

**BEFORE THE
GEORGIA PUBLIC SERVICE COMMISSION**

**IN THE MATTER OF GEORGIA POWER
COMPANY'S TWENTY-THIRD SEMI-ANNUAL
VOGTLE CONSTRUCTION MONITORING REPORT**

DOCKET NO. 29849

**DIRECT TESTIMONY
AND EXHIBITS
OF
STEVEN D. ROETGER
WILLIAM R. JACOBS, JR., PhD.**

**ON BEHALF OF THE
GEORGIA PUBLIC SERVICE COMMISSION
PUBLIC INTEREST ADVOCACY STAFF**

NOVEMBER 24, 2020

1

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10 **Exhibits:**

11 STF-SDR-1 Resume of Steven D. Roetger

12 STF-WRJ-1 Resume of William R. Jacobs, Jr., Ph.D.

13

1 **I. INTRODUCTION**

2 **Q. PLEASE STATE YOUR NAMES, TITLES AND BUSINESS ADDRESSES.**

3 **A.** My name is Steven D. Roetger. I am the lead analyst for the Georgia Public Service
4 Commission (“Commission”) Staff Public Interest Advocacy Team for the Vogtle
5 Construction Monitoring Docket 29849. My business address is 244 Washington
6 Street, S.W., Atlanta, Georgia, 30334. My name is William R. Jacobs, Jr., Ph.D. I
7 am an executive consultant with GDS Associates, Inc. My business address is 1850
8 Parkway Place, Suite 800, Marietta, Georgia, 30067.

9
10 **Q. MR. ROETGER, PLEASE SUMMARIZE YOUR EDUCATIONAL**
11 **BACKGROUND AND EXPERIENCE.**

12 **A.** I hold a Bachelor of Business Administration degree from Georgia State University.
13 I have been employed by the Georgia Public Service Commission since September
14 of 2008, primarily in the capacity as the Staff team leader for monitoring the Plant
15 Vogtle Unit 3 and 4 Project under Docket 29849. Also, I was a member of the Public
16 Interest Advocacy Staff team for the Plant Vogtle Unit 3 and 4 Certification (Docket
17 27800), and a Commission Advisory Staff team member for various other
18 proceedings. Prior to joining the Commission, I held various positions in either an
19 accounting or finance capacity for firms in different industries. My resume is
20 included in Exhibit STF-SDR-1.

21

1 **Q. DR. JACOBS, PLEASE SUMMARIZE YOUR EDUCATIONAL**
2 **BACKGROUND AND EXPERIENCE.**

3 **A.** I received a Bachelor of Mechanical Engineering in 1968, a Master of Science in
4 Nuclear Engineering in 1969 and a Ph.D. in Nuclear Engineering in 1971, all from
5 the Georgia Institute of Technology. I am a registered Professional Engineer and a
6 member of the American Nuclear Society. I have more than forty years of
7 experience in the electric power industry including more than twelve years of
8 nuclear power plant construction and start-up experience. I have participated in the
9 construction and start-up of seven nuclear power plants in this country and overseas
10 in management positions including start-up manager and site manager. As a loaned
11 employee to the Institute of Nuclear Power Operations (“INPO”), I participated in
12 the Construction Project Evaluation Program, performed operating plant evaluations
13 and assisted in development of the Outage Management Evaluation Program. Since
14 joining GDS Associates, Inc. in 1986, I have participated in rate case and litigation
15 support activities related to power plant construction, operation and
16 decommissioning. I have evaluated nuclear power plant outages at numerous
17 nuclear plants throughout the United States. I served on the management committee
18 during construction of Plum Point Unit 1, a 650 Megawatts Electric (“MWe”) coal
19 fired power plant. As a member of the management committee, I assisted in
20 providing oversight of the Engineering, Procurement and Construction (“EPC”)
21 contractor for this Project. I have assisted the Georgia Public Service Commission
22 as the Independent Construction Monitor in providing oversight of the Vogtle 3 and
23 4 Project since August 2009. My resume is included in Exhibit STF-WRJ-1.

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Q. WHOM ARE YOU REPRESENTING IN THIS PROCEEDING?

A. We are representing the Commission’s Public Interest Advocacy Staff (“Staff”) team in this matter.

Q. MR. ROETGER, WHAT IS YOUR INVOLVEMENT WITH THE VOGTLE 3 AND 4 PROJECT?

A. Since Docket No. 27800, I have been directly involved in the oversight of the Plant Vogtle Unit 3 and 4 Project (“Project”) as lead analyst of the Staff Team. I have closely monitored the Project with Dr. Jacobs since certification. Among other oversight, along with Dr. Jacobs, I monitor the Project areas that either have realized schedule delays or show a risk of potentially experiencing delay or increased Project cost. I have testified in the Eighth through the Twenty-Second Semi-Annual Vogtle Construction Monitoring (“VCM”) proceedings.

Q. DR. JACOBS, WHAT IS YOUR INVOLVEMENT WITH THE VOGTLE 3 AND 4 PROJECT?

A. I am the Commission’s Independent Construction Monitor (“CM”) for the Project. My duties are to assist the Staff Team in its regulatory oversight of all aspects of the Project and to keep the Commission informed of significant Project issues or changes in the Project forecast Cost and Schedule as they occur. In addition, I keep the Commission informed of significant challenges to the Project that could impact the Project forecast Cost and/or Schedule. I have presented testimony in the Plant

1 Vogtle Unit 3 and 4 Certification (Docket 27800) and the First through the Twenty-
2 Second Semi-Annual VCM proceedings describing the construction monitoring
3 activities, the status of the Project and any concerns or significant issues.
4

5 **Q. WHAT IS YOUR ASSIGNMENT IN THIS PROCEEDING?**

6 **A.** Our assignment is to present the results of the Staff’s oversight from certification of
7 the Project to the present with emphasis on the time period covered by the Twenty-
8 Third Semi-annual VCM Report (“23 VCM”), January 1, 2020 to June 30, 2020. In
9 this testimony, we present our analysis of the current status of the Project and discuss
10 at a high level the status of the most recent Schedule and Cost forecast provided by
11 the Company and identify risks and areas of concern for the Project. Details of the
12 schedule and cost analyses are provided in the testimony of Mr. Donald Grace.
13 Finally, we make a recommendation regarding Georgia Power Company’s
14 (“Company”) request for verification and approval of costs incurred during the
15 Twenty-Third Semi-annual VCM Report period in the amount of \$701 million.
16

17 **Q. PLEASE DESCRIBE THE CONSTRUCTION MONITORING PROGRAM**
18 **THAT THE STAFF TEAM HAS IMPLEMENTED TO MONITOR THE**
19 **CONSTRUCTION OF THE VOGTLE 3 AND 4 PROJECT.**

20 **A.** As described in prior VCM testimonies, the Staff Team continues to actively
21 monitor the Project. Monitoring activities include monthly meetings between Staff
22 and Company personnel to discuss Project status. As a result of COVID-19, Staff
23 has not made regular site visits as in the past. This practice continues. However,

1 Staff continues to be active in all major site related meetings such as the Monthly
2 Project Review (“MPR”) meeting. We review the Company’s Weekly Metrics
3 reports, Monthly Status Reports including addenda, and submit data requests to the
4 Company for additional information. The Team has continued its review of the
5 Company’s process for handling Project invoices from WEC¹ and Bechtel², and
6 other Company contractors. This includes review of the Project cost control
7 procedures and sampling of processed invoices. Please refer to the Shemetha Q.
8 Jones testimony for further details. Other examples of activities conducted by the
9 Staff Vogtle Construction Monitoring Team include:

- 10 • Review of Monthly status reports issued by Bechtel and Westinghouse;
- 11 • Review of the Company’s Semi-Annual VCM Reports and testimony;
- 12 • Preparation of discovery requests for additional information as needed
13 following review of the monthly status reports, semi-annual construction
14 monitoring reports or meetings with the Company;
- 15 • Monitoring via teleconference the site Plan of the Day and Work-To-Go
16 meetings;
- 17 • Attendance via teleconference at management briefings by the Vogtle
18 Construction Review Board;
- 19 • Attendance via teleconference in bi-weekly SNC Management Update
20 Calls;
- 21 • Attendance via teleconference in monthly meetings with the Company to
22 review the Project Management Board presentation;

¹ Westinghouse provides the engineering, design, and applicable analyses for the Design Certification Document (“DCD”).

² Bechtel is the construction contractor.

- 1 • Participation in Nuclear Regulatory Commission (“NRC”) public
- 2 meetings in person and via conference call as appropriate;
- 3 • Review of public correspondence between the Company and the NRC;
- 4 • Review of correspondence between the Contractor and the Company;
- 5 • Review of trade articles and journals related to new nuclear power plant
- 6 development;
- 7

8 In addition, as described in our testimony in the Twenty-First VCM, the Vogtle
9 Project monitoring activities by Staff and the Construction Monitor have been
10 augmented by the addition of the Vogtle Monitoring Group (“VMG”) personnel.
11 VMG activities include a full-time experienced construction manager stationed at
12 the Vogtle site and detailed schedule and cost analyses as presented in Mr. Don N.
13 Grace’s testimony.

14
15 **Q. WHAT TIME PERIOD BEYOND JUNE 2020 DOES YOUR TESTIMONY**
16 **COVER AND WHY?**

17 **A.** The results of our monitoring includes the July through October 2020 time period.
18 Staff covers the most recent months for which it has accurate data in order to keep
19 the Commission apprised of the status of the Project in as close to real time as
20 possible.

21
22 **Q. HAS STAFF’S STANDARD FOR EVALUATING THE PERFORMANCE OF**
23 **SNC AND GEORGIA POWER COMPANY CHANGED AS A RESULT OF**
24 **COVID-19?**

1 A. No. Under all circumstance Staff uses the reasonableness and prudence standards
2 as dictated by statute.

3
4 **Q. HAS STAFF LOOKED AT THE COSTS AND IMPACTS OF COVID?**

5 A. Now that COVID-19 has been present on the Project for nearly seven months, Staff
6 is able to factor into its analyses and conclusions assumptions regarding the impacts
7 of the virus.

8 **II. INTEGRATED PROJECT SCHEDULE UPDATES**

9
10 **Q. DID SNC UPDATE THE INTEGRATED PROJECT SCHEDULE DURING**
11 **OR AFTER THE TWENTY-THIRD VCM PERIOD?**

12 A. Yes. SNC performed two Integrated Project Schedule (“IPS”) updates. The first,
13 referred to as the 2020 July Refinement, was necessary primarily to align the
14 schedule to actual status on the ground. A second update, the 2020 October Site
15 Working Schedule, was performed during the September time frame to ease the Unit
16 3 schedule by slipping the major milestone dates for Hot Functional Test (“HFT”),
17 Fuel Load, and COD. For Unit 4, a more aggressive schedule was established to
18 close the Commercial Operation Dates (“COD”) of the two Units to within 10
19 months.

20
21 **Q. WHAT DOES STAFF MEAN BY EASE THE UNIT THREE SCHEDULE?**

1 **A.** In Staff’s opinion, since inception of the Project in 2009, all IPS iterations have been
2 overly aggressive and unachievable. The history of the Project has shown that the
3 CODs projected by SNC have ultimately been required to be delayed. The easing
4 of the Unit 3 IPS means it is less aggressive than in the past, but in Staff’s opinion
5 there still exists a high likelihood of the COD not being achievable.

6
7 **Q.** **PLEASE DESCRIBE THE RESULTS OF THE 2020 JULY SCHEDULE**
8 **UPDATE ON BOTH UNITS.**

9 **A.** The 2020 July Schedule Update incorporated known impacts from COVID-19,
10 further integrated sub-contract work scope and aligned the schedule with the actual
11 status on the ground but still remained very aggressive. The start of Unit 3 Cold
12 Hydro Test (“CHT”) was moved out two- and one-half months to September 10,
13 2020, the start of HFT was moved out two months to October 1, 2020, and Fuel
14 Load was moved out one month to December 30, 2020.³ The COD remained the
15 same at May 23, 2021. All but approximately 30 days of ‘management time’ was
16 removed from the schedule. The Unit 4 schedule returned the COD lag between the
17 Units to twelve months (from thirteen months) with a COD on May 23, 2022.

18

³ Schedule Review Package 2020-06-27 DD CoWG page 7.

1 **Q. WERE HARD CONSTRAINTS USED ON MAJOR MILESTONES IN THE**
2 **JULY 2020 UPDATE?**

3 **A.** Yes. As of a June 27, 2020 data date the Unit 3 IPS had 2 hard constraints⁴. This is
4 a significant decrease from the previous schedule of 141 hard constraints. However,
5 by the end of August 2020 the Unit 3 construction schedule contained 121 hard
6 constraints⁵. In other words, as schedule adherence began to deteriorate, in order to
7 maintain the major milestone dates in the schedule, SNC Project Management was
8 forced to hard constrain precursor activities that led to the major milestones.

9

⁴ Ibid page 39.

⁵ Schedule Review Package 08-29-2020 page 33.

1 **Q. HOW DID SNC’S EXECUTION OF THE PROJECT FAIR AGAINST THE**
2 **JULY 2020 UPDATE?**

3 A. When the July 2020 Update was issued, the major milestones to be achieved in 2020
4 were CHT, HFT, and Fuel Load (“FL”). Table A below shows the schedule creep
5 for CHT beginning on July 14, 2020:

6 **TABLE A**

7 **Source: Weekly Metrics as Dated, CHT Complete 10/17/2020**

Completion of Unit 3 Cold Hydro Test					
	A	B	C ⁶	Forecast Delay	
Date	January 2020 IPS Snap	July 2020 IPS Update	Forecast	C - A	C - B
07/14/20	06/06/20	09/10/20	09/01/20	87	-9
07/21/20	06/06/20	09/10/20	09/08/20	94	-2
07/28/20	06/06/20	09/10/20	09/08/20	94	-2
08/04/20	06/06/20	09/10/20	09/15/20	101	5
08/11/20	06/06/20	09/10/20	09/16/20	102	6
08/18/20	06/06/20	09/10/20	09/23/20	109	13
08/25/20	06/06/20	09/10/20	09/30/20	116	20
09/01/20	06/06/20	09/10/20	09/27/20	113	17
09/09/20	06/06/20	09/10/20	10/04/20	120	24
09/15/20	06/06/20	09/10/20	09/23/20	109	13
09/22/20	06/06/20	09/10/20	10/05/20	121	25
09/29/20	06/06/20	09/10/20	10/05/20	121	25
10/06/20	06/06/20	09/10/20	10/11/20	127	31
10/13/20	06/06/20	09/10/20	10/18/20	134	38
10/17/20	06/06/20	09/10/20	10/17/20	133	37

8 As of July 14, 2020, completion of CHT was forecast to be early by nine days
9 (therefore the negative number). CHT was completed on October 17, 2020. Under

⁶ SNC Project Site Forecast

1 the forecast column C-B that represents a 46-day delay. Or re-stated, in 95 days the
2 test was delayed 46 days.

3
4 Using the same reports, HFT and FL were forecast on July 14, 2020 to complete on
5 November 9, 2020 and December 19, 2020, respectively. As of September 26, 2020,
6 prior to the October 2020 Refinement, HFT and FL were forecast to slip to
7 December 17, 2020 and January 24, 2021, respectively. These re-forecasts represent
8 a 38 day slip for HFT and a 36 day slip for FL.

9
10 **Q. DOES STAFF BELIEVE THERE ARE RISKS ASSOCIATED WITH THE**
11 **USE OF AN OVERLY AGGRESSIVE SCHEDULE?**

12 **A.** Yes. As stated in our testimony in 20/21 VCM, Staff agrees with SNC that the IPS
13 should be challenging to ensure that all parties involved in the completion of the
14 Project are pushed to perform to their utmost efficiency. However, as Staff has
15 repeatedly stated, there is a cost to using an unachievable IPS and this approach is
16 not recommended by the Institute of Nuclear Power Operations, a nuclear industry
17 organization that provides guidance for the nuclear industry.

18
19 **Q. WHEN WAS THE OCTOBER 2020 SCHEDULE REFINEMENT ISSUED**
20 **AND WHAT WAS THE IMPACT TO UNIT THREE MAJOR**
21 **MILESTONES?**

22 **A.** The October, 2020 Schedule Refinement was issued on or about September 26,
23 2020. The shifts for Unit 3 major milestones are shown in Table B below.

1

2

TABLE B⁷

Milestone	Current Forecast (In Progress)	Unit 3 November Benchmark	Unit 3 July 2020 Plan
<i>Cold Hydro Start</i>	<i>10/18/20 (A)</i>	<i>10/28/2020</i>	<i>09/10/2020</i>
Hot Functional Test (HFT) Start	12/29/2020	01/14/2021	10/01/2020
Fuel Load	04/08/2021	06/30/2021	12/30/2020
Commercial Operation	08/30/2021	11/30/2021	5/21/2021

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From the Unit 3 July 2020 Schedule Update, the start of HFT has moved out from 10/01/2020 to 12/29/2020; FL has moved out from 12/30/2020 to 04/08/2021; and COD has moved out from 05/21/2021 to 08/30/2021. Note, based on SNC's current forecast, there remains only three months of margin to the regulatory approved November COD date.

11

III. PROJECT STATUS AND CONSTRUCTION

12

EXECUTION

13

Q. PLEASE DESCRIBE THE CURRENT STATUS OF THE PROJECT.

⁷ 10-2020 MPR Meeting Presentation.

1 A. Construction continues on the Vogtle Project with SNC's emphasis being focused
2 on completion of major milestones. Several major milestones have been completed
3 during the period from January 2020 to the present including:

- 4 • Completion of Unit 3 Containment Integrated Leak Rate Test and Structural
5 Integrity Test;
- 6 • Completion of Unit 3 Cold Hydro Test;
- 7 • Completion of Unit 3 Turbine on Gear;
- 8 • Completion of Unit 3 Shield Building Civil Construction; and
- 9 • Set Unit 4 Containment Vessel Top Head.

10 While completion of these major milestones are significant accomplishments, as
11 discussed in prior testimony, we do not believe that the accomplishment of major
12 milestones in isolation is an appropriate way to gauge the overall progress of the
13 Project. Metrics including construction percent complete, number of systems turned
14 over to ITP, number of preoperational tests completed and number of systems turned
15 over to operations provide a more comprehensive and better indication of the overall
16 status of the Project. The Project continues to face several significant challenges to
17 achieve HFT, Fuel Load and Commercial Operation.

18

19 **Q. PLEASE DESCRIBE SOME OF THE CHALLENGES FACING THE**
20 **PROJECT IN MORE DETAIL.**

21 A. Some of the challenges facing the Project are described below:

- 22 • Construction completion – Completing construction, in particular electrical
23 construction at a rate sufficient to allow turnover to ITP and conducting pre-

1 operational tests continues to be a challenge for SNC. The latest information
2 provided by the Company indicates that construction is not earning enough hours in
3 scheduled electrical work⁸ to meet the HFT start date based on the November
4 Benchmark schedule.⁹ This is the regulatory approved schedule of COD on
5 November 21, 2021.

- 6 • Work Package Closure – Construction work at Plant Vogtle is directed by individual
7 work packages to perform specific tasks. Once the work related to a work package
8 is completed, the paperwork must be closed out. This means all QC issues and
9 engineering issues must be resolved prior to closing the work package. All work
10 packages must then be closed for a system or partial system to be turned over to ITP.
11 As of 10/16/2020, SNC reported that there are 9,741 open Unit 3 work packages.¹⁰
12 The Georgia Power Nuclear Development Weekly Report dated October 30, 2020
13 states that the rate of work package closure must *double* to meet the current HFT
14 start date. This report further states that the average closure rate over the last four
15 weeks has been approximately 200 per week.

16 However, with 1,900+ remaining open packages for HFT and 680+ for
17 condenser vacuum alone, the required weekly closure rate through the end
18 of the year is required to double to 450+ per week to support these two
19 milestones alone. Additionally, new work packages being added to the
20 project is introducing additional strain on the closure organization. Over the
21 last 8 weeks. (sic) The Project has closed 1,700 + packages, but the quantity

⁸ Scheduled electrical work is work that is assigned to a specific plant system.

⁹ Monthly Project Review Meeting dated October 21, 2020, page 7.

¹⁰ Ibid, page 22.

1 of open packages has only decreased by 189 as the total quantity of packages
2 has increased by 1,500+.¹¹
3

- 4 • System turnovers – Once construction is completed on a system or partial system,
5 that system is turned over to ITP for testing. This requires completion of all
6 construction, excluding any exception(s)¹² agreed upon by Construction and ITP,
7 and closure of all QC and engineering issues. System turnovers are far behind
8 schedule. Only 39 of 107 planned partial system turnovers were turned over at the
9 end of September 2020.¹³ The Georgia Power report also states “System turnovers
10 have fallen below the JBM (November Benchmark) plan in September with the
11 potential to pressure a June 2021 Fuel Load without management focus.”
- 12 • Subcontractor work completion – In addition to completion of construction work
13 being performed by the Bechtel direct craft, additional critical work is being
14 performed by subcontractors. For example, PCI Promatec (“PCIP”) is responsible
15 for installing penetration seals. As the name implies, penetration seals seal the
16 opening where pipes and electrical cables go through walls, ceilings, floors and other
17 barriers in the plant. Penetration seals are important because they act as fire barriers,
18 pressure boundaries, and also allow the required ventilation to be balanced between
19 various areas of the plant. Installation of penetration seals is a significant task.
20 There is a total of 6,065 penetration seals in Unit 3, including 1,873 seals required

¹¹ Georgia Power Nuclear Development Weekly One-Pager dated 10/30/2020.

¹² An exception is typically a small level of work that is not necessary for the successful completion of the intended test. However, all exceptions do represent work being pushed forward.

¹³ Plant Vogtle Units 3&4 Schedule Review Package dated 9/26/2020, page 14.

1 for HFT, and an additional 4,130 seals required for Fuel Load. For the period
2 07/05/2020 through 10/25/2020, installation of penetrations seals required for HFT
3 averaged 13 per week with a peak of 30 seals installed during the week of
4 08/30/2020.¹⁴ Other critical subcontractor work scopes which are at risk of not
5 meeting the site working plan include insulation of piping, HVAC and equipment;
6 installation of fire detection and suppression equipment; and installation of HVAC
7 equipment and ducting. All of the associated subcontractors for these scopes of
8 work have significant work remaining to support HFT and Fuel Load.

- 9 • Inspection, Tests, Analyses and Acceptance Criteria (“ITAAC”) – Verification of
10 ITAAC is the method prescribed by 10 CFR 50.52 to ensure that the Vogtle Units
11 are built according and perform to the approved design and functionality. A total of
12 399 ITAAC must be completed per Unit, submitted to the NRC and approved by the
13 NRC prior to fuel load. As of October 19, 2020, 149 ITAAC have been submitted
14 to and approved by the NRC, leaving 250 ITAAC to be approved.¹⁵ The plan is to
15 submit 30 ITAAC in November 2020, 81 ITAAC in December 2020, 95 ITAAC in
16 January 2021, 34 ITAAC in February and 6 in March 2021.¹⁶ To put this in
17 perspective, from January through October 2020 the peak number of ITAAC
18 completed in any month was 6.
- 19 • Component and Preoperational Testing – Following completion of construction, the
20 testing of individual components such as pumps and valves is conducted to verify

¹⁴ Weekly Metrics report dated 11/03/2020, page 15.

¹⁵ Monthly Project Review Meeting October 21, 2020, page 20.

¹⁶ Ibid.

1 that the components function as designed. In our VCM 22 testimony, we noted the
2 Company had reported that initial components were experiencing a failure rate of
3 80% during initial testing. The Company has recently reported that the failure rate
4 of initial component tests has improved to 40%, a rate that remains unacceptably
5 high. The Georgia Power Company Nuclear Development Weekly One-Pager
6 report dated 10-30-2020 stated “Unit 3 ITP continues to only complete
7 approximately 1/3 of the weekly scheduled component tests.” Following
8 completion of component testing, plant systems are tested to verify that they
9 function as designed. This testing is referred to as preoperational testing. As of
10 11/17/2020, SNC reports that approximately 255 ITP preoperational test activities
11 related to major milestones out of a total of 920 activities have been completed.¹⁷

- 12 • Turnover to Operations – Following completion of construction and preoperational
13 testing, all plant systems must ultimately be turned over to the Plant Operations
14 Group (“Ops”) to operate and maintain the Unit. This turnover involves a
15 complicated process as specified in the Southern Nuclear Operating Company
16 procedure ND-AD-VNP-029. This procedure specifies that the transition process
17 shall not be completed until all Preoperational and Acceptance testing is complete.
18 The process involves compilation of many construction, design, software and cyber
19 security documents and drawings as prescribed in the procedure ND-AD-VNP-029
20 in Attachment L which specifies four pages of drawings to be turned over during the

¹⁷ Estimated from slide 43, Monthly Project Review meeting slide package dated November 17, 2020.

1 transition to Operations. As of this writing, only one complete system, the
2 Containment Leak Rate Test system (VUS), has been turned over to Ops. Turning
3 over the remaining 92 systems is a significant body of work that must be
4 accomplished and will require management attention.

5
6 **IV. CONSTRUCTION TO INITIAL TEST PROGRAM**
7 **CHALLENGES**

8 **Q. CAN STAFF PROVIDE EXAMPLES OF ACTUAL CHALLENGES TO ITP**
9 **TESTING THAT UNIT 3 AND UNIT 4 HAVE EXPERIENCED TO DATE?**

10 A. Yes. Below, Staff addresses a sample of challenges that SNC has had to overcome.
11 These challenges are discussed in the order below:

- 12
13 • Spent Fuel System (“SFS”) demineralization tank replacement and Liquid
14 Radwaste System (“WLS”) demineralization tank replacements¹⁸;
- 15 • Main Steam System (“MSS”) pipe stress removal;
 - 16 • Main AC Power System (“ECS”) non-segregated busbar replacement;
 - 17 • Turbine on Gear milestone, specifically the Jacking Oil Pumps replacement;
 - 18 • Variable Frequency Drives (“VFD”).
- 19

¹⁸ Similar issues and results applied to both the SFS and WLS tanks.

1 Q. PLEASE DESCRIBE THE FUNCTION OF THE SFS
2 DEMINERALIZATION TANKS AND THE WLS DEMINERALIZATION
3 TANKS.

4 A. The purpose of these demineralizers is to purify the water running through each
5 system. Each demineralizer contains a screen and resins to purify the water before
6 being pumped back into the SFS and WLS. The WLS tanks are used to process
7 liquid radwaste from multiple systems¹⁹. Each Unit has 4 WLS tanks and 2 SFS
8 tanks for a total of 6 tanks.

9
10 Q. FOR WHAT MILESTONE ARE THESE TANKS REQUIRED TO
11 FUNCTION?

12 A. HFT.

13
14 Q. PLEASE DESCRIBE THE ISSUES WITH THE DEMINERALIZERS.

15 A. The installed demineralizers would not have functioned according to their design.
16 The original demineralizers were purchased in 2009 and 2014 (SFS) and 2012 and
17 2014 (WLS). Issues were found with the resin coating and the metallic screens
18 inside the tanks. These issues could not be remediated requiring the removal of each
19 demineralizer, the purchase of new demineralizers, and the re-installation of the new
20 demineralizers.

¹⁹ Reactor Coolant System (“RCS”), SFS, Radioactive Waste Drain System (“WRS”), Waste Water System (“WSS”), Normal Residual Heat Removal System (“RNS”), Chemical and Volume Control System (“CVS”), and Passive Core Cooling System (“PXS”).

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Q. DID THIS REWORK DELAY A MAJOR MILESTONE?

A. Staff's current opinion is that the rework did not delay a major milestone.

Q. HOW WERE THESE ISSUES ULTIMATELY RESOLVED?

A. In 2020 new demineralizers were purchased.

Q. WHAT WAS THE COST TO IDENTIFY, TROUBLE SHOOT AND RESOLVE THE ISSUES WITH THE SFS TANKS?

A. The Company reports that the cost to perform removal, re-purchase, and re-installation the six demineralizers for Unit 3 was \$635,717.

Q. PLEASE DESCRIBE THE FUNCTION OF THE MAIN STEAM SYSTEM PIPING.

A. The MSS delivers steam to drive the high-pressure turbine, the low-pressure turbines, and moisture separator re-heaters during normal operation of the plant.

Q. PLEASE DESCRIBE THE ISSUE WITH THE WELDING OF THESE PIPES.

A. The design required that zero stress be placed on pipe runs A, B, C, and D which supply steam to the main high-pressure turbine. After installation by welding the pipes to their locations it was found that each of the pipe runs contained varying degrees of stress at the weld point.

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Q. DID THIS REWORK DELAY A MAJOR MILESTONE?

A. Staff's current opinion is that the rework did not delay a major milestone.

Q. HOW WERE THESE ISSUES ULTIMATELY RESOLVED?

A. Grinding out the existing welds to adjust the piping such that when re-attached to the high-pressure turbine there would be zero stress.

Q. WHAT WAS THE COST TO IDENTIFY, TROUBLE SHOOT AND RESOLVE THE ISSUES WITH THE MSS PIPING?

A. The Company reports that the cost to perform the re-work of the pipes for Unit 3 was \$1,340,000.

Q. PLEASE DESCRIBE THE FUNCTION OF THE MAIN AC POWER SYSTEM.

A. The ECS provide power to the plant auxiliary and service loads during normal plant operation.

Q. PLEASE DESCRIBE THE ISSUE WITH THE MAIN AC POWER SYSTEM NON-SEGREGATED BUSBAR.

A. The busbar was coated with an epoxy resin that protects the metal during its service life. As the busbar was being installed on Unit 3 it was noticed that the epoxy had cracks and was peeling.

1

2 **Q. DID THIS REWORK DELAY A MAJOR MILESTONE?**

3 A. Staff's current opinion is that the rework did not delay a major milestone.

4

5 **Q. HOW WAS THIS ISSUE ULTIMATELY RESOLVED?**

6 A. The decision was made to scrap the designed non-segregated busbar in its entirety
7 and install conductor cables. SNC believes that the manufacturer AZZ Inc.'s design
8 was defective and therefore could not meet Project requirements.

9

10 **Q. WHAT WAS THE COST TO IDENTIFY, TROUBLE SHOOT AND**
11 **RESOLVE THE ISSUE WITH THE NON-SEGREGATED BUSBAR?**

12 A. At this time no cost estimate has been determined by the Company due to ongoing
13 litigation with the manufacturer of the original busbar design AZZ Inc.

14

15 **Q. PLEASE DESCRIBE THE FUNCTION OF THE JACKING OIL PUMPS.**

16 A. The main turbine shaft rides on a thin film of oil when the turbine is in operation. In
17 order to rotate the turbine when it is stopped, lubricating oil must be injected between
18 the turbine bearing and the turbine shaft to lift the shaft slightly and prevent metal
19 to metal contact between the turbine shaft and the bearings. The function of the
20 jacking oil pumps is to inject the lubricating oil as needed to lift the turbine shaft
21 and allow the turbine to rotate.

22

1 **Q. FOR WHAT MILESTONE ARE THESE PUMPS REQUIRED TO**
2 **FUNCTION?**

3 A. The jacking oil pumps were required to be operational to meet the Turbine on Gear
4 milestone.

5
6 **Q. PLEASE DESCRIBE THE ISSUES WITH THE JACKING OIL PUMPS**
7 **DURING THE INITIAL OPERATION IN PREPARATION FOR THE**
8 **TURBINE ON GEAR MILESTONE.**

9 A. Many issues were identified with the jacking oil pumps during the commissioning
10 process. The jacking oil pumps could not reliably provide sufficient oil pressure to
11 the bearings to lift the turbine shaft the required amount. These issues are discussed
12 in more than 35 Condition Reports issued during commissioning. A partial list of
13 the issues includes:

- 14 • Improper valve jacking device used on the valves;
- 15 • Test solenoids not tubed correctly;
- 16 • Test solenoids allowing flow to multiple ports;
- 17 • Pump 10F piping had a through wall leak;
- 18 • Discharge pressure gauge failed;
- 19 • Jacking oil pump stopped unexpectedly after start;
- 20 • Design impacting reliability and operations;
- 21 • Jacking oil pump not starting, stopping, tripping;
- 22 • New Jacking Oil Pump found non-functional even before installation;
- 23 • Jacking oil pump loss of pressure.

24
25 Note that Staff requested copies of these Condition Reports but was only provided
26 with a list of the subjects.

27
28 **Q. DID THESE ISSUES DELAY THE TURBINE ON GEAR MILESTONE?**

1 A. Yes. The Turbine on Gear milestone was planned to be completed on 6/20/2020 in
2 the February 2020 Schedule Refinement. This forecast was revised to 6/30/2020 in
3 the July 2020 Schedule update. During the Monthly Project Review meeting on
4 8/18/2020, SNC stated that trouble shooting was in progress and they had recognized
5 the need for design change of the jacking oil pumps to provide the needed reliability.
6 Extensive trouble shooting and repairs continued and the Turbine on Gear milestone
7 was finally achieved on 10/21/2020.

8

9 **Q. HOW WERE THESE ISSUES ULTIMATELY RESOLVED?**

10 A. After extensive efforts to ensure that the original jacking oil pumps could be made
11 to operate reliably, SNC ultimately concluded that the original jacking oil pumps
12 would be replaced by pumps that were designed for this application and in use on
13 other plants in the Southern Company fleet.

14

15 **Q. WHAT WAS THE COST TO IDENTIFY, TROUBLE SHOOT AND**
16 **RESOLVE THE ISSUES WITH THE JACKING OIL PUMPS?**

17 A. Staff issued the following data requests to the Company on this question:

18

19 STF-185-14.i - Please provide an estimate of costs for the installation and proper
20 operation of each original pump. Cost includes, but is not limited to, direct labor,
21 design, engineering, additional testing, sub-contractor work, other non-manual
22 staff, allocations, etc... Present the information in Excel format broken out by cost
23 account.

24

25 STF-185-14.j - Please provide an estimate of costs for the installation and proper
26 operation of each replacement pump. Cost includes, but is not limited to, direct
27 labor, design, engineering, additional testing, sub-contractor work, other non-

1 manual staff, allocations, etc... Present the information in Excel format broken
2 out by cost account.
3

4 The Company's response was that this work took a crew of 5 craft personnel 40
5 standard hours and 10 overtime hours resulting in a cost of \$4,608.90 to perform
6 all of the work described above. This answer is clearly not credible. Staff will
7 issue additional follow-up DRs on this question.
8

9 **Q. PLEASE DESCRIBE THE FUNCTION OF THE VARIABLE FREQUENCY**
10 **DRIVES (VFD).**

11 A. The VFDs are used to control the speed at which the Reactor Coolant Pumps
12 ("RCP") operate. In the AP 1000 reactor design, the RCPs initially start at low speed
13 and then are gradually brought up to the full operating speed. Once at full speed,
14 the VFDs are not required for operation as the RCPs operate at synchronous speed
15 with the 60-cycle power supply.
16

17 **Q. FOR WHAT MILESTONE ARE THESE PUMPS REQUIRED TO**
18 **FUNCTION?**

19 A. The RCPs and thus the VFDs must be operable for Hot Functional Testing.
20

21 **Q. PLEASE DESCRIBE THE ISSUES WITH THE VFDS IDENTIFIED**
22 **DURING COMMISSIONING.**

23 A. Numerous issues were encountered during commissioning of the VFDs as evidenced
24 by the more than 90 condition reports that were issued related to VFD problems. A

1 frequent issue discovered during commissioning was failure of the power cells
2 which are required for the VFD to function. In addition to power cell failures other
3 issues identified in the condition reports include:

- 4 • VFD switchgear drawing deficiencies;
 - 5 • Component Cooling system leaks;
 - 6 • Cooling motors and pumps needing lubrication;
 - 7 • VFD cooling pump issues;
 - 8 • Unbalanced flow indications;
 - 9 • VFD internal cooling pumps powered from the same motor control center;
 - 10 • PLS interface testing unsatisfactory;
 - 11 • Drawing discrepancies between WEC and Eaton design documents;
 - 12 • Improper cable grounding;
 - 13 • Incorrect breaker indications;
 - 14 • Deionizer tank replacement.
- 15

16 **Q. DID THESE ISSUES DELAY THE HOT FUNCTIONAL MILESTONE?**

17 A. No, they did not. Hot Functional Test was delayed due to the need to complete
18 construction, turnover and testing of the many systems required for HFT.

19

20 **Q. HOW WERE THESE ISSUES ULTIMATELY RESOLVED?**

21 A. Many of the issues were routine commissioning problems such as drawing
22 discrepancies, coolant leaks, insufficient pump performance and improper
23 grounding. These were resolved by the ITP group with help from construction and
24 engineering as needed. The power cell issues were initially resolved by replacing
25 the power cells with spare power cells and then with power cells from Unit 4 when
26 no more spares were available. It was ultimately determined that a capacitor in the
27 power cells was failing due to age. The final resolution was to send the power cells
28 back to the factory to be refurbished.

1

2 **Q. WHAT WAS THE COST TO IDENTIFY, TROUBLE SHOOT AND**
3 **RESOLVE THE ISSUES WITH THE VARIABLE FREQUENCY DRIVES?**

4 A. In response to STF-185-8.i and STF-185-8.j, the Company states that the direct labor
5 cost related to the Unit 3 VFDs was \$543,292.09 and the cost of refurbishment,
6 updating and pre-commissioning was \$1,395,465 and the cost of refurbishing the
7 remaining power cells was \$1,600,200.

8

9 **VI. RECOMMENDATIONS OTHER ISSUES**

10

11 **Q. WHAT IS STAFF'S RECOMMENDATION WITH REGARD TO THE**
12 **AMOUNT REQUESTED BY THE COMPANY TO BE VERIFIED AND**
13 **APPROVED?**

14 A. Staff recommends that the expenditures of \$701 million incurred during the Twenty-
15 Third VCM period be verified and approved. As Staff has previously explained,
16 "verification and approval" of costs means a determination that such costs have
17 actually been spent on the Project and does not preclude a subsequent disallowance
18 by the Commission.

19

20 **Q. PLEASE PROVIDE A SUMMARY WITH THRESHOLDS FOR WHOM**
21 **HAS THE BURDEN TO SHOW REASONABLENESS AND PRUDENCE.**

22 A. Please refer to Table C below:

Table C

Source	Language	Threshold	Burden of Reasonableness	Burden of Prudence
Certification	Certified cost	<\$4,400mm	N/A	Staff/Interveners
Certification	Certified cost	>\$4,400mm	Company	Company
SIR Stipulation	Costs incurred through 12/31/15 were <u>deemed</u> prudent	\$3,510mm	(i) N/A	N/A
SIR Stipulation	Revised forecast of \$5,680mm is presumed reasonable and prudent	\$3,510mm-\$5,680mm	(ii) Staff/Interveners (\$4,400mm to \$5,680mm)	Staff/Interveners (\$3,510mm-\$5,680mm)
SIR Stipulation	Costs greater than \$5,680mm Company has burden for <u>reasonableness and prudence</u>	>\$5,680mm	Company	Company
Order 17 th VCM	New GPC forecast \$7.3 billion deemed reasonable	\$5,680mm-\$7,300mm	(iii) N/A	Company
GPC 19 th VCM	Write-off by GPC of \$694mm	>\$7,300mm;=<\$7,994mm	N/A	N/A
Order 17 th VCM	New GPC forecast \$7.3 billion deemed reasonable	>\$7,994mm	(iv) Company	Company

(i) GPC 14th VCM Table 1.1

(ii) \$2,170mm

(iii) Order 17th VCM found costs up to \$7.3 to be reasonable

(iv) GPC must first exhaust funds written off second quarter 2019.

1

2

3 **Q. WHY IS THIS AN IMPORTANT ISSUE NOW?**

4 A. The Commission has deemed costs up to \$7.3 billion reasonable. As the Company
5 itself has stated during their VCM 23 hearing, based on their forecast spend, the
6 actual spend on the Project will reach \$7.3 billion early in the first quarter of 2021.
7 Further, only \$3.5 billion has been deemed prudent. Given the duration of this
8 Project and the multiple stipulations and orders affecting which party has the burden,
9 Staff wants to summarize each threshold where that burden shifts between the
10 Company, and Staff or interveners.

11

12 **Q. WHY DOES TABLE C SHOW N/A FOR THE SECOND TO LAST ROW**
13 **RELATING TO THE \$694 MILLION THE COMPANY HAS WRITTEN**
14 **OFF?**

1 A. Before the Company allocates spending to their contingencies, which the Company
2 has reserved the right to seek recovery of, the Company must first exhaust the \$694
3 million that the Company has stated it will never seek recovery for.

4

5 **Q. DOES THIS CONCLUDE YOUR TESTIMONY?**

6 **A.** Yes, it does.

EXHIBIT STF-SDR-1

Resume Of

Steven D. Roetger

Steven D. Roetger

244 Washington Street, S.W.
Atlanta, GA 30334

Professional Experience

Georgia Public Service Commission Atlanta, Georgia 2008-Present

Analyst Primary responsibilities include monitoring the Vogtle expansion of Units 3 and 4, attending site visits on a regular basis, participate with the Commission and Company interface, and assist in the preparation of testimony.

Key achievements

Manage the Vogtle Construction monitoring process including engineering, procurement, and construction; economic analysis of the value of the Project; and financial accounting review for the Project's costs.

Write and review direct pre-filed testimony of the status of the Project for a semi-annual hearings.

BCD Travel Atlanta, Georgia 2007-2008

Finance Manager Primary responsibilities were to manage financial analysts, generate and review variance analyses, analyze departmental financials, and facilitate the coordination between our group and various internal departments.

Key achievements

Elevated team's performance to improve consistency, accuracy, and timeliness of service
Identified client missed revenue opportunities and communicated to Operations for recapture and/or inclusion with future invoicing

Key Requirements

Train, motivate, and develop 3 financial analysts to achieve an outstanding level of service and performance

Direct work flow to maintain efficiency and productivity without compromising standards

Analyze departmental financials to maximize profitability by reviewing contracts, perform variance analyzes, and ensure complete transaction billing

Review complex contracts and interpret for finance reconciliation and billing procedures

Prepare client budgets and forecasts

Marine Bank of Florida Marathon, Florida 2003-2005

Accounting Operations Manager/Bank Officer Primary responsibilities were to manage the Bank's Accounting Department and, as directed by the COO, Deposit Operations' functions.

Key achievements

Identified high-risk, time sensitive accounts for dedicated review to significantly reduce financial risk to the Bank

In partnership with the CFO reduced audit management exceptions from 13 to zero year over year

Launched new wire department procedures to decrease response time, increase capacity, and improve customer service without increasing staff

Resume of Steven D. Roetger

In partnership with the COO implemented the Bank's new ACH operations to enhance existing customer relations, attract new business, and respond in a timely manner to ACH adjustments/returns

Key Requirements

Comprehensive G/L management including reconciliations, adjusting entries, and monthly/annual close

Manage and review the activities of 3 accounting and 2 deposit operations personnel responsible for accounts payable, wires, ACH operations, VISA check card operations, branch settlements, electronic funds transfers, and check clearing.

Establish and refine departmental policies and procedures to improve accuracy and timeliness of reporting, facilitate employee transition, and meet audit requirements

Oversaw Federal Reserve, FHLB, and IBB correspondent accounts

Supported the CFO to meet external audit requirements

Oversaw the Bank's daily cash position to minimize overnight net interest expense

Support branch operations by assisting branch managers maintain acceptable internal controls, provide training on Bank reporting procedures, and process exceptions

B. Terfloth & Co. USA) Inc. Atlanta, Georgia 1998-2000

Accounting Manager Primary responsibilities were to manage the Branch's Accounting Department with an emphasis on controlling expenses and manage the yearly audit process.

Key achievements

Re-established accurate and timely monthly reporting to the Corporate Office

Developed a cash flow forecasting model to assess the Branch's financing needs and negotiated under the President's supervision a working capital credit line to meet those needs

Key requirements

Comprehensive G/L management including reconciliations, adjusting entries, and monthly/annual close

Manage the annual audit process

Accounts payable and accounts receivable

Payroll and annual bonus calculations

Bridgetown Grill Restaurants Inc. Atlanta, Georgia 1996-1997

Interim Controller Primary responsibilities were to re-establish a reliable Accounting process and once established facilitate the transition to a new Controller.

Key achievements

Established internal controls to better manage purchases, inventories, and reduce cash variances
Developed Accounting procedures for Unit Managers and trained the management staff on those procedures

Assisted the Owner in evaluating an outside purchase offer

Key requirements

Comprehensive G/L management including reconciliations, adjusting entries, and monthly close procedures

Coordinate the annual audit process

Manage accounts payable and payroll processing

Manage credit card transaction procedures to reduce charge backs

Turner Broadcasting System Inc. Atlanta, Georgia 1991-1996

Staff Accountant Primary responsibility was to support the Managers with accurate and timely completion of assigned tasks.

Key achievements

Partnered with Management to streamline the procedure for The Statement of Cash Flows

Corrected the EPS calculation

Streamlined governmental reporting and incorporated detailed procedures for each report

Provided a Companywide vacation and sick time accrual analysis

Key requirements

Worked, as part of a team, on the Consolidated Financial Statements of TBS, Inc.

Develop various footnotes to the Financial Statements

Provide analysis of accounts for actual to budget and actual to rolling 12 month forecast variances

Provide analysis of, and recommendations for, lease capitalizations

Coordinate with 72 Operating Unit Controllers for the content and timely receipt of Unit financial data

Prepare debt covenant calculations for 4 issues and provide forecasts with sensitivity analysis

Prepare all U.S. Department of Commerce and U.S. Treasury Department statistical reports

Software

PeopleSoft/nVision reporting, *Kirchman/Bankway* and *IPS Sendero* banking software, *MSA* accounting software, *Excel*, *Outtask*, and *Word*

Education

BBA Georgia State University in Finance with an equivalent in Accounting

Completed 70 percent of course work toward an MBA in Finance from Georgia State University

EXHIBIT STF- WRJ-1

Resume Of

William R. Jacobs, Ph.D.

EDUCATION: Ph.D., Nuclear Engineering, Georgia Tech 1971
MS, Nuclear Engineering, Georgia Tech 1969
BS, Mechanical Engineering, Georgia Tech 1968

ENGINEERING REGISTRATION: Registered Professional Engineer

PROFESSIONAL MEMBERSHIP: American Nuclear Society

EXPERIENCE:

Dr. Jacobs has over thirty-five years of experience in a wide range of activities in the electric power generation industry. He has extensive experience in the construction, startup and operation of nuclear power plants. While at the Institute of Nuclear Power Operation (INPO), Dr. Jacobs assisted in development of INPO's outage management evaluation group. He has provided expert testimony related to nuclear plant operation and outages in Texas, Louisiana, South Carolina, Florida, Wisconsin, Indiana, Georgia and Arizona. He currently provides nuclear plant operational monitoring services for GDS clients. Dr. Jacobs was a witness in nuclear plant certification hearings in Georgia for the Plant Vogtle 3 and 4 project on behalf of the Georgia Public Service Commission and in South Carolina for the V.C. Summer 2 and 3 projects on behalf of the South Carolina Office of Regulatory Staff. His areas of expertise include evaluation of reactor technology, EPC contracting, risk management and mitigation, project cost and schedule. He is assisting the Florida Office of Public Counsel in monitoring the development of four new nuclear units in the State of Florida, Levy County Units 1 and 2 and Turkey Point Units 6 and 7. He also evaluated extended power uprates on five nuclear units for the Florida Office of Public Counsel. He has been selected by the Georgia Public Service Commission as the Independent Construction Monitor for Georgia Power Company's new AP1000 nuclear power plants, Plant Vogtle Units 3 and 4. He has assisted the Georgia Public Service Commission staff in development of energy policy issues related to supply-side resources and in evaluation of applications for certification of power generation projects and assists the staff in monitoring the construction of these projects. He has also assisted in providing regulatory oversight related to an electric utility's evaluation of responses to an RFP for a supply-side resource and subsequent negotiations with short-listed bidders. He has provided technical litigation support and expert testimony support in several complex law suits involving power generation facilities. He monitors power plant operations for GDS clients and has provided testimony on power plant operations and decommissioning in several jurisdictions. Dr. Jacobs represents a GDS client on the management committee of a large coal-fired power plant currently under construction. Dr. Jacobs has provided testimony before the Georgia Public Service Commission, the Public Utility Commission of Texas, the North Carolina Utilities Commission, the South Carolina Public Service Commission, the Iowa State Utilities Board, the Louisiana Public Service Commission, the Florida Public Service Commission, the Indiana Regulatory Commission, the Wisconsin Public Service Commission, the Arizona Corporation Commission and the FERC.

A list of Dr. Jacobs' testimony is available upon request.

1986-Present GDS Associates, Inc.

As Executive Consultant, Dr. Jacobs assists clients in evaluation of management and technical issues related to power plant construction, operation and design. He has evaluated and testified on combustion turbine projects in certification hearings and has assisted the Georgia PSC in monitoring the construction of the combustion turbine projects. Dr. Jacobs has evaluated nuclear plant operations and provided testimony in the areas of nuclear plant operation, construction prudence and decommissioning in nine states. He has provided litigation support in complex law suits concerning the construction of nuclear power facilities. Dr. Jacobs is the Georgia PSC's Independent Construction Monitor for the Plant Vogtle 3 and 4 nuclear project.

1985-1986 Institute of Nuclear Power Operations (INPO)

Dr. Jacobs performed evaluations of operating nuclear power plants and nuclear power plant construction projects. He developed INPO Performance Objectives and Criteria for the INPO Outage Management Department. Dr. Jacobs performed Outage Management Evaluations at the following nuclear power plants:

- Connecticut Yankee - Connecticut Yankee Atomic Power Co.
- Callaway Unit I - Union Electric Co.
- Surry Unit I - Virginia Power Co.
- Ft. Calhoun - Omaha Public Power District
- Beaver Valley Unit 1 - Duquesne Light Co.

During these outage evaluations, he provided recommendations to senior utility management on techniques to improve outage performance and outage management effectiveness.

1979-1985 Westinghouse Electric Corporation

As site manager at Philippine Nuclear Power Plant Unit No. 1, a 655 MWe PWR located in Bataan, Philippines, Dr. Jacobs was responsible for all site activities during completion phase of the project. He had overall management responsibility for startup, site engineering, and plant completion departments. He managed workforce of approximately 50 expatriates and 1700 subcontractor personnel. Dr. Jacobs provided day-to-day direction of all site activities to ensure establishment of correct work priorities, prompt resolution of technical problems and on schedule plant completion.

Prior to being site manager, Dr. Jacobs was startup manager responsible for all startup activities including test procedure preparation, test performance and review

and acceptance of test results. He established the system turnover program, resulting in a timely turnover of systems for startup testing.

As startup manager at the KRSKO Nuclear Power Plant, a 632 MWE PWR near Krsko, Yugoslavia, Dr. Jacobs' duties included development and review of startup test procedures, planning and coordination of all startup test activities, evaluation of test results and customer assistance with regulatory questions. He had overall responsibility for all startup testing from Hot Functional Testing through full power operation.

1973 - 1979 NUS Corporation

As Startup and Operations and Maintenance Advisor to Korea Electric Company during startup and commercial operation of Ko-Ri Unit 1, a 595 MWE PWR near Pusan, South Korea, Dr. Jacobs advised KECO on all phases of startup testing and plant operations and maintenance through the first year of commercial operation. He assisted in establishment of administrative procedures for plant operation.

As Shift Test Director at Crystal River Unit 3, an 825 MWE PWR, Dr. Jacobs directed and performed many systems and integrated plant tests during startup of Crystal River Unit 3. He acted as data analysis engineer and shift test director during core loading, low power physics testing and power escalation program.

As Startup engineer at Kewaunee Nuclear Power Plant and Beaver Valley, Unit 1, Dr. Jacobs developed and performed preoperational tests and surveillance test procedures.

1971 - 1973 Southern Nuclear Engineering, Inc.

Dr. Jacobs performed engineering studies including analysis of the emergency core cooling system for an early PWR, analysis of pressure drop through a redesigned reactor core support structure and developed a computer model to determine tritium build up throughout the operating life of a large PWR.

SIGNIFICANT CONSULTING ASSIGNMENTS:

Georgia Public Service Commission – Selected as the Independent Construction Monitor to assist the GPSC staff in monitoring all aspects of the design, licensing and construction of Plant Vogtle Units 3 and 4, two AP1000 nuclear power plants.

Georgia Public Service Commission – Assisted the Georgia Public Service Commission Staff and provided testimony related to the evaluation of Georgia Power Company's request for certification to construct two AP1000 nuclear power plants at the Plant Vogtle site.

South Carolina Office of Regulatory Staff – Assisted the South Carolina Office of Regulatory Staff in evaluation of South Carolina Electric and Gas' request for certification of two AP1000 nuclear power plants at the V.C. Summer site.

Florida Office of Public Counsel – Assists the Florida Office of Public Counsel in monitoring the development of four new nuclear power plants and extended power uprates on five nuclear units in Florida including providing testimony on the prudence of expenditures.

East Texas Electric Cooperative – Represented ETEC on the management committee of the Plum Point Unit 1 a 650 Mw coal-fired plant under construction in Osceola, Arkansas and represents ETEC on the management committee of the Harrison County Power Project, a 525 Mw combined cycle power plant located near Marshall, Texas.

Arizona Corporation Commission – Evaluated operation of the Palo Verde Nuclear Generating Station during the year 2005. Included evaluation of 11 outages and providing written and oral testimony before the Arizona Corporation Commission.

Citizens Utility Board of Wisconsin – Evaluated Spring 2005 outage at the Kewaunee Nuclear Power Plant and provided direct and surrebuttal testimony before the Wisconsin Public Service Commission.

Georgia Public Service Commission - Assisted the Georgia PSC staff in evaluation of Integrated Resource Plans presented by two investor owned utilities. Review included analysis of purchase power agreements, analysis of supply-side resource mix and review of a proposed green power program.

State of Hawaii, Department of Business, Economic Development and Tourism – Assisted the State of Hawaii in development and analysis of a Renewable Portfolio Standard to increase the amount of renewable energy resources developed to meet growing electricity demand. Presented the results of this work in testimony before the State of Hawaii, House of Representatives.

Georgia Public Service Commission - Assisted the Georgia PSC staff in providing oversight to the bid evaluation process concerning an electric utility's evaluation of responses to a Request for Proposals for supply-side resources. Projects evaluated include simple cycle combustion turbine projects, combined cycle combustion turbine projects and co-generation projects.

Millstone 3 Nuclear Plant Non-operating Owners – Evaluated the lengthy outage at Millstone 3 and provided analysis of outage schedule and cost on behalf of the non-operating owners of Millstone 3. Direct testimony provided an analysis of additional post-outage O&M costs that would result due to the outage. Rebuttal testimony dealt with analysis of the outage schedule.

H.C. Price Company – Evaluated project management of the Healy Clean Coal Project on behalf of the General Contractor, H.C. Price Company. The Healy Clean Coal Project is a 50 megawatt coal burning power plant funded in part by the DOE to demonstrate advanced

clean coal technologies. This project involved analysis of the project schedule and evaluation of the impact of the owner's project management performance on costs incurred by our client.

Steel Dynamics, Inc. – Evaluated a lengthy outage at the D.C. Cook nuclear plant and presented testimony to the Indiana Utility Regulatory Commission in a fuel factor adjustment case Docket No. 38702-FAC40-S1.

Florida Office of Public Counsel - Evaluated lengthy outage at Crystal River Unit 3 Nuclear Plant. Submitted expert testimony to the Florida Public Service Commission in Docket No. 970261-EI.

United States Trade and Development Agency - Assisted the government of the Republic of Mauritius in development of a Request for Proposal for a 30 MW power plant to be built on a Build, Own, Operate (BOO) basis and assisted in evaluation of Bids.

Louisiana Public Service Commission Staff - Evaluated management and operation of the River Bend Nuclear Plant. Submitted expert testimony before the LPSC in Docket No. U-19904.

U.S. Department of Justice - Provided expert testimony concerning the in-service date of the Harris Nuclear Plant on behalf of the Department of Justice U.S. District Court.

City of Houston - Conducted evaluation of a lengthy NRC required shutdown of the South Texas Project Nuclear Generating Station.

Georgia Public Service Commission Staff - Evaluated and provided testimony on Georgia Power Company's application for certification of the Intercession City Combustion Turbine Project - Docket No. 4895-U.

Seminole Electric Cooperative, Inc. - Evaluated and provided testimony on nuclear decommissioning and fossil plant dismantlement costs - FERC Docket Nos. ER93-465-000, et al.

Georgia Public Service Commission Staff - Evaluated and prepared testimony on application for certification of the Robins Combustion Turbine Project by Georgia Power Company - Docket No. 4311-U.

North Carolina Electric Membership Corporation - Conducted a detailed evaluation of Duke Power Company's plans and cost estimate for replacement of the Catawba Unit 1 Steam Generators.

Georgia Public Service Commission Staff - Evaluated and prepared testimony on application for certification of the McIntosh Combustion Turbine Project by Georgia Power Company and Savannah Electric Power Company - Docket No. 4133-U and 4136-U.

New Jersey Rate Counsel - Review of Public Service Electric & Gas Company nuclear and fossil capital additions in PSE&G general rate case.

Corn Belt Electric Cooperative/Central Iowa Power Electric Cooperative - Directs an operational monitoring program of the Duane Arnold Energy Center (565 Mwe BWR) on behalf of the non-operating owners.

Cities of Calvert and Kosse - Evaluated and submitted testimony of outages of the River Bend Nuclear Station - PUCT Docket No. 10894.

Iowa Office of Consumer Advocate - Evaluated and submitted testimony on the estimated decommissioning costs for the Cooper Nuclear Station - IUB Docket No. RPU-92-2.

Georgia Public Service Commission/Hicks, Maloof & Campbell - Prepared testimony related to Vogtle and Hatch plant decommissioning costs in 1991 Georgia Power rate case - Docket No. 4007-U.

City of El Paso - Testified before the Public Utility Commission of Texas regarding Palo Verde Unit 3 construction prudence - Docket No. 9945.

City of Houston - Testified before Texas Public Utility Commission regarding South Texas Project nuclear plant outages - Docket No. 9850.

NUCOR Steel Company - Evaluated and submitted testimony on outages of Carolina Power and Light nuclear power facilities - SCPSC Docket No. 90-4-E.

Georgia Public Service Commission/Hicks, Maloof & Campbell - Assisted Georgia Public Service Commission staff and attorneys in many aspects of Georgia Power Company's 1989 rate case including nuclear operation and maintenance costs, nuclear performance incentive plan for Georgia and provided expert testimony on construction prudence of Vogtle Unit 2 and decommissioning costs of Vogtle and Hatch nuclear units - Docket No. 3840-U.

Swidler & Berlin/Niagara Mohawk - Provided technical litigation support to Swidler & Berlin in law suit concerning construction mismanagement of the Nine Mile 2 Nuclear Plant.

Long Island Lighting Company/Shea & Gould - Assisted in preparation of expert testimony on nuclear plant construction.

North Carolina Electric Membership Corporation - Prepared testimony concerning prudence of construction of Carolina Power & Light Company's Shearon Harris Station - NCUC Docket No. E-2, Sub537.

City of Austin, Texas - Prepared estimates of the final cost and schedule of the South Texas Project in support of litigation.

Tex-La Electric Cooperative/Brazos Electric Cooperative - Participated in performance of a construction and operational monitoring program for minority owners of Comanche Peak Nuclear Station.

Tex-La Electric Cooperative/Brazos Electric Cooperative/Texas Municipal Power Authority (Attorneys - Burchette & Associates, Spiegel & McDiarmid, and Fulbright & Jaworski) - Assisted GDS personnel as consulting experts and litigation managers in all aspects of the lawsuit brought by Texas Utilities against the minority owners of Comanche Peak Nuclear Station.