actuals are then tracked on a pro-active (versus after the fact) basis. Within the same actual Project scenario, as it was discovered that planned work was not complete (yet credit had already been taken for its completion), this led to “emergent corrective work” which instead of being charged to the originally budgeted scope was funded and charged separately thus causing Project Controls to report inaccurate information. and limit their ability to accurately forecast work to complete. With this method, the reasons for the past variances tend to be masked simply because there is an ever-increasing supply of contingency to cover past errors. As contingency approached zero the Project simply increased the TPC EAC by adding more money into contingency and the cycle kept repeating.[[18]](#footnote-19)

**3.2 Deficiencies of the April 2019 Baseline; Assumed Bases of Estimate:** The main purposes of a new project baseline are to (a) establish an improved/ informed plan for executing the remainder of the project scope, (b) establish a reliable basis for reporting on the progress of the remaining work, and (c) based on variances against the plan, for the remaining work identify areas for possible improvement, and provide updated forecasts of a Total Project Estimate at both Completion (TPC EAC) and project completion date.[[19]](#footnote-20) Also, when establishing a new baseline of such critical importance as the April 2019 baseline, all past variances are to be eliminated by taking the ACWP and setting both the BCWP and the BCWS to this same value (see footnote 19). This then eliminates past variances and provides the opportunity to revisit and update the bases of estimates (now that the state of the engineering is over 70% complete and is at a relatively mature state, and achievable/ realistic production rates are known) to reflect a more realistic plan going forward that is no longer encumbered by past deficient planning assumptions.

VMG reviewed the “Bases of Estimate” for the April 2019 Baseline and found many of the assumptions to be unrealistic/ deficient. A summary of these deficiencies plus additional deficiencies associated with the April 2019 baseline are presented below.

1. The IPS does not represent the total scope, and it is only partially resource loaded (and only at the highest levels, and certainly not at the more detailed working levels).
2. The assumed installation rates are much lower than experience would indicate as ever being achievable (and in particular, for pipe fitters and electricians).
3. Given that unachievable/ unrealistic installation rates were used, the activity durations were artificially short (particularly with respect to bulk commodity installations).
4. Based on b) above, the total craft requirements that were developed significantly underestimated that required to achieve the required production; yet this is further compounded by the fact that already being over-staffed, with further increases of staff the production efficiencies deteriorated even further.
5. Absenteeism was much higher (4 x higher) than industry standards and much higher than was assumed in the BOE assumptions, yet no allowance was made in the baseline planned staffing. So, when the Project was determining activity durations the higher absenteeism rate should have been incorporated.
6. Component testing failures were reported at over 60%[[20]](#footnote-21), yet no rework plans or allowances were made for either cost or schedule.
7. When establishing a new baseline, ACWP, BCWP, and BCWS were not set equal; therefore, CPIs were not re-set to 1.0. This is a significant inconsistency with the established guidelines.
8. Project percent complete was over reported (ref: Table 3.2-1).
9. Risks either were not identified, or were not included in the schedule, or if identified, appropriate risk mitigation efforts were not identified (of note, was the need to properly train personnel on IEEE-384).
10. Known delays of at least 6 months (such as was the case with bulk installations and system turnovers to ITP) were not incorporated into the schedule (rather, the CODs were slipped by only one month).[[21]](#footnote-22)
11. For the major intermediate milestone of Integrated Flush, the milestone was modified to a start vs finish milestone, which violated their own procedures and was again misleading in that it indicated meeting a milestone which had been missed.
12. Unrealistic assumptions made in the BOE were as follows:
13. Construction will meet system turnover dates to ITP “with no exceptions”.
14. No rework from Construction will be required (yet inspections were not being done as construction work was being reported as complete).
15. Parts will be procured to support testing work packages.
16. Construction flushing and hydro will be complete prior to turnover.
17. All work packages will be planned and ready.

Given the above approach, one could assume that the risks identified above could be covered by an assessment of the probability of their occurring and their possible impacts. However, whenever developing a “baseline”, one normally assumes a certain “confidence level” that the baseline plan can be achieved and depending on the desired/ pre-defined confidence level, one then would include in the baseline plan some level of “imbedded contingency” to cover these high probability risks. However, in viewing the BOE assumptions for the April 2019 baseline, it is obvious that this was not done. In other words, with the BOE assumptions that went into developing the April 2019 Baseline, it had (as all the Company rebaselined plans have had) a zero percent chance of ever being achieved.

In past testimony, VMG has acknowledged that SNC has been successful in managing Refueling Outages at its six operating nuclear plants. Further, one might argue that depending on the specific project and most notably its duration, an approach such as has been taken by the Project might be acceptable. For example, with an overly aggressive planned duration of say 2.5 to 4 weeks (such as what is done during a refueling outage (RFO) possibly extending to say 5 to 8 weeks does not have near the impact as a multi-billion-dollar project (with several orders of magnitude additional numbers of activities and associated risks) being extended by years. To further illustrate, there is very little comparison of what is required to successfully manage a Refueling Outage versus what is required to successfully manage the design and construction of a new nuclear power plant. With a RFO the numerous plant systems have already been successfully operated at power in an integrated fashion, the design records are complete and represent the “as-built” plant, and maintenance records exist to document the performance of the systems and components within the systems. All that needs to be done during the RFO is to make the planned “incremental changes” to an existing plant and perform other routine tasks that are a part of normal business during refueling outages. This is very different to constructing a new plant from the ground up, especially in the case of Vogtle 3 & 4 where many components were purchased long before they were needed, maintenance records were sometimes lacking, and the numerous systems have yet to be proven reliable and capable of operating at power in an integrated manner.

**3.3 Over-Reporting of Project Status**

**3.3.1 Project Progress at the April 2019 Baseline was Significantly Over-stated:** As noted previously, given the increased risks following the cancellation of the other six dual unit AP 1000 projects and the subsequent WEC bankruptcy, the TPC EAC of $ 17.1 billion was a “reasonable” estimate for the TPC at project completion. If completed for this cost, this would then represent an “as spent Capital Construction Cost” (exclusive of financing) TPC of $ 17.1 billion.

When developing an updated baseline, industry practices dictate that all three primary measures (i.e., BCWS = ACWP = BCWP) are set to equal the ACWP.

SNC, through the April 2019 Baseline, established that the Project was 77% complete, whereas based on past as spent dollars and the $ 17.1 billion TPC EAC the percent complete should have been 57.89 %; i.e., an overstated % complete of 33 % (i.e., 77 %/ 57.89 %). This over-reported status was previously highlighted in Table 3.1-1.

SNC did not have, nor could it have obtained via its EVMS a clear status of the Project and an accurate ETC.

**3.3.2. Post April 2019 Baseline:** An analysis of the over-reporting within the various categories of the Project effort is complicated by the fact that the Company, prior to taking over the Project, did not allocate the expenditures to the various Project categories. However, starting with the April 2019 re-baseline the Company provided Estimates to Complete (ETCs; *which for both data dates provided in Table 3.3.2.-1 below is for the period starting in July 2017 to Project completion).*

In the ETC budgets established in April 2019, the period covered by the budget therefore started in July 2017. By April 2019, of $127 million that had been budgeted for engineering $ 191 million had already been spent, and the percentage of engineering reported as being complete was 98.1%. By January 2023, the EAC for engineering had increased to $ 293 million.

For Procurement, SNC Labor, Distributables and Owners Cost baseline budgets as well as the additional budget growth no performance measurement was ever provided.

|  |  |  |  |
| --- | --- | --- | --- |
| **Table 3.3.2-1, Budgeted Efforts % Growth,** | | | |
| **(ETCs from July 2017 To Project Completion.)** | | | |
| Budget Category | Budgeted $ M; Without Contingency; Est as of \_\_\_\_\_ | | Budget Growth |
| Apr-19 | Jan-23 |
| Engineering | 191 | 293 | 53.40% |
| Procurement | 514 | 811 | 57.80% |
| Construction | 3,579 | 5,652 | 57.90% |
| ITP | 101 | 169 | 67.30% |
| SNC Labor | 1,337 | 2,794 | 109.00% |
| Subcontracts | 1,360 | 1,849 | 36.00% |
| Distributables | 208 | 330 | 58.70% |
| Owner's Cost | 474 | 632 | 33.30% |

For categories where some performance measurement was used none of the budget growth was re-planned or provided with a basis of where that scope could also be earned.

Construction and subcontracts were the two areas where EVMS guidelines were followed with deficiencies as highlighted elsewhere in this report.

**3.3.3 Detailed Reporting of Over 100% Complete:** In addition to what has been discussed above in terms of over-reporting of progress after the April 2019 baseline, there is additional evidence of Project over-reporting. To illustrate, individual earned value accounts were throughout the years overstating Project status at more than 100%, which with a properly administered EVMS should not be possible. For ITP, as an example, the number of activities completed divided by the total number of activities was used as a basis for reporting percent complete. And although EVMS guidelines recommend using resource hours, if we accept this method the reporting (as reporting in paragraph (a) below) was deficient, as were other areas as are also explained below.

1. For ITP, as scope was added (e.g., additional ITP activities were added in the IPS, from 46,000 at the 2019 Baseline to 52,000 soon thereafter) the Project earned against all activities old and new but used the original basis to calculate percent complete which resulted in over reporting percent complete. So, as an example, if there were originally 100 ITP activities in the baseline, when 50 of these were completed, the project would correctly report 50% complete. However, assuming 100 activities were added, the IPS now has 200 activities, the percent complete of 50 activities completed should be reported as 25%. The Project continued to over report even after it was brought to their attention and only towards the end made the corrections.
2. Construction Specific examples where progress has been over overstated can be seen from the March 2020 QURRs. These “detailed” over-reporting’s would then contribute to an over-reporting of the Project.
3. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
4. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
5. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
6. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
7. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
8. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
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18. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
19. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

**3.3.4 Reporting of “Non-Existent” Schedule Margin:** Even though the Project has always had an unachievable Site Work Plan, the Project schedule status was reported as “having margin between the SWP schedule and the Commission Regulatory Approved Schedule.” If margin is to exist between an early date and a later date, this is true only if there is some measurable chance of the earlier date being achievable and that has never been the case. Further, it was not until it became clear (e.g., as evidenced by the October 2021 MPR date entries in Table 3.3.4-1) that the regulatory dates could not be met (i.e., the alleged margin was approaching zero) did the Company start reporting in terms of the early SWP date, and the newly coined term “Risk Adjusted Schedule” (RAS) date. As shown in Table 3.3.4-1, this latter reporting started in roughly October 2021 (i.e., not until it was obvious that the November 2021 U-3 COD could not be achieved), yet as it happened was not achieved until July 2023).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Table 3.3.4-1; Company Reporting of “U-3 & U-4 Schedule Margin”** | | | | | |
| Data Source | | Site Work Plan COD | Commission Approved COD | Risk Adjusted Schedule COD | Reported Schedule Margin |
| Document | Date |
| Unit 3: |  |  |  |  |  |
| MPR | Jan-21 | Oct-21 | Nov-21 |  | 1 ½ mos. |
| MPR | Feb-21 | Nov-21 | Nov-21 |  | < I mos. |
| MPR | May-21 | Dec-21 | Nov-21 |  | - 1 mos. |
| MPR | Jun-21 | Feb-22 | Nov-21 |  | -3mos. |
| MPR | Oct-21 | May-22 |  | Jun-22 | 1 mo. |
| MPR | Dec-21 | Jul-22 |  | Sep-22 | 2 mos. |
| MPR | Feb-22 | Sep-22 |  | Dec-22 | 3 mos. |
| MPR | Jul-22 | Dec-22 |  | Mar-23 | 3 mos. |
| MPR | Jan-23 | Mar-23 |  | Apr-23 | 1 mo. |
| MPR | Feb-23 | Apr-23 |  | Jun-23 | 2.2mos. (68days) |
|  |  |  |  |  |  |
| Unit 4: |  |  |  |  |  |
| MPR | Mar-21 | Aug-22 | Nov-22 |  | 4 mos. |
| MPR | Apr-21 | Dec-22 | Nov-22 |  | - 1 mos. |
| MPR | Nov-22 | Sep-23 |  | Dec-23 | 3 mos. |
| MPR | Feb-23 | Oct-23 |  | Mar-24 | 5 mos. |

As U-3 approached the start of HFT, and to compound the schedule reporting issue discussed above, and as the alleged “schedule margin” started to disappear (and even beyond when it became clear that the Regulatory Approved CODs could not be met) the Company started to claim that their originally planned durations of 6 months from HFT to Fuel Load, and another 6 months between Fuel Load and COD, had imbedded “schedule margin”. The changes made in this regard are demonstrated by table 3.3.4-2.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Table 3.3.4-2, Site Work Plan, Planned Durations**  (where “F” indicates Forecast, and “A” indicates Actual) | | | | |
| Data Source | | U-3, Planned Duration, From \_\_\_ to \_\_\_\_ | | Remarks |
| Document | Date | HFT to Start Fuel Load | Start Fuel Load to COD |
| STF 90-1 | Feb-19 | 6 ½ mos. (F) | 6 mos. (F) |  |
| Baseline | Apr-19 | 5.25 mos. (F) | 6 mos.(F) |  |
| MPR | Jan-21 | 3.75 mos. (F) | 3.5 mos. (F) |  |
| Actuals |  | 18 mos. (A) | 9 mos.(A) | U-3 COD 7/31/2023 (A) |

In summary, this is just another example of how the Company’s reporting of the status of the Project was flawed,[[22]](#footnote-23) and it appears that the Company was always attempting to paint a picture of the Project status that was much more favorable than reality.

**3.4 Deficient Risk Analysis and Contingency Management**: As was noted in prior sections, instead of defining new scope and using contingency to budget for the planning and execution of new scope, contingency was simply used on an “after the fact basis” to pump more money into activities for which monies were budgeted but would become seriously over-expended.

One way of further explaining the Company’s deficiencies in this subject area is to first revisit the extent to which high probability/ high dollar risk events were or were not included in the development of the Site Work Plan. As has been noted in Section 3.2, these items not being included to any extent in the Site Work Plan is a serious deficiency. What this then resulted in was the Company creating excessive contingencies (schedule contingency, and direct work/ production efficiency related contingency).

In taking this analysis one step further, it is appropriate to look at industry norms/ benchmarks as to what percentage of budgeted work should be assumed to calculate the total contingency required to finish a project. Good practice calls for looking at this at different stages of the project effort, with the required contingency (as a percentage of the ETC), where, as the project nears completion, the percentage would decrease (as the previously identified plus previously unknown risks either materialized and were added into the budgeted work or did not materialize). For Industry norms/ benchmarks that help in this regard, versus what the Company has used, see Table 3.4.1 below.

What is shown by the table is that the Company had chosen to under budget planned work by excluding high probability risk events (such as the Regulatory Schedule never being achievable, plus unrealistic unit rates, etc.) in the budgeting of the work, then including / attempting to cover the highly probable risks with contingency, and as work is over-spent simply adding funds to cover over expenditures. All the while, given the highly probable contingencies, the Company attempted to report margins to both schedule and cost in the budgeted plans.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 3.4-1; Company Contingencies vs Industry Norms** | | | | | | | | |
| VPMB Source Dated | Co Reported % Complete | Co SWP ETC, $Bs | Company Reported Contingencies ($Bs) | | | | Cont as % of ETC | Industry Norm (%) |
| Schedule | SNC | Other | Total |
| XXXX | XX | XXX | XXX | XXX | XXX | XXX | XXX | [[23]](#footnote-24) At 70 % complete & beyond, contingency as a % of the ETC should not exceed 5-10% & should be decreasing[[24]](#footnote-25) |
| XXXX | XXX | XXX | XXX | XXX | XXX | XXX | XXX |
| XXXX | XXX | XXX | XXX | XXX | XXX | XXX | XXX |
| XXXX | XXX | XXX | XXX | XXX | XXX | XXX | XXX |
| XXXX | XXX | XXX | XXX | XXX | XXX | XXX | XXX |
| XXXX | XXX | XXX | XXX | XXX | XXX | XXX | XXX |
| XXXX | XXX | XXX | XXX | XXX | XXX | XXX | XXX |
| XXXX | XX | XXX | XXX | XXX | XXX | XXX | XXX |
| XXXX | XXX | XXX | XXX | XXX | | XXX | XXX |
| Note 1: Data not available | | | | | | | | |

**3.5 Additional Deficiencies of Company’s EVMS:** The National Defense Industrial Association (NDIA) Integrated Program Management Division (IPMD) along with others (DOE 413.3 EVMS guide, DOD EVMSIG, subsequently further evolved guides developed by the Project Management Institute, etc.) created this Intent Guide to provide additional insight into the EIA-748 Standard for Earned Value Management Systems, and a means (via a compliance map) for documenting how an earned value management system complies with the 32 guidelines of the EIA-748 Standard. The objective of the compliance map is to demonstrate that a contractor has thought through each guideline and can describe how their process supports the guideline requirements. It is worth noting that the Company’s EVMS does not meet any of the 32 guidelines. As examples of why not:

Guideline 1: SNC failed to meet Guideline 1 – Define Work Scope (WBS):

1. The Work Breakdown Structure (WBS) was not used for the planning of ***all*** authorized work[[25]](#footnote-26).
2. The WBS did not break down elements for budgeting and cost accounting.
3. EVMS based Performance Measurement represented less than 30% of the total Budget.
4. The WBS did not consistently extend to the levels at which control accounts are established.
5. The WBS used did not include revisions for authorized changes and modifications.
6. The WBS elements did not collectively provide a complete definition of work scope.
7. As partial system turnovers were introduced, and more work packages were added, very little of that work scope was re-planned or budgeted to monitor progress or report schedule and/ or cost overruns.

Guideline 2: Define the Project Organization (via an Organizational Breakdown Structure (OBS)): SNC failed to meet this criterion in the following ways:

1. For the roughly 30% of the scope that EVMS was used, the OBS was identified. Not All authorized work was assigned to organizational elements.
2. Major subcontractor work efforts as well as major project functions such as Engineering, Procurement, SNC Labor, Distributables were not integrated into the Project structure, but rather a few were segregated, and monitored individually.

Guideline 3: Integration of Processes: SNC has failed to meet this criterion in the following ways:

1. Integrated master schedule. The master schedule frequently used constraints dates (in the thousands) rather than logical ties and integration was not a functioning reliable option.
2. Manufacturing/Enterprise Resource Planning (M/ERP) operational schedules, and other tools were in use, but none were integrated with the IPS.
3. Management performance reports by WBS and OBS were available but only representing a small portion of the total Project.

Guideline 4 – Identify Overhead Management: SNC failed to meet this criterion entirely since No Overhead Management was represented in the EVMS environment. The Project separately monitored overhead (indirect costs) as part of their accounting system.

Guideline 7 – Identify Products and Milestones for Progress Assessment: This guideline states the following: “Identify objective interim performance measures within control accounts or lower-level tasks/activities that align with how technical performance will be accomplished and enable accurate performance assessment each month.” The integrated master schedule includes key project and contractual requirements. What VMG observed, however, was that 16 of 20 U-3 intermediate major milestones (and 17 out of 20 milestones for U-4) were start milestones which even under the best circumstances do not meet the intent as briefly described above. Additionally, SNC decided to defer significant work to interpret the start of the milestone as representing success.

EVMS Earning Rules (Rules of Credit): In addition to the above, there are guidelines which govern how earning rules (when met) help assure accuracy and consistency for how work is planned, costed, and earned. To this end, examples of non-compliances are provided below.

1. Procurement: At the April 2019 Re-baseline, SNC reported Procurement to be 94.0 % complete with the remaining 6% of the budget to be earned as “spent”. This type of rule of credit only applies to fixed price contracts and in this case, it is a major non-compliance. No plan, and no earned, just spent, does little to provide for any trend in both schedule and budget forecasts. As discussed, and shown previously in Table 3.2-2, Procurement grew by 58% between the April 2019 Baseline and January 2023, yet the percent complete was prematurely (at the time of the April 2019 Baseline) reported as being 94.0 % complete.
2. Construction: There are numerous examples of where thousands of hours were earned, yet nothing was reported as spent. There are also numerous examples of where the spent was significantly more than earned which suggests that the scope worked on was not planned. An example of this would be re-work.

**4. COST AND SCHEDULE IMPACTS OF**

**IMPRUDENT MANAGEMENT PRACTICES**

In spite of what VMG has identified as imprudent actions on the part of SNC, VMG respects GPC’s holding to the $ 7.3 billion GPC Capital Construction limit (adjusted primarily due to COVID to $ 7.562 billion). Also, given that the Commission Approved CODs were established at VCM 17 as November 2021/ November 2022, for purposes of computing financing costs, VMG has suggested developing a funding profile based on the $ 7.562 billion with an assumed slip of these CODs by 4 months (to account for COVID delays) to May 20222/ May 2023.

The following is offered to help provide a clearer picture of how the Management of the Project resulted in the TPC of $ 17.1 billion being exceeded by roughly $ 4 billion, and the CODs having slipped by 20 months for U-3 (from November 2021 to August 2023) and now forecast for U-4 by 16 months (from November 2022 to the current RAS date of March 2024).

**Schedule Delays and Associated Schedule Delay Costs: As indicated by their identification of schedule contingency, t**he Company has historically estimated the Hotel Load (Distributables, SNC Controlled Labor, etc.) cost of the delayed completion of both U-3 and U-4 to be roughly $ 100 million/ month, and as part of their VPMB presentations has estimated a singular unit delayed COD at cost of roughly $ 30 to $ 40 million / month. For example, if the CODs for both units were to be delayed by one year from November 2021/ 2022 to November 2022/ 2023, the schedule delay related costs would amount to $ 1.2 billion (i.e., $ 100 million x 12 months = $ 1.2 billion)[[26]](#footnote-27). Also, this does not include the increased financing costs associated with schedule delays; therefore, wanting to keep the schedule as short as possible was certainly a desirable goal. Finally, the $ 17.1 billion TPC was composed of the SWP Budgeted Costs, and schedule contingency (which if used would account for November 2021/ November 2022 CODs), but per Table ES-1 had no production contingency.

U**sing the Company’s hotel load delay costs of $ 100 million/ month for both units, and a roughly $ 30 million/ month cost delay for just one unit, VMG calculates the schedule delay costs as roughly $ 1.720 B (see Table 4.1-1 below).**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Table 4.1-1 Schedule Delay Costs (as currently forecast by VMG)** | | | | |
| **Unit** | **Regulatory Approved COD** | **Actual COD, i.e. (A)** | **Schedule Slip** | **Schedule Delay Cost Impact** |
|  |
| **& RAS COD, i.e. (F)** |  |
| **U-3** | **Nov-21** | **July 2023 (A)** | **20 months** | **Both Units: 16 mos. x $ 0.1 B/mo. = $1.600 B; Plus 4 mos. just 1 unit, 4 x $ .03 B/mo. = .120 B** |  |
| **U-4** | **Nov-22** | **Mar 2024 (F)** | **16 months** |  |
|  |

This approximately accounts for $ 1.720 billion (i.e., $ 1.6 billion plus $ .120 billion) of the roughly $ 4 billion over-run of the TPC.

**4.2 Production Errors and Inefficiency Related Cost Increases Due to Imprudent Management[[27]](#footnote-28)**

In addition to “hotel load” cost increases (discussed above in section 4.1), a second category of cost impacts of imprudent management are related to the craft inefficiency SNC experienced in executing the required scope of work. Hereafter, we will use the term “production inefficiencies” to address this issue. These production inefficiencies can be further broken down to consider the actual craft labor hours required to complete work versus the planned (i.e., budgeted) labor hours, and the poor quality of work which then necessitated emergent re-work. The corrective actions required to remediate the poor initial quality also added complexity to the planning and execution (and therefore also to the cost) of the Project.

It was previously mentioned, that from January 2021 through February 2022 (a period of 13 months) that $ 2.6 billion had been spent, yet the Estimate to Complete had increased by $ 0.2 billion. Over this 13-month period VMG concludes that the TPC had increased by $ 2.8 billion. Also, by late February (as reported in the February 28, 2022, VPMB) the CODs for U-3 and U-4 had been reforecast as September 2022, and February 2023, respectively.

In looking at the $ 2.8 billion increase of the TPC, and by extracting the schedule delay portion (Section 4.1), a rough estimate of the production inefficiencies that the Project was experienced, was $2.3 billion as shown on Table 4.2-1.

|  |  |  |  |
| --- | --- | --- | --- |
| **Table 4.2-1 Schedule Delay Costs (as reflected by February 28, 2022, VPMB)** | | | |
| **Unit** | **Regulatory Approved COD** | **Forecast CODs per Feb 28, 2022 VPMB** | **Schedule Slip** |
|  |
| **U-3** | **Nov-21** | **Sep-22** | **10 months** |  |
| **U-4** | **Nov-22** | **Feb-23** | **3 months** |  |
| **XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX** | | | |  |
| **XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX** | | | |  |

Therefore, the over-all schedule delay cost of $ 1.720 billion, and the production inefficiency cost of $ 2.3 billion, can be shown to account for all the $ 4 billion cost over-run of the TPC.

**4.3 Summary Over-view of Negative Cost and Schedule Impacts Caused by Imprudent Management Practices:** Table 4.3-1 provides a summary history of the reforecast of both TPC and EAC up through April 2023.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Table 4.3-1 Total Project Cost (TPC) and Forecast COD History, VCM 17 Order (dated January 2018) to April 2023** | | | | |
| Company Data Source | CA’d/ RAS CODs[[28]](#footnote-29) | | Total TPC | Remarks |
| U-3 | U-4 |
| See Remarks | Nov-21 | Nov-22 | 17.1 | **Starting point is VCM Order 17, dated Jan 2018** |
| Apr 2019 VPMB & Baseline | Nov-21 | Nov-22 | 17.1 | Basis of Estimate (BOE) for SWPs were flawed such that a “false margin” existed between the SWP and RA CODs, and company should have known better. Company attempting to cover the going forward risks with unplanned/ large contingencies and unrealistic improvements. Yet, the Company was directed to (and did) validate quantities and committed to this TPC and RA’d CODs, **therefore, these CODs and TPC should be treated in a sense as contractual requirements beyond which (in the absence of uncontrollable events) the company is held financially accountable.** |
| Feb 2021 VPMB | Nov-21 | Nov-22 | 17.8 | Company has now taken credit for achieving all U-3 start milestones through Cold Hydro (see “U-3 SWP Major Milestones”). However, **to get there they deferred significant work, and started accumulating problems** (costed per this table by company at roughly $ 0.7 B; i.e., 17.8-17.1). |
| Jun 2021 VPMB | Nov-21 | Nov-22 | 17.9 | **Still holding on to RA’s dates while TPC is clearly trending upward. Company’s awareness of the seriousness of the IEEE-384 issue is starting to set in as the NRC commences their “Special Investigation” in June 2021, the results of which result in increased regulatory oversight; however, the company has no clue yet as to the amount of rework that will be required, and the impacts to the over-all schedule.** |
| Aug 2021 VPMB | Jun-22 | Mar-23 | 18.9 | With the prematurely “declared start” of HFT in April 2021, the company experiences numerous problems and is still grappling with the amount of required rework and over-all schedule impacts. As expenses approach their TPC they recognize the need for immediate funds relief **(Note $ 1 B increase in 2 months yet still grappling with the total impact)** |
| Feb 2022 VPMB | Mar-23 | Sep-23 | 20.6 | **Between Jan 2021 through Feb 2022 Company spends $ 2.6 B, yet the ETC has increased by $ 0.2 B. All of the past sins have come home to roost and the company can no longer ignore what has been going on.** |

**5. SUMMARY OF VMG’S OBSERVATIONS AND RECOMMENDATIONS**

**Summary Observations and Recommendations (April 2017 – Present):** Based on the events leading to WEC’s bankruptcy, VMG’s subsequent engagement with the Project (which includes both its prior written testimonies and participation in the associated hearings), and the contents of this report, VMG’s summary observations and recommendations are as follows:

1. When the Company had an EPC contract with WEC the basis of estimate upon which the TPC had been negotiated was significantly different than it was when SNC took over the project, and this then presented significantly increased cost and schedule risks.
2. On a TPC basis, the $ 7.3 billion relates to a TPC of $ 17.1 billion, which in turn represents a roughly 50% cost increase over what it could have been if all seven of the companies that had originally applied for dual unit AP 1000 plants had continued with their projects. Also, if one were to include the Toshiba Warranty payment of $ 3.6 billion that was credited to the project (and is therefore not included in the $ 17.1 billion), the cost increase could be viewed as significantly more than 50%.
3. Although difficult to analyze the cost and schedule risks at the time of VCM 17, the $ 17.1 billion (more specifically, the $ 7.3 billion for the Company portion of the project), together with the November 2021/ November 2022 CODs was the basis upon which the Company presented its case to Commission to approve approving continuation of the Project.
4. Based on VMG’s initial preliminary review of the project over a period of roughly 3 months, by June 2018 VMG had concluded that the November 2021/ November 2022 CODs were simply unachievable.
5. In an apparent effort to shorten the schedule and thereby decrease both the Capital Construction Cost and the COD related financing costs, SNC employed numerous non-traditional and imprudent management practices, which in the long run only served to increase the TPC (by roughly $ 4 billion over the $ 17.1 billion) and the CODs beyond the regulatory required dates by 20 months for U-3 and 16 months (as forecast at this time) for U-4.
6. Despite the actual performance of the project versus the basis upon which it was approved to continue at VCM 17, the stipulation represents a proposed settlement versus litigation, where the latter has its own risks. Further, in some respects the $ 7.3 billion and November 2021/ November 2022 CODs could be viewed as “a non-binding contract” between the Commission and the Company.
7. VMG recommends accepting the proposed $ 7.562 billion GPC Capital Construction Cost. This is because with a relatively minor upward adjustment for non-controllable COVID cost impacts, and minor adjustments to the Company’s non-shared costs, the GPC Capital Construction Cost of $ 7.562 billion is consistent with the $ 7.3 billion basis upon which the Commission approved continuing the project.
8. With respect to the financing costs, VMG has limited it’s input to providing recommended CODs for U-3 and U-4, which together with a Company Capital Construction Cost of $ 7.562 billion, would facilitate J. Kennedy and Associates developing a funding profile. This funding profile would then provide a basis for analyzing what a reasonable and prudent decision would be regarding all the financially related costs (i.e., NCCR Tariff, AFUDC, and allowed return on equity). These recommended CODs are March 2022/ March 2023, for U-3 and U-4, respectively, and these dates represent slipping the regulatory required November 2021/ November 2022 dates by four months to account for the company’s analyzed schedule impact due to COVID.
9. Given SNC’s relatively strong operational performance in managing the operation of its six other nuclear plants, and the current operational performance of U-3, it is reasonable to expect that U-3 and U-4 will provide a reliable source of carbon free energy for decades to come.

1. Please refer to the J. Kennedy testimony and report for a detailed discussion of these costs. [↑](#footnote-ref-2)
2. It is also VMG’s understanding that the Company did not receive government funds that had been provided to assist companies in dealing with the COVID crisis. Otherwise, if such funding had been provided, VMG would have recommended that the portion of this funding that could be credited to the Project be deducted from the COVID impact that the company is proposing. [↑](#footnote-ref-3)
3. Please refer to the J. Kennedy testimony and report for a more detailed discussion of the economics of the Project. [↑](#footnote-ref-4)
4. All costs identified in this report exclude financing costs. [↑](#footnote-ref-5)
5. The reference for this quote is GPC Testimony in Support of GPC’s Application to Adjust Rates to Include Reasonable and Prudent Plant Vogtle Units 3 and 4 Costs; page 23, line 8. [↑](#footnote-ref-6)
6. [↑](#footnote-ref-7)
7. Cost was provided in terms of an “EPC Cost” of $ 7.65 billion; all other costs were estimated in terms of 20% of the total TPC, therefore the total TPC would be $ 7.65 billion / 0.8 = $ 9.56 billion [↑](#footnote-ref-8)
8. Given AP1000 clients assuming they would be protected against increased costs via an EPC Contract, plus WEC then declaring bankruptcy, an evaluation of the risks at that point in time became extremely complicated, and in reviewing the Commission Orders immediately prior and after VCM Order 17 it appears that the TPC EAC was changing rapidly. With respect then to the TPC of $ 17.1 billion and whether or not it was “reasonable”, it appears that Southern Company was determined to complete the Project, and their analyses were most likely biased toward an” under-estimated” (or as is sometimes stated “low-balled estimate”) of the TPC. In support of this opinion, VMG notes that within VCM 19, the company was accepting a loss of nearly $ 0.7 billion (which on a 100% equity ownership basis is roughly $ 1.8 billion). [↑](#footnote-ref-9)
9. Examples of unrealistic assumptions made as part of the April 2019 “Bases of Re-baselined Schedules” are provided in Section 3. [↑](#footnote-ref-10)
10. If one views SNC’s taking control of the project as a separate project effort and viewing the April 2019 Baseline (which was not actually completed until sometime after April 2019) as the “company’s first validated baseline”, the TPC Estimate to Complete (TPC ETC) the project in April 2019 was $ 7.2 billion (not to be confused with the GPC $ 7.3 billion Capital Construction Cost), and with an assumed VMG forecast TPC of say $ 21.1 billion, the $ 7.2 billion TPC ETC has now grown by $ 4 billion to $ 11.2 billion (for that same scope of work); i.e., in 4 years, SNC’s cost to finish the project has grown by over 55 %. [↑](#footnote-ref-11)
11. The negative impacts due to employing imprudent management practices manifested themselves much more on U-3 than U-4, and it appears that the company did learn from those experiences. As evidence of this, and even though U-4 is projected (per the Company’s RAS) to achieve Commercial Operations by roughly March 2024 (16 months after the Regulatory Approved November 2022 date), March 2024 is 4 months less than the originally forecast 12 month lag between U-3 and U-4 COD (i.e., U-3 achieved COD in July 2023, and U-4 per the RAS March 2024 date is now 8 months (versus the originally forecast 12 months) after the U-3 COD. [↑](#footnote-ref-12)
12. It is recognized that the company has analyzed the maximum impacts of COVID 19 to the Company’s Capital Construction Cost of $ 7.3 billion to be roughly $ 200 million. [↑](#footnote-ref-13)
13. Also, “realistic TPC” as used in this context is simply assessing the costs for SNC to complete the Project, and then adding that to the prior “as spent costs” (which includes a credit from the Toshiba Guarantee Payment). In other words, VMG is not providing a review and assessment of costs prior to the WEC bankruptcy, as that is the subject of the testimony of Mr. Roetger and Dr. Jacobs. [↑](#footnote-ref-14)
14. Another potential reason for this is that components had been sitting either within the plant or in the warehouse for years, with questionable attention having been paid to properly maintaining them and documenting such in accordance with Quality Control requirements, and to resolve questions of component reliability as quickly as possible this could have also been a reason for accelerating the turnover of completed construction work to ITP. [↑](#footnote-ref-15)
15. Both the process of taking “technical exceptions” and doing a “partial release for test (PRT)” can become very complicated, by not only complicating the planning and execution of work but also the administrative processes for documenting the completion of the work. As one example for the PRT process, ITP may want to test a component within a particular system, yet associated work within the governing Construction Work Package is not yet done, so they then request a PRT. As a “lesson learned” from U-3, the use of this process on U-4 has been minimized whereby ITP has to first obtain senior management approval prior to implementing the process. [↑](#footnote-ref-16)
16. As an example of the complexity of IEEE-384, the project focused on completing “scheduled” electrical work (i.e., primarily nuclear safety related work) prior to “unscheduled” electrical work (which includes things such as lighting and is primarily “field routed”). However, IEEE-384 requires a review of the various design basis hazards present throughout the various areas of the plant (e.g., a seismic event, fire, and flooding). And to illustrate, a simple item like a non-safety raceway falling onto a safety related component could (during a design basis hazard such as a seismic event) potentially render the safety related system (or safety related train within a safety related system) inoperable. [↑](#footnote-ref-17)
17. In addition, the structures of the Nuclear Island (which comprises the Containment Building and Auxiliary Building) were originally designed for the AP 600 Nuclear Plant (which is basically a 600 MW, vs 1102 MW plant), and therefore the larger AP 1000 had to fit within this same size, which suggests greater attention to detailed design and engineering should have been performed for all Nuclear Island related electrical raceways prior to releasing the design for construction. [↑](#footnote-ref-18)
18. In fairness to the SNC Project Controls group, given the amount and rate at which undefinable rework was being created, and the Project wanting to continue maximum construction efforts, even a perfect EVMS would find it difficult to keep up with what was going on. [↑](#footnote-ref-19)
19. The three main parameters used in reporting project progress are (a) planned work (termed the Budgeted Cost of Work Scheduled, BCWS), (b) the Actual Cost of Work Performed (ACWP), and (c) earned work (termed Budgeted Cost of Work Performed (BCWP). Utilizing these measures over pre-defined time periods, one then develops “cost variances” and “schedule variances”, both for the specific time period, and cumulatively since the start of the new baseline. [↑](#footnote-ref-20)
20. Perhaps this was due to components having been ordered while under the control of WEC, and not having been properly maintained (either in storage, or after having been installed). [↑](#footnote-ref-21)
21. The April 2019 slipped the SWP CODs by only one month from April 2021/ April 2022 to May 2021/ May 2022, thus not recognizing delays of bulk installation (which based on actual vs unrealistic planned rates would have slipped the schedule by at least 6 months). [↑](#footnote-ref-22)
22. In addition, with the problems in constructing electrical raceways to be compliant to IEEE-384, and the deferral of inspections, this work should have never been progressed as 100% complete in the first place since these practices only served to generate an enormous amount of emergent rework. [↑](#footnote-ref-23)
23. [↑](#footnote-ref-24)
24. Ref: American Associate of Cost Engineers International (1997) and EPRI (1993) [↑](#footnote-ref-25)
25. As an example, the scope of work definitions for construction WBSs would include completing inspections as part of the work that would need to be completed prior to taking total credit for its completion. [↑](#footnote-ref-26)
26. These schedule delay related costs would be apart from the construction labor and construction indirect costs and would include management and all support related functions such as project controls, accounting, etc**.** [↑](#footnote-ref-27)
27. As a preamble to this discussion, it should be noted that production inefficiency related costs per the analysis that follows includes those resulting from the impact of COVID, and for GPC’s share of this total cost impact to the project they are already being absorbed by the proposed increase of the GPC Capital Construction Cost to $ 7.562 billion from $ 7.3 billion. [↑](#footnote-ref-28)
28. “CA” stands for “Commission Approved” and is synonymous with “Regulatory Approved” (RA). Also, “RAS” stands for Risk Adjusted Schedule CODs, where this latter “RAS” term did not start being used until it became obvious that the CA CODs could not be met. [↑](#footnote-ref-29)