

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

DOCKET NO. E-7, SUB 1146

In the Matter of	)	
Application of Duke Energy Carolinas,	)	TESTIMONY OF
LLC, for Adjustment of Rates and	)	DUSTIN R. METZ
Charges Applicable to Electric Utility	)	PUBLIC STAFF – NORTH
Service in North Carolina	)	CAROLINA UTILITIES
	)	COMMISSION

**BEFORE THE NORTH CAROLINA UTILITIES COMMISSION  
DOCKET NO. E-7, SUB 1146**

**TESTIMONY OF DUSTIN R. METZ  
ON BEHALF OF THE PUBLIC STAFF  
NORTH CAROLINA UTILITIES COMMISSION**

**JANUARY 23, 2018**

1   **Q.   PLEASE STATE YOUR NAME, BUSINESS ADDRESS, AND**  
2       **PRESENT POSITION.**

3   A.   My name is Dustin Ray Metz. My business address is 430 North  
4       Salisbury Street, Dobbs Building, Raleigh, North Carolina. I am an  
5       Engineer with the Electric Division of the Public Staff – North Carolina  
6       Utilities Commission.

7   **Q.   BRIEFLY STATE YOUR QUALIFICATIONS AND DUTIES.**

8   A.   My qualifications and duties are included in Appendix A.

9   **Q.   WHAT IS THE PURPOSE OF YOUR TESTIMONY?**

10  A.   The purpose of my testimony is to present the results of my  
11       investigation of Duke Energy Carolinas, LLC's (DEC or Company):  
12       (1) proposed coal inventory levels; (2) request for cancelation of the  
13       proposed W.S. Lee Nuclear (Lee Nuclear) plant; and (3) the request  
14       for recovery of the Lee Nuclear plant project development costs.

1 **COAL INVENTORY**

2 **Q. WHAT IS THE COMPANY'S PROPOSED COAL INVENTORY**  
3 **ADJUSTMENT IN THIS CASE?**

4 A. The Company's proposed adjustment for coal inventory, as reflected  
5 in its Form E-1, Item 10, Adjustment NC-1600, sets the inventory  
6 balance to 40 days of 100 percent full load burn, resulting in a  
7 reduction to the materials and supplies component of cash working  
8 capital in this case. This is the level of coal inventory that was utilized  
9 in DEC's last general rate case, Docket No. E-7, Sub 1026, for the  
10 materials and supplies component of cash working capital, and was  
11 stipulated to by the Public Staff and the Company in their Agreement  
12 and Stipulation of Settlement filed with the Commission on June 17,  
13 2013, and approved by the Commission by Order dated September  
14 24, 2013.

15 **Q. WHAT WAS THE COMPANY'S ACTUAL LEVEL OF COAL**  
16 **INVENTORY AT THE TIME OF FILING OF THIS CASE?**

17 A. Based upon the Company's response to a Public Staff data request  
18 and my calculations, the inventory on hand at the time of the filing of  
19 this case was approximately 54 days of full load burn.<sup>1</sup>

---

<sup>1</sup> Coal Balance (\$) / Projected Price of Coal (\$/ton) / Full Load Burn Rate (tons/day) =  
on hand inventory (day)

1    **Q.    HOW DID THE COMPANY REACH 50 PLUS DAYS OF 100**  
2           **PERCENT FULL LOAD BURN INVENTORY?**

3    A.    There is no single reason, but a primary reason is the continued low  
4           cost of natural gas for electricity generation, combined with legacy  
5           coal contracts with purchase/delivery requirements. Unprecedented  
6           development of renewable generation, particularly solar PV, has also  
7           played a role.    Similar circumstances and outcomes were also  
8           observed during the recent Duke Energy Progress, LLC general rate  
9           case, Docket No. E-2, Sub 1142 (Sub 1142 case).

10   **Q.    HOW DID YOU REVIEW DEC'S PAST AND PROSPECTIVE COAL**  
11           **GENERATION?**

12   A.    First, I reviewed DEC's coal plant capacity factors (CF)<sup>2</sup> for the  
13           period 2013-2016. Next, I calculated a simple average CF for each  
14           year, as well as a simple linear average to smooth out any  
15           "lumpiness" in certain years due to unusual or abnormal events.

16           I selected 2013 as the beginning year for my analysis, because, as  
17           you can see from Metz Exhibit 1, it was the year that natural gas  
18           prices reached historically low price levels, price volatility decreased,  
19           and DEC had reached its current level of natural gas combined cycle

---

<sup>2</sup> Capacity Factor is a ratio of the actual energy generated to the maximum possible energy that could have been generated.

1 generating capacity after several years of construction activities.<sup>3</sup>  
2 Also, as can be seen by the trend line of capacity factors shown in  
3 Metz Exhibit 2, there has been a decreasing trend of coal plant  
4 generation output since 2013 of approximately 4%.

5 Next, I analyzed prospective coal generation for upcoming years. In  
6 response to a Public Staff data request, the Company provided  
7 expected annual CFs (by unit) for its coal fleet for the years 2017  
8 through 2020. Metz Exhibit 3 combines historical CF data with the  
9 DEC-provided prospective CFs based on expected coal fleet  
10 operation. This exhibit shows a continued expected downward trend  
11 in coal generation, leading to an expected overall decrease in coal  
12 plant CFs of nearly 19% for the period 2013-2020.

13 **Q. EARLIER IN YOUR TESTIMONY YOU REFERRED TO “FULL**  
14 **LOAD BURN”. PLEASE DEFINE THIS PHRASE.**

15 A. “Full load burn” refers to the physical quantity of coal needed for full  
16 generation output for the entire DEC coal fleet for a continuous 24-  
17 hour period. Forty days of “full load burn” or 100 percent full load  
18 burn refers to the quantity of coal (in tons) necessary for DEC’s entire  
19 coal fleet (Allen, Belews Creek, Cliffside, and Marshall ) to operate  
20 for 40 continuous 24 hour periods, regardless of actual system loads.

---

<sup>3</sup> Buck Combined Cycle Power Plant achieved commercial operation in November, 2011; Dan River Combined Cycle Power Plant achieved commercial operation in December, 2012.

1     **Q.     HAS THE COMPANY EVER OPERATED ITS ENTIRE FLEET OF**  
2           **COAL PLANTS AT FULL LOAD OR FULL LOAD BURN FOR A**  
3           **CONTINUOUS 24-HOUR PERIOD?**

4     A.     The Company stated that it does not track, compile or report that  
5           statistic; therefore, it is unknown. However, it would not be unheard  
6           of to expect the Company's coal generation fleet, in whole or in part,  
7           to operate for 24 continuous hours during certain times of the year,  
8           particularly during extreme weather conditions. Based upon my  
9           review of CF profiles and Company responses to a Public Staff data  
10          request, however, it is unlikely that the Company's coal fleet would  
11          operate at 100 percent full load burn for anything approaching 40  
12          consecutive days, particularly in light of the current state of natural  
13          gas prices combined with the total natural gas and renewable  
14          generation capacity interconnected to DEC's system.

15    **Q.     WHY DOES THE COMPANY CONTINUE TO ADVOCATE FOR A**  
16          **40-DAY, 100 PERCENT FULL LOAD BURN COAL INVENTORY**  
17          **METHODOLOGY, VERSUS AN AVERAGE BURN, OR SOME**  
18          **OTHER METHODOLOGY?**

19    A.     The initial application in this proceeding states as follows: "The  
20          Company does not use "average" burn to report how many "days" of  
21          inventory is in storage because the average burn for any given period  
22          can vary greatly due to many factors and it can over-state the amount

1 of inventory in storage.”

2 In response to a Public Staff data request regarding coal inventory  
3 strategy, the Company stated that it contemplated increasing its coal  
4 inventory from the currently approved 40 days of full load burn due  
5 to a variety of factors, but ultimately decided to continue to operate  
6 at 40 days of full load burn inventory.

7 While I do not disagree with the above explanation, there is a  
8 difference in a target value established in a general rate case for  
9 annual cash working capital requirements, and a strategy to prepare  
10 for short term operational needs.

11 **Q. ARE DEC’S COAL PLANTS, AS CURRENTLY OPERATED,**  
12 **CONSIDERED TO BE INTERMEDIATE OR BASELOAD**  
13 **GENERATION?**

14 **A.** DEC’s coal fleet is currently operated as a mixture of baseload,  
15 intermediate, and peaking generation;<sup>4</sup> however, these plants were  
16 originally built to operate, and did so for many years, as baseload  
17 generation.

---

<sup>4</sup> Intermediate generating plants are traditionally characterized as generation that has an annual capacity factor of 10% up to 60%; baseload generating plants typically operate at an annual capacity factor in excess of 60%. In its 2017 IRP Update Report filed on September 1, 2017, in Docket No. E-100, Sub 147, DEC designates Belews Creek Units 1 and 2, and Marshall Units 3 and 4 as baseload; Allen Unit 5, Cliffside Unit 6, and Marshall Units 1 and 2 as intermediate; and Allen Units 1-3 and 5, and Cliffside Unit 5 as peaking.

1 Metz Exhibit 4 shows a monthly CF profile for DEC's Belews Creek  
2 Steam Station (Belews) for the period 2015 through 2017. The CF  
3 profile clearly demonstrates that Belews' CF exceeded 70% in only  
4 13 of the 32 months shown. Metz Exhibit 5 shows that Cliffside  
5 Steam Station had a monthly CF very different from Belews for the  
6 same time period. However, significant contribution to the system's  
7 energy needs (consumption of coal or energy produced from the  
8 utilization of coal generation) is still occurring during peak periods.

9 DEC's coal fleet provides a significant contribution to meeting system  
10 requirements during peak periods, most notably Belews Creek and  
11 Marshall Steam Stations. Table 1, below, illustrates capacity factors  
12 by station during the months of June through August. On a fleet level  
13 from 2011 to 2017, the weighted average capacity factor and coal  
14 consumption rates during this peak 3 month period is approximately  
15 61%. Focus should be on the total coal consumption or generation  
16 over the entire fleet and not solely on a single plant or some  
17 combination of a select group of units because the cash working  
18 capital requirement to support a particular inventory level is based  
19 on a system wide calculation.



	Capacity Factors (%)			
Peak Period June-Aug.	Belews	Cliffside	Marshall	Allen
2011	91.2	51.2	77.8	54.9
2012	85.6	41.2	63.2	36.9
2013	78.5	54.4	41.6	27.8
2014	78.9	59.7	48	29.6
2015	78.3	61.6	61.9	37.4
2016	75.6	57.8	72.4	30.8
2017	78.9	58.4	65.4	15.2

Table 1: Peak Contribution

**Q. WHAT IS THE WEIGHTED CAPACITY FACTOR FOR DEC'S COAL FLEET AND HOW DOES IT EQUATE TO A PHYSICAL COAL INVENTORY OF LOAD BURN DAYS IN "REAL TIME" OPERATION?**

A. Utilizing both the historic and DEC-provided prospective CFs for the Company's coal fleet (Metz Exhibit 3) produces a weighted<sup>5</sup> average CF of 39.7% for the period 2013-2020. This is similar to DEP's weighted average CF of 39.4% for the period 2013-2019, as referenced in my testimony filed in the Sub 1142 case.

Regarding the "real time" operation of the system, a 40-day full load (100% CF) burn inventory is equivalent to 101 days of burn for a coal fleet operating at a 39.7% CF. The ~54 days of full load burn in

<sup>5</sup> A "weighted" average adjusts the percentage contribution for a single unit (or plants) to the system (fleet). For example, the greater the nameplate generation, the more it contributes to the overall system, and the more it influences the average capacity factor.

1 inventory at the time of filing of this case equates to 136 days of burn  
2 at a 39.7% CF.

3 **Q. ARE YOU RECOMMENDING THAT THE COMPANY'S PHYSICAL**  
4 **COAL INVENTORY BE BASED ON AN ANNUAL WEIGHTED**  
5 **AVERAGE CF OF 39.7%?**

6 A. No. I was only using the 39.7% CF to highlight that the Company's  
7 coal fleet is not being utilized at anywhere close to 100% annually.

8 **Q. WHAT IS YOUR RECOMMENDATION FOR A COAL INVENTORY**  
9 **ADJUSTMENT AND WHY?**

10 A. I recommend an adjustment to the materials and supplies  
11 component of cash working capital to reflect a 40-day inventory  
12 based on a 70% CF full load burn, versus the DEC-requested 40-day  
13 inventory based on a 100% CF full load burn.

14 My recommendation of the use of a 70% CF recognizes that during  
15 a portion of the year, coal generation assets are operating  
16 substantially above my calculated weighted annual CF of 39.7%,  
17 particularly during the summer months of June through August, with  
18 a fleet weighted average CF of approximately 61% (reference Metz  
19 Exhibits 4 and 5 and Table 1). In addition, cold weather events  
20 sometimes necessitate increased utilization of the coal fleet during  
21 the winter season; however these winter events are typically of a

1 shorter duration than the summer utilization of these coal generation  
2 assets.

3 In evaluating Metz Exhibits 4 and 5 in conjunction with the summer  
4 and winter peak periods mentioned directly above, I believe a 70%  
5 CF represents a reasonable estimate, and incorporates a margin of  
6 contingency to account for the Company's coal fleet performance  
7 during peak conditions (See Table 1 for coal fleet CF performance  
8 during peak periods). My recommendation does not mean that the  
9 Company should keep inventory levels at all times of the year to  
10 support a 70% CF. In fact, I expect that the Company will adjust its  
11 inventory levels based on anticipated seasonal needs as it has  
12 historically done. In addition, the Company has the opportunity to  
13 purchase coal on the spot market to address near term needs should  
14 they arise, as well as from their own interim coal storage.

15 **Q. PLEASE DISCUSS YOUR SELECTION OF 40 DAYS OF**  
16 **INVENTORY.**

17 A. During my investigation, I requested that the Company provide its  
18 most recent coal inventory reliability study (or equivalent). The  
19 Company indicated that it has not conducted a reliability study or  
20 other analysis related to determining the appropriate level of coal  
21 inventory within the last five years. In fact, DEC has never conducted  
22 a study to determine the appropriate level of fleet wide coal inventory.

1 My analysis took into consideration DEC's coal generation assets,  
2 including its use of supercritical coal-fired generation technology,<sup>6</sup>  
3 and fuel pricing. DEC's coal generation, in terms of \$/MWh, operates  
4 closer to the dispatch margin with its combined cycle natural gas  
5 generation than is typically the case with DEP's coal generation. In  
6 other words, lower delivered fuel prices for DEC's coal generation  
7 (due to closer proximity to coal sources), combined with more  
8 efficient generation technology, places certain of DEC's coal  
9 generation assets closer to the dispatch stack "bubble" than DEP's  
10 coal generation assets.

11 Finally, I analyzed DEC's requested cash working capital for their  
12 coal inventory in prior rate cases, and in combination with all my  
13 other analyses, I was led to the conclusion that a 40-day inventory at  
14 70% CF for the DEC coal fleet was the appropriate level to  
15 incorporate into the materials and supplies component of cash  
16 working capital, given the historical trends and predicted use of  
17 DEC's coal fleet.

---

<sup>6</sup> DEC's supercritical units are Belews Creek Units 1 and 2, Cliffside Unit 6, and Marshall Units 3 and 4. Supercritical units operate at higher turbine pressure than subcritical units, resulting in less fuel burned per unit of generation output, i.e., greater efficiency.

4     A.     The inventory levels have varied slightly over the last three rate  
5           cases; however, Table 2 below illustrates its “on hand” inventory (at  
6           full load burn) at the time of the filing of the rate case, along with  
7           DEC’s requested level of inventory.

Docket E-7, Sub ____	On hand Inventory	Requested Level
Sub 909	36 days	36 days
Sub 989	33 days	40 days
Sub 1026	64 days	40 days

8 Table 2: Coal Inventory Levels

11 A. Based upon my review and the supporting values shown in Table 2,  
12 yes, the quantity of DEC's "on hand" inventory has changed over the  
13 years.

14 Q. WHAT ARE THE COAL STORAGE CAPABILITIES (EXPRESSED  
15 IN DAYS AT FULL LOAD BURN) FOR EACH OF THE  
16 COMPANY'S COAL GENERATION PLANTS?

1     A.     The Company is currently performing on site construction projects at  
2           some of their plants due to CCR and CAMA regulations. Therefore,  
3           the current storage capabilities are temporarily limited.

4           DEC reported that Allen Steam Station (Allen) historically has had a  
5           66 day storage capability. Currently, Allen's coal capacity is reduced  
6           to 39 days of storage. The target completion date of construction  
7           activities limiting coal storage capability at Allen is November 2018.  
8           The Company does not expect that the site will be able to return to a  
9           66 day storage capability post construction, but it should be able to  
10          increase from the current 39 day storage capability.

11          Marshall is undergoing similar construction activities to Allen,  
12          resulting in reduced coal storage capability. Historically, Marshall  
13          has had a 93 day storage capability; however, capacity is currently  
14          reduced to a 60 days of storage. Similar to Allen, once the  
15          construction activities are completed in April 2018, coal storage  
16          capabilities will increase from the current 60 day storage capability.

17          Currently, Belews Creek has 91 days of storage capability, and  
18          Cliffside has 38 days of storage capability.

19     **Q.     WHAT IS YOUR PROPOSED ADJUSTMENT IN FULL LOAD**  
20     **BURN DAYS?**

1 A. My proposed adjustment would equate to 28 days of full load burn  
2 for cash working capital purposes.

3 **Q. ARE YOU ASKING THE COMMISSION TO DIRECT DEC AS TO**  
4 **HOW IT SHOULD OPERATE AND DISPATCH ITS COAL FLEET?**

5 A. Absolutely not. I am asking the Commission to make an adjustment  
6 to the materials and supplies component of cash working capital for  
7 coal inventory that is more reflective of how DEC has operated its  
8 coal fleet in recent years and how DEC expects to operate its coal  
9 fleet in future years. This adjustment should not have any effect on  
10 the Company's actual dispatch and operation of its generating  
11 plants.

12 **Q. WHAT IS THE DOLLAR VALUE OF YOUR PROPOSED**  
13 **ADJUSTMENT?**

14 A. My recommendation of a 40-day full load burn at a 70% CF results  
15 in a further reduction of \$55,475,240 (system) to coal inventory, in  
16 addition to the Company's already proposed reduction of  
17 \$66,473,000 (system),<sup>7</sup> for a total test year reduction of  
18 \$121,948,240 (system). This adjustment has been provided to  
19 Public Staff witness Boswell for incorporation in her testimony.

---

<sup>7</sup> Based on the Company's proposed reduction to a 40-day full load burn at a 100% CF.

1                                    **W. S. LEE III NUCLEAR PROJECT**

2        **Q.        CAN YOU PROVIDE AN OVERVIEW OF THE PUBLIC STAFF'S**  
3                    **INVESTIGATION INTO THE COMPANY'S REQUEST FOR**  
4                    **RECOVERY OF COSTS ASSOCIATED WITH THE W. S. LEE III**  
5                    **NUCLEAR PROJECT?**

6        **A.        Yes. The Public Staff hired Global Energy & Water Consulting, LLC**  
7                    **(Consultants) to:**

- 8                    1.        Review the details of all costs charged to the capital  
9                                    accounts assigned to engineering, licensing, and  
10                                  regulatory compliance for the W. S. Lee III Nuclear  
11                                  Project (Lee Project);
- 12                    2.        Review of the decisions to begin, continue, and  
13                                    cancel the project, in light of various North Carolina  
14                                  Utilities Commission orders, as well as issues arising  
15                                  during the course of the Lee Project with the AP1000<sup>8</sup>  
16                                  design; with Westinghouse Electric Company  
17                                  (including bankruptcy); and with Toshiba  
18                                  Corporation, majority owner of Westinghouse;

---

<sup>8</sup> AP1000 is a nuclear power plant design developed and sold by Westinghouse Electric Company, and is the design selected by DEC for the Lee Project. The AP1000 received final design certification from the United States Nuclear Regulatory Commission (NRC) in December, 2005.



1           3.     Provide an expert opinion as to whether and how the  
2                 decisions DEC made during the course of project  
3                 planning affected the costs;

4           4.     Determine whether the actual costs for engineering,  
5                 licensing, regulatory compliance, etc., were  
6                 commensurate with other utilities as they were  
7                 planning for the addition of similar units; and

8           5.     Identify any costs incurred by DEC that can be  
9                 substantiated as not being reasonable, used and  
10                useful, or prudent.

11           In addition to the analysis by the Consultants, the Public Staff also  
12           performed its own internal investigation of the events and costs,  
13           including a site visit. Due to the complexity and scope of the  
14           prudence review, the Public Staff relied on the Consultants'  
15           extensive professional experience with other nuclear construction  
16           activities and NRC application processes, particularly those related  
17           to Vogtle Units 3 and 4, V. C. Summer Units 2 and 3, and Turkey  
18           Point Units 6 and 7.

19           The Consultant's findings, attached as Metz Exhibit 6, as well as the  
20           Public Staff's internal investigation, conclude that the costs incurred  
21           by DEC in pursuit of the Combined Operating License (COL) for the  
22           Lee Project, including costs associated with pre-construction and site

1 development, land and right-of-way purchases, supply chain,  
2 construction planning and detailed engineering (with one exception  
3 as discussed below), operational planning, and post-COL costs were  
4 reasonable and prudent based upon information reasonably known  
5 at the time. Public Staff witness Maness will address the issue of  
6 recovery of costs related to AFUDC (allowance for funds used during  
7 construction).

8 **Q. ARE YOU RECOMMENDING ANY ADJUSTMENTS TO THE**  
9 **COSTS IN THE DEVELOPMENT/DETAILED ENGINEERING**  
10 **CATEGORY?**

11 A. Yes, I am requesting a disallowance for the costs incurred for the  
12 architectural and engineering (AE) design of a visitor center.

13 **Q. PLEASE EXPLAIN WHY YOU ARE RECOMMENDING THIS**  
14 **DISALLOWANCE.**

15 A. In its August 5, 2011 Order in Docket No. E-7, Sub 819 (2011 Order)  
16 the Commission stated as follows: “the approval granted by this  
17 Order is limited to Duke’s decision to incur only those nuclear project  
18 development costs that must be incurred to maintain the status quo  
19 with respect to the Lee Station, including Duke’s COL application at  
20 the NRC.” (emphasis added) In this same Order, the Commission  
21 further stated: “all activities and expenditures will be subject to later  
22 determinations as to their prudence and reasonableness.” I relied

1           upon my understanding of the above-referenced Commission  
2           language from the 2011 Order to evaluate the reasonableness of  
3           expenditures for which the Company is seeking cost recovery in this  
4           proceeding.

5           In my opinion, the costs incurred for the Visitor Center: (1) do not  
6           directly support the Lee Project COL application process at the NRC;  
7           and (2) given their timing, were not necessary to maintain the “status  
8           quo” with respect to the Lee Project. Therefore, based upon the  
9           2011 Order, the costs should be excluded from cost recovery.

10   **Q.     WHAT WAS THE COMPANY’S RATIONALE FOR BUILDING A**  
11   **VISITOR CENTER?**

12   A.     Initially, in response to a Public Staff data request, the Company  
13           stated that “A Visitors Center is provided for the purposes of  
14           educating the public and to allow the public to observe the  
15           construction of the Lee Nuclear Station Units 1 & 2. The proposed  
16           plan is for a one story center with the observation deck extending out  
17           over the edge of the mountain.”

18           The Public Staff sent DEC a follow-up data request to obtain more  
19           detailed information on the overall “need” to incur costs at the time  
20           for the AE design of the Visitor Center. DEC responded:

1           “The purpose of the visitor center deck, which would allow  
2           the public to observe the construction of the Lee Nuclear  
3           Station Units 1 and 2, was to provide transparency of the  
4           construction activities and confidence in the project.”

5           “Other beneficial uses of the Visitor Center during the  
6           construction phase of the project (and through operation)  
7           are public education and provision of meeting space  
8           (auditorium, conference room) that would be available for  
9           use by persons such as teachers or local government  
10          officials at no cost to them.”

11          “While the A/E design costs of the Visitor Center were not  
12          absolutely required at this time, it was determined to be  
13          beneficial, as described above, to develop the Visitor  
14          Center in the time to support construction of the Lee  
15          Nuclear Station, thus maximizing the timeframe of the  
16          benefits of the Visitor Center (i.e., during the period of  
17          construction as well as operation of the plant).”

18          The Company further responded:

19          “Commercial building design activities, and specifically the  
20          design of the six buildings in question, were necessary to  
21          preserve the Lee Nuclear Project as an option during the  
22          timeframe identified in the Company’s IRPs.”

1    **Q.    IN YOUR OPINION, WERE THE AE DESIGN COSTS FOR THE**  
2           **VISITORS CENTER A REASONABLY AND PRUDENTLY**  
3           **INCURRED COST?**

4    A.    No. DEC has not demonstrated that the Visitors Center was  
5           necessary to support the NRC application process or to maintain the  
6           status quo of the project. Therefore, I recommend that these costs  
7           be disallowed.

8    **Q.    WHAT IS THE DOLLAR VALUE OF YOUR PROPOSED**  
9           **ADJUSTMENT?**

10   A.    I recommend a disallowance of \$507,009 (system) for the costs  
11           spent toward AE design of the visitor center (exclusive of AFUDC).  
12           This adjustment has been provided to Public Staff witness Boswell  
13           for incorporation in her testimony.

14   **Q.    ARE THERE OTHER AE DESIGN COSTS THAT YOU BELIEVE**  
15           **WERE REASONABLY AND PRUDENTLY INCURRED?**

16   A.    Yes. In January 2011, an AE report (AECOM Study) was completed  
17           that identified **commercial** buildings that were necessary to support  
18           the Lee Project. The report outlined 15 buildings to be built as  
19           ancillary or adjunct support buildings to the Lee Nuclear Plant.  
20           These facilities included administration buildings, storage facilities, a  
21           receiving warehouse, and a training center, in addition to the

1           aforementioned Visitors Center. The overall AE agreement for the  
2           detailed design of these adjunct buildings was completed in the  
3           December 2013 timeframe.

4           I based my review of the prudence of the decisions made to incur  
5           these AE costs by reviewing DEC's Integrated Resource Plans  
6           (IRPs) that identified a need for the Lee Nuclear Plant (Lee Project)  
7           as well as the planning horizon and the required construction time  
8           for these facilities as detailed in DEC's responses to Public Staff  
9           discovery requests in both the relevant IRP dockets and this case.  
10          With the exception of the Visitors Center, I believe that the Company  
11          has demonstrated a need for the buildings to support the Lee Nuclear  
12          project and that it undertook a well-documented, competitive request  
13          for proposals and evaluation process with multiple vendors. In my  
14          opinion, other than the AE costs of the Visitors Center, the remaining  
15          AE costs appear to have been reasonable and prudently incurred.  
16          The non-Visitor Center AE costs included for cost recovery in this  
17          case total approximately \$3.8 million. I do not recommend any  
18          adjustment to these AE costs.

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

20   **A.     Yes.**

## Appendix A

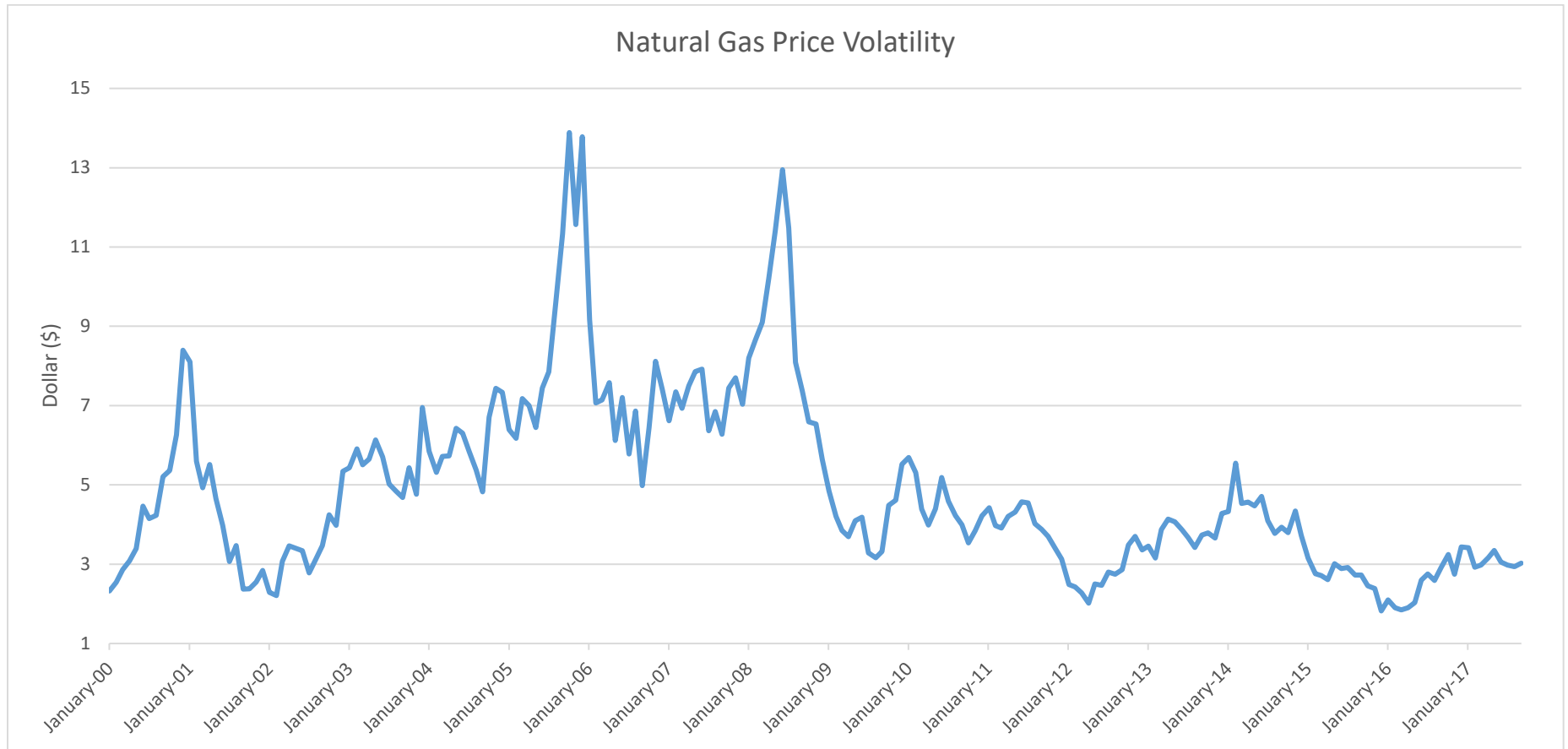
Dustin R. Metz

Through the Commonwealth of Virginia Board of Contractors, I hold a current Tradesman License certification of Journeyman and Master within the electrical trade, 2008 and 2009 respectively. I graduated from Central Virginia Community College with Associates of Applied Science degrees in Electronics and Electrical Technology (Magna Cum Laude), 2011 and 2012 respectively, and an Associates of Arts in Science in General Studies (Cum Laude) in 2013. I graduated from Old Dominion University in 2014, earning a Bachelor of Science degree in Engineering Technology with a major in Electrical Engineering and a minor in Engineering Management.

I have over 12 years of combined experience in engineering, electromechanical system design, troubleshooting, repair, installation, commissioning of electrical & electronic control systems in industrial and commercial nuclear facilities, project planning and management, and general construction experience, including 6 years with AREVA NP, where I provided onsite technical support and participated in root cause analysis teams at commercial nuclear power plants, including those owned by both Duke and Dominion.

I joined the Public Staff in the fall of 2015. Since that time, I have worked on general rate cases, fuel cases, applications for certificates of public convenience and necessity, customer complaints, nuclear decommissioning, power plant performance, and other aspects of utility regulation.

Exhibit 1: Henry Hub Natural Gas Prices, January 2000 thru September 2017



1) <https://www.quandl.com>



Exhibit 2: 2013 thru 2016 Annual Capacity Factor for DEC Coal Generation Plants

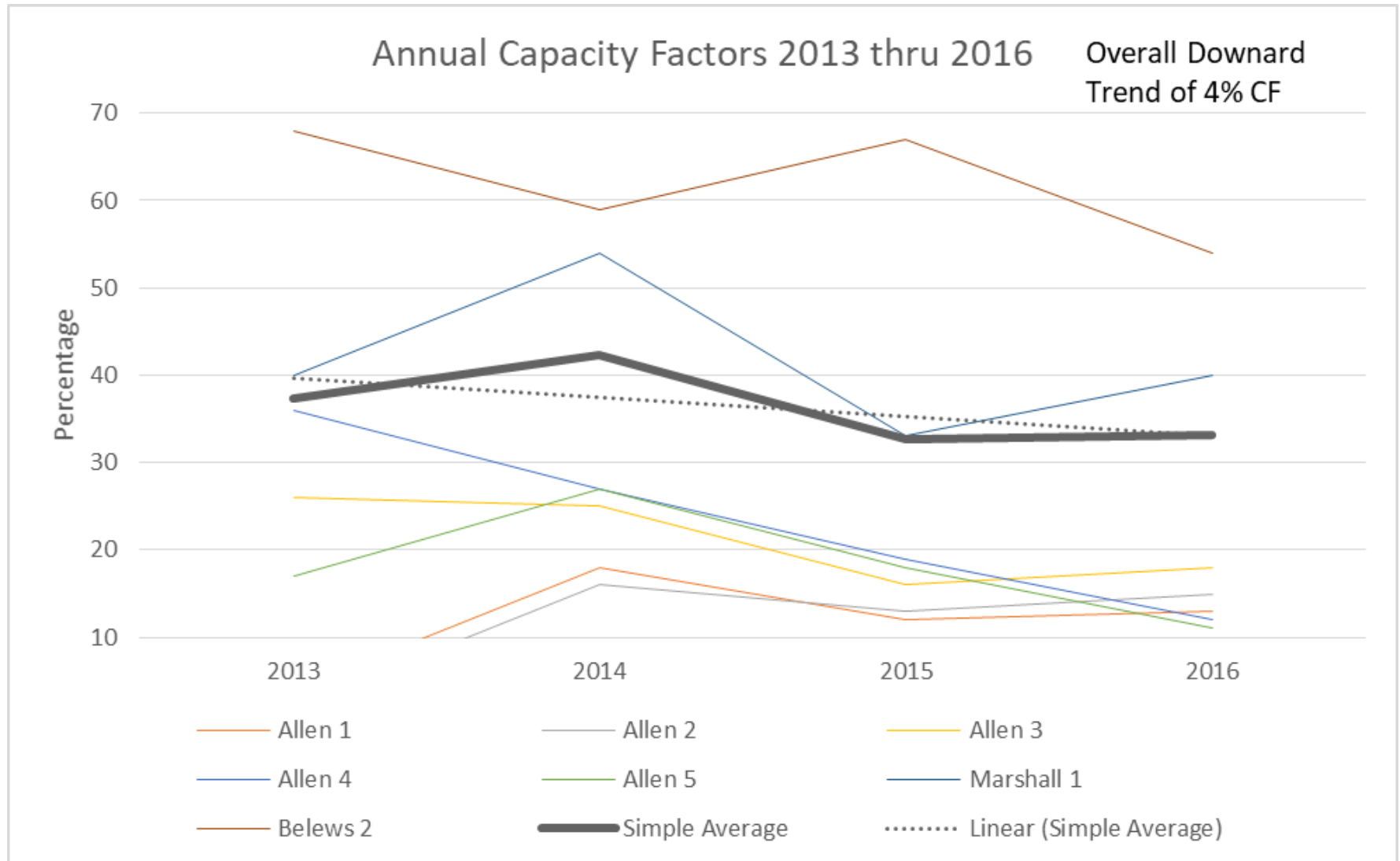


Exhibit 3: 2013 thru 2019 Annual Capacity Factor for DEC Coal Generation Plants

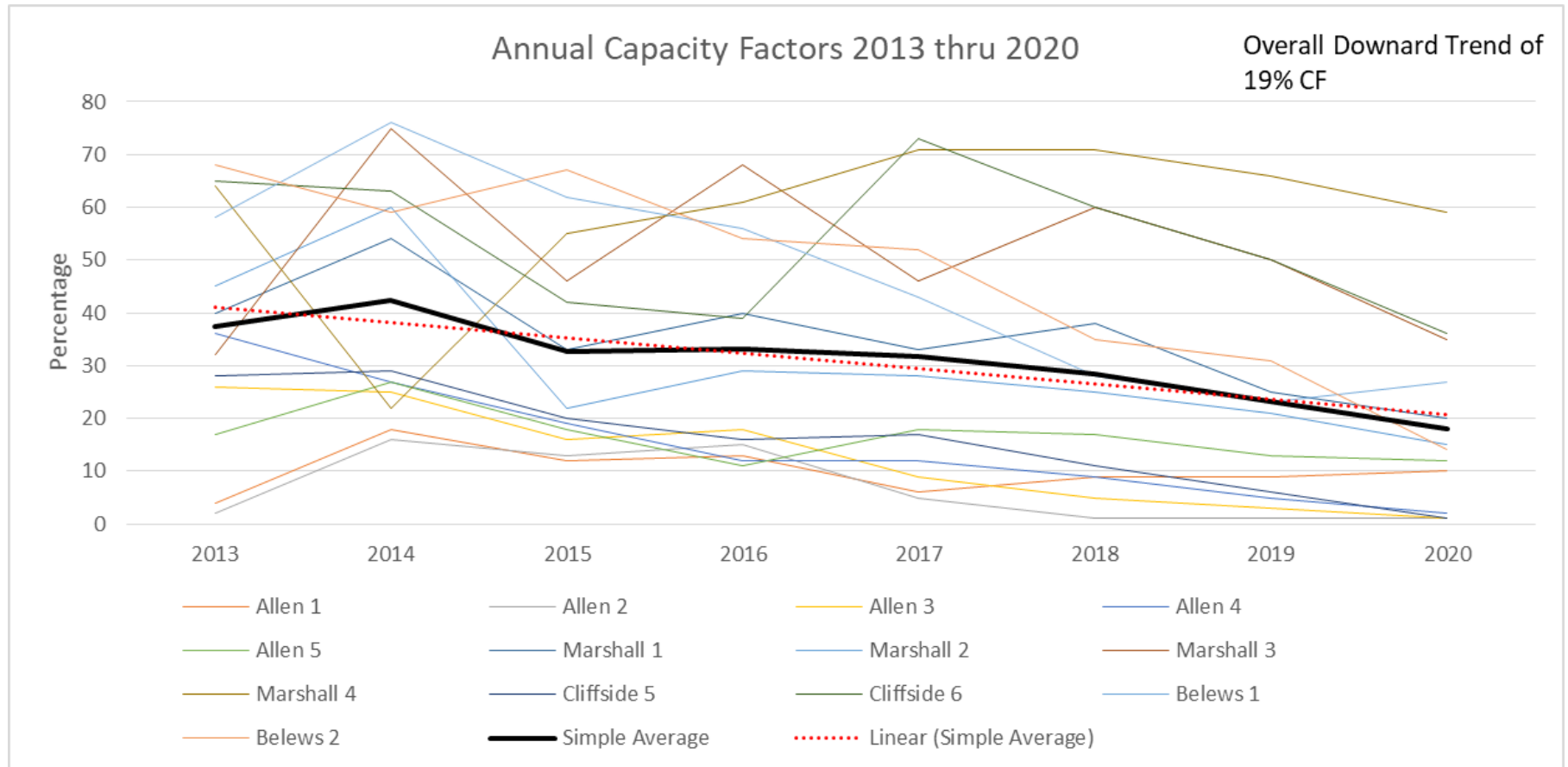
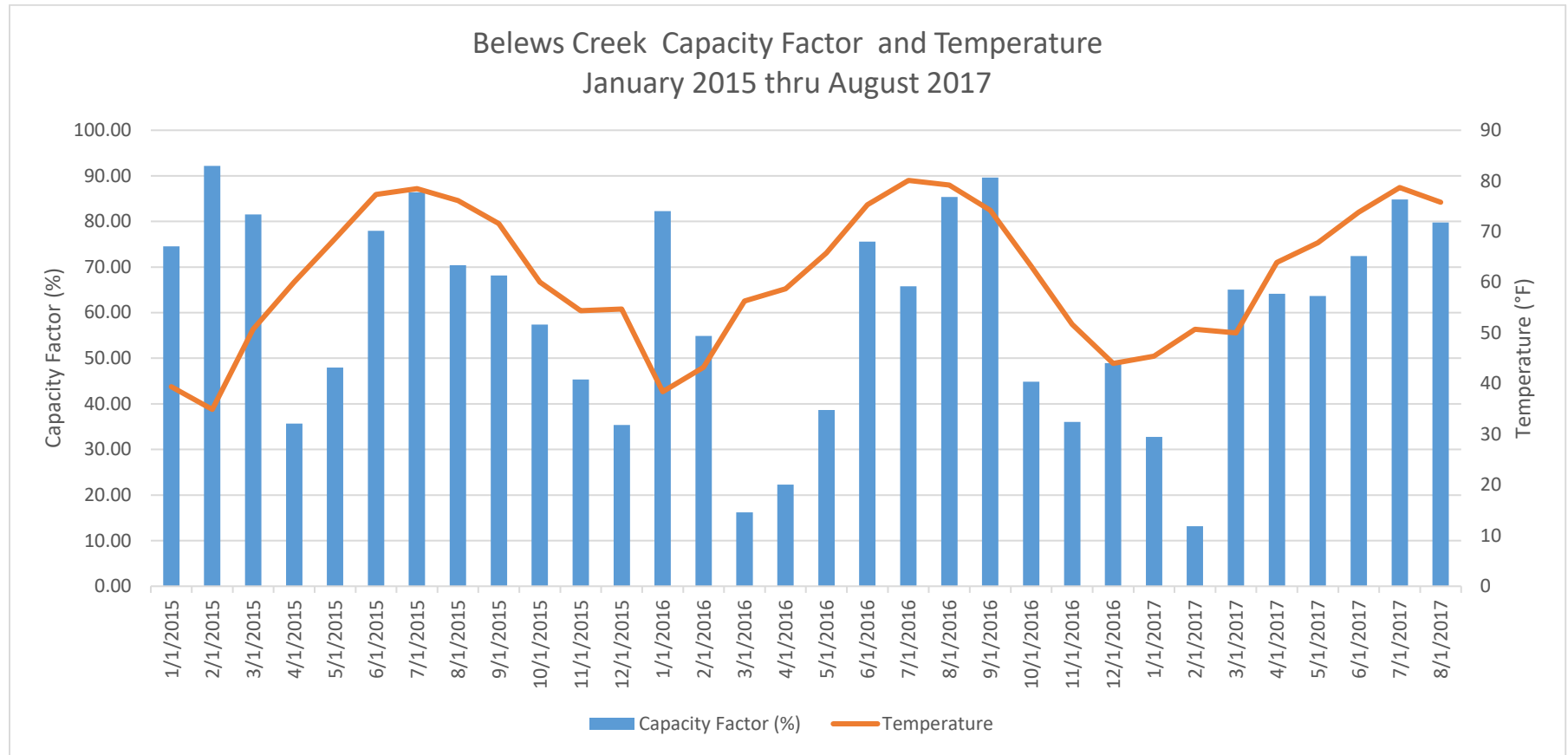
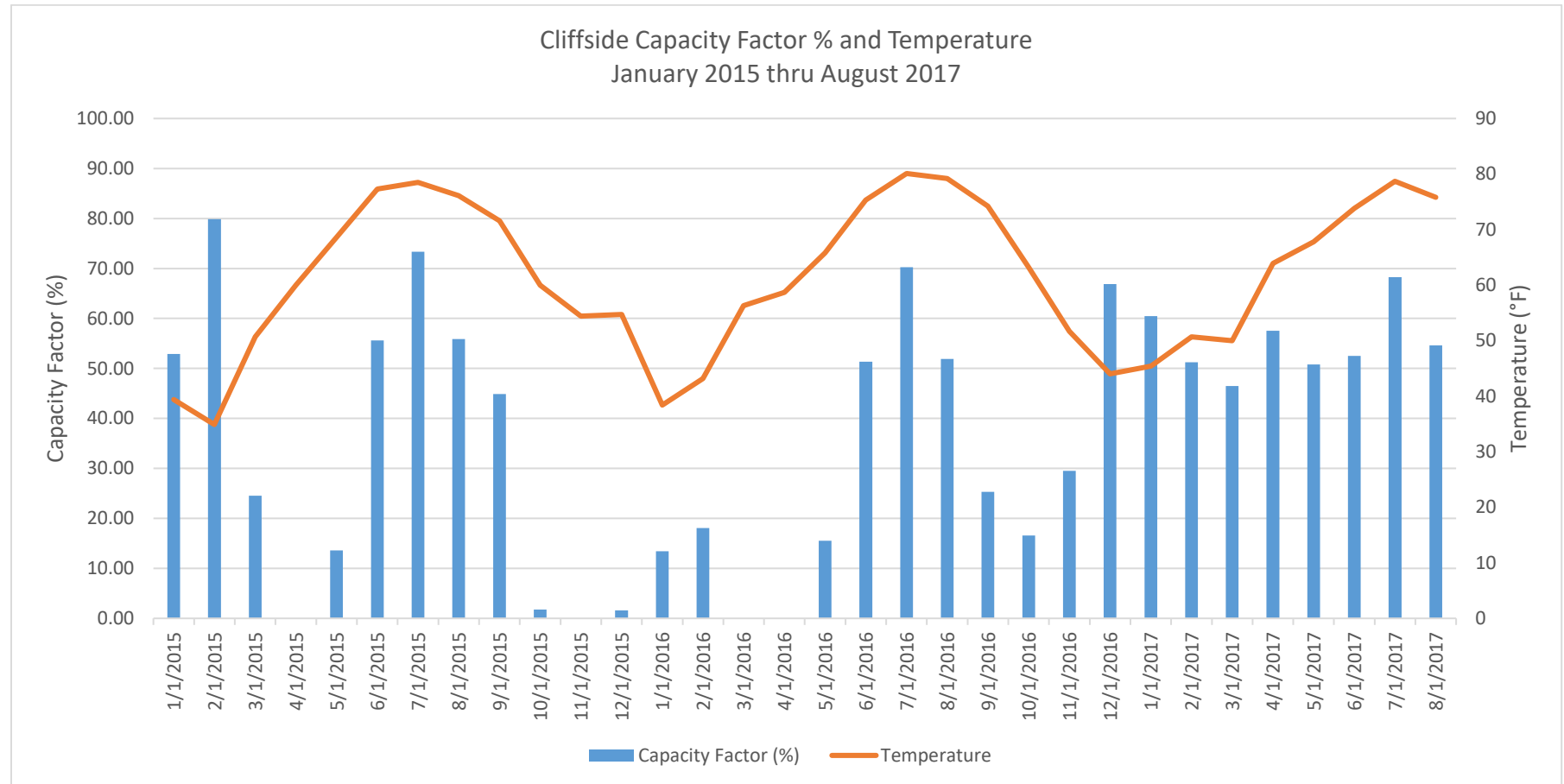


Exhibit 4: Belews Creek Steam Station Capacity Factor



- 1) Capacity Factors obtained from SNL.
- 2) Temperature=North Carolina State wide average. NOAA National Centers for Environmental information, Climate at a Glance: U.S. Time Series, Average Temperature, published September 2017, retrieved on September 27, 2017 from <http://www.ncdc.noaa.gov/cag/>

Exhibit 5: Cliffside Steam Station Capacity Factor



- 1) Capacity Factors obtained from SNL.
- 2) Temperature=North Carolina State wide average. NOAA National Centers for Environmental information, Climate at a Glance: U.S. Time Series, Average Temperature, published September 2017, retrieved on September 27, 2017 from <http://www.ncdc.noaa.gov/cag/>

**Final Report**  
**to the**  
**Public Staff - North Carolina Utilities Commission**  
**Independent Investigation of the Prudence & Reasonableness**  
**of**  
**Costs Incurred by Duke Energy Carolinas, LLC**  
**to**  
**Develop the W. S. Lee III Nuclear Plant (“Project”)**  
**and its**  
**Request to Cancel the Project**  
**January 22, 2018**

**Prepared and Submitted By:**



**Global Energy & Water Consulting, LLC**  
**4539 Woodvalley Drive, Suite 100**  
**Acworth, Georgia 30101**

**Phone: 404.395.1255**  
**Email: [mark.crisp@globalewc.com](mailto:mark.crisp@globalewc.com)**

## **Table of Contents**

SECTION 1.0: INTRODUCTION.....	3
SECTION 2.0: EXECUTIVE SUMMARY .....	6
SECTION 3.0 EVALUATION OF COSTS BY TASK DESCRIPTION:.....	9
Section 3.1 – COLA PREPARATION -.....	10
Section 3.3 – LAND AND RIGHT-OF-WAY PURCHASES – .....	13
Section 3.4 – PRE-CONSTRUCTION AND SITE PREPARATION – .....	14
Section 3.5 – SUPPLY CHAIN, CONSTRUCTION PLANNING, & DETAILED ENGINEERING –.....	15
Section 3.6 – OPERATIONAL PLANNING – .....	16
Section 3.7 –POST COL – .....	17
Section 3.8 – AFUDC - .....	18
SECTION 4.0 REQUEST FOR APPROVAL TO CANCEL THE W. S. LEE NUCLEAR PROJECT:.....	18
Appendix: Qualifications of Global Energy & Water Consulting, LLC.....	20

## SECTION 1.0: INTRODUCTION

**Global Energy & Water Consulting, LLC** (“Global or Consultant”), has been retained by the Public Staff - North Carolina Utilities Commission (“Public Staff”) to assist with a review of the prudence and reasonableness of approximately \$353M in costs (North Carolina retail jurisdictional costs only, including AFUDC) incurred by Duke Energy Carolinas, LLC (“DEC”), to develop the proposed W. S. Lee III Nuclear Plant (“WSL”), as well as DEC’s request to cancel the Project. DEC received from the Nuclear Regulatory Commission (“NRC”) a Combined Operating License on December 19, 2016. DEC filed a Request for Approval to Cancel the Project in Docket No. E-7, Sub 819, on August 25, 2017. DEC also filed a request to recover costs of the Project in a request for base rate increase in Docket No. E-7, Sub 1146, also filed on August 25, 2017. Subsequent to the filing to cancel the project and request to recover costs, the Public Staff entered into a contract with Global and our team of consultants to assist Public Staff with the prudence review.

The Global Team consists of Dr. William Jacobs, PE, Mr. George Evans, and Mr. Mark Crisp, PE. The members of the Global Team, both individually and as a team have been involved with reviews of Combined Operating License Applications (“COLA”), AP-1000 budgets and schedules, technology selection, integrated resource planning (“IRP”) filings, and construction progress, as well as contracting issues at V. C. Summer (SCANA), Vogtle (Southern Nuclear – Georgia Power), Turkey Point (Florida Power & Light), and Levy County (Progress Energy Florida), among other assignments in the nuclear industry. The focus of the Global assignment has been to review, investigate and assess the prudence and reasonableness of the approximately \$353M (North Carolina retail jurisdictional costs) in costs incurred by DEC during the application development process of the COL and filing with the NRC, costs associated with the Land and Right-of-Way Purchases for the site of the WSL plant, costs associated with Pre-Construction and Site Preparation, costs incurred for Supply Chain, Construction Planning, and Detailed Engineering, costs for Operational Planning, and investment financial costs included as Allowance for Funds Used During Construction (“AFUDC”) of \$155,440,000 (North Carolina retail jurisdictional cost) as of June 30, 2017, based on the DEC filing to the Commission. In addition, we have been charged with reviewing DEC’s Termination filing before the Commission.

In order for us to carry out the requirements of our engagement, Data Requests developed by our Team were propounded upon DEC to obtain the necessary information to provide a review of the

decision-making process DEC employed from the project conception up to the point of the filing of its Request for Approval to Cancel and its request for cost recovery before the Commission. In order for our Global Team to offer an opinion on the prudence and reasonableness of decisions and costs by DEC, we formed our position based on the preponderance of supportable documentation provided by DEC and the definition of prudence and reasonableness. The Public Staff provided us with the following language to guide our consideration of prudence:

...the standard for determining the prudence of the Company's actions should be whether management decisions were made in a reasonable manner and at an appropriate time on the basis of what was reasonably known or reasonably should have been known at that time. The Commission agrees that this is the appropriate standard to be used in judging the various claims of imprudence that have been put forth in this proceeding...and adopts it as the standard to be applied herein. The Commission notes that this standard is one of reasonableness that must be based on a contemporaneous view of the action or decision under question. Perfection is not required. Hindsight analysis -- the judging of events based on subsequent developments — is not permitted.

78 North Carolina Utilities Commission Report, 238 at 251-52 (1988)

This language is consistent with our experience in similar regulatory cases including other public utility commission's findings regarding prudence and the standard of proof necessary to support determinations of prudence. In our review, we looked at the following six (6) considerations:

- What data was available at the time of decision-making, as well as, management systems and procedures implemented to enable appropriate analysis.
- The effectiveness of the flow of information and whether data was communicated in a manner that facilitated sound decision-making.
- How the information was evaluated; whether the data was interpreted accurately; what alternatives were evaluated; and whether or not sound decisions or conclusions were drawn to meet the needs of the project, corporate entity, and the ratepayer.
- Whether or not decisions were made in a transparent manner with full participation.
- Whether or not these decisions were monitored and readdressed as necessary with changing conditions.
- Whether or not changes were communicated satisfactorily to all parties.



Of significant importance in our review was the first consideration, what data (information) was available ***at the time of decision-making*** (Emphasis added). A determination of prudence is not based on the final outcome of the work process. It is specifically confined to decisions made based on the data available or that should have been reasonably available to the utility at the time of the decision-making.

During the later years of the project, prior to the decision to terminate the project, DEC's IRPs provided updates on the Company's continued actions to obtain a COL and indicated that new nuclear generation was "a carbon-free, cost-effective, reliable option within the Company's resource portfolio." (See DEC 2014 and 2016 IRP) The Commission issued Orders approving DEC's IRPs. This is consistent with DEC's position that maintaining the COL had value and DEC should continue to engage with the NRC to formally maintain the "Status Quo" (NCUC Order dated August 5, 2011, Ordering Paragraph 1). The "Status Quo" for DEC was defined under that Order by the requirement that DEC "incur only those nuclear project development costs that must be incurred to maintain the status quo with respect to the Lee Station, including Duke's COL application at the NRC." The Order of the NCUC appears to indicate that the Commission found it appropriate for DEC to continue on its current trajectory of pursuing the COL from the NRC. As added direction for our team concerning the meaning of the term "status quo", we relied on our own experience in previous regulatory cases and the specific definition of "status quo" as published by both Merriam-Webster and Black's Law Dictionaries to be "*maintaining the existing state of affairs.*" Our professional experience supports this definition and further supports DEC's continued efforts to obtain a COL. In order to accomplish this task, not only was it necessary for DEC to continue its legal and administrative duties to work with the NRC to resolve all outstanding issues with its application but, just as importantly, DEC needed to continue to pursue permitting, pre-construction, engineering design, construction planning, and operational planning. Discontinuing effort in any one of these areas would have signaled to the NRC that DEC was not actively pursuing the COL, and could have resulted in termination of the COL review process by the NRC prior to its issuance of the COL. The existing COL possesses value and can be used to pursue the option to build a nuclear plant at the WSL site if conditions warrant in the future.

## SECTION 2.0: EXECUTIVE SUMMARY

Global Energy & Water Consulting, LLC was awarded a contract on October 10, 2017, to support the Public Staff with its review of the prudence and reasonableness of approximately \$353M (North Carolina retail jurisdictional costs) incurred by DEC to develop the WSL Plant. Global immediately began its investigation by reviewing previously filed documents and testimony in Docket No. E-7, Subs 819 and 1146 and DEC's responses to data requests. The goal of our analysis was to provide the Public Staff with our professional analysis and opinion as to whether DEC's expenditures for the pre-construction of the WSL Plant were prudent and reasonable, along with our professional opinion concerning DEC's request to cancel the Project.

After careful consideration and thorough review of all public and confidential data made available to us, documents filed with the NCUC, filed testimony, review of data responses that covered the 2006 – 2016 time period, and our professional experience with other utilities in the Southeast concerning the development of the Westinghouse AP 1000 nuclear units, we have concluded that DEC's decisions were appropriate at the time they were made. We found the expenditures to obtain the COL to be reasonable and prudent within the limits of the definitions of reasonableness and prudence. We also found the costs incurred for pre-construction and site development, land and right-of-way purchases, supply chain, construction planning and detailed engineering, operational planning and post-COL to be reasonable and prudent, as well, subject to an issue raised by the Public Staff concerning the Visitors' Center. Additionally, the Public Staff is also examining issues involving AFUDC. It is worth reiterating at this point that all of DEC's decisions were reviewed on the basis of the knowledge that DEC had, or reasonably should have had, based on the contemporaneous information available, at the time of its decisions. A determination of prudence does not involve, nor should the determination be subjected to, a review of information that was not available to DEC at the time its decisions. Therefore, it is our opinion that all costs associated with the application for the COL and subsequent costs should be deemed prudent and reasonable, subject to the recommendation of the Public Staff on the costs of the Visitors' Center and issues involving AFUDC.

Our review of the project development costs for obtaining the WSL Plant COL concluded the dollars spent by DEC were similar in nature to project development costs we reviewed in SCANA's V. C. Summer Units 2 & 3 Baseload Review Act (South Carolina); in Southern Nuclear-Georgia Power's Alvin W. Vogtle Units 3 & 4; and in the COL Application of Florida Power & Light's Turkey Point Units 6 & 7.

While it is virtually impossible to perform a side-by-side comparison of costs by category, the total outlay of dollars can be reasonably compared. For example, DEC closed out the accrual of costs in the COLA Preparation category at the time the Application was accepted by the NRC. However, the cost category for “NRC Review and Hearing Fees” appropriately continued to capture costs. The NRC costs post-COL Application are nearly 100% associated with the NRC review of the application, efforts to respond to NRC requests for additional information (“RAI”), NRC review and approval of design changes, as well as modifications to the application due to external factors as determined by the NRC. Therefore, in DEC’s case, the cost to obtain the COL is almost entirely composed of dollars booked to the NRC Review and Hearing Fees account and to COL Preparation account.

Comparing the costs of the COL for DEC of \$275M+, including a pro rata share of AFUDC, with costs from SCANA, Southern Nuclear, and FP&L (\$286M, \$300M, & \$330M, respectively)<sup>1</sup> indicates DEC’s costs to be well within the realm of similar costs reported by other southeastern utilities, and in fact, tend towards the lower boundary of the composite cost. However, it would be inappropriate to attempt to make a direct comparison of such costs, as each of these utilities account for particular work tasks in somewhat different manners, according to their own internal accounting procedures, requirements of their specific state regulatory authorities, and certain requirements established by their regulatory authority with regards to AFUDC, return on equity (“ROE”), and the weighted average cost of long-term debt used to establish AFUDC. However, it is appropriate to compare the total cost of obtaining the COL across these utilities. Other external activities that also affect the “cost” of obtaining the COL include: the quality of the work performed by the individual utility or its contractor(s) and how this effort is accepted by the NRC. In the case of DEC, it appears that the quality of the application and the review by the NRC was performed without a significant volume of “rework” that would typically drive up the cost of the COL. It must be pointed out that during the time that DEC’s application was before the NRC, the NRC promulgated a significant volume of revisions and design changes to address safety related issues and “lessons learned” from the 2011 Fukushima accident.

In addition to the cost evaluation, we were tasked with the analysis of DEC’s decision to select nuclear generation as the next baseload resource to add to its generation fleet, and whether or not this decision was in the interest of the Ratepayer. The genesis of this decision dates back as early as 2004 in

---

<sup>1</sup> Actual line item costs used to develop a total cost to obtain a COL are not available as such level of cost detail is protected by Confidentiality Agreements that are within the regulatory purview of each utility and its State regulator.

DEC's annual IRP filings with the NCUC. These IRPs modeled current loads and future load forecasts, existing generation fleet operating criteria, existing and future cost of generation resources, fuel cost forecasts, and known and anticipated costs of environmental compliance. In short, we thoroughly reviewed and analyzed each of the confidential IRPs filed by DEC with the NCUC from 2005 through and including 2017, with particular focus on DEC's decision to pursue a COL with the NRC for the WSL Project. In addition, we evaluated DEC's responses to all discovery requests from the Public Staff related to these IRPs.

In summary we concluded that DEC's pursuit of the COL for the WSL Project was reasonable and prudent. Absent the COL, under circumstances known at the time, DEC would have been in an untenable and precarious situation regarding fuel diversity and the ability to reduce carbon dioxide ("CO<sub>2</sub>") emissions. During this period of time, there was extensive pressure, both politically and publicly to reduce the CO<sub>2</sub> and nitrous oxide ("NO<sub>x</sub>") constituents of fossil fuel emissions. The Obama Administration was proposing new heightened compliance regulations through the Clean Power Plan ("CPP"). There were also new state-level criteria for particulate matter, mercury, and other point source constituents. However, no formal, uniform "energy plan" was developed on which a utility could base its planning process. Therefore, it was necessary for DEC to make its best estimate as to the criteria that would govern decision-making during the planning horizon. As such, nuclear energy was a baseload generation source that fit the criteria for low particulate and gaseous emissions, while providing sustainable and reliable fuel diversity. At the time of its decision to plan for the addition of baseload generation resources to its generating fleet, nuclear generation was a reasonable option for planning purposes.

## SECTION 3.0 EVALUATION OF COSTS BY TASK DESCRIPTION:

Throughout our analysis, the best method for us to audit costs was by maintaining the same categories DEC had developed to submit its analysis to the Commission for its semi-annual filing requirements established in ordering paragraph 4 of the Commission's August 5, 2011, *Order Approving Decision to Incur Limited Project Development Costs* in Docket No. E-7, Sub 819. The costs were tracked in the following eight (8) categories, and also shown in Table 1:

- COLA Preparation
- NRC Review & Hearing Fees
- Land and Right-of-Way Purchases
- Pre-construction and Site Preparation
- Supply Chain, Construction Planning, and Detailed Engineering
- Operational Planning
- Post COL
- AFUDC

Due to time and resource constraints, we elected to sample costs from a population that would support a statistical finding of 95% confidence, based on total dollars. We limited our review to the costs associated with tasks associated each of the eight (8) major cost categories listed above. Review of these costs can provide an additional level of confidence. If reasonableness and prudence is established for these cost groupings, we would then expect that an analysis of all cost groupings and cost categories to satisfy the same reasonableness and prudence. As an example, Enercon Consulting performed individual work tasks in each of the seven (7) non-AFUDC cost categories. They assisted with the COL Application. They also performed tasks supporting NRC Review and Hearings, Land and Right-of-Way Purchases, and Pre-construction, Supply Chain and Operational Planning. Since these costs supported the construction effort, AFUDC was accrued for these costs. Therefore, a thorough evaluation of these cost groupings provided a "statistical view" of the costs and decisions for all cost categories. In

addition to our specific cost analysis, we also performed a parallel review of costs and budgets to detailed information provided in various Data Requests. These documents include one hundred (100) integrated project reports authored by DEC, along with nearly 80 monthly status reports authored by Westinghouse/Shaw/Stone & Webster.

### Section 3.1 – COLA PREPARATION -

COLA preparation “includes Duke labor, expenses and contract support for preparation of the Combined Construction and Operating License (COL) Application tendered to the Nuclear Regulatory Commission (NRC) on December 13, 2007. The NRC determined the application was suitable for review and docketed the application on February 25, 2008.”

The cost category for COLA Preparation included mainly costs incurred by DEC in the early years of the project (up through 2009), including its contractors. These costs were necessary to finalize the COLA and submit it to the NRC. DEC’s application for COL was docketed by the NRC in February of 2008; the final COL was issued by the NRC in December 2016. During the time period leading up to February 2008, DEC and its contractors were focused on completing the extensive requirements of the Code of Federal Regulations Title 10, Part 52 (10 CFR Part 52) and NUREG/BR-0298. DEC incurred costs of \$27.4M up to and through filing of the license application with the NRC.

Subsequent to the filing, DEC and its contractors also were required to attend NRC hearings, respond to NRC RAIs (over 950 per NRC Staff reports), and make modifications to the COL application. During the same period of time, the NRC Staff expended over 67,000 man-hours on DEC’s application. It is not unreasonable to expect that DEC a similar number of man-hours, if not more, developing the responses to the NRC RAIs and other requirements for design changes.

Our analysis of costs and billings provided in response to Data Request #14 shows that DEC clearly documented the costs of obtaining the COL. However, these were not the total costs for the COL, as once the filing had been successfully docketed with the NRC, DEC was required to respond to all questions raised by the NRC Staff and the Nuclear Safety Review Board (“NSRB”). The dollars in the NRC Review and Hearing cost category are included in order to capture all COL-related costs incurred through the issuance of the COL in 2016.

The NRC has captured the costs of the COL Application for seven licensee applications and made that information publicly available. Based on the NRC developed cost figures, the average cost of a COL,

based on those these seven sites, is \$29.9M. In the case of WSL Project, DEC spent \$27.4M for its application, well within the average of the seven sites.

The WSL Project began to accrue costs for the COL Application in August of 2006. These costs were primarily to cover in-house DEC Labor and expenses. There were also costs for outside consulting and supplies. These costs continued until December of 2008 when the application was submitted to the NRC. At the time that the COL costs started to decline, the cost category for COL Review started to accrue costs and continued until the Summer of 2017, even after DEC was granted its COL from the NRC in December 2016. DEC formally submitted its Request for Approval to Cancel the WSL Plant to the NRC on August 25, 2017. DEC's current strategy is to maintain the WSL Project COL until a future time that shows economic and environmental conditions once again indicate nuclear generation to be a reasonable choice for DEC to add to its generating portfolio. Until such time, however, DEC will be required to submit annual updates of its Final Safety Analysis Report ("FSAR"), including any design changes proposed by the NRC. Therefore there will be continuing costs that accrue to the NRC Review & Hearing Fees and to Post COL Licensing cost categories.

### Section 3.2 – NRC REVIEW AND HEARING FEES –

The category of NRC Review and Hearing Fees "includes the cost of the NRC review fees, Duke labor and expenses, contract labor and legal support required to support the NRC review of the Lee Nuclear Station COL application, and preparation for the Advisory Committee on Reactor Safeguards Subcommittee Hearing. This category also includes interactions with South Carolina Department of Health and Environmental Control (SCDHEC) and the US Army Corps of Engineers (USA CE), as required to move the environmental permit applications forward. The Lee project received the National Pollutant Discharge Elimination System (NPDES) Operations permit on July 17, 2013. The Final Environmental Impact Statement was issued by the NRC on December 23, 2013, and the 401 Water Quality Certification was issued on January 2, 2014. The Final Environmental Impact Statement prepared by the U.S. Forest Service to support mitigation activities in Sumter National Forest was issued on December 5, 2014. Lee Nuclear Station received its USACE 404 Permit on September 29, 2015."

The NRC Review and Hearing Fees cost category captures costs associated with the NRC's review of the COL application along with costs for the NRC to hold various internal and public meetings associated with the review and approval process. In support of the internal NRC review of the application, there are externally driven process and regulatory requirements that must also be formalized and approved by the NRC. These externalities include the National Pollution Discharge Elimination System permit, Corps of Engineers 404 Permits, and State and Federal Air Quality & Emission

permits, along with specific State environmental permits that all support the Environmental Review and the Final Environmental Impact Statement (Green Path in the following picture).

### New Reactor Licensing Process



The NRC convenes a third party independent Board, the Advisory Committee on Reactor Safety (“ACRS”), to evaluate the overall safety related issues of the technology selected, specific requirements of the AP 1000 certification process, and specific review of the Final Safety Evaluation Report and Advanced Final Safety Evaluation Report (“SER”). NRC employees with specific knowledge of law, engineering, and the nuclear industry are appointed by the Commission to conduct the formal license review process. Their function is held at arm’s length from the Commission itself to safe guard their independence and ethical standards. These NRC employee “review boards” assist the Commission with processing and approving applications, as well as reviewing on-going technical issues with the COL and project deployment following the issuance of the COL. The costs of these review boards, public hearings, and Applicant oversight are partially borne by the Applicant through the fees assessed by the NRC Safety Review path in the “New Reactor Licensing Process” figure above).

The NRC also convenes the Atomic Safety and Licensing Board Panel (“ASLBP”) that conducts hearings for the Commission. The specific responsibility of the ASLBP as it pertains to the COL process “is to conduct public hearings concerning contested issues that arise in the course of licensing and



enforcement proceedings regarding nuclear reactors and the civilian use of materials in the United States.”<sup>2</sup>

As a result of the review and approval process, these costs are appropriately included in the cost of obtaining and maintaining the COL along with the on-going compliance with COL requirements following the award of the COL to the Applicant. A summation of the COL costs and the NRC Review and Hearing Fees provides a much more representative cost of the COL, approximately \$150M+ in the case of WSL.

We evaluated specific contracts with Shaw/CB&I/Stone & Webster/Wectec, Enercon Services, and the US Nuclear Regulatory Commission for cost and decision compliance. These three (3) contracts totaled more than \$110M. Of particular interest is the contract amount of \$24.7M+ for the US NRC, which covered the hearing and various NRC review boards, inspections, etc., and were not in any way negotiable. We also found the costs billed by the Shaw Team and Enercon to be necessary, reasonable, and prudent.

### **Section 3.3 – LAND AND RIGHT-OF-WAY PURCHASES –**

The category of Land and Right-of-Way Purchases “includes the purchase of land required for the Lee site and rail right-of-ways. Category also includes cost of purchasing additional land for a supplemental cooling pond in event of severe drought as well as costs for surveying the selected transmission right-of-way.”

The cost category of Land and Right-of-Way Purchases includes the purchase of the WSL site, as well as subsequent purchases to add additional acreage for necessary cooling and make-up water storage. Because most of the heavy forgings and modular structures were to be delivered to the site via railroad, access rights-of-way for rail service was also necessary. The total accrued cost for Land and Right-of-Way Purchases through June 2017 is approximately \$44.6M. 96% (\$43M) of this cost was incurred prior to the NCUC imposed requirement for six (6) month financial project reporting updates. The \$44.6M in Land and Right-of-Way includes \$14M for the purchase of the WSL Project site in 2006 and 2007. Electric generation from WSL Project was to have been interconnected to DEC’s existing grid

---

<sup>2</sup> <https://www.nrc.gov/about-nrc/regulatory/adjudicatory/aslbp-respons.html>

via overhead transmission lines constructed along purchased rights-of-way, included in in the Land and Right-of-Way Purchases category, but excluded from the \$14M purchase of the 1900 acre site, itself.

The Land and Right-of-Way category was essentially closed out as of June of 2014.

### **Section 3.4 – PRE-CONSTRUCTION AND SITE PREPARATION –**

The category of Pre-Construction and Site Preparation “includes site activities to both maintain the site and prepare the site for construction. Site preparation activities included: dewatering and cleanup of the excavated area, site remediation activities required to identify and properly dispose of hazardous wastes, and costs associated with the demolition and removal of unusable structures. Necessary maintenance of existing rail bed and required Make-up Pond B spillway repair were completed. Engineering of offsite infrastructure for potable water, sewer, and rail spur; and, geotechnical evaluations (needed for engineering) have been completed. Engineering for bringing communications to the site is also included in this category. Engineering of necessary traffic improvements was brought to 85% completion by December 2013. Ongoing and continuing activities include: site security, utilities and miscellaneous site maintenance.”

The Pre-construction and Site Preparation category captures the costs for most of the identifying activities that are visible at the site today. It was necessary to begin pre -construction activities prior to the receipt of the COL in order to maintain the schedule for the original Commercial Operations Date (“COD”) of 2016 and subsequent later dates as the schedule was revised based on results of IRP analysis. It was also necessary to initiate pre-construction activities to support the Construction Engineering and Detailed Engineering functions. Much of the detailed engineering relied heavily on the findings of the pre-construction and site preparation activities for foundation designs, rail and road designs, infrastructure to support cooling water storage, make up water storage, on and offsite communications and security. These activities had to be completed prior to the issuance of the COL to avoid COD delay.

For all practical purposes, the activities associated with the Pre-Construction and Site Preparation were concluded in 2015. Prior to the 2015 period biennial costs were consistently in the \$2-4M range. Beginning in 2015 these biennial costs dropped to \$200-\$500K range and further decreased to \$40K range by 2017. However, there are on-going activities in this category in order to maintain the site conditions and provide on-site security.

### Section 3.5 – SUPPLY CHAIN, CONSTRUCTION PLANNING, & DETAILED ENGINEERING –

The category of supply Chain, Construction Planning, & Detailed Engineering “includes activities associated with working with the supplier to negotiate an Engineering, Procurement and Construction (EPC) agreement. Negotiations in 2008 did not result in an executed contract. Conceptual site specific engineering and construction planning activities necessary to develop a complete project definition are included in this category. Continuing construction planning activities serve to further develop construction plans and keep the construction plans in line with latest engineering. Detailed site specific engineering began in January 2011 and was brought to 70% completion in December 2013. Commercial building design activities started in June 2012. Design of the first six commercial buildings was completed in December 2013.”

This category should be sub-categorized rather evaluated broadly. The three topics in the category heading are sufficiently different to warrant individual focus. The Supply Chain deals primarily with the contracting activities whether it be one Engineer, Procure, and Construction (“EPC”) contract, or several individual contracts managed by a General Contractor (“GC”). DEC originally intended to sign an EPC contract. The Westinghouse Consortium was contemplated as the best EPC choice based on knowledge, cost and expertise, but DEC could not come to a final resolution with Westinghouse on an EPC contract. Therefore, DEC acted as its own GC and initiated DEC’s own work schedule with contract assistance from Westinghouse, Shaw, Stone & Webster and CB&I, all members of the Westinghouse Consortium. Contracts for major installed equipment and large forgings were also covered under the Supply Chain. Many of these were to be constructed by international manufacturers such as Doosan (Korea), Mangiarotti (Italy), and Japan Steel Works, requiring extensive lead time and Supply Chain Management. Because DEC was unsuccessful with negotiating an EPC contract, it was DEC’s responsibility to develop the necessary policies and procedures for supply chain activities, including everything from international communications to in-country deliveries, as well as nuclear quality assurance and quality control (“QA/QC”).

Construction Planning is a huge and very costly undertaking on its own. Within Construction Planning resides the scheduling responsibility that must be integrated with all craft and contract labor, equipment purchases, site development, operational planning, design engineering, and NRC Licensing. Construction Planning touches all phases of project deployment. As such, it was essential to assign significant resources from the very first moment this project was conceived. Even with the Notice to

Cancel in August of 2017, Construction Planning activities are still on-going to assist with shutting down the project. Simply “closing the door” and walking away is not an option.

The Detailed Engineering function is self-evident. The number of design activities associated with a project of this magnitude is vast. As a result, the interface between engineering, supply chain, and construction planning is critical.

The total dollars accruing to the Supply Chain, Construction Planning, and Design Engineering through the Notice to Cancel is \$57M. This cost tracks consistently with the Vogtle and Summer sites for work accomplished in similar project periods. Nevertheless, there are some significant differences between the WSL site and the Summer and Vogtle sites. One of the major differences is that both Summer and Vogtle sites executed an EPC contract, while WSL did not. DEC’s failure to successfully negotiate an EPC contract was not a result of lack of effort on its part, however. In fact, a primary stumbling block to negotiating a successful EPC contract was the inability of Westinghouse to resolve issues it had with the transfer of intellectual property. The intellectual property in this case was analogous to the owner’s manual for an automobile. A utility owner of a nuclear plant, in this case DEC, needs all pertinent documentation, not just bits and pieces. This issue is still on-going today with both the Summer and Vogtle projects.

### Section 3.6 – OPERATIONAL PLANNING –

The Operational Planning process “includes activities associated with operator and plant staff training, including costs associated with the Knowledge and Abilities Catalog, required for operator license examinations for AP 1000 plants, and the standardization of the nomenclature in the Westinghouse Master Equipment List (MEL). Continuing activities include: supporting operations program development, such as Quality Assurance (QA) Program, and the review of approximately 500 procedures. The training materials, operational programs, and operating procedures are all being developed in concert with other AP 1000 utilities within the APOG framework. The *Operational Planning* category also includes generation of administrative procedures that must be in place upon receipt of COL from NRC.”

Operational Planning is a critical component of the nuclear construction process. Typically, the operational planning component focuses on preparing human logistics for the long-term operations of the commercial plant. This involves the development of hundreds if not thousands of operating procedures detailing the application for every piece of equipment from the water coolers to the turbines

and generators, and thousands of subsets of each. As soon as a utility determines the technology it will deploy, the operational planning effort begins. The effort and the man-power requirements of the Operational Planning section continue to increase up to the point that actual plant operators are brought on-board to begin training. This effort begins very early in the pre-construction phase, as the first set of operators to be trained are actually being “trained to train” the next generation of operators. The training effort for the WSL plant began during the COL Application period. The COL Application must contain discussions of and commitments for Operational Planning. Upon receipt of the COL, there was a marked increase in the Operational Planning budget in order to ramp up the planning process because DEC’s intent was to move forward with the project. As soon as the DEC decision was made to terminate the project, the Operational Planning budget dropped rapidly beginning in 2017. The \$16.5M incurred to date for Operational Planning was well within the budgets of other plants we have reviewed at a similar stage of development.

### Section 3.7 –POST COL –

A Combined Construction Permit and Operating License (COL) was received for the Lee AP 1000 Project in December 2016. Design finalization and first-of-a-kind construction issues at the lead plants (Summer 2 and 3, Vogtle 3 and 4) have required Westinghouse to make numerous changes to the AP 1000 design. Design changes continue to be issued as the lead plants advance towards completion. Submittal of an annual FSAR update and recurring regulatory reporting are required to maintain the COL.

The category of Post-COL was established to capture on-going costs associated with the continuing support of the COL.

The Post-COL category has only recently been added to DEC’s cost documentation. Its first entry was included for the period of January 1, 2017 through June 30, 2017. As the description provides, this category captures costs associated with on-going COL activities, primarily changes and updates to the certified design document as a result of “lessons learned” at the Vogtle and Summer sites. It also includes the necessary revision and annual submittal of the FSAR. It is difficult, if not impossible, to accurately forecast a budget for this category as it is not known what might be found at the Vogtle and Summer sites that must be modified and subjected to the FSAR review. However, as long as DEC maintains the COL and as long as there is construction progress at the Vogtle or Summer sites, Post-COL costs will be incurred.

### Section 3.8 – AFUDC -

The cost category of AFUDC is the net cost of money used for construction purposes. Critical to the determination of AFUDC is the weighted cost of money, the Return on Equity approved by the NCUC, determination of the exact start date for which AFUDC can be accrued, any temporary halt in construction, and the date at which the AFUDC is no longer allowed to accrue.

AFUDC for the WSL plant has been accruing since 2004. To compare AFUDC for one utility's project to that of another utility is simply not possible due to varying costs of money over time, different commercial ratings impact on borrowing costs, timeframe for accruing AFUDC, cashflow of dollars, and timing of the expenditures relative to each of the utilities. However, all things being equal, the total AFUDC for one utility relative to another can be compared as a data point. However, since WSL has been cancelled and Vogtle and Summer continued through the Fall of 2017, it is not advisable to make this comparison because the decisions of each utility relative to their own set of specific issues such how to proceed during bankruptcy proceedings, if the continuation will actually occur, and certainly how will future cashflow and contracts be resolved by each utility will affect the accounting of AFUDC dependent on the specific utility's decisions. The only measure of appropriateness would be an accounting analysis to make certain that DEC is using the correct interest rates, ROE, and other embedded variables. The Public Staff is conducting further analysis regarding AFUDC, including the accounting treatment, and the beginning and end dates.

## **SECTION 4.0      REQUEST FOR APPROVAL TO CANCEL THE W. S. LEE NUCLEAR PROJECT:**

DEC received a COL from the NRC on December 19, 2016. Prior to this date, DEC had been pursuing the COL and preparing the site for construction since the early 2000's. During the period of 2008 through 2017, many externalities affected DEC's ability and need to continue the pursuit of the WSL Project. Significant among these were: sluggish economic conditions between 2008 and 2016, decreased natural gas prices as a result of the advancements of fracking technology; stagnant or in some cases, retracting forecasts of load growth; and the impact on the nuclear technology revolution as a result of the failures of Westinghouse and its subsequent filing for bankruptcy protection. Additionally, the new units under construction at the V. C. Summer Plant and the Alvin W. Vogtle Plant were not progressing as forecast, schedules were falling significantly behind, and cost overruns were beginning to critically erode their economic viability. In other words, over the last five (5) years a "perfect storm" has descended upon the nuclear industry.

Because DEC was in the midst of permitting and licensing the WSL Plant, without legislation from the North Carolina General Assembly permitting recovery of CWIP financing costs outside of a general rate case, and with no immediate prospects for the passage of any such legislation, DEC determined that while it should continue to pursue its COL, along with pre-construction activities to “maintain the status quo” (See Sub 819 Order issued August 5, 2011), it should not move forward with construction. DEC received the COL in December of 2016. Economic conditions still had not improved significantly, and with the significant scale back of carbon regulation through court delays and by the Trump Administration, the IRP process indicated the need for baseload generation, and particularly nuclear baseload generation, had been delayed until the late 2020s. Westinghouse’s problems with continuing construction at the Summer and Vogtle sites were also beginning to manifest themselves during this time period. Early in 2017, Westinghouse announced it had suffered significant losses from its AP 1000 projects in the US. Finally, on March 29, 2017, Westinghouse filed for bankruptcy protection under Chapter 11. The announcement by Westinghouse and the subsequent financial issues relative to bankruptcy led to the Summer project being canceled, but the Vogtle project has recently been allowed to proceed subject to significant regulatory scrutiny to which Georgia Power/Southern Nuclear has agreed.

As a result of this perfect storm scenario, DEC elected to file the Request to Cancel the W. S. Lee Project. We believe that based on the changes to economic conditions, the Westinghouse bankruptcy, and issues being experienced at Summer and Vogtle, DEC’s decision to cancel the W. S. Lee Project was, in our opinion, reasonable and prudent. Therefore, it is our opinion, to the extent that Commission approval of DEC’s decision to cancel the W. S. Lee project is required (which would require a legal opinion beyond the scope of our expertise or employment), that the Request to Cancel the W. S. Lee Plant be approved. We note that currently, DEC has a viable COL for the W. S. Lee project and has the site under its ownership. There are significant pre-construction activities completed and design documents completed. The project could be resurrected should all of the concerns previously identified be positively addressed.

## Appendix: Qualifications of Global Energy & Water Consulting, LLC

### MARK W. CRISP – PROJECT MANAGER

Mark W. Crisp is Managing Consultant with Global Energy & Water Consulting, LLC. His 35+ years of experience in the electric and water utility industry covers most functional areas of these utilities including construction of water & wastewater facilities, electric generation, transmission, operations, **utility economics, regulatory compliance, policy and prudence**. He has managed projects ranging from a few million dollars to well over \$9 Billion. He is recognized as an Expert in his fields throughout the US and the International community including electric restructuring, generating resource selection, renewable energy in the form of biomass, wind, PV, and hydro. He is regularly engaged to provide immediate solutions. He has successfully guided clients through such issues as **wholesale and retail electric accounting issues**, unbundling of services, FERC open access transmission, **integrated resource planning (“IRP”)**, FERC and NRC licensing, as well as, fuel hedging strategies. Mr. Crisp is a recognized expert on utility issues and has provided expert witness and testimony before several state regulatory bodies, the FERC, the NRC, Federal and State courts, and the US Congress.

Mr. Crisp, teaming with longtime partner Mr. George Evans, has most recently completed the review, analysis and acknowledgment of the IRP’s submitted to the Arizona Corporation Commission for the first review under the newly approved IRP Rules in Arizona. This analysis included the review of IRP’s submitted by Arizona Public Service, Tucson Electric, UNS Electric, Inc., and Arizona Electric Power Cooperative, Inc. The process in Arizona is very similar to the requirements in Louisiana in that we performed the review of the IRP’s, facilitated public input sessions, evaluated not only conventional resource planning but also included demand-side management, renewable requirements of the State and transmission.

Mr. Crisp is a “hands-on” consultant having spent 20 years of his career working for Electric Utilities. His experience includes clients and projects around the world. The following sample of engagements is indicative of Mark’s diverse skills and breadth of experience.

- **State Regulatory bodies in Arizona, Connecticut, Georgia, Maryland, South Carolina, Mississippi, Arizona and Utah**
- Southeastern Federal Power Customers (Group of Electric Cooperatives and Municipal Electric systems throughout the Southeastern US)
- El Paso Electric Company
- Northeast Utilities
- Niagara Mohawk
- City of Walla Walla, Washington
- City of LaGrange, Georgia
- City of Litchfield Park, Arizona
- City of North Little Rock, Arkansas
- City of Ocala, Florida
- International Privatization of Utility Assets in Argentina, Brazil, Chile, Ecuador, Nicaragua, Australia and Europe
- Puerto Rican Electric Authority (“PREPA”)
- Tennessee Valley Authority (“TVA”)
- South Texas Electric Cooperative (“STEC”)
- GLOBALCON Holdings
- Highland Nigeria Limited
- Highland Energy Solution Services Limited
- Oglethorpe Power Corporation (“OPC”)
- Grand River Dam Authority (“GRDA”)
- US DOE and US DoD
- Utility Privatization for Marine Corps and Navy Bases throughout California, Arizona and Nevada



Mark has Bachelor degrees in Civil and Electrical Engineering from the Georgia Institute of Technology ("Ga. Tech") along with Master of Business Administration (Finance and Accounting) from the University of Arkansas at Little Rock.

Mark is a registered professional engineer in the States of Georgia, Florida and South Carolina.

**Power Plant Experience:**

**Nuclear Power Generating Facilities**

Plant Vogtle – Georgia Power Company (Southern Nuclear)  
Plant Hatch – Georgia Power Company (Southern Nuclear)  
Plant Farley – Alabama Power Company (Southern Nuclear)  
Palo Verde – Arizona Public Service and Joint Owners  
North Anna Power Station – Dominion Resources  
Bellefonte – Tennessee Valley Authority  
V. C. Summer – South Carolina Gas & Electric  
Monticello Nuclear – Xcel Energy  
Prairie Island Nuclear – Xcel Energy  
Arkansas Nuclear 1 – Entergy Arkansas

**Coal-fired Generating Facilities**

Plant Bowen – Georgia Power Company  
Plant Branch – Georgia Power Company  
Plant Hammond – Georgia Power Company  
Plant McDonough – Georgia Power Company  
Plant Mitchell – Georgia Power Company  
Colbun System – Chile S.A.  
Mejionelles – Chile S.A.  
Puerto Rican Electric Power Authority San Juan, Puerto Rico

**Hydro-electric Generating Facilities (Domestic)**

Wallace Dam – Georgia Power Company  
Sinclair Dam – Georgia Power Company  
Rocky Mountain Pumped Storage Project – Georgia Power Company  
Bartlett's Ferry Dam – Georgia Power Company  
Oliver Dam – Georgia Power Company  
Jackson Dam – Georgia Power Company  
Allatoona Dam – U.S. Army Corps of Engineers

Buford Dam – U.S. Army Corps of Engineers  
 Carter’s Dam – U.S. Army Corps of Engineers  
 Hartwell Dam – U.S. Army Corps of Engineers  
 Richard Russell Pumped Storage Project – U.S. Army Corps of Engineers  
 Strom Thurmond Dam – U.S. Army Corps of Engineers  
 West Point Dam – U.S. Army Corps of Engineers  
 W. F George Dam – U.S. Army Corps of Engineers  
 Jim Woodruff Dam – U.S. Army Corps of Engineers  
 Wolf Creek Dam – U.S. Army Corps of Engineers  
 Center Hill Dam – U.S. Army Corps of Engineers  
 Texoma Dam – U.S. Army Corps of Engineers  
 Dennison Dam – U.S. Army Corps of Engineers  
 Amistad Dam – International Boundary Waters Commission  
 Falcon Dam – International Boundary Waters Commission

### **Hydro-electric Generating Facilities (International)**

Alicura - Argentina	El Toro - Argentina
Piedra del Aquila - Argentina	El Tigre - Argentina
El Chocon - Argentina	Los Nihuiles - Argentina
El Chanar - Argentina	Pichi Picun Lefue - Argentina
Cerros Coloradas - Argentina	Yacereta – Argentina & Paraguay
Los Reyunes - Argentina	Itaipu – Argentina – Paraguay
Copalar – Nicaragua	Undeveloped Sites in Ecuador
Undeveloped Sites in Sub-Saharan Africa	

### **Renewable Energy Projects (Domestic)**

Milam Tennessee – Waste to Energy - Green Power Inc.  
 Wyoming Wind  
 Milledgeville, GA. Waste To Energy and PV - SolarZone, LLC

### **Renewable Energy Projects (International)**

Haiti Reconstruction  
 Lagos, Nigeria WTE  
 Nigeria Transitional Gas Power Plant

### **Testimony and Expert Witness**

State of Arizona Corporation Commission  
State of South Carolina Public Service Commission  
State of Georgia Public Service Commission  
State of Mississippi Public Service Commission  
State of Maryland Public Service Commission  
State of Utah Public Utilities Commission  
Federal Energy Regulatory Commission  
Nuclear Regulatory Commission  
United States Congress  
Federal District Court of Washington D.C.  
5th Circuit Court of Appeals – Washington DC  
Federal District Court in the Northern District of Georgia  
Federal District Court in the Northern District of Alabama  
US Court of Appeals - 11th Circuit

### **Abbreviated List of Testimony and Filings before State Regulatory Bodies**

**Arizona Commerce Commission DOCKET NO. E-00000A-11-0113, December 2012**

**Review and Analysis of the Integrated Resource Plans of Arizona Public Service Company, Tucson Electric Power Company, UNS Electric, Inc., and Arizona Electric Power Cooperative, Inc.**

**Arizona Commerce Commission DOCKET NO. E-00000V-13-0070, December 2014**

**Review and Analysis of the Integrated Resource Plans of Arizona Public Service Company, Tucson Electric Power Company, UNS Electric, Inc., and Arizona Electric Power Cooperative, Inc.**

**South Carolina Office of Regulatory Staff DOCKET NO. 2008-196-E, October 2008**

**Review and Determination of Approval of a Combined Application of SCE&G for the Construction and Operation of Units 2 & 3 at V.C. Summer Nuclear Facility**

**South Carolina Office of Regulatory Staff DOCKET NO. 2009-293-E, September 2009**

**Update of Construction Progress and Request for Updates and Revisions to Schedules Related to the Construction of V.C. Summer Units 2 & 3 Nuclear Base Load Generation Facility**

**South Carolina Office of Regulatory Staff DOCKET NO. 2010-376-E, February 2011**

**Petition of South Carolina Electric & Gas Company for Updates and Revisions to Schedules Related to the Construction of V.C. Summer Units 2 & 3 Nuclear Base Load Generation Facility**

Minnesota Department of Commerce, Energy Resources Division, DOCKET NO. E002/CI-13-754, July 2014,

Investigation into Xcel Energy's Monticello Nuclear Plant Life Cycle Management/Extended Power Uprate Project and Request for Recovery of Cost Overruns

City of Miami, Florida Office of the City Attorney, DOCKET NO. 52-040 & 52-041, May 2017

Affidavit Before the Nuclear Regulatory Commission ("NRC") In the Matter of Florida Power & Light's Turkey Point Unit 6 & 7 Combined Operating License

Utah Division of Public Utilities, DOCKET NO. 10-035-124, May 2011

In the Matter of the Application of Rocky Mountain Power For Authority to Increase its Retail Electric Utility Service rates in Utah and for Approval of its Proposed Electric Service Schedules and Electric Service Regulations.

Mississippi Public Utilities Staff, DOCKET NO. 2010-UA-374, July 2013

Entergy Mississippi, Inc. Application for Approval of Accounting Treatment for Grand Gulf 3; "Costs Incurred in Connection with Generation Resource Planning, Evaluation, Monitoring, and Development of Activities Related to Grand Gulf 3"

Staff of the Georgia Public Service Commission, DOCKET NO. 17687-U, April 2004

Georgia Power Company's Application for Approval of its 2004 Integrated Resource Plan

Staff of the Georgia Public Service Commission, DOCKET NO. 17688-U, April 2004

Savannah Electric and Power Company's Application for Approval of its 2004 Integrated Resource Plan

Staff of the Georgia Public Service Commission, DOCKET NO. 24505-U, April 2007

Georgia Power Company's Application for Approval of its 2007 Integrated Resource Plan

**William R. Jacobs, Jr.**  
**Executive Consultant**

**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.

## **GEORGE W. EVANS – UTILITY COST AND REPLACEMENT ENERGY CONSULTANT**

### **EDUCATION:**

Master of Science, Applied Mathematics, Georgia Institute of Technology, 1976

Bachelor of Science, Applied Mathematics, Georgia Institute of Technology, 1974

### **PROFESSIONAL MEMBERSHIP:**

Institute of Electrical and Electronic Engineers

### **EXPERIENCE:**

Mr. Evans is the President of Evans Power Consulting, Inc. he has served the electric power utility industry for over thirty years. His primary areas of expertise include market price forecasting, integrated resource planning, the analysis of purchased power, system operations, interruptible rates, the optimal scheduling of generator maintenance, demand-side resources, and the computer simulation of electric power systems. As an expert witness in these areas, Mr. Evans has submitted testimony on over 40 occasions, before the FERC, the Georgia Public Service Commission, the Pennsylvania Public Utilities Commission, the South Dakota Public Utility Commission, the Michigan Public Service Commission, the Alabama PSC, the Mississippi PSC, the Colorado PUC, the Delaware PSC, the Utah PSC, the South Carolina PSC, and the Arkansas PSC. He is an expert in the utilization of Strategist and PROMOD and is a nationally recognized expert in the application of these simulation models.

### **Specific Experience Includes:**

1997-2011 Slater Consulting

Golden Spread Electric Cooperative – Presented expert testimony in a FERC complaint concerning the actual operation of an economy sales agreement between Golden Spread and Southwestern Public Service Company.

Cooper Nuclear Plant - Development of the estimated damages caused by imprudent outages of a Nebraska nuclear generating unit.

Millstone 3 Nuclear Unit - Analysis of the replacement energy costs for the Millstone 3 nuclear unit on behalf of the co-owners.

Independent Power Producers - Presented expert testimony before the Alabama and Mississippi PSCs concerning the construction of new combined cycle facilities in those states.

S.C. State Energy Office - Developed a report summarizing and evaluating the Integrated Resource Plans filed by the electric utilities of South Carolina.

1989-1997 GDS Associates, Inc.

Mr. Evans served as a principal and the Manager of the System Modeling group, where he was responsible for performing analyses, providing expert testimony and developing customized software. He is an expert in the use of the industry standard computer models PROMOD III, PROSCREEN II, PROVIEW, MAINPLAN, CAT II and ENPRO. A sampling of representative assignments follows:

Tenaska, Air Liquide & Tenneco - Developed forecasts of market clearing prices for electricity in the ERCOT region.

GEMC - Produced a forecast of market clearing prices for electricity in the SERC region and estimated stranded costs.

Central Virginia Electric Cooperative - Designed, developed and installed software to allow the Cooperative to purchase economy energy in an optimal manner on a daily basis.

City of Grand Island, Nebraska - Developed the initial Integrated Resource Plan for the City of Grand Island.

Georgia PSC - Evaluated the 1995 Integrated Resource Plans filed by Georgia Power and Savannah Electric. Developed alternative Integrated Resource plans that were approved by the Commission.

Nucor Steel - Audited the bills for electric service for the Nucor-Hickman Steel Mill.

Nucor Steel - Testified before the Arkansas PSC concerning the reasonableness of a buy-through clause for interruptible customers.

Nucor Steel - Developed a comprehensive forecast of the likely levels of interruptions of service over the next ten years.

South Dakota Public Utility Commission - Evaluated the rate filing and Integrated Resource Plan filed by Black Hills Power & Light.

Georgia PSC - Evaluated Georgia Power's initial RFP for power, all bids received and Georgia Power's selection process. Testified before the Georgia PSC concerning the reasonableness of Georgia Power's evaluation process and resulting request for certification.

Michigan Attorney General - Performed studies concerning the availability of the Midland Cogeneration Venture and Consumer Power Company's avoided costs.

Michigan Attorney General - Developed estimates of cost reductions due to improved projected fossil performance and changes in cogeneration levels in a Consumers Power rate case.

Pennsylvania PUC - Testified concerning the capacity needs of a Pennsylvania utility and the appropriate avoided costs due potential cogeneration projects.

Golden Spread Electric Cooperative - Developed detailed historical reconstructions of five years of hourly operations of a major Texas utility to illustrate the penalties arising to wholesale ratepayers as a result of off-system sales.

Sam Rayburn G&T - Designed, developed and implemented a PC-based software system to facilitate daily load forecasting, optimal resource scheduling and inadvertent accounting in a user-friendly fashion.

Tex-La Electric Cooperative - Designed, developed and implemented a similar software system for daily load forecasting and optimal resource scheduling. This application also included the development of an optimization process which maximizes the total economy energy scheduled while adhering to limitations on load factor and the number of hourly changes.

PG&E-Bechtel Generating Company - Assisted this NUG developer in forecasting the dispatchability of a project and estimating likely costs in a power bidding solicitation.

1980-1989 Energy Management Associates, Inc. - now known as Ventyx

While with EMA, Mr. Evans performed product development, maintenance programming and client support on the three major products marketed and developed by EMA - PROMOD III, PROSCREEN II, and MAINPLAN. He is extremely well-versed in the development of databases for these tools and in applying these tools to particular studies.

As MAINPLAN Product Manager (1985-1989), Mr. Evans supervised and directed the development, maintenance, and client support for MAINPLAN - the software package that is the industry leader in the area of generating unit maintenance scheduling. The client base for MAINPLAN grew from two clients to over thirty clients during his involvement. Also during his tenure, a chronological production costing model was added to MAINPLAN. This highly detailed model has been used to evaluate interchange opportunities, the cost of forced outages, short-term fuel requirements and unit commitment strategies.

**Publications:**

Backcasting - A new computer application can determine historical truth for utilities that must refute damage claims, Fortnightly, October 1, 1993.

"Avoiding and Managing Interruptions of Electric Service under an Interruptible Contract or Tariff", Industrial Energy Technology Conference, April, 1995.

"Analysis and Evaluation of the Integrated Resource Plans of the Investor-Owned and State-Owned Electric Utilities in South Carolina", for the South Carolina State Energy Office, April, 1998.