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STEVE CRISAFULLI
*Speaker of the House of
Representatives*



June 13, 2016

Ms. Carlotta Stauffer, Commission Clerk
Florida Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, Florida 32399-0850

Re: Docket No. 160009-EI

Dear Ms. Stauffer:

Please find enclosed for filing in the above referenced docket the Direct Testimony of **William R. Jacobs, Jr. Ph.D.** This filing is being made via the Florida Public Service Commission's Web Based Electronic Filing portal.

If you have any questions or concerns; please do not hesitate to contact me. Thank you for your assistance in this matter.

Sincerely,

A handwritten signature in blue ink, appearing to read "Patricia A. Christensen".

Patricia A. Christensen
Associate Public Counsel

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Patricia A. Christensen
Associate Public Counsel

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In Re: Nuclear Cost Recovery)
Clause.)
_____)

Docket No. 160009-EI
FILED: June 13, 2016

DIRECT TESTIMONY

OF

WILLIAM R. JACOBS, JR., Ph.D.

ON BEHALF OF THE CITIZENS OF

THE STATE OF FLORIDA

REVIEW OF FLORIDA POWER AND LIGHT COMPANY'S

NUCLEAR COST RECOVERY RULE FILING

J.R. Kelly
Public Counsel

Office of Public Counsel
c/o The Florida Legislature
111 W. Madison Street, Room 812
Tallahassee, FL 32399-1400

Attorney for the Citizens
of the State of Florida

1 **DIRECT TESTIMONY**

2 **OF**

3 **WILLIAM R. JACOBS, JR., Ph.D.**

4 On Behalf of the Office of Public Counsel

5 Before the

6 Florida Public Service Commission

7 Docket No. 160009-EI

8

9 **Q. PLEASE STATE YOUR NAME, TITLE AND BUSINESS ADDRESS.**

10 A. My name is William R. Jacobs, Jr., Ph.D. I am an Executive Consultant with GDS
11 Associates, Inc. ("GDS"). My business address is 1850 Parkway Place, Suite 800,
12 Marietta, Georgia 30067.

13

14 **Q. DR. JACOBS, PLEASE SUMMARIZE YOUR EDUCATIONAL BACKGROUND**
15 **AND EXPERIENCE.**

16 A. I received a Bachelor of Mechanical Engineering in 1968, a Master of Science in Nuclear
17 Engineering in 1969 and a Ph.D. in Nuclear Engineering in 1971, all from the Georgia
18 Institute of Technology. I am a registered professional engineer and a member of the
19 American Nuclear Society. I have more than 35 years of experience in the electric power
20 industry, including more than 12 years of power plant construction and start-up experience.
21 I have participated in the construction and start-up of seven power plants in this country
22 and overseas in management positions, including start-up manager and site manager. As a
23 loaned employee at the Institute of Nuclear Power Operations ("INPO"), I participated in

1 the Construction Project Evaluation Program, performed operating plant evaluations and
2 assisted in the development of the Outage Management Evaluation Program. Since joining
3 GDS in 1986, I have participated in rate case and litigation support activities related to
4 power plant construction, operation and decommissioning. I have evaluated nuclear power
5 plant outages at numerous nuclear plants throughout the United States. I served on the
6 management committee of Plum Point Unit 1, a 650 MWe coal-fired power plant located
7 near Osceola, Arkansas. As a member of the management committee, I assisted in
8 providing oversight of the engineering, procurement and construction (“EPC”) contractor
9 for this project. I am currently the Georgia Public Service Commission’s (“GPSC”)
10 Independent Construction Monitor for Georgia Power Vogtle Units 3 and 4 nuclear project
11 (“Vogtle”). As the Independent Construction Monitor, I assist the GPSC Commissioners
12 and Staff in providing regulatory oversight of the project. My monitoring activities include
13 regular meetings with project management personnel and regular visits to the Vogtle plant
14 site to monitor construction activities and assess the project schedule and budget. My
15 résumé is included as Exhibit WRJ-1.

16
17 **Q. WHAT IS THE NATURE OF YOUR BUSINESS?**

18 **A.** GDS is an engineering and consulting firm with offices in Marietta, Georgia; Austin, Texas;
19 Manchester, New Hampshire; Madison, Wisconsin; and Auburn, Alabama. GDS provides
20 a variety of services to the electric utility industry, including power supply planning,
21 generation support services, rates and regulatory consulting, financial analysis, load
22 forecasting and statistical services. Generation support services provided by GDS include
23 fossil and nuclear plant monitoring, plant ownership feasibility studies, plant management

1 audits, production cost modeling and expert testimony on matters relating to plant
2 management, construction, licensing and performance issues in technical litigation and
3 regulatory proceedings.

4
5 **Q. ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS PROCEEDING?**

6 A. I am appearing on behalf of the Florida Office of Public Counsel (“OPC”), who represents
7 the ratepayers of Florida Power & Light Company (“FPL” or “Company”).

8
9 **Q. WHAT WAS YOUR ASSIGNMENT IN THIS PROCEEDING?**

10 A. I was asked to assist OPC in their review and evaluation of the overall request by FPL for
11 authority to collect historical and projected costs associated with FPL’s Turkey Point Units
12 6 and 7 new nuclear project through the nuclear cost recovery clause (“NCRC”). I was
13 asked to present my findings to assist the Florida Public Service Commission (“FPSC” or
14 “Commission”) in making its determination regarding FPL’s requests.

15
16 **Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THIS COMMISSION?**

17 A. Yes. I testified on behalf of OPC in the previous NCRC proceedings in Docket Nos.
18 080009-EI, 090009-EI, 100009-EI, 110009-EI, 120009-EI, 130009-EI and 150009-EI.

19
20 **Q. PLEASE SUMMARIZE OPC’S PAST PARTICIPATION IN THE PROCEEDINGS
21 REGARDING TURKEY POINT UNITS 6 AND 7.**

22 A. I am informed that OPC’s earliest involvement was when OPC objected to FPL’s request
23 for a declaratory statement concerning the classification of expenses that FPL was to incur

1 prior to the date that site selection expenses were completed. FPL asked the Commission
2 to confirm that such items would be treated as pre-construction expenses and, thus, would
3 qualify for recovery through the NCRC. Because FPL's examples included expensive,
4 "long lead" equipment, OPC asked for a hearing to develop the impact of FPL's petition
5 on customers' bills. The Commission denied OPC's request for a hearing and granted
6 FPL's petition.

7 In Docket No. 080009-EI, I criticized FPL's initial policy of contracting for the
8 development of Turkey Point Units 6 and 7 on the basis of separate contracts rather than
9 an overall EPC contract. More recently, it has been my opinion that the minimalist
10 approach that FPL is taking with respect to the development of its proposed new nuclear
11 units is a preferable course of action in light of the downward trend in natural gas prices,
12 uncertainty regarding future load growth, and construction delays being experienced with
13 current nuclear power plant construction projects – all of which are factors potentially
14 affecting the long-term feasibility of constructing a nuclear plant. Prior to this proceeding,
15 OPC had not taken exception to FPL's pursuit of the Combined License ("COL") from the
16 Nuclear Regulatory Commission ("NRC") or the costs related to that effort.

17
18 **Q. WHAT ISSUES WILL YOU ADDRESS IN YOUR TESTIMONY?**

19 A. I will address FPL's decision not to submit a feasibility analysis for the Turkey Point 6 and
20 7 project.

21
22 **Q. WHAT IS THE CURRENT STATUS OF THE TURKEY POINT 6 AND 7**
23 **PROJECT?**

1 A. FPL is continuing its efforts to obtain the COL from the NRC for the project. However,
2 FPL witness Steven Scroggs stated in his April 27, 2016 testimony on pages 2 and 3, that
3 FPL does not have plans to move forward at this time into the pre-construction phase of
4 the project. Upon receipt of the COL, the project will be placed in a “license maintenance”
5 phase. FPL does not have plans at this time to enter into a contract for engineering,
6 procurement or construction services or to begin procurement of long lead equipment for
7 the project.

8

9 **Q. HAS THE SCHEDULE FOR THE NRC’S COL DECISION CHANGED SINCE**
10 **2015?**

11 A. Yes, the COL decision has slipped from the first quarter of 2017 to the fourth quarter of
12 2017, according to a comparison of Scroggs’ “Remaining Steps to Obtain Key State and
13 Federal Licenses for Turkey Point 6 & 7”, attached to his 2015 and 2016 testimonies,
14 Exhibits SDS-12 and SDS-9, respectively.

15

16 **Q. DO YOU EXPECT THE COL DECISION TO CONTINUE TO SLIP?**

17 A. Yes, it could continue to slip for some of the reasons discussed in my testimony.

18

19 **Q. DID FPL SUBMIT A FEASIBILITY STUDY FOR THIS PROJECT IN 2016 WITH**
20 **THEIR YEARLY NUCLEAR COST RECOVERY FILING?**

21 A. No, they did not.

1 **Q. HAS FPL SUBMITTED A FEASIBILITY STUDY FOR THE TURKEY POINT 6**
2 **AND 7 PROJECT IN PRIOR YEARS?**

3 A. Yes, FPL submitted a feasibility study every year in the NCRC filing as required from 2008
4 through 2015.

5

6 **Q. WHY DID FPL NOT SUBMIT THE REQUIRED FEASIBILITY STUDY THIS**
7 **YEAR?**

8 A. The reason that FPL is asking the Commission to accept for failing to submit this year's
9 feasibility study is they felt this year's required feasibility study would provide no
10 additional information and would be of no real value. In his May 11, 2016 deposition, Mr.
11 Scroggs stated:

12 We made a determination that we were going to pause in the pursuit of the
13 earliest practical schedule in light of delays to the first wave projects, and
14 deemed that a feasibility analysis would provide no additional information
15 at this point.

16 * * *

17 There is no real value to be had from a feasibility analysis that's not going
18 to receive any additional updates, particularly capital cost estimates.

19

20 Scroggs' Deposition at p. 15, line 19-23, and p. 16, lines 19-23.

21

22 **Q. DO YOU BELIEVE A FEASIBILITY STUDY SHOULD BE REQUIRED THIS**
23 **YEAR AND, IF SO, WHY?**

24 A. Yes. A feasibility study is required by Commission Rule, it is required as a condition of
25 the Turkey Point 6 & 7 Need Determination Order¹, and, as discussed below, is crucial in
26 monitoring the overall costs and feasibility of the project.

¹ Order No. PSC-08-0237-FOF-EI, issued April 11, 2008, in Docket No. 070650-EI (The Turkey Point 6 and 7 Need Determination Order).

1 **Q. WHAT DO THE RULE AND THE TURKEY POINT 6 AND 7 NEED**
2 **DETERMINATION ORDER APPROVING THE DETERMINATION OF NEED**
3 **SAY ABOUT A FEASIBILITY ANALYSIS?**

4 A. The nuclear cost recovery rule, Rule 25-6.0423(6)(c)5, Florida
5 Administrative Code, states:

6
7 Along with the filings required by this paragraph, each year a utility shall
8 submit for Commission review and approval a detailed analysis of the long-
9 term feasibility of completing the power plant. Such analysis shall include
10 evidence that the utility intends to construct the nuclear or integrated
11 gasification combined cycle power plant by showing that it has committed
12 sufficient, meaningful, and available resources to enable the project to be
13 completed and that its intent is realistic and practical.
14

15 (Emphasis added). The Turkey Point 6 and 7 Need Determination Order, states:

16
17 FPL shall provide a long-term feasibility analysis as part of its annual cost
18 recovery process which, in this case, shall also include updated fuel
19 forecasts, environmental forecasts, break-even costs, and capital cost
20 estimates. In addition, FPL should account for sunk costs. Providing this
21 information on an annual basis will allow us to monitor the feasibility
22 regarding the continued construction of Turkey Point 6 and 7.²
23

24 Both the Rule and Need Determination Order require a long-term feasibility analysis as
25 part of the annual cost recovery process. I am aware that FPL has requested a waiver of
26 the Rule and the Commission is scheduled to address that waiver request. However, I felt
27 it was important to address FPL's failure to supply this crucial measure of cost control and
28 monitoring in my testimony since Mr. Scroggs raises and attempts to justify FPL's failure
29 to supply it in his testimony.³

² Id. at page 29 (Emphasis added).

³ See, Scroggs' April 27, 2016 testimony at pp. 2-4.

1 **Q. PLEASE DESCRIBE THE ASPECTS OF THE TURKEY POINT 6 AND 7**
2 **PROJECT THAT SHOULD BE ADDRESSED IN A FEASIBILITY STUDY.**

3 A. A feasibility study for the Turkey Point 6 and 7 project should address all aspects of the
4 project that are required for the project to be successful. This includes the economic
5 feasibility of the project, the regulatory feasibility of the project, and the technical
6 feasibility of the project. If the project is not feasible in any of these areas, the risk to
7 ratepayers of continuing the project is too great since FPL's ratepayers are ultimately
8 responsible under the statute for any spending that may ultimately prove to be fruitless.

9

10 **Q. WHY IS IT OF PARTICULAR IMPORTANCE IN THIS NCRC DOCKET FOR FPL**
11 **TO FILE A FEASIBILITY STUDY FOR THE TURKEY POINT 6 AND 7**
12 **PROJECT?**

13 A. In addition to being required by the NCRC rules and The Turkey Point 6 and 7 Need
14 Determination Order, it is of particular importance for FPL to file a feasibility study for the
15 Turkey Point 6 and 7 units in this year's docket because uncertainty has increased in all
16 three of the key areas of feasibility: economic, regulatory and technical. Below I will
17 specifically detail the reasons I believe uncertainty has increased related to the economic,
18 regulatory and technical feasibility of the Turkey Point 6 and 7 project.

19

20 **Q. PLEASE DISCUSS THE INCREASED UNCERTAINTY IN THE ESTIMATED**
21 **COST OF THE TURKEY POINT 6 AND 7 PROJECT.**

22 A. As discussed in detail in my testimony last year in docket number 150009-EI, it is my
23 opinion that the cost estimate that FPL has used in its economic feasibility analyses is

1 flawed. The publicly reported costs of the Vogtle and Summer projects currently in
2 construction that have been used for FPL's benchmark for its estimated costs do not reflect
3 the true costs of these projects. The costs being publicly reported by Vogtle and Summer
4 are only the owner's costs under their EPC agreements, and these costs do not reflect the
5 additional, actual costs being incurred and absorbed by the contractors for these projects.
6 Since my testimony last year, the major litigation related to the Vogtle project has settled.
7 As a result of this settlement, the capital forecast for the Vogtle project has increased \$713
8 million. However, this settlement payment reflects only a portion of the project costs that
9 have been incurred by the contractors. On May 26, 2016, South Carolina Electric and Gas
10 announced a cost increase of \$852 million for their 55% share of the Summer project, or
11 an increase of \$1.55 billion for the total project. The continued increases in costs for the
12 Vogtle and Summer projects demonstrate the uncertainty in estimating the true cost of the
13 Turkey Point 6 and 7 project. And because the costs incurred by the contractors is not
14 publicly available, the true total costs of the Vogtle and Summer projects will never be
15 known; however, these costs are significantly higher than the publicly reported costs.

16
17 **Q. DOES THE UNCERTAINTY IN THE TYPE OF CONTRACT FOR THE TURKEY**
18 **POINT 6 AND 7 PROJECT INCREASE THE UNCERTAINTY RELATED TO THE**
19 **PROJECT?**

20 **A.** Yes, it does. FPL witness Scroggs states in his May 11, 2016 deposition:

21 Q. Okay. Do you expect to be able to receive fixed price contracts for
22 Turkey Point 6 and 7?

23 A. No.

24 Q. Okay. What type of contracts would you expect to receive?

25 A. I would expect it will be a mix of fixed price, firm price, variable
26 price.

1 Scroggs' Deposition at p. 116, lines 7-13. Without a fixed/firm type of contract, the
2 certainty of the final cost is greatly reduced. This uncertainty was experienced in the earlier
3 construction of nuclear plants in which the owner was responsible for all cost overruns,
4 and the costs of completed plants skyrocketed to many times the initial cost estimates. FPL
5 also experienced this type of cost increase without a fixed or firm price contract when the
6 cost of their Extended Power Uprate projects at Turkey Point 3 and 4 and St. Lucie 1 and
7 2 nearly doubled from the initial need determination cost estimate of \$1.8 billion to a final
8 total estimated cost of \$3.4 billion.⁴

9
10 **Q. DOES FPL ACKNOWLEDGE THE UNCERTAINTY IN THE ESTIMATED COST**
11 **OF THE TURKEY POINT 6 AND 7 PROJECT?**

12 A. Yes. On page 4, lines 4 through 7 of his April 27, 2016 testimony, FPL witness Scroggs
13 states "Projected quantitative benefits, however, remain uncertain due to lack of a refined
14 assessment of capital construction costs that will be developed following completion of
15 first wave AP 1000 construction experience." While this is obviously true, the use of the
16 term "refined" does not connote that the total true cost of the project is a matter of a "fine-
17 tuning" type of "refinement." Rather, my experience and observations lead me to conclude
18 that there are likely material adjustments to the overall project cost and schedule that FPL
19 has yet to incorporate in the estimates it provides to the Commission each year.

20
21 **Q. WHEN ARE THE FIRST WAVE AP 1000 CONSTRUCTION PROJECTS**
22 **SCHEDULED TO BE COMPLETED?**

⁴ Docket 140009-EI, Nuclear Filing Requirements Book, Schedule TOR-2 (True-up to Original) filed May 1, 2014, sponsored by Jennifer Grant-Keene, JGK-10, and Terry O. Jones.

1 A. The Vogtle and Summer projects are scheduled to be completed in mid-2020. Based on
2 Mr. Scroggs' testimony, it will be at least 2020 before FPL will be able to develop a "refined
3 assessment of capital construction costs" for the Turkey Point 6 and 7 project. However,
4 as stated above, even when the final publicly reported costs of the Vogtle and Summer
5 projects are known, these costs will not be representative of the true costs to engineer,
6 procure and construct these projects.

7

8 **Q. PLEASE DISCUSS THE INCREASED REGULATORY UNCERTAINTY FOR THE**
9 **TURKEY POINT 6 AND 7 PROJECT.**

10 A. On April 20, 2016, the Florida Third District Court of Appeal reversed and remanded the
11 decision by the State Siting Board to certify the Turkey Point 6 and 7 site. This decision
12 increases the uncertainty of the feasibility of the proposed Turkey Point 6 and 7 site.

13

14 **Q. PLEASE DESCRIBE THE POTENTIAL IMPACT OF THIS DECISION IN MORE**
15 **DETAIL.**

16 A. On April 20, 2016, the Third District Court of Appeal reversed the Final Order on
17 Certification rendered by Florida's State Siting Board for Turkey Point 6 and 7.⁵ That Final
18 Order allowed:

19 . . . Florida Power & Light Company ("FPL") to construct and operate two
20 new nuclear generating units and associated facilities at Turkey Point, in
21 addition to allowing FPL to install miles of new transmission lines. . . . We
22 reverse and remand because the Siting Board failed to apply the City of
23 Miami's applicable land development regulations, the Siting Board
24 erroneously thought it did not have the power to require FPL to install the
25 lines underground at FPL's expense, and the Siting Board erred in

⁵ Miami-Dade Cnty. v. Fla. Power & Light Co., 41 Fla. L. Weekly D964 (Fla. 3d DCA, April 20, 2016).

1 interpreting the County's East Everglades Ordinance as a zoning regulation,
2 rather than an environmental one.⁶
3

4 Thus, I am informed by the attorneys at the OPC that FPL does not have permission from
5 the State of Florida to build the plant at the Turkey Point site. The ultimate impact of this
6 decision on issuance of the COL by the NRC is uncertain at this time. However, the project
7 must have State approval to construct the needed transmission facilities to carry the power
8 generated at the plant to FPL's customers. Without the needed transmission, the plant is of
9 no use. Thus, reversal of the site certification clearly increases the regulatory uncertainty
10 in constructing the project. While I am not expressing an opinion on the legal issues related
11 to this court decision, I am expressing that the uncertainty it interjects into the project at
12 this juncture does have a material negative impact on the feasibility of the project at this
13 time.
14

15 **Q. PLEASE DISCUSS THE INCREASED TECHNICAL UNCERTAINTY FOR THE**
16 **TURKEY POINT 6 AND 7 PROJECT.**

17 A. On April 21, 2016, the Atomic Safety and Licensing Board ("ASLB") for Turkey Point 6
18 and 7 issued a Memorandum and Order in which the panel found one admissible contention
19 to be litigated before the Board. This contention is that plant waste water, containing
20 carcinogenic liquids, proposed to be injected into the Boulder Zone deep below the surface,
21 could migrate upward into drinking water supplies. This contention will require a hearing
22 and expert testimony to be presented by the Company, NRC staff, and intervenors. If this
23 matter is not resolved in the Company's favor, a new plan for handling waste water will be
24 needed. This could be a difficult technical issue to solve.

⁶ Id. at p. 2 (footnote omitted).

1 **Q. WHY COULD IT BE A DIFFICULT TECHNICAL ISSUE TO SOLVE?**

2 A. All power plants, including nuclear power plants, must have a means for disposing of waste
3 water. If the ASLB concludes that discharge of waste water into the Boulder Zone is not
4 allowed, an alternate means of disposal of waste water will be required. This would entail
5 a change in the plant design and would also likely require additional environmental review
6 if the alternate means involves discharging waste water into the sensitive environment
7 surrounding the Turkey Point site. In summary, revising the design for waste water
8 discharge and any additional regulatory and/or environmental reviews could significantly
9 impact the cost and schedule for the project.

10

11 **Q. PLEASE DESCRIBE THE IMPACT OF THE TURKEY POINT 3 AND 4 COOLING**
12 **CANAL ISSUE ON THE TURKEY POINT 6 AND 7 PROJECT.**

13 A. The Turkey Point 3 and 4 cooling canal issue involves a contention that the high salinity
14 of the cooling canals is resulting in saltwater intrusion into the aquifer that provides
15 drinking water for most of south Florida. On April 25, 2016, the State of Florida
16 Department of Environmental Protection (“Department”) issued an order which found that
17 the Turkey Point Cooling Canal System (“CCS”), used by Turkey Point Units 1-5, is the “.
18 . . . major contributing cause to the continuing westward movement of the saline water
19 interface:” and “[t]he CCS groundwater discharge of hypersaline water contributes to
20 saltwater intrusion” and “[s]altwater intrusion into the area west of the CCS is impairing
21 the reasonable and beneficial use of adjacent G-II groundwater. . .”⁷ The Company had 21
22 days to file additional information and to enter into consultations with the Department. If

⁷ Notice of Violation and Orders for Corrective Action, State of Florida Department of Environmental Protection v. Florida Power & Light Company, Inc., OCG File No.: 16-0241 dated April 25, 2016, at p. 3.

1 the parties are unable to come up with a suitable remediation plan within 60 days, the
2 Department will issue its own comprehensive management plan to abate the problem.

3
4 **Q. HOW DOES THIS ISSUE RELATED TO TURKEY POINT 3 AND 4 AFFECT THE**
5 **TURKEY POINT 6 AND 7 PROJECT?**

6 A. While this issue does not directly affect the Turkey Point 6 and 7 project at this time, it
7 illustrates the extremely sensitive nature of any water-related issues for the Turkey Point
8 projects. As described above, the Turkey Point 6 and 7 project is facing a contention related
9 to the discharge of waste water from the project. This issue demonstrates that all water-
10 related issues for the Turkey Point 6 and 7 project will be highly scrutinized and receive a
11 high level of attention from the public and from governmental bodies and agencies in the
12 south Florida area. The intense scrutiny of all water-related issues for Turkey Point could
13 lead to additional intervention and contentions before the ASLB and NRC. Defending the
14 current design or revising the design, if needed, would increase the project cost and could
15 impact the schedule as well.

16
17 **Q. WHAT IS YOUR RECOMMENDATION REGARDING FPL'S FAILURE TO**
18 **SUBMIT A FEASIBILITY STUDY FOR THE TURKEY POINT 6 AND 7**
19 **PROJECT?**

20 A, I recommend that FPL not be allowed to recover any new costs related to the Turkey Point
21 6 and 7 project until such time as FPL has submitted a long-term feasibility study upon
22 which the Commission can make an informed decision regarding these costs.

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

2 A. Yes, it does.

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.

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that a true and correct copy of the foregoing has been furnished by electronic mail on this 13th day of June, 2016, to the following:

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