THE OFFICE OF REGULATORY STAFF

DIRECT PANEL TESTIMONY

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OCTOBER 17, 2008

DOCKET NO: 2008-196-E

PUBLIC
VERSION

PANEL TESTIMONY

OF

C. H. GUERNSEY TEAM OF CONSULTANTS

FOR

THE SOUTH CAROLINA OFFICE OF REGULATORY STAFF

DOCKET NO: 2008-196-E

COMBINED APPLICATION OF SCE&G FOR THE CONSTRUCTION AND OPERATION OF A NUCLEAR FACILITY IN JENKINSVILLE, SOUTH CAROLINA

OCTOBER 17, 2008

TESTIMONY OF

DR. ZHEN ZHU

Q: PLEASE STATE YOUR NAME, BUSINESS ADDRESS AND OCCUPATION.

A: My name is Dr. Zhen Zhu, and I am a Senior Consulting Economist with C. H. Guernsey and Company located at 5555 N. Grand Blvd, Oklahoma City, OK 73112.

Q: PLEASE STATE YOUR EDUCATIONAL BACKGROUND AND EXPERIENCE.

A: I obtained a Bachelor's degree in business administration from Renmin University in China in 1985, and obtained a Master's degree in economics from Bowling Green State University in 1987. In 1994, I graduated from the University of Michigan with a Ph.D. in economics. Currently I am employed by C. H. Guernsey and Company as a Senior Consulting Economist. I have been responsible for building and maintaining natural gas price models, underground gas storage models and load forecasting models. A copy of my resume is included in the Appendix.

Q. WHOM ARE YOU REPRESENTING IN THIS PROCEEDING?

A. I am representing the South Carolina Office of Regulatory Staff ("ORS").

Q. WHAT IS YOUR ASSIGNMENT IN THIS PROCEEDING?

My assignment is to assist ORS in evaluating South Carolina Electric and Gas's ("SCE&G" or "the Company") Combined Application for Certificate of Environmental Compatibility, Public Convenience and Necessity and for a Base

Load Review Order in Docket No. 2008-196-E. The subject of this filing is the proposed construction of two new Westinghouse AP1000 nuclear units at the V.C. Summer nuclear plant site. I functioned as a member of a team of consultants evaluating SCE&G's filing. My responsibilities included analysis of Load Forecast, Fuel Forecast, and Energy Sales.

Q: HAVE YOU TESTIFIED BEFORE THIS COMMISSION?

A: No, I have not, but I have presented testimony to the Corporate Commission in the State of Oklahoma regarding natural gas price issues. I also testified before the Public Service Commission of Georgia regarding load forecasting and gas prices. My resume is included in the Appendix to this testimony.

LOAD FORECAST

Q: HAVE YOU REVIEWED SCE&G'S LOAD FORECAST?

A: Yes, I reviewed the load forecast as presented in the May 2008 Update to the South Carolina Electric and Gas Integrated Resource Plan ("IRP") (Docket No. 2006-103-E). In addition, I reviewed SCE&G's forecast modeling details on site, and conducted analyses of its forecast performances.

Q: DESCRIBE SCE&G'S ENERGY SALES AND PEAK DEMAND IN 2007.

A: The total energy sales for SCE&G in 2007 were 23,661 Gigawatt Hours ("GWH"), the summer peak was 4,926 Megawatts ("MW"), and the winter peak was 4,629 MW. The three primary customer classes - residential, commercial and industrial accounted for about 91% of total territorial sales. The residential class accounted for 34%, commercial class 31% and industrial class 26%. The

remaining 9% was comprised of street lighting, other public authorities, municipalities and cooperatives.

Q: PLEASE BRIEFLY DESCRIBE SCE&G'S FORECASTS OF ENERGY SALES AND PEAK DEMAND FOR THE NEXT FIFTEEN YEARS?

A: In the May 2008 Update to its IRP (Docket No: 2006-103-E), SCE&G projected total territorial energy sales will grow at an average of 1.3% per year over the next 15 years (from 2008 to 2022). The firm territorial summer peak and winter peak demands are projected to increase at 1.7% per year for the next 15 years.

Q: HOW DOES SCE&G'S FORECASTS COMPARE TO OTHER UTILITIES IN THE REGION?

A: Exhibits ZZ-1 and ZZ-2 show that SCE&G's forecasts of total energy sales growth rate and summer peak demand growth rate are similar to those of other utilities in the region.

Q: HOW DO SCE&G'S FORECASTS OF SALES AND PEAK DEMAND COMPARE TO ITS HISTORICAL VALUES?

A: The total territorial sales (weather normalized) from 1996 to 2007 increased at an annual rate of 2.66%. However, from 2001 to 2007, the annual growth rate slowed to about 1.7%. The summer peak demand has increased at an annual rate of 2.5% for the last 15 years. SCE&G uses a forecast of 1.7% annual growth rate for the next 15 years, from 2008 to 2023, for its summer and winter peak demand.

Q: WHAT CAUSED THE FORECAST OF TERRITORIAL SALES AND SUMMER PEAK DEMAND TO BE LOWER THAN THE HISTORICAL GROWTH RATE OF SALES AND SUMMER PEAK DEMAND?

A: The forecasted sales growth is slightly lower than the more recent historical growth rate due to three main factors: an explicit reduction in residential and commercial sales in 2012 due to light-bulb replacements that support federal law (Energy Independence and Security Act of 2007) that requires an increase in lighting efficiency, an increase in minimum Seasonal Energy Efficiency Ratio ("SEER") in residential air-conditioning, and the expiration of contracts to serve some of SCE&G's large wholesale customers. If the impact of the wholesale customer loss is excluded from the calculation by looking at retail sales only, the energy sales growth rate increases to 1.7%. Removing the efficiency savings from the forecasts would increase the sales growth to a 2.1% annual growth rate. Therefore, SCE&G's forecast is consistent with its historical values.

Q: HOW HAS SCE&G DEVELOPED THE FORECAST IN ENERGY SALES?

A: For the energy sales forecast, SCE&G developed econometric models. Short range models (for 2008 and 2009) were developed for over 30 forecasting groups based on the company's customer class and rate structure. Long range models (for 2010 and beyond) were developed for seven classes (residential, commercial, industrial, street lighting, other public authorities, municipal and cooperatives) of services which were further divided based on the characteristics of the subgroups. In order to develop the model and forecast, various historical sales values as well

as historical and forecasted values of other variables are used. Other variables include demographic variables such as population, economic variables such as real personal income, employment, industrial production, weather variables including temperatures, and other variables identified through residual analysis or knowledge of political changes and major economic events.

Q: DISCUSS SCE&G'S LONG RANGE ENERGY FORECAST MODELS.

A: For the long range forecast of energy sales, SCE&G developed econometric models for customer numbers and models of average uses. The energy sales forecast was obtained as the product of the customer numbers forecasts and the average use forecasts. Both the customer numbers and average sales models were developed based on the historical relationships of these variables and economic, demographic, weather and other variables.

Q: PLEASE EXPLAIN THE REASON FOR THE LARGE REDUCTION IN THE FORECAST OF SALES TO WHOLESALE CUSTOMERS.

A: The large decline in the forecast of sales to wholesale customers is due to the expiration of contracts to serve SCE&G's three largest wholesale customers in 2009 and 2010. The total loss amounts to about 5.7% of total territorial load (See Exhibit JML-3 in Direct Testimony of Joseph M. Lynch Docket No. 2008-196-E), and to about 5.6% of total territorial sales.

Q: DID SCE&G ADJUST MODEL FORECASTS TO REACH THE FINAL FORECASTS OF ENERGY SALES?

A: Yes. The forecasted values from the models have been adjusted to generate the final forecasts.

Q: DESCRIBE THE ADJUSTMENT TO MODEL FORECAST OUTPUT.

A: Several adjustments have been made to the model forecasts. The first is related to federal mandates (Energy Independence and Security Act of 2007) for air-conditioning units and heat pumps. The mandates raise the efficiency and the effect was not reflected in the historical data, so the adjustment leads to reductions in energy sales. The second adjustment is based on savings related to lighting beginning in 2012 when mandated federal efficiencies (as a result of the Energy Independence and Security Act of 2007) will take effect and be phased in through 2014. The last adjustment to the baseline forecast is to account for new industrial growth on SCE&G's system.

Q: PLEASE DESCRIBE AND COMMENT ON THE MAGNITUDE OF THE ADJUSTMENT.

A: The efficiency impact is as much as a 5% reduction while the new industrial growth impact amounts to about 1 to 1.5% increase in energy sales (See page 5, May 2008 Update to SCE&G's IRP (Docket No: 2006-103-E)). Based on my review, these adjusted amounts appear to be reasonable.

Q: PLEASE DESCRIBE SCE&G'S FORECASTS OF PEAK DEMAND.

A: A load factor methodology was used to develop the summer and winter peak demands. For summer peak demand, load factors for selected classes and rates were computed first from historical data and then used to estimate peak demands from the projected energy consumption among these categories. In the second step, for a number of large customers, planning peaks were determined. The total demands from these classes were combined for rate and individual customers

which resulted in the summer territorial peak demand. The summer peak demand was adjusted by demand reductions due to the Company's standby generator and interruptible programs.

The Company's winter peak demand projection was obtained by employing a regression model with total territorial energy and weather during the day of the winter peaks' occurrence.

Q: ARE SCE&G'S FORECASTING METHODS CONSISTENT WITH INDUSTRY CONVENTIONS?

A: Yes, in a typical load and demand forecasting process, econometric models and other methods such as end-use, load factor methods are employed. Various assumptions about underlying factors that drive demand and energy sales are made. SCE&G followed industry norms in building its forecast models and its forecasting models appear to be reasonable.

Q: HAVE YOU EVALUATED SCE&G'S MODEL PERFORMANCE?

A: Yes, I evaluated the forecast performance of SCE&G's IRPs in the last several years. Exhibit ZZ-3 shows that early IRP (especially 2001) forecasts had relatively large forecast errors in forecasting total energy sales. This was mainly due to SCE&G's over-forecast of industrial sales at the time. However, the IRPs in more recent years appear to have acceptable ranges of forecast errors.

Exhibit ZZ-3 also shows that the percentage forecast errors for the summer peak demand forecast are in acceptable ranges.

Q: DO YOU BELIEVE SCE&G HAS OVER ESTIMATED FUTURE LOAD GROWTH?

A: No, I do not. If anything, SCE&G's load forecast is conservative. The forecast will likely underestimate future load growth. SCE&G used a revised lower economic growth rate forecast based on forecasts provided by Global Insight, Inc. Global Insight, Inc. is a well-known and reputable company that provides economic, financial and other analyses and forecasts. (Global Insight, Inc. is a part of the HIS family of firms including Jane's Information Group and Cambridge Energy Research Associates.) In addition, SCE&G's estimates of the impact of efficiency mandates are likely on the high side, which could result in lower sales and peak demand forecasts.

GAS PRICES

Q: PLEASE DESCRIBE SCE&G'S GAS PRICE FORECAST.

A: SCE&G provided three scenarios of projected natural gas prices: a base price, a high price, and a low price.

Q: HOW WAS SCE&G'S GAS PRICE FORECAST OBTAINED?

A: SCE&G's base gas price projection was based on New York Mercantile Exchange ("NYMEX") gas futures prices on April 22, 2008. Trading prices through 2010 were used and the prices for later years were escalated at a rate of 2.8%. High and low prices were obtained by adding or subtracting 25% of the base prices.

Q: COMMENT ON THE METHOD SCE&G USED IN OBTAINING GAS PRICE PROJECTIONS.

A: NYMEX prices represent the market judgment of future gas prices, given the information at that point in time. However, NYMEX prices fluctuate on a daily basis based on information flows, and the daily price swings can be large. Due to large price volatilities in the market, therefore, the date when the prices were selected can influence the price projection substantially. For instance, Exhibit ZZ-4 shows that April 22, 2008 is a day when prices were increasing.

Q: HOW DOES SCE&G'S GAS PRICE FORECAST COMPARE TO CURRENT NYMEX PRICES?

A: SCE&G's base price forecast is higher than the current NYMEX prices. However, the current NYMEX gas prices match well with SCE&G's low gas forecast.

Q: HOW DOES SCE&G'S GAS PRICE FORECAST COMPARE TO U.S. DEPARTMENT OF ENERGY'S LONG TERM PRICE FORECAST?

A: The Energy Information Administration ("EIA") of U.S. Department of Energy provides long term energy price forecasts in its Annual Energy Outlook ("AEO"). The EIA's prices are based on long term demand and supply analyses and forecasts. Compared to the 2008 EIA AEO natural gas price forecast, SCE&G's low price forecast is slightly higher than the EIA forecast.

COAL PRICE AND NUCLEAR FUEL PRICE FORECASTS

Q: HAVE YOU REVIEWED SCE&G'S COAL PRICE FORECAST?

A: Yes. We also compared SCE&G's coal price forecasts to EIA's forecast of coal prices and found that SCE&G's coal price forecast is consistent with EIA's forecast for the region.

Q: HAVE YOU REVIEWED SCE&G'S NUCLEAR FUEL PRICE FORECAST?

A: Yes. SCE&G's nuclear fuel price forecast is slightly lower than the EIA forecast for the period of 2009 to 2010, but slightly higher than the EIA forecast for the period of 2011 to about 2020. The forecasts are about the same after 2020. In general, however, SCE&G's nuclear fuel price forecast is consistent with the EIA forecast. In addition, SCE&G's nuclear fuel cost projection appears to be consistent with others (for example, with several fuel cost projections cited in Figure 4 of *Nuclear Fuel Future* by Edward Kee in *Public Utility Fortnightly*, Feb 2008, pages 26-31).

Q: WHAT IS YOUR CONCLUSION REGARDING SCE&G'S LOAD AND FUEL PRICE FORECASTS?

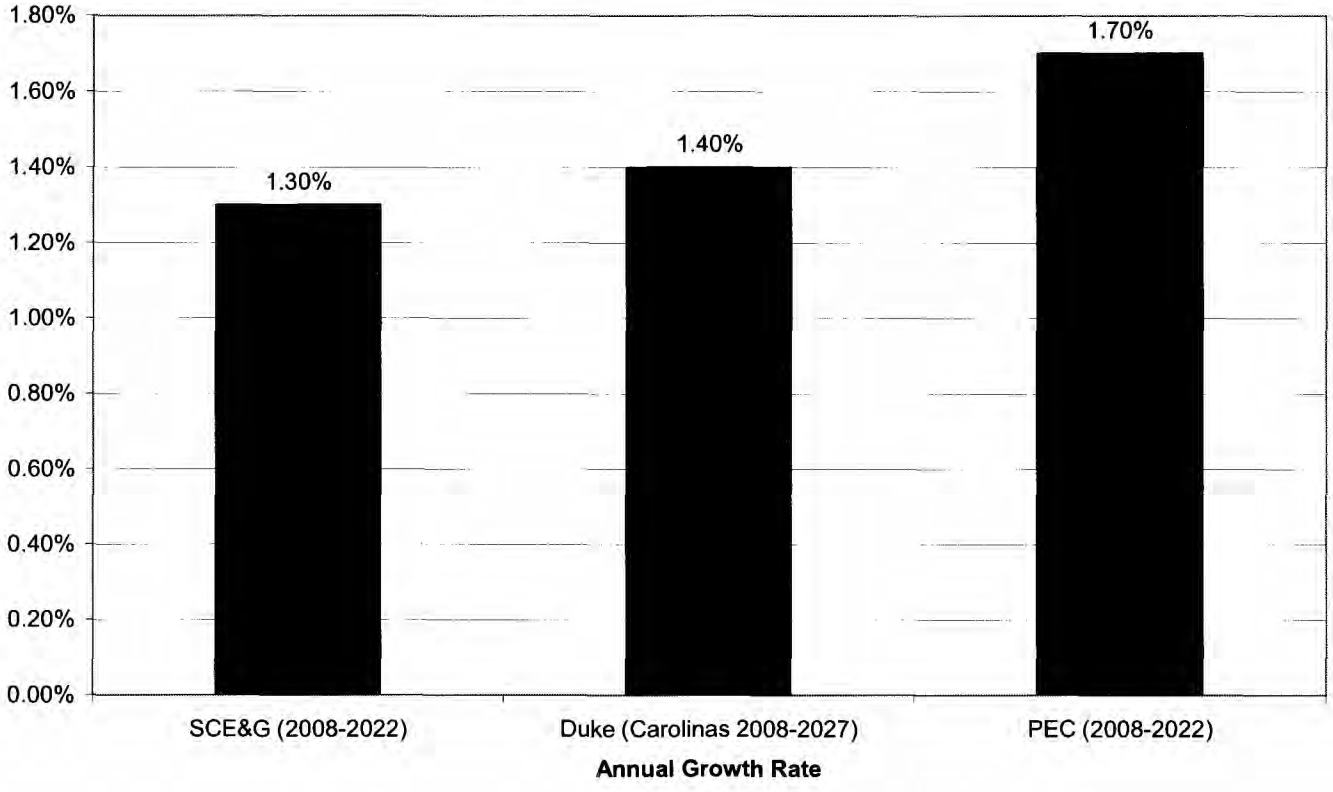
A: SCE&G's load and fuel price forecasting process followed industry standards and the forecasts are reasonable.

Q: DOES THIS CONCLUDE YOUR TESTIMONY?

Q: Yes.

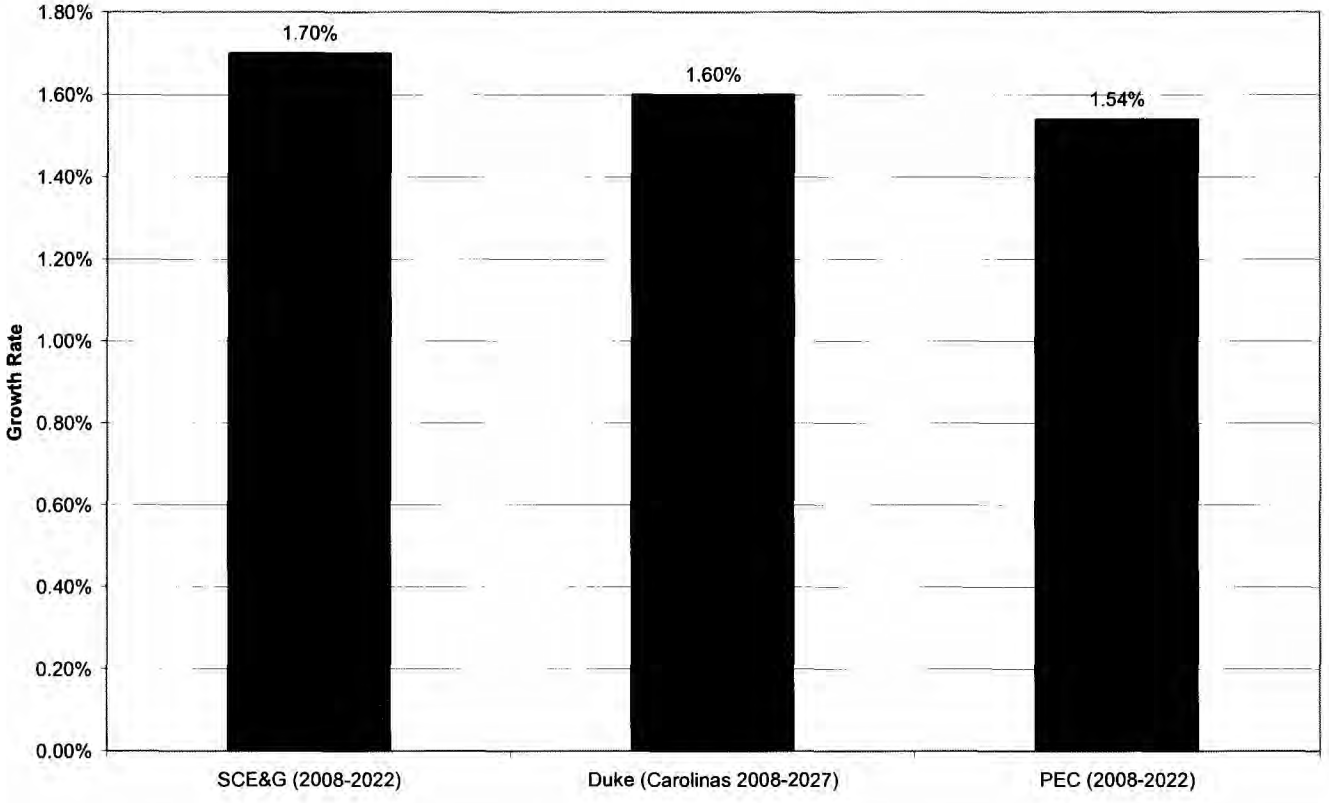
Exhibit ZZ-1

Energy Sales Annual



Data Source: The Duke Energy Carolinas Annual Plan, November 15, 2007, and PEC Integrated Resource Plan, 2008, Docket No. 2006-174-E

Summer Peak Demand Growth



Data Source: The Duke Energy Carolinas Annual Plan November 15, 2007, and PEC Integrated Resource Plan, 2008, Docket No. 2006-174-E

Exhibit ZZ-3

SCE&G Load Forecast Performance

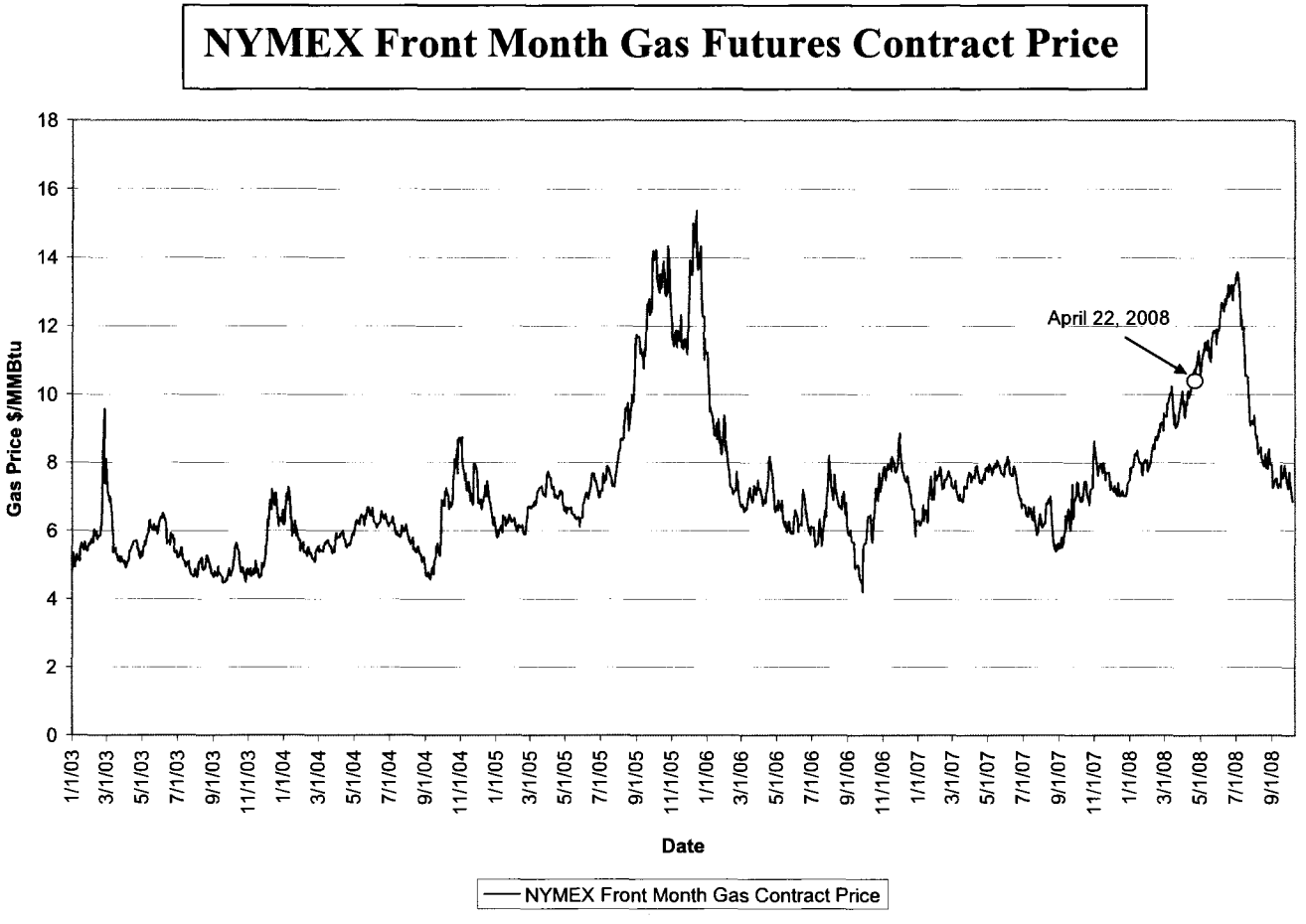
Total Territorial Sales Percentage Forecast Error - Weather Normalized Sales

	IRP2000	IRP2001	2002 Budget	IRP2003	IRP2004	IRP2005	IRP2006	IRP2007
2000	-1.65%							
2001	0.71%	2.32%						
2002	-1.10%	1.19%	-1.05%					
2003	0.22%	3.11%	0.55%	0.48%				
2004	-1.47%	1.33%	-0.95%	-1.10%	-2.00%			
2005	0.29%	3.04%	0.49%	0.64%	-0.76%	0.90%		
2006	2.65%	5.59%	3.37%	3.30%	1.91%	3.22%	3.42%	
2007	1.83%	4.71%	2.92%	3.00%	1.66%	2.65%	3.39%	-0.18%

Summer Peak Demand Percentage Forecast Error - Weather Normalized

	IRP2000	IRP2001	2002 Budget	IRP2003	IRP2004	IRP2005	IRP2006	IRP2007
2000	2.80%							
2001	-0.19%	-0.92%						
2002	0.00%	0.70%	-0.23%					
2003	1.70%	1.84%	1.04%	2.09%				
2004	0.33%	0.53%	-0.31%	0.89%	0.33%			
2005	-0.62%	-0.69%	-1.83%	-0.24%	-1.10%	-0.06%		
2006	1.03%	1.09%	0.21%	1.70%	0.84%	1.39%	1.39%	
2007	-0.27%	-0.23%	-0.83%	0.85%	0.08%	0.44%	0.75%	0.33%

Source Data: SCE&G
Negative numbers indicate underestimated percentages



Source: Gas Daily

TESTIMONY OF

GEORGE W. EVANS

Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS AND OCCUPATION.

A. My name is George W. Evans. I am a Vice President of Slater Consulting at 1150 Charlton Trace, Marietta, Georgia 30064, and a member of the C. H. Guernsey & Company team.

Q. MR. EVANS, PLEASE STATE YOUR EDUCATIONAL BACKGROUND AND EXPERIENCE.

A. I received a Bachelor of Science in Applied Mathematics from the Georgia Institute of Technology in 1974. In 1976, I received a Master of Science in Applied Mathematics, also from the Georgia Institute of Technology. My area of concentration was probability and statistics. In 1980 I joined Energy Management Associates, Inc. ("EMA"), the company responsible for the development of the premier electric utility modeling tools, PROMOD®, PROSCREEN®, PROVIEW® and MAINPLAN®. While at EMA, I worked with some fifty (50) major electric utilities in the United States and Canada in the application of these modeling tools for generation expansion planning, fuel budgeting, the analysis of power purchases and the development of optimal maintenance schedules for generating units.

In 1989 I left EMA to join GDS Associates, Inc., a consulting firm located in Marietta, Georgia. At GDS I was a principal and the Manager of System Modeling. In this position I was primarily responsible for performing analyses

and presenting expert testimony concerning integrated resource planning, the forecasting of system production costs, developing estimates of the likelihood of service interruptions, developing estimates of replacement power costs and related activities.

In August of 1997 I left GDS to join Slater Consulting as a Vice President. A copy of my résumé is included in Appendix A.

Q. WHERE HAVE YOU TESTIFIED BEFORE?

A. I have provided expert testimony on 34 previous occasions, before the public utility commissions in Pennsylvania, Georgia, Michigan, Arkansas, South Dakota, Colorado, Illinois, Mississippi, Alabama, Delaware, and Oklahoma; and also before the FERC (Federal Energy Regulatory Commission). A complete list of the proceedings that I have testified in is in my resume.

Q. HAVE YOU APPEARED BEFORE THE PUBLIC SERVICE COMMISSION OF SOUTH CAROLINA IN THE PAST?

A. No, I have not.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. South Carolina Electric & Gas Company ("SCE&G" or "the Company") has applied for certification of two new nuclear generating units to be in service in 2016 and 2019, each providing 614 MW of new base load capacity to the SCE&G generating system. The purpose of my testimony as part of the C. H. Guernsey team hired by the South Carolina Office of Regulatory Staff is to present my

analysis and evaluation of SCE&G's need for capacity, and more specifically, the contribution that the proposed new nuclear facilities are likely to make to the economy and reliability of SCE&G's system.

Q. PLEASE SUMMARIZE YOUR CONCLUSIONS.

A. SCE&G will need additional base load generating capacity in the years 2016 and 2019, and the selection of the proposed new nuclear generating units will provide the needed reliability in the most economic manner, when compared to all reasonable alternatives. The selection of these units are best suited to allow SCE&G to maintain low electric rates while at the same time, minimize additional emissions of CO_2, SO_2, and NOX (Carbon Dioxide, Sulfur Dioxide and Nitrous Oxide).

Q. HOW IS YOUR TESTIMONY ORGANIZED?

A. I first present a description of the process SCE&G utilized to evaluate the need for additional capacity in the future. The process involves the development of a load forecast, the forecasted impact of demand-side management resources ("DSM"), the forecasted capabilities of existing and known generating resources, the development of an appropriate reserve margin requirement, and finally, the need for additional resources in future years. I then describe my evaluation of this process and give my conclusions.

Next, I address SCE&G's selection of new nuclear generating units to satisfy the given needs for additional generating capacity. After describing the process used by SCE&G to make this decision, I describe my evaluation of SCE&G's process

and the results of my independent analysis. Finally, I summarize my conclusions on SCE&G's selection process.

Q. WHAT PROCESS DID SCE&G FOLLOW IN ESTIMATING FUTURE NEEDS FOR ADDITIONAL RESOURCES?

A. To estimate future needs for additional resources, SCE&G performed the following steps:

- Development of a load forecast - future energy and peak demand requirements of SCE&G customers;
- Identification of the capabilities of existing resources; and,
- Development of an appropriate reserve requirement – reserve margin.

The results of these three steps were then combined to produce an estimate of future resource needs.

Q. WOULD YOU DESCRIBE THIS PROCESS AS BEING INDUSTRY STANDARD?

A. Yes, I would. Each of these steps and SCE&G's results are described in the following sections.

Q. PLEASE DESCRIBE SCE&G'S DEVELOPMENT OF ITS CURRENT LOAD FORECAST.

A. See the testimony of Dr. Zhen Zhu below for a description and evaluation of SCE&G's load forecast

Q. HOW DID SCE&G DETERMINE THE CAPABILITIES OF ITS EXISTING RESOURCES?

A. SCE&G estimates the maximum net continuous output of each generator on a 100 degree summer day, based on actual historical output, with adjustments for the ambient conditions on a 100 degree summer day, and any modifications and upgrades that were planned prior to the summer of 2008.

Q. IS THIS AN INDUSTRY STANDARD APPROACH?

A. Yes, it is.

Q. DO YOU FIND THE CAPABILITIES USED BY SCE&G TO BE REASONABLE?

A. Yes, I do. Page 2 of 3 in Mr. Lynch's Exhibit No. JML-1 shows the maximum capabilities computed by SCE&G for each existing generating unit and certain long-term purchases, giving a total installed capability of 5,745 MW. The total is made up of 14% hydro, 11% nuclear, 45% coal, 29% natural gas, and 1% long-term purchases.

Q. DO YOU AGREE THAT SCE&G WILL NEED ADDITIONAL BASE LOAD GENERATION AT LEAST BY 2016?

A. Yes - comparing existing capabilities of SCE&G base load generation to the 2016 load duration curve, SCE&G will need additional base load generation (See Exhibit GWE-1.) That is, additional generation will be required to produce energy at a high capacity factor.

Q. WHAT RESERVE MARGIN DOES SCE&G USE TO DETERMINE WHETHER IT HAS SUFFICIENT GENERATING CAPACITY?

A. SCE&G uses a range of 12% to 18% reserve margin. This means that SCE&G will require the total installed generating capacity to exceed projected peak

demand (adjusted for Demand Side Management/"DSM") by at least 12% of peak demand, but no more than 18%. This generating capacity in excess of peak demand is meant to provide sufficient capacity to meet customer requirements when one or more generating units is unexpectedly forced out of service or summer weather is unusually hot.

Q. IS THIS 12 TO 18% REQUIREMENT SIMILAR TO OTHER LOCAL ELECTRIC UTILITIES?

A. Yes, it is. Progress Energy Carolinas uses a 13% target reserve margin and Duke utilizes a 17% target reserve margin. Southern Company has a 15% target reserve margin. SCE&G's reserve margin range is reasonable when compared to other local utilities.

Q. COMBINING SCE&G'S LOAD FORECAST, PORTFOLIO OF EXISTING GENERATING CAPACITY AND RESERVE MARGIN REQUIREMENT, WHAT FUTURE CAPACITY NEEDS EMERGE?

A. The chart attached as Exhibit GWE-2 shows the resulting capacity requirements in future years. This chart shows SCE&G's existing generating capacity of 5,745 MW as the large block at the bottom of the chart, the additional generating capacity required to maintain a 12% reserve margin above that block and finally, the additional generating capacity required to maintain an 18% reserve margin. SCE&G will need additional generating capacity to cover at least the 12% reserve margin block to maintain reliable service to its customers.

Q. DO THE PROPOSED NUCLEAR ADDITIONS FIT INTO SCE&G'S FUTURE CAPACITY NEEDS?

A Yes, they do. This is illustrated in the chart attached as Exhibit GWE-3.

Q. PLEASE DESCRIBE THE PROCESS USED BY SCE&G TO SELECT THE PROPOSED NUCLEAR ADDITIONS.

A. SCE&G utilized two computer simulation models – EGEAS® and PROSYM®. These are both industry standard computer simulation models, widely used throughout the electric utility industry. Each performs a simulation of the operation of the SCE&G electric system and produces forecasted values for operating costs, including fuel costs and operations and maintenance costs. SCE&G performed model runs for each of three potential expansion plans – a coal based plan, a gas based plan and the proposed nuclear plan. The forecasted operating costs from model runs were combined with capital costs for each expansion plan in a spreadsheet of SCE&G's design, so that total costs for each of the various expansion plans could be compared on an economic basis. The Company compared the three basic expansion plans under a wide array of basic assumptions, comparing the plans under different fuel price forecasts, DSM impacts, CO_2 costs and assumptions regarding the future availability of the Company's existing coal plants.

Q. DO YOU CONSIDER THE COMPANY'S PROCESS TO BE SUFFICIENT TO JUSTIFY THE SELECTION OF THE PROPOSED NUCLEAR ADDITIONS?

A. Yes, I do. SCE&G utilized industry standard practices, and evaluated its proposed plan under a wide array of potential future outcomes. The Company sufficiently

analyzed reasonable alternatives to arrive at what will likely be the most economic plan.

Q. WHAT PROCESS HAVE YOU USED TO REACH THIS CONCLUSION?

A. To evaluate the Company's economic analyses, I examined the results of the Company's analyses and the data used for the various analyses, requested additional analyses from the Company, and performed my own independent analysis.

Q. WHAT WERE THE RESULTS OF YOUR EXAMINATION OF THE COMPANY'S ANALYSES?

A. To verify the reasonableness of SCE&G's analyses, I compared reported historical data to forecasted results from the Company's analyses. The comparisons are shown in graphic form on the pages of Exhibit GWE-4. Based on my comparison, the graphs show that the forecasted results from SCE&G's economic analyses are very reasonable. The left-hand portion of each of these charts displays historical recorded data taken from SCE&G's FERC Form 1 for the years 2000 through 2007. The right-hand portion of each of these charts shows information taken from SCE&G's computer simulations developed for the economic analyses, for the years 2008 through 2016. The first of these charts compares historical SCE&G nuclear generation with forecasted nuclear generation from SCE&G's computer simulation in future years. The forecasted nuclear generation is very similar to the historical nuclear generation, giving credence to SCE&G's computer simulations. The large increase in nuclear generation in 2016 is due to the addition of the first proposed nuclear unit. Other

pages in Exhibit GWE-4 compare generation for other types of generating units and also cost data by generation type.

Q. WHAT WERE THE RESULTS OF YOUR INDEPENDENT ANALYSIS?

A. I developed what is known in the industry as a "busbar" comparison – an analysis that compares all of the costs of a series of proposed generating sources (such as coal, gas, and nuclear) on the same basis. The results of my analysis are illustrated in Exhibit GWE-5. This comparison shows the cost advantage that nuclear generation has over coal and natural gas.

Q. WHAT DO YOU RECOMMEND?

A. I recommend that the Commission approve SCE&G's request to certify the proposed nuclear additions.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes it does.

Exhibit GWE-1

South Carolina Electric and Gas
2016 Load Duration Curve versus Existing Baseload Capacity

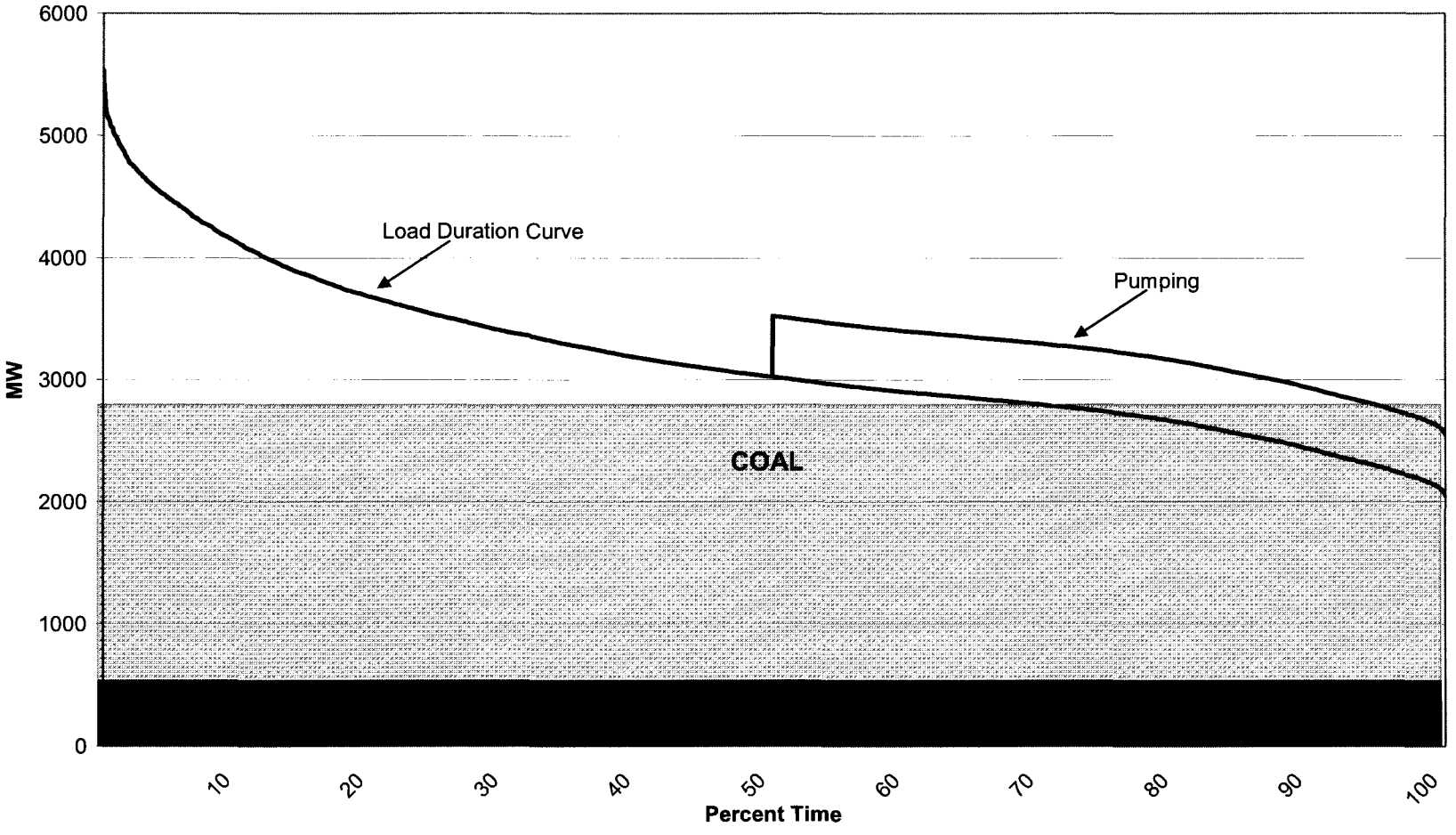


Exhibit GWE-2

SCE&G - Future Capacity Needs

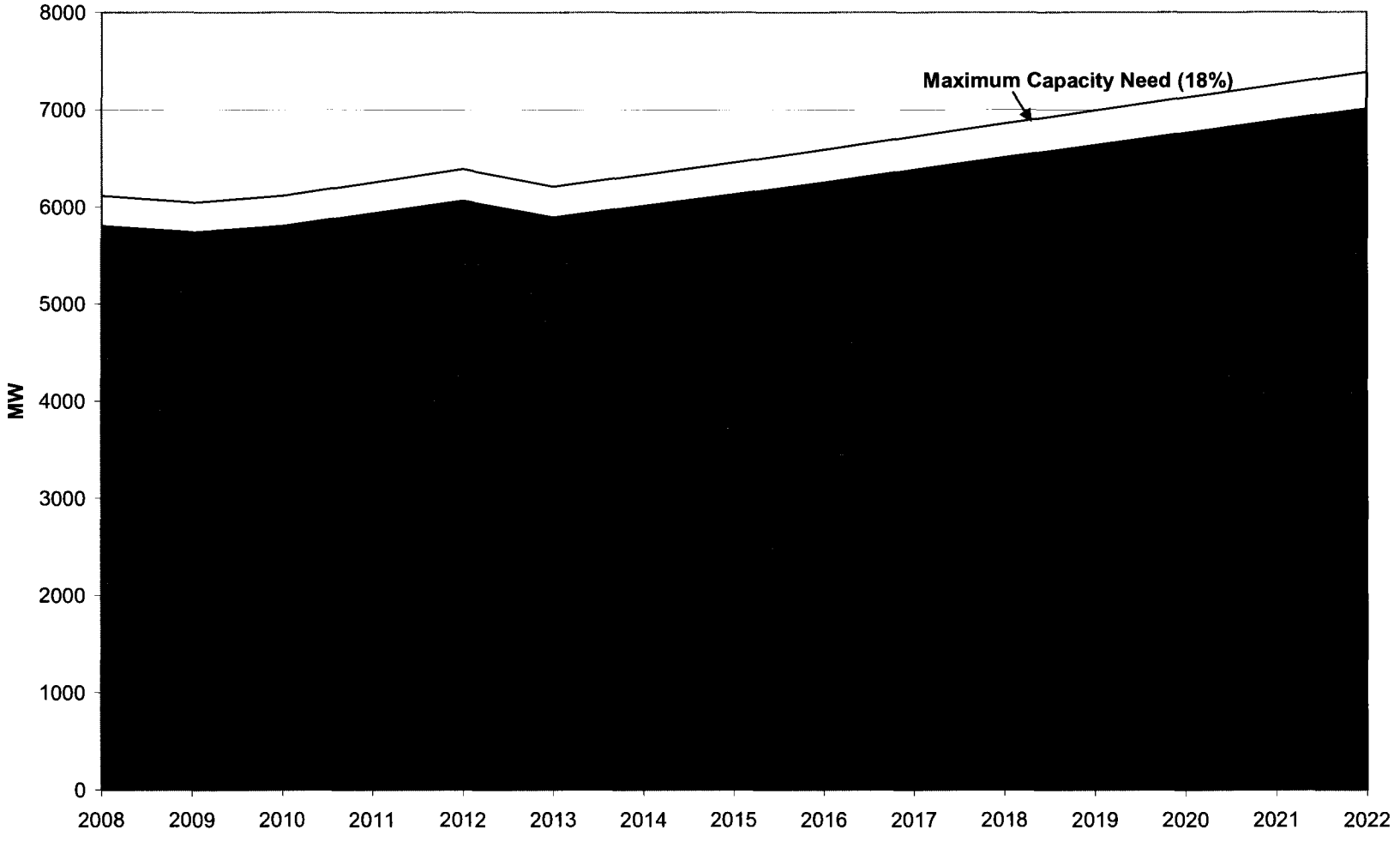


Exhibit GWE-3

SCE&G - Future Capacity Needs with Proposed Nuclear Additions

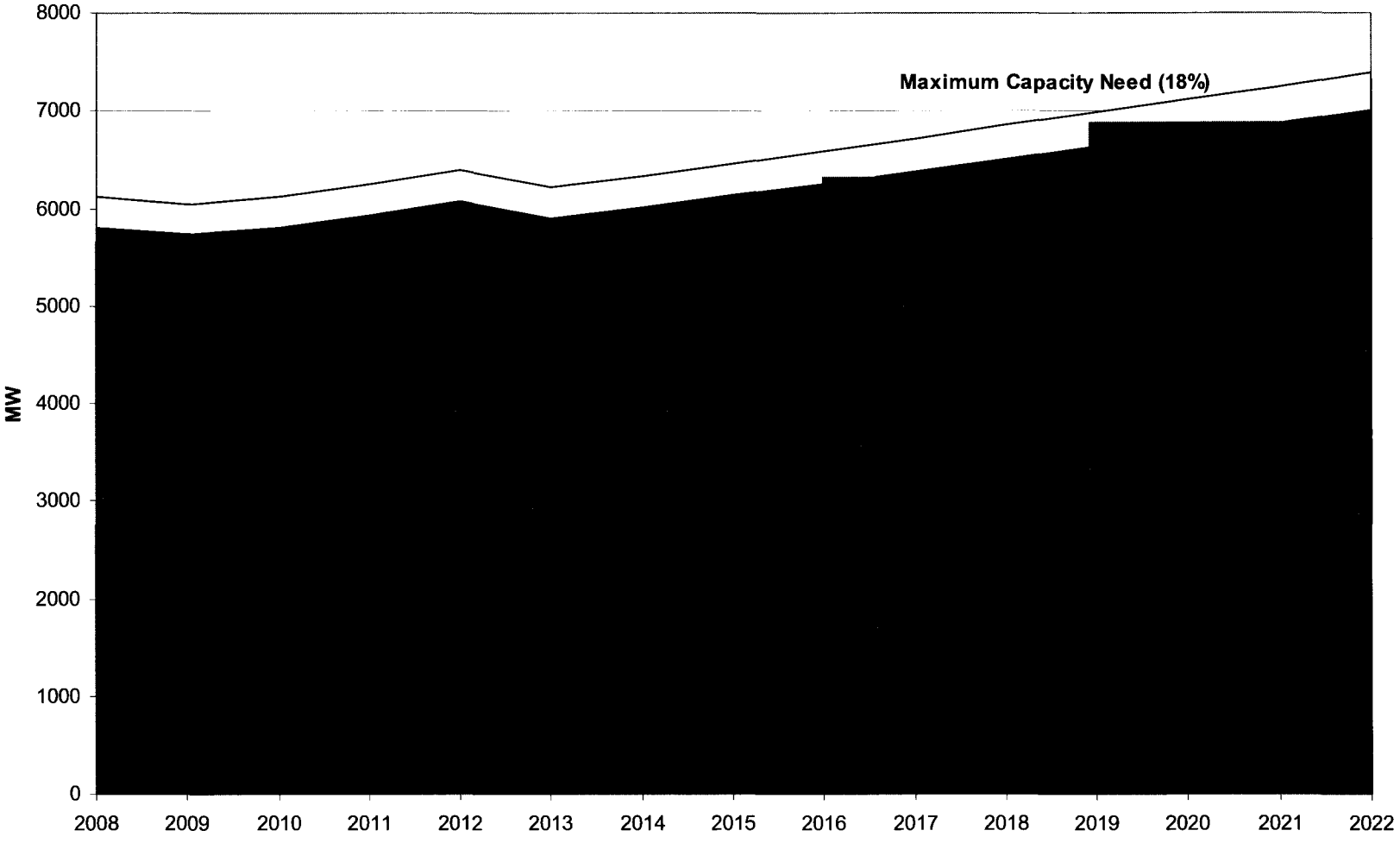


Exhibit GWE-4 REDACTED

Exhibit GWE-4 REDACTED

Exhibit GWE-4 REDACTED

Exhibit GWE-4 REDACTED

Exhibit GWE-4 REDACTED

Exhibit GWE-4 REDACTED

Exhibit GWE-4 REDACTED

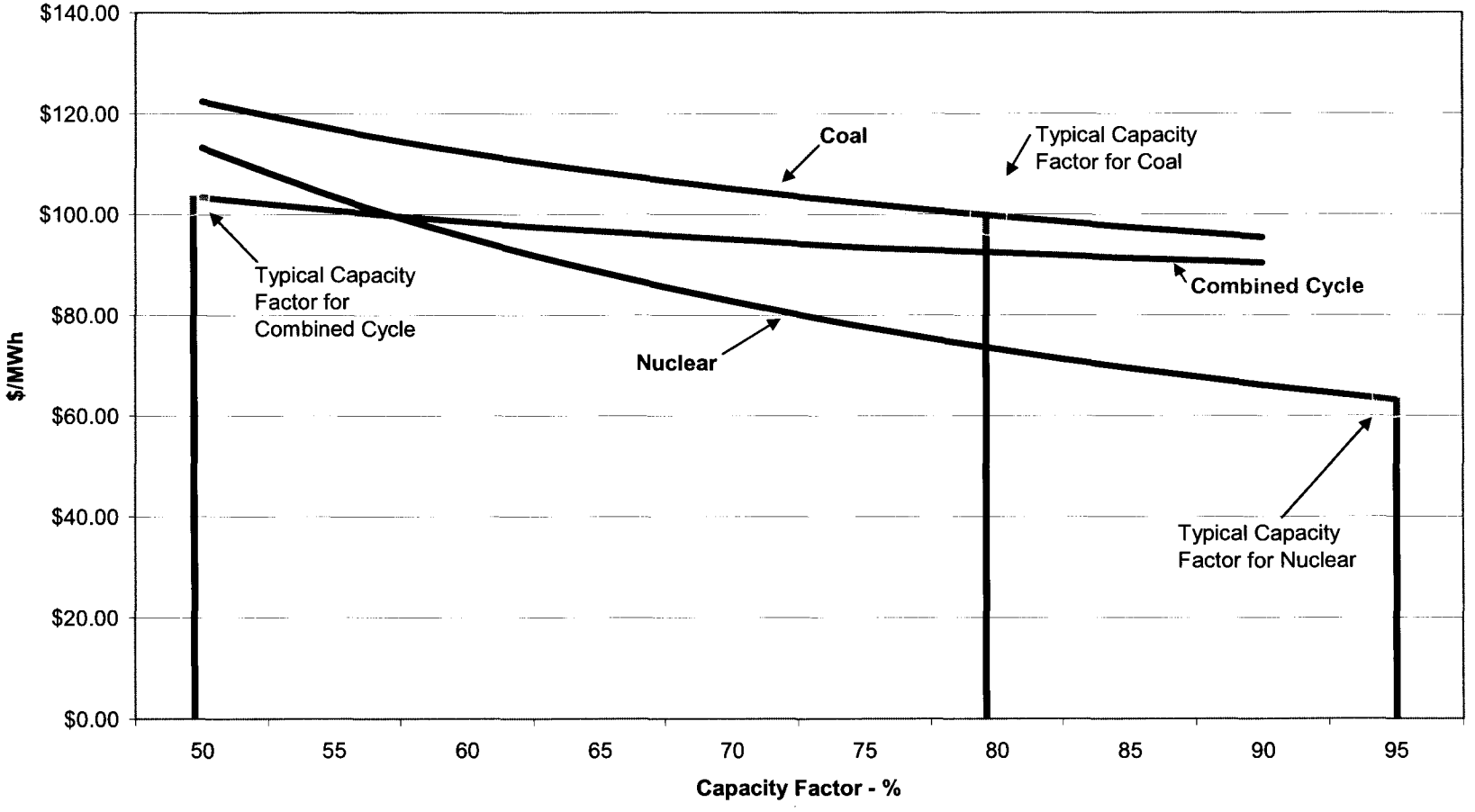
Exhibit GWE-4 REDACTED

Exhibit GWE-4 REDACTED

Exhibit GWE-4 REDACTED

Exhibit GWE-5

Busbar Estimates
Levelized Cost in 2008 Dollars



TESTIMONY OF

WILLIAM R. JACOBS, JR., PhD

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

A. My name is William R. Jacobs, Jr., Ph.D. I am a Vice President of GDS Associates, Inc. My business address is 1850 Parkway Place, Suite 800, Marietta, Georgia, 30067, and I am a member of the C. H. Guernsey & Company team.

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

A. I received a Bachelor of Mechanical Engineering in 1968, a Master of Science in Nuclear Engineering in 1969 and a Ph.D. in Nuclear Engineering in 1971, all from the Georgia Institute of Technology. I am a registered professional engineer and a member of the American Nuclear Society. I have more than thirty years of experience in the electric power industry including more than twelve years of power plant construction and start-up experience. I have participated in the construction and start-up of seven power plants in this country and overseas in management positions including start-up manager and site manager. As a loaned employee at the Institute of Nuclear Power Operations ("INPO"), I participated in the Construction Project Evaluation Program, performed operating plant evaluations and assisted in development of the Outage Management Evaluation Program. Since joining GDS Associates, Inc. in 1986, I have participated in rate case and litigation support activities related to power plant construction, operation and decommissioning. I have evaluated nuclear power plant outages at numerous nuclear plants throughout the United States. I am currently on the management

committee of Plum Point Unit 1, a 650 Megawatts Electric ("MWe") coal fired power plant under construction near Osceola, Arkansas. As a member of the management committee, I assist in providing oversight of the Engineering, Procurement and Construction ("EPC") Contract for this project. My resume is included in Appendix A.

Q. WHAT IS THE NATURE OF YOUR BUSINESS?

A. GDS Associates, Inc. ("GDS") is an engineering and consulting firm with offices in Marietta, Georgia; Austin, Texas; Corpus Christi, Texas; Manchester, New Hampshire; Madison, Wisconsin; Manchester, Maine; Bellingham, Washington; and Auburn, Alabama. GDS provides a variety of services to the electric utility industry including power supply planning, generation support services, rates and regulatory consulting, financial analysis, load forecasting and statistical services. Generation support services provided by GDS include fossil and nuclear plant monitoring, plant ownership feasibility studies, plant management audits, production cost modeling and expert testimony on matters relating to plant management, construction, licensing and performance issues in technical litigation and regulatory proceedings.

Q. WHOM ARE YOU REPRESENTING IN THIS PROCEEDING?

A. I am representing the South Carolina Office of Regulatory Staff ("ORS").

Q. WHAT IS YOUR ASSIGNMENT IN THIS PROCEEDING?

My assignment is to assist ORS in evaluating South Carolina Electric and Gas's Combined Application for Certificate of Environmental Compatibility, Public Convenience and Necessity and for a Base Load Review Order in Docket No.

2008-196-E. The subject of this filing is the proposed construction of two new Westinghouse AP1000 nuclear units at the V.C. Summer nuclear plant site. I functioned as a member of a team of consultants evaluating SCE&G's filing. The specific areas assigned to me include the selection of the AP1000 nuclear reactor technology, the capabilities of Westinghouse and Shaw Stone and Webster, the major contractors selected to design and construct the plant and the EPC contract between SCE&G and Westinghouse and Shaw Stone and Webster.

Q. HOW IS YOUR TESTIMONY ORGANIZED?

A. My testimony is organized into an introduction presented in Section I, Section II describes the AP1000, Section III describes Westinghouse and Shaw Stone and Webster and Section IV which describes the EPC contract. Each section of my testimony refers to an exhibit which provides more detailed information on the topic addressed in that particular section. Finally I have included Section V in which my conclusions are summarized.

II. The Westinghouse AP1000

Q. PLEASE PROVIDE A BRIEF DESCRIPTION OF THE WESTINGHOUSE AP1000.

A. The AP1000 is a pressurized water reactor ("PWR") of approximately 1100 megawatts capacity utilizing advanced passive design features that greatly simplify the construction and operation of the plant while providing reliable safety features that do not require actuation of active components such as pumps and diesel generators to mitigate postulated accident scenarios. The AP1000 is

designated by the Department of Energy as a Generation III+ reactor because it is an Advanced Light Water Reactor with improved economics and safety.

Q. PLEASE DESCRIBE THE PASSIVE SAFETY FEATURES IN MORE DETAIL.

A. The passive safety features of the AP1000 are described in more detail in Exhibit WRJ-1. The design philosophy behind the AP1000 was to eliminate the need for active safety components such as pumps, motor operated valves, emergency diesel generators to mitigate a postulated accident and use natural forces such as natural circulation, gravity, convection and compressed gas to maintain the reactor in a safe condition following an accident. The plant is designed such that in the event of a loss of coolant along with loss of all on-site power and off-site power and with no operator action, the plant will safely shut down and remain in a safe, cool condition.

Q. PLEASE EXPLAIN YOUR STATEMENT THAT THE DESIGN GREATLY SIMPLIFIES THE CONSTRUCTION AND OPERATION OF THE PLANT.

A. The elimination of active safety related components greatly simplifies the construction and operation of the plant. The passive design yields a significant reduction in components, amount of required cable and volume of plant buildings. The reduction in components, cable and building size greatly reduces the scale and complexity of construction. In the current generation of nuclear plants the many active safety components require extensive, recurring testing to ensure the operability. Much of the time of the operating staff is spent conducting the

required surveillance testing. This testing is greatly reduced in a passive safety plant.

Q. WHAT IS THE STATUS OF THE NRC LICENSING OF THE AP1000?

A. The design of the AP1000 was certified by the Nuclear Regulatory Commission ("NRC") on January 27, 2006. The AP1000 is the first and only Generation III+ reactor to receive design certification by the NRC. On May 26, 2007, Westinghouse submitted an application to amend the DCD and provided Revision 16 to the NRC for review. Revisions 1 – 15 have been reviewed and approved by the Nuclear Regulatory Commission. Revision 16 of the Design Control Document ("DCD") includes modifications that will aid in reducing the cost, schedule and risks for US utilities that plan to apply for a combined construction and operating license ("COL"). In addition, Revision 16 of the DCD incorporates measures to enhance security and aircraft crash resistance and addresses approximately 40 percent of the 166 COL information items that were included in the AP1000 Design Certification issued by the NRC. The remaining COL information items, mostly related to site-specific issues, will be addressed by utilities when submitting COL applications to the NRC. The current schedule calls for issuance of the Final Safety Evaluation Report of Revision 16 by the NRC in March 2010.

Q. HOW MANY AP1000 PLANTS HAVE BEEN BUILT?

A. No AP1000 plants have been constructed at this time.

Q. IS THERE A SIGNIFICANT RISK BECAUSE AN AP1000 HAS NOT BEEN PLACED IN OPERATION?

A. The fact that no AP1000 plants have been constructed and placed in operation does present a risk to the project. Many of the major components of the AP1000 including the reactor vessel and internals, the steam generator, the nuclear fuel and the pressurizer are similar to those in currently operating reactors. The canned motor reactor coolant pumps are used in many industrial applications and will be thoroughly tested prior to use in the AP1000.

Q. PLEASE DESCRIBE SCE&G'S EVALUATION OF OTHER REACTOR TECHNOLOGIES THAT LED TO SELECTION OF THE AP1000.

A. SCE&G conducted a thorough and detailed evaluation of the existing reactor technologies before selecting the AP1000 for the new reactors. The reactor technologies considered were the AP1000, the General Electric Economic Simplified Boiling Water Reactor ("ESBWR") and the Areva Evolutionary Power Reactor "(EPR"). SCE&G identified a preference for a pressurized water design given the experience at the V.C. Summer Unit 1 and for a passive technology due to the simplified plant design. Also, construction cost and projected operation and maintenance costs were considered. Other key technical attributes were the design features of the technology, regulatory risk to obtaining the construction/operating license, compatibility of the unit size with the SCE&G system and long term operating and maintenance considerations and ability to meet the desired schedule. Another important factor in the selection was the ability of the contractor to successfully execute the project including the degree of engineering completeness and the status of the supply chain needed to provide the required components. SCE&G also considered the opportunities to collaborate with other

regional utilities. The AP1000 was found to be the preferred technology from both a technical and a financial perspective

Q. HAVE OTHER U.S. UTILITIES SHOWN AN INDICATION TO SELECT THE AP1000 FOR THEIR NEW NUCLEAR PROJECTS?

A. Yes. Utilities planning new nuclear power plants have shown a clear preference for the AP1000 over the competing technologies. Utilities including SCE&G, Duke Energy Carolinas, Georgia Power Company, Florida Power and Light, Progress Energy and Tennessee Valley Authority have indicated plans to order 14 AP1000 units. This compares to indicated plans to order 7 Evolutionary Pressurized Reactor's ("EPR") and 6 Economic Simplified Boiling Water Reactor ("ESBWR") units.

Q. WHAT HAVE YOU CONCLUDED REGARDING THE PRUDENCE OF SCE&G'S SELECTION OF THE AP1000 FOR THE NEW NUCLEAR UNITS?

A. I have concluded that the Company's selection of the AP1000 as the reactor technology for the new nuclear units is reasonable and prudent. SCE&G's evaluation of the competing reactor designs was detailed and comprehensive from both a technical and commercial perspective. Key aspects of the various reactor designs were identified and ranked. Given the combination of construction and operating cost, status of licensing, ability of the main contractors to complete the project, Pressurized Water Reactor ("PWR") technology of V.C. Summer Unit 1 and the opportunities for synergies with other utilities in the Southeast, the AP1000 is an appropriate choice.

Q. HAVE YOU PROVIDED ADDITIONAL INFORMATION ON THE AP1000 DESIGN?

A. Yes. I have provided additional information on the AP1000 design in Exhibit WRJ-1 of this testimony.

III. Westinghouse and Stone & Webster

Q. WHO ARE THE PRINCIPAL CONTRACTORS AND SUPPLIERS INVOLVED IN THE ENGINEERING, PROCUREMENT AND CONSTRUCTION AGREEMENT ("EPC CONTRACT")?

A. SCE&G, for itself, and as agent for South Carolina Public Service Authority ("Santee Cooper") has signed an EPC Contract with a consortium consisting of Westinghouse Electric Co., LLC ("Westinghouse") and Stone and Webster, Inc., a subsidiary of the Shaw Group, to build two Westinghouse AP1000 Advanced Passive Safety Power Plants. In 2006, Toshiba Corporation acquired Westinghouse from British Nuclear Fuels Limited and subsequently sold a 20 percent share to The Shaw Group.

Q. WHAT WAS THE BASIS FOR SELECTING THIS CONSORTIUM?

A. In the first round of nuclear plant development, utilities had the option of selecting a reactor design and a separate engineering firm to design the project. This is not the case with the AP1000. The AP1000 nuclear plant is offered only on an EPC basis with Westinghouse providing the reactor design and Stone and Webster acting as the engineer and construction manager for the project. Thus, selection of the AP1000 reactor design was also, in effect, selection of Westinghouse and Stone and Webster as the consortium members.

Q. IS WESTINGHOUSE RECOGNIZED AS A MAJOR SUPPLIER OF NUCLEAR TECHNOLOGY?

A. Yes. Westinghouse has been involved in nuclear power technology from the inception of the industry, beginning with the U.S. Navy submarine force.

Q. HOW WAS WESTINGHOUSE INVOLVED WITH U. S. NAVY REACTORS?

A. Westinghouse built the first nuclear submarine reactor, the S1W, and its prototype which was operated in Idaho as a training facility for Navy nuclear trained personnel. The S1W nuclear power plant was installed in the USS NAUTILUS, whose keel was laid in June 1952. Westinghouse has continued to design nuclear power plants for the Navy, while it has also been designing power plants for commercial use.

Q. WHEN DID WESTINGHOUSE GET INVOLVED WITH COMMERCIAL NUCLEAR POWER?

A. Westinghouse has been a major supplier of commercial nuclear power plant generation from the industry's beginning. Westinghouse supplied the Shippingport, PA, reactor, a Pressurized Water Reactor ("PWR") – the world's first commercial nuclear reactor in 1957. On October 1, 1982, the reactor ceased operation after 25 years in service. The Shippingport plant has been decommissioned and the site released for unrestricted use.

Q. WHAT OTHER EXPERIENCE DOES WESTINGHOUSE HAVE IN THE UNITED STATES?

A. Westinghouse has been, and is, the primary designer of nuclear power plants in the United States. Currently, almost 60% of the United States' operating reactors are based on Westinghouse designs. The last Westinghouse unit to be placed in commercial operation in the United States is Tennessee Valley Authority's ("TVA") Watts Bar Nuclear Station Unit 1 located 10 miles south of Spring City, Tennessee. Watts Bar Unit 1 achieved commercial operation in May 1996. The AP1000 has proven to be a very popular design, there are fourteen (14) AP1000's currently under consideration for construction in the southeastern United States.

Q. IS WESTINGHOUSE'S EXPERIENCE LIMITED TO THE UNITED STATES?

A. No. Westinghouse has been active all over the world, providing the design basis for commercial nuclear power plants - almost 50 % of the world's operating reactors. Westinghouse sold its AP1000 design in China. Ground was broken in February, 2008, for two AP1000 reactors in Sanmen, China, and two more AP1000 reactors in July, 2008, in Haiyang, Shandong Province, China. Both of these sites are scheduled to be operational well before the V.C. Summer units 2 and 3 are completed. Westinghouse and Stone & Webster are involved in the China construction efforts. This will allow SCE&G, Westinghouse and Stone & Webster to learn from the Chinese construction experience.

Q. DOES SCE&G HAVE ANY HISTORY OF WORKING WITH WESTINGHOUSE?

A. Yes. Westinghouse designed the Parr Experimental Nuclear Plant which was constructed adjacent to the V.C. Summer site and became operational in May,

1964. Westinghouse also designed the current V.C. Summer Unit 1, which became operational in January 1984. Westinghouse has been involved for over forty-four years at the V.C. Summer Unit 1 site.

Q. WHO OWNS WESTINGHOUSE?

A. In 2006, Toshiba Corporation became the majority owner of Westinghouse. The Shaw Group is a minority owner (20% stake) of Westinghouse and wholly owns Stone & Webster. Thus, a relationship between Westinghouse and Stone & Webster would be expected.

Q. IS STONE & WEBSTER A RECOGNIZED MAJOR CONTRACTOR IN THE NUCLEAR POWER INDUSTRY?

A. Yes. Stone & Webster, a 110 year old company, like Westinghouse, has been involved with design, construction and maintenance of nuclear power plants since the earliest days of commercial nuclear power, beginning with the Shippingport reactor in 1957. Stone & Webster was also involved in the Parr Experimental Reactor construction.

Q. WHO OWNS STONE & WEBSTER?

A. The Shaw Group became owners of Stone & Webster in 2000. Stone & Webster's 5,000 employees comprise almost 20% of the Shaw Group employees. The Shaw Group has 27,000 employees working in almost 180 locations worldwide.

Q. WHEN DID SHAW GROUP FORM A CONSORTIUM WITH WESTINGHOUSE ELECTRIC?

A. The Shaw Group joined Westinghouse Electric in 2005 in an AP1000 consortium. This was prior to Shaw Group's purchase of a minority ownership in Westinghouse Electric.

Q. IS THERE AN ADDITIONAL RELATIONSHIP BETWEEN THESE TWO ORGANIZATIONS?

A. Yes. The Shaw Group and Westinghouse Electric announced in August 2008, that they are building a module construction facility to support AP1000 construction. The Shaw Group and Westinghouse are forming an organization that will be known as Global Modular Solutions, LLC. Global Modular Solutions will operate the new facility which will be built in Lake Charles, LA, and begin operation in late summer 2009.

Q. WHAT IS YOUR CONCLUSION REGARDING SELECTION OF WESTINGHOUSE AND STONE & WEBSTER AS THE PRIMARY CONTRACTS FOR DEVELOPMENT OF THE NEW NUCLEAR UNITS?

A. I conclude that the consortium of Westinghouse and Stone & Webster have the experience and technical ability to build V.C. Summer Units 2 and 3 and their selection as primary contractors is reasonable and prudent.

Q. HAVE YOU PROVIDED ADDITIONAL INFORMATION ON WESTINGHOUSE AND STONE & WEBSTER?

A. Yes. I provided additional information related to Westinghouse and Stone & Webster in Exhibit WJR-2 of this testimony.

IV. THE EPC CONTRACT

Q. WHAT IS THE SCOPE OF THE EPC CONTRACT?

A. The term "EPC" stands for Engineering, Procurement and Construction. The scope of the EPC contract is for Westinghouse/Stone & Webster to provide the engineering design, procure the required materials, and construct two AP1000 nuclear power plants at the V.C. Summer site. The EPC contractor will furnish the required field labor, supervision and project management systems to construct the project in accordance with the project documents and regulatory requirements. The EPC contractor will provide quality assurance and quality control to ensure that the project meets the strict quality requirements for nuclear safety related construction. The EPC contractor will perform construction, preoperational and performance tests in accordance with the startup test program to demonstrate that the components and systems of the plant meet the performance requirements.

Q. WHO ARE THE PRIMARY CONTRACTORS?

A. The primary contractors and signatories of the EPC contract are Westinghouse and Stone & Webster. In addition to Westinghouse and Stone & Webster, numerous other subcontractors will contribute to the project. A detailed discussion of the primary subcontractors is provided in the testimony of Mark Crisp.

Q. PLEASE DESCRIBE THE KEY FEATURES OF THE EPC CONTRACT.

A. The key features of the EPC contract include the scope of work, the division of responsibility, the contract price and schedule, the performance guarantees, the reporting requirements and the terms and conditions.

Q. DESCRIBE THE DIFFERENT COST CATEGORIES CONTAINED IN THE EPC CONTRACT.

A. **Fixed Price** – This cost category includes major pieces of equipment that Westinghouse and Stone & Webster will provide at a fixed price without escalation.

Firm with Fixed Adjustment Rate A – This cost category applies to remaining major equipment items. The cost of these items is determined by the initial cost and an escalation amount determined by the delivery date at Fixed Adjustment Rate A.

Firm with Fixed Adjustment Rate B – This cost category applies primarily to Westinghouse internal costs. Fixed Adjustment Rate B consists of two components. The largest component is the same escalation factor that is applied to costs with Fixed Adjustment Rate A. The second component is a smaller adjustment to compensate Westinghouse for the additional risk and cost of attracting skilled personnel including nuclear engineers, technicians and other experts in the current market.

Firm with Indexed Adjustment – This cost category applies to equipment not listed elsewhere and other costs that are confidential. Escalation is based on the Handy-Whitman All Steam Generation Plant index, South Atlantic Region.

Target Price – This category includes wages for site craft labor and supervision, construction materials, consumables, field office expense and subcontractors providing warehouses and construction buildings. The costs in this category are paid at actual cost, with contingencies for efficient work completion.

Time and Materials – This category includes work by Westinghouse and Stone & Webster in support of SCE&G's permitting efforts and startup support after substantial completion. These are paid at actual cost.

Mr. Mark Crisp provides a further discussion of these cost categories later in his testimony.

Q. WHAT WARRANTIES ARE CONTAINED IN THE EPC CONTRACT?

A. The contract contains warranty provisions that the equipment will be free from defects in design, workmanship and material. The equipment shall also conform to the design specifications and drawings for the facility. In addition, services provided by Westinghouse and Stone & Webster are warranted to conform to good industry practices and the requirements of the EPC contract.

Q. HOW ARE THE COMPANY AND THE RATE PAYERS PROTECTED IN THE EPC CONTRACT?

A. A significant portion of the contract price is either fixed or firm. The fixed or firm portion is subject to specified escalation but no other cost increases. The Target Price portion of the contract is based on actual costs which are not capped. However, the contract provides financial incentives for Westinghouse and Stone & Webster to control the costs incurred under the target cost category. The contract provides for liquidated damages for schedule delays and failure to meet specified plant performance levels. The EPC contract for the new nuclear units reasonably attempts to equitably balance the risks between all parties.

Q. WHAT IS YOUR CONCLUSION REGARDING THE PRUDENCE OF THE EPC CONTRACT?

A. I believe the EPC contract to be complete and the result of lengthy negotiations between the parties. I believe the contract reasonably shares the project risks between the owners and the contractors. Accordingly, I conclude that the EPC contract is reasonable and prudent based upon what is known at this time.

V. CONCLUSIONS

Q. PLEASE SUMMARIZE YOUR CONCLUSIONS.

A. As described above in my testimony I have reached the following conclusions:

1. SCE&G's selection of the Westinghouse AP1000 reactor technology for the new nuclear units was reasonable and prudent.
2. Selection of Westinghouse and Stone & Webster as prime contractors for the new nuclear units was inherent in the selection of the AP1000 and was reasonable and prudent.
3. The EPC contract between SCE&G and the consortium of Westinghouse and Stone & Webster was reasonable and prudent.

Q. DOES THAT CONCLUDE YOUR TESTIMONY?

A. Yes, it does.

Exhibit WRJ-1
Description of the Westinghouse AP1000

Description of the AP1000

The AP1000 is a two-loop pressurized water reactor ("PWR") with a licensed power rating of 3,415 megawatts thermal ("MWt") and a net electrical output of 1,117 megawatts electric ("MWe").

Design features

The design feature that distinguishes the AP1000 from the current generation of PWRs is the passive safety systems. In the current generation of PWRs, many active components such as pumps, valves and emergency generators must function to mitigate the effects of a design basis accident. A design basis accident is a loss of reactor coolant (or, Loss of Coolant Accident – LOCA) from a pipe rupture coincident with a Loss of Offsite Power ("LOOP"). This is known as a LOOP/LOCA accident scenario. In the current generation of PWRs, large pumps must actuate to pump emergency coolant into the reactor vessel to ensure that the reactor core remains covered with water and is adequately cooled to prevent core melting. This injection of coolant also requires the positioning of large motor operated valves. Since the pumps and valves are powered by electric motors, large emergency diesel generators must start and operate to provide the required power if offsite power is lost. These requirements result in a very complicated design with numerous safety related components and support systems.

The AP1000 relies on natural forces such as gravity, natural circulation, convection and compressed air to ensure that the reactor core remains covered and cooled. The Passive Core Cooling System consists of Core Makeup Tanks, Accumulators and the In-containment refueling water storage tank. These sources of make up water are located above the reactor core and drain by gravity, or compressed nitrogen in the case of the accumulators, into the reactor vessel in the event of a loss of coolant accident to ensure that the reactor core remains covered.

Following a loss of coolant accident ("LOCA"), long term containment cooling is provided by the Passive Containment Cooling System. This system cools the containment vessel by means of natural circulation of flow of air in the space between the steel containment vessel and the outer shield building. The flow of air is driven by the chimney effect of air that is heated by the containment vessel rising and being exhausted through an opening in the shield building roof.

Benefits of passive safety features

The passive safety design of the plant provides many benefits in the areas of construction and operation. The simplified design requires significantly fewer pumps, valves and less cable and piping. A comparison with a traditional PWR plant is shown in the table below.

Comparison of AP1000 to Traditional PWR Plant		
Component	1000 MWe Reference PWR	AP1000
Pumps	280	180
Safety class valves	2,800	1,400
Safety class piping, ft	110,000	19,000
Cable, million ft	9.1	1.2
Seismic Building Volume, million ft3	12.7	5.6

The reductions in components and commodities results in reduced construction cost and a shorter construction schedule. Financing during the construction phase and the amount of skilled craft labor hours are both reduced. In addition, the AP1000 design utilizes modular construction to further reduce construction costs. Modular construction allows many tasks traditionally performed in series to be performed in parallel in a controlled factory environment.

The AP1000 design also provides operating and maintenance benefits. In a traditional PWR, the active safety components must be regularly tested to ensure that they are operable. Much of an operating crew's time is spent conducting the required operating surveillance tests. In addition, if one of the many required safety related

components is found to be inoperable, it must be restored to operable status within a specified time limit or the plant must shut down. The AP1000 design greatly reduces the requirement for surveillance testing. The design features such as digital instrumentation and control systems and improved human interface features are projected to result in reduced Operation and Maintenance ("O&M") costs. The Institute of Nuclear Power Operations ("INPO") estimates that a mature passive advanced light water reactor will require one-third less O&M staff than a currently operating nuclear plant.

A final, and perhaps most important, benefit of the passive safety design is improved safety of the plant. The overall safety of a nuclear plant design is characterized by a term called the Core Damage Frequency ("CDF"). This is the number of events per year that would result in damage to the core. The CDF is a very small number such as 0.00001. Another way to think of this is how many years would elapse before a core damage event. If the CDF for a plant design is 0.0001, a core damage event would be expected once every 10,000 years (calculated as 1/0.0001). The Nuclear Regulatory Commission ("NRC") requirement for CDF is 0.0001 or $1x10^{-4}$. The CDF of current plants is $5x10^{-5}$ or one CDF event every 20,000 years. The AP1000 Design Certification application includes a Probabilistic Risk Assessment ("PRA") in accordance with NRC requirements. The PRA for the AP1000 calculates the CDF for an AP1000 is calculated to be $5x10^{-7}$ or one core damage event every 2,000,000 years. The inherent level of safety in the AP1000 design is 100 times greater than for the current generation of nuclear power plants.*

* Sources of Information include:
- AP1000 Design Control Document, Revision 16
- The Westinghouse AP1000 Advanced Nuclear Plant Description

Exhibit WRJ-2
Background Information concerning
Westinghouse Electric Company and Shaw Stone & Webster

Westinghouse Electric Company, LLC

Westinghouse Electric Company, LLC, a group company of Toshiba Corporation, is the world's pioneering nuclear power company, and a leading supplier of nuclear plant products and technologies to utilities throughout the world. Westinghouse Electric was founded in 1886 and bought CBS in 1995. In 1997 it renamed itself CBS Corporation, then CBS Corporation sold off its nuclear energy business in 1998 to British Nuclear Fuels Limited (BNFL). In 2000 BNFL purchased the ABB nuclear power business (formerly Combustion Engineering) and merged it into Westinghouse Electric Company. This entire nuclear energy operation was subsequently sold to Toshiba Corporation for $5.4 billion in 2006. Toshiba sold minority shares in the company, but remains the majority owner and The Shaw Group owns 20% of the company. This nuclear energy company operates today as Westinghouse Electric Company.

Throughout all these ownership changes, this nuclear energy company (now called Westinghouse Electric Company) has continued to design and service nuclear power plants throughout the world. Its operations include various nuclear services: power generating technology, licensing expertise, nuclear fuel fabrication, inspection equipment, advanced welding services, and remote handling equipment. The company provides services in the United States, Europe, Asia and Africa. Following its purchase by Toshiba, Westinghouse Electric Company has continued to purchase other nuclear energy associated companies, such as Astare, a French nuclear engineering company, thus strengthening its position as a premier nuclear energy/service company. Toshiba Corporation, the parent company, had revenues of $76.68 billion for the fiscal year ending in March 2008.

Westinghouse Electric technology today is the basis for about one-half the world's 440 operating nuclear plants, and almost 60% of the operating plants in the United States. Westinghouse Electric developed the Generation III AP 600 which achieved NRC Design Certification in December 1999. Recognizing the industry needed a plant with larger generation capability, Westinghouse took the approved AP 600 design and upgraded it to

the AP1000 design. Changes were limited to those structures, systems and components affected by the increase in power output, thus it is not significantly different from the AP 600.

Westinghouse Electric, with its partner The Shaw Power Group, in April 2008 signed the first announced EPC Contract to build nuclear power plants in the United States. This contract was for two AP1000 units to be built for Georgia Power (a subsidiary of Southern Company) at its Alvin W. Vogtle site near Waynesboro, GA. Westinghouse has subsequently signed with SCE&G for two more AP1000 units. Four other southeastern utilities have indicated their preference for the AP1000 technology – potentially ten more AP1000 units. Westinghouse is also involved in the Generation IV reactor technology. Westinghouse Electric Company is, and will continue to be, a major force in the nuclear power industry.

Stone & Webster, Inc.

Stone & Webster was founded in the early 1890's as an electrical engineering consulting firm. It has had over the years managerial, engineering and financial consulting roles, but has always been known primarily as an engineering and construction company. Stone & Webster was the original engineer/constructor for seventeen U. S. nuclear power plants. It was acquired by The Shaw Group in 2000.

The Shaw Group is a twenty one year old company headquartered in Louisiana. Shaw is a nationally top ranked design, contractor, construction and environmental firm with 2007 revenues of $5.7 billion. It is a Fortune 500 company with 27,000 employees working in nearly 180 locations worldwide. It provides engineering, procurement, construction, technology, maintenance, fabrication, manufacturing, consulting, remediation, and facilities management. In 2005 Shaw joined Westinghouse in the AP1000 consortium as Architect Engineer. In 2006 Shaw acquired a 20% ownership of Westinghouse Electric Company. In 2007 Shaw was awarded the maintenance and modifications service contract by Exelon Generation Company, LLC, for its seventeen nuclear stations –the largest nuclear operation in the United States.

Currently Shaw's ongoing projects include design and construction of the Department of Energy Mixed Oxide Fuel Fabrication Facility, design of the Louisiana Energy

Services National Enrichment Facility in New Mexico, engineering support for the Lungmen nuclear power plant in Taiwan, engineering support for four Korean Power Engineering Company nuclear units and design of the Private Fuel Storage Facility in Utah.

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TESTIMONY OF
JERRY W. SMITH

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

A. My name is Jerry W. Smith. I am a Senior Consultant at C. H. Guernsey & Company. My business address is 102 Heritage Court, Andalusia, Alabama 36420.

Q. PLEASE DESCRIBE YOUR PROFESSIONAL BACKGROUND AND EXPERIENCE.

A. I am an electrical engineer with 36 years experience in the electric industry. I graduated from Auburn University in 1972 with a Bachelors Degree in Electrical Engineering. I have worked 12 years as an engineer for a regional generation and transmission utility, Alabama Electric Cooperative in Alabama and Florida, 12 years as a manager of an electric distribution utility (West Florida Electric Cooperative) in Florida, and 12 years as a consultant for Jackson Thornton and C.H. Guernsey to the electric, natural gas, water and wastewater and telecommunications industries, as well as utility regulatory agencies in Florida, Georgia, Maryland, and Connecticut. I am a registered professional engineer in the states of Alabama and Florida. Additional information regarding my professional background and experience is contained in my resume which is included in the Appendix.

Q. PLEASE DESCRIBE YOUR EXPERIENCE THAT IS DIRECTLY RELEVANT TO THE STUDIES THAT ARE AT ISSUE IN THIS PROCEEDING.

A. At the Alabama Electric Coopertive, I was Manager of System Planning and was responsible for performing load forecasting, generation and transmission planning studies, negotiations for interconnections and interchange agreements and numerous other duties. In addition to my normal duties as manager of system planning, I was chosen to serve as the Project Manager of a project that is directly relevant to the issues being considered in this proceeding. I was responsible for the: (1) feasibility studies, engineering design, development of technical specifications, procurement, installation, checkout, start-up and commercial operation of a 470 MW coal-fired power plant, specifically, the plant electrical and the 230 kilovolt ("kV") generator step-up station, 230 kV switching station, 230-115kV substation and two 230 kV interconnection lines with the investor owned utility (" IOU"). As a consultant, I have been involved in several projects that are directly relevant to the projects at issue including the following two projects: (1) Project Manager of a research project for a national trade association that studied the methodologies that are currently, or will soon be, available to improve the capacity of transmission lines, and (2) Lead Consultant on a review team where my responsibility was to analyze the transmission studies and recommended projects filed in conjunction with the Integrated Resource Plans ("IRP") of a large investor-owned utility in the southeast. In conjunction with this project, I utilized the Siemens PSS/E ® program which was the basic study tool for the Company's transmission planning.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING?

A. I am providing testimony on behalf of the South Carolina Office of Regulatory Staff ("ORS").

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THIS COMMISSION?

A. No. However, I have testified before Public Utility Commissions of a number of other states including Florida, Georgia and Maryland. Additional information regarding this experience is included in my resume located in the Appendix.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. My testimony will address the transmission projects proposed by the Company to integrate V. C. Summer Units #2 and 3 into the grid.

Q. WOULD YOU PLEASE SUMMARIZE YOUR TESTIMONY?

A. My testimony will provide an overview of the basic transmission planning criteria used by the Company in their studies; a review of the studies performed by the Company; a review of the projects the Company has determined to be needed; a summary of the Company's conclusions and recommendations about these projects; a summary of our review, conclusions and recommendations about these projects and a review of the cost impacts of these projects.

Q. WOULD YOU PLEASE REVIEW THE BASIC PLANNING CRITERIA USED BY THE COMPANY?

A. Yes. The Company, like all transmission providers, has established basic planning criteria that it uses to evaluate the need for new or upgraded transmission facilities. This criterion, while unique to its system, is typical of

other utilities and is essentially based on the criteria established by NERC and SERC.

Q. WOULD YOU TELL US WHO NERC AND SERC ARE?

A. The role of the NERC (North American Electric Reliability Corporation) is best explained by these two statements taken verbatim from its website at www.nerc.com. Statement # 1: *"NERC is a self-regulatory organization, subject to oversight by the U.S. Federal Energy Regulatory Commission and governmental authorities in Canada."* Statement #2: *"Our mission is to ensure the reliability of the bulk power system in North America. To achieve that, we develop and enforce reliability standards; assess reliability annually via 10-year and seasonal forecasts; monitor the bulk power system; evaluate users, owners, and operators for preparedness; and educate, train, and certify industry personnel."*

SERC (originally the Southeastern Electric Reliability Council; but, after reorganization of NERC, is now the SERC Reliability Corporation) is one of eight (8) regional entities that work with NERC to meet its objectives. Specifically, according to its website at www.serc1.org:

"The SERC Reliability Corporation (SERC) is a nonprofit corporation responsible for promoting and improving the reliability, adequacy, and critical infrastructure of the bulk power supply systems in all or portions of 16 central and southeastern states. Owners, operators, and users of the bulk power system in these states cover an area of approximately 560,000 square miles and comprise what is known as the SERC Region."

Q. WHAT SPECIFIC CRITERIA DOES NERC AND SERC HAVE FOR TRANSMISSION PLANNING STUDIES THAT ARE BEING REVIEWED IN THESE PROCEEDINGS?

A. NERC has, over the past few years, transitioned from a voluntary reliability council to an organization with reporting responsibility to the federal government through the Federal Energy Regulatory Commission ("FERC"). As part of its responsibility to improve the reliability of the three interconnected grids in the United States following the nearly catastrophic outage in 2003 that affected nearly 50 million customers in the U.S. and Canada, NERC has proposed, and FERC has approved, a number of reliability standards for all phases of utility planning and operations. Among them are the transmission planning standards referred to as TPL-001 through TPL-006. These standards outline the contingencies on which a transmission planner should use to plan its transmission projects. For example, the TPL-001 addresses system performance under "normal" conditions, TPL-002 addresses loss of a single element (e.g., transmission line, generator, etc.), which at one time was known in the industry as the N-1 (or first contingency) criteria. The other four standards address various other contingency analyses (N-2 through extreme events) and regional and interregional self assessment reliability reports. It is important to know that these are now standards, not voluntary criteria that the utility community has agreed ought to be used. Utilities must now use them to plan their transmission systems to insure the reliability of the entire electric grid.

Q. HOW DOES THE COMPANY'S PLANNING CRITERIA COMPARE WITH THE CRITERIA REQUIRED BY NERC AND SERC?

A. The Company's planning criteria are essentially the same as those mentioned above as TPL-001 through TPL-006.

Q. IS IT YOUR OPINION THAT THE COMPANY'S PLANNING CRITERIA ARE COMPLIANT WITH THE NERC AND SERC CRITERIA?

A. Yes, I think that there is no significant difference in the Company's criteria and that mandated by NERC. The Company has to perform studies with its neighboring utilities using the NERC criteria and any other specific criteria that might have been put forth by SERC.

Q. WHAT TRANSMISSION PLANNING STUDIES DID THE COMPANY PREPARE TO DETERMINE THE TRANSMISSION FACILITIES NEEDED TO INTEGRATE THIS NEW GENERATION INTO THE TRANSMISSION GRID?

A. The primary studies performed by the Company and included as a part of its "Combined Application for a Certification of Environmental Compatibility and Public Convenience and Necessity and for a Base Load Review Order" application are those done in compliance with FERC Order 2003. Order 2003 requires that any generation and transmission utility must perform certain studies of any new generation units that is connected to the electric grid. The Order was specifically meant to insure that non-utility generators, co-generators, and the like were able to get a "fair shake" from the incumbent utility. The studies evaluate the impact on the electric grid of the addition of new generator units, even when those generators might be owned by the utility. The three basic "large generation" (over 20 MW) interconnection studies that are required by Order

2003 and which have been done by the Company include the following: (1) feasibility study, (2) system impact study, and (3) facilities study.

Q. WHAT ADDITIONAL STUDIES DID YOU REVIEW IN CONJUNCTION WITH YOUR ANALYSIS OF THESE TRANSMISSION PROJECTS?

A. The Company provided for our review studies of their transmission system, some of which had direct applicability to the affects of these two new units (See JWS-1). In addition, the Company provided access to one confidential study that was done in conjunction with the Southern Company, of which Georgia Power Company is a member and neighboring utility immediately to the south of the Company's transmission system.

Q. DO YOU HAVE ANY ADDITIONAL COMMENTS ABOUT THE COMPANY'S TRANSMISSION STUDIES RELATED TO V.C. SUMMER UNITS #2 AND 3?

A. Yes, during our review and discussions with the Company about this matter, they informed us that they continue to study their internal transmission system to determine the appropriateness of their proposed transmission projects. In addition, they plan to conduct additional studies with their neighboring utilities to determine the overall impacts of the V. C. Summer units as well as other nuclear units being added to the grid in the southeast.

Q. PLEASE SUMMARIZE THE TRANSMISSION PROJECTS THAT THE COMPANY HAS DETERMINED ARE NECESSARY.

A. I will summarize the projects required for each unit.

For Unit #2, the transmission projects that the Company has determined as necessary are listed in: Exhibit JWS – 2 (Part A).

For Unit #3, the transmission projects that the Company has determined as necessary are listed in: Exhibit JWS- 2 (Part B).

Q. PLEASE SUMMARIZE THE COSTS OF THESE PROJECTS.

A. The transmission projects associated with Unit #2 are expected to cost $132.6 million and $355 million for Unit #3. These costs are "in-service year dollars" based on 2008 estimates and a 4% per year escalation factor. The total cost, including contingencies and escalation, is estimated to be $638.0 million, which is part of the total project cost discussed in Mr. Crisp's testimony.

Q. WHAT ALTERNATIVES TO THESE PROPOSED PROJECTS DID THE COMPANY CONSIDER?

A. Based on our discussions with the Company, SCE&G considered numerous other alternatives. Mr. Young discussed the Company's planning methodology in a step by step process, explaining some of the major alternatives considered. The final recommended projects are those that provide the best performance according to the planning criteria and were the most cost effective options. One alternative we discussed with the Company in some detail was why the Company was building so many 230 kV lines (especially for Unit #3) when it could have built less miles of 500 kV. The Company's response was that it evaluated the 500 kV option, but found it to be much more expensive. In fact, SCE&G found that it might be as much as $500 million more expensive than the 230 kV projects they proposed.

Q. WHY DOES THE COMPANY HAVE TO SPEND SO MUCH MORE MONEY FOR TRANSMISSION PROJECTS RELATED TO UNIT #3?

A. First, let me explain what function transmission lines serve in the electric grid. Transmission lines are high-voltage lines (by definition 100 kV or more) and are needed to take the bulk power from the generation plant to the load centers where it is distributed to the consumer. As is discussed in the "Generator Interconnection Feasibility Study for SCE&G V. C. Summer Nuclear Unit #3 – Version 2" (included in Mr. Clay Young's SCE&G's Testimony), the Company has several large load centers. The two of interest in this report are the Columbia area and the Charleston area. The Company must get the bulk power out of Unit #3 to the Charleston area. This necessitates the building of considerable new 230 kV lines from the V. C. Summer plant site (which is within the Columbia load center) to Charleston. This distance is about 135 miles.

Q. WHAT AFFECT WILL THESE PROJECTS HAVE ON THE OVERALL COST OF THE V. C. SUMMER PLANT?

A. These transmission projects are about 10% of the total cost of the project.

Q. WHAT ARE YOUR CONCLUSIONS ABOUT THE TRANSMISSION PROJECTS PROPOSED BY THE COMPANY?

A. I conclude that the Company utilized sound methods and industry standards to develop the proposed transmission projects and that these projects will be necessary to move the power generated by the nuclear units to the Company's load centers. In my opinion, SCE&G has fulfilled the statutory requirements of

the Base Load Review Act with respect to transmission requirements and, therefore, I recommend to the Commission they should be approved.

Exhibit JWS-1

List of Transmission Studies Provided by SCE&G For Review

- VACAR-Southern-TVA-Entergy Study Group 2008 Summer Future Year Study (December 2003)
- VACAR 2009 Summer Peak Reliability Study (April 2005)
- VACAR-Southern-TVA-Entergy (VSTE) Stability Study Group
- SERC Under-Voltage Load Shedding Study (May 2005)
- V.C. Summer Transient Stability Study (Summer 2005)
- VACAR Stability Study of Projected 2012 Summer Peak Conditions (April 2006)
- VACAR Stability Study of Projected 2010 Summer Peak Conditions (March 2007)
- VACAR 2011 Summer Peak Reliability Study FINAL (April 2007)
- SERC Intra-Regional Dynamics Study Group – Discussion of the 2007 SERC UFLS Program Study (September 2007)
- SERC 2011 Summer Future Year Study (December 2007)
- VACAR Stability Study of Projected 2008 Light Load Conditions (March 2008)
- SERC 2008 Summer Reliability Study of Projected Operating Conditions (May 2008)
- VACAR 2013 Summer/Winter Peak Reliability Study Final (June 2008)
- SCE&G NERC Reliability Standards TPL001-TPL004 Criteria Study (June 2008)

Exhibit JWS-2

Cost of Transmission Projects Associated with V. C. Summer Units 2 and 3

Part A	
V. C. Summer #2 Transmission Projects	**In-Service Year Cost (in $ million)**
Sixty (60) miles of new or rebuilt 230 kV lines and six new 230 kV terminals	62.58
One mile of rebuilt 115 kV line	1.53
One new 230 kV switching station at V. C. Summer plant with seven terminals	33.00
672 MVA of additional transformer capacity (primarily 230-115 kV transformations)	18.00
Add six (6) new 230 kV terminals with OCBs	6.10
Replace nine (9) 230 kV oil circuit breakers	6.30
Replace nine (9) 115 kV oil circuit breakers	3.80
Miscellaneous other improvements	1.33
Total Projects for Unit #2	**$ 132.64**

Part B	
V. C. Summer #3 Transmission Projects	**In-Service Year Cost (in $ million)**
One hundred seventy-five (175) miles of new or rebuilt 230 kV lines and six new 230 kV terminals	283.44
Twenty three (23) miles of upgraded 115kV line	19.10
An addition to the new 230 kV switching station at V. C. Summer plant to add six terminals (8 OCBs)	18.90
A new 230 kV switching station at St. George	18.24
A 230 kV series reactor	6.10
Replace three (3) 230 kV oil circuit breakers	1.06
Replace eight (8) 115 kV oil circuit breakers	1.92
Miscellaneous other improvements	6.48
Total Projects for Unit #3	**$ 355.24**

TESTIMONY OF

MARK W. CRISP, PE

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

A. My name is Mark W. Crisp. I am Managing Consultant of C. H. Guernsey & Company ("Guernsey") and Engagement Director for this project. My business address is 1100 Circle 75 Parkway, Suite 1530, Atlanta, Georgia 30339

Q. PLEASE STATE YOUR EDUCATIONAL BACKGROUND AND EXPERIENCE.

A. I graduated from the Georgia Institute of Technology (Ga. Tech) in 1978 with my degree in Civil Engineering (my resume is included in the Appendix to this testimony). In addition to my studies in Civil Engineering, I have completed post graduate studies in Finance and Accounting and career development programs. Following completion of my formal education, I spent seventeen (17) years employed by Arkansas Power & Light (Middle South Utilities now Entergy – Arkansas) and Georgia Power Company/The Southern Company. I completed assignments in the planning, siting, design, construction, and operations of nuclear, coal and hydroelectric generating plants. In addition to my utility operating experience, I was also responsible for technical due diligence on Southern Company's International Acquisition Team. In this capacity, I was responsible for evaluating all operating, environmental, staffing and operational aspects of power generating facilities, worldwide, that were the focus of The Southern Company's acquisition strategy.

Following my employment in the utility industry, I joined the consulting ranks providing services to electric, water, wastewater and natural gas utilities and regulatory bodies throughout the continental US, Hawaii, Alaska and internationally. I continue to provide these services, as well as, provide senior management at Guernsey. I am responsible for overall operations of the Atlanta Regional Office of Guernsey, a multi-functional engineering, environmental, and consulting firm. (In addition to my resume included in the Appendix, I have attached a list of major electric generating facilities I have been involved with over my career). I am a registered professional engineer licensed in Georgia and Florida.

I. INTRODUCTION

Q. WHAT IS THE NATURE OF YOUR BUSINESS?

A. C. H. Guernsey & Company is a multi-disciplined Engineering, Environmental and Consulting Engineering firm with offices in Atlanta, Georgia; Oklahoma City, Oklahoma; Tallahassee, Florida; Andalusia, Alabama; Amarillo, Texas; Anchorage, Alaska and affiliate offices in Washington D.C., and Seattle, Washington. We specialize in engineering design and consulting services to the electric, natural gas, water and wastewater industry. We have completed engagements with utilities or regulatory bodies in all 50 states, Canada, Mexico, South America, Europe, Africa, the Pacific Rim and India. Our expertise includes utility resource planning, site selection, contract negotiations, design, construction and operations support. We also specialize in power purchases, contract

negotiations, transmission analysis, power plant design, substation and distribution design.

Q. HAVE YOU TESTIFIED BEFORE THE PUBLIC SERVICE COMMISSION OF SOUTH CAROLINA?

A. No. However, I have testified before several other State Commissions, the Federal Energy Regulatory Commission ("FERC"), the United States Congress, and several Federal Courts in the capacity as an Expert Witness. (See resume)

Q. WHAT IS YOUR ASSIGNMENT IN THIS PROCEEDING?

A. My assignment is to assist the South Carolina Office of Regulatory Staff ("ORS") in evaluating South Carolina Electric and Gas's Combined Application for Certificate of Environmental Compatibility, Public Convenience and Necessity and for a Base Load Review Order in Docket No. 2008-196-E. The subject of this filing is the proposed construction of two new Westinghouse AP1000 nuclear units at the V.C. Summer nuclear plant site. I functioned as the Engagement Director and a member of a team of consultants evaluating SCE&G's filing. The specific areas assigned to me include the Contractors and Suppliers other than the Shaw/Westinghouse Group (filed in Exhibit D of the SCE&G Application), Construction Schedule (filed in Exhibit E of the SCE&G Application), Capital Costs and Schedule of Cash flow (filed in Exhibit F of the SCE&G Application), the Inflation Indices (filed in Exhibit I of the Appendix of the Application), and Risk Factors Related to Construction and Operation of the Facilities (filed in Exhibit J of the SCE&G Application).

Q. HAS THIS PANEL TESTIFIED BEFORE THE PUBLIC SERVICE COMMISSION OF SOUTH CAROLINA?

A. No, we have not. However, each member of our Team has been called upon as an expert to testify before several state Commissions, Federal Energy Regulatory Commission ("FERC"), and other regulatory bodies.

Q. WHAT IS THE PURPOSE OF THIS PANEL'S TESTIMONY IN THIS PROCEEDING?

A. The testimony of this Panel is provided as technical experts to the South Carolina Office of Regulatory Staff in support of its statutory responsibilities and requirements set forth in the Base Load Review Act.

Q. HOW IS YOUR TESTIMONY ORGANIZED?

A. My testimony is organized into an Introduction presented in Section I; Section II discusses the "Other Suppliers," Supplier Qualifications, and Quality Assurance Program (filed in Exhibit D of the SCE&G Application); Section III describes the Construction Schedule, Milestones and Schedule Risks (filed in Exhibit E of the SCE&G Application), Section IV explores the Capital Costs and the Schedule of these Costs for the duration of the construction period (filed in Exhibit F of the SCE&G Application), and Section V discusses the Inflation Indices and Risk Factors inherent in the construction and operations of V.C. Summer Units 2&3 (filed in Exhibit I and J, respectively, of the SCE&G Application). As identified above, each section of my testimony refers to a specific Exhibit contained in SCE&G's formal Combined Application for Certificate of Environmental Compatibility, Public Convenience and Necessity and for a Base Load Review

Order in Docket No. 2008-196-E and provides more detailed information on the topic addressed in that particular section. Section VI discusses the environmental assessment and related information. Finally, I have included section VII in which my conclusions are summarized.

Q. PLEASE PROVIDE A SUMMARY OF THE PANEL'S TESTIMONY.

A. This panel of experts examined the nuclear program presented by SCE&G in its Combined Application for Base Load Review Order. We reviewed the terms and conditions of the Engineering, Procurement and Construction ("EPC") contract between SCE&G and the Westinghouse/Shaw/Stone & Webster consortium. We evaluated the Integrated Resource Plan ("IRP") of SCE&G and its recommendation to build the two new nuclear units to meet the forecasted load growth requirements, the need for new base load generation, the selected fuel type and sensitivities that may impact the decision process. We evaluated the fuel price forecasts, load growth forecast and their effects on the SCE&G system. We studied the budget, schedule, sub-contractors, inflation indices and risk factors for the construction of Units 2 & 3 at V. C. Summer.

Our team's conclusion is that SCE&G has taken the necessary steps to properly evaluate its growth needs, and to determine the most economical long term approach to solving its base load needs, it is also our opinion that the schedule and cost for the two new units as currently set forth is reasonable and prudent.

Q. PLEASE PROVIDE A DISCUSSION OF YOUR TEAM AND THE TEAM MEMBERS.

A. The C. H. Guernsey Team (the "Team") is made up of members of our senior consultants and analysts. We supplemented our experts with the addition of three (3) senior consultants with experience in specific areas of national and international nuclear consulting and production cost modeling. The Guernsey Team consists of Mr. Jerry Smith, Dr. Zhen Zhu, Mr. Mark W. Crisp, Mr. George Evans, Mr. Richard Johannes and Dr. William R. Jacobs. Mr. Evans, Mr. Johannes and Dr. Jacobs have been brought together with our Guernsey consultants to form a strong team of consultants to support the South Carolina Office of Regulatory Staff ("SC ORS" or "ORS") in addressing the requirements of the Base Load Review Act.

Although Mr. Johannes did not file testimony, I want to describe his background since he assisted the team. Mr. Richard Johannes comes to our team after a distinguished career in the US Navy as a Commander of nuclear submarines with a subsequent career as a consultant in many nuclear operating plant analyses. Mr. Evans, Dr. Jacobs and I worked together for a number of years at GDS Associates, Dr. Jacobs' current employer. My goal as the Engagement Director has been to establish the very best team of consultant's available to provide support to the South Carolina Office of Regulatory Staff.

II. "OTHER SUPPLIERS," SUPPLIER QUALIFICATIONS, AND QUALITY ASSURANCE PROGRAM

Q. DR. JACOBS'S TESTIMONY ADDRESSED THE WESTINGHOUSE/SHAW/STONE AND WEBSTER RELATIONSHIP

AND SERVICES. ARE THERE OTHER SUPPLIERS RESPONSIBLE FOR SPECIFIC EQUIPMENT FOR THE V. C. SUMMER UNITS 2 & 3?

A. Yes.

Q. PLEASE ADDRESS THE OTHER SUPPLIERS BY NAME AND TYPES OF EQUIPMENT THEY WILL PROVIDE.

A. A list of the "other" major suppliers is attached as Exhibit MWC-1. Some of the major suppliers that will be recognized are Caterpillar Inc., Chicago Bridge & Iron Company, Siemens Corporation, Ansaldo Camozzi, and Toshiba Corporation.

Q. ARE ALL OF THE "OTHER" SUPPLIERS UNITED STATES MANUFACTURERS?

A. No, as a matter of fact, approximately one half of the potential suppliers are located "off shore."

Q. DO THESE INTERNATIONAL SUPPLIERS PRESENT PROBLEMS WITH REGARDS TO THE BUDGET AND SCHEDULE FOR V. C. SUMMER 2 & 3?

A. No, it does not present problems. However, the physical location of the manufacturer does present unique challenges with selection of the supplier, qualification of the supplier, on-site inspection and proof testing of materials and finished product, and deliveries. The emergence and growth of our global economy over the last 30+ years has evolved to a point that international suppliers are a mainstay in any supply chain. The single important issue will be quality assurance, as would be with any U.S. manufacturer.

Q. WHAT STEPS HAS SCE&G TAKEN TO MINIMIZE THEIR EXPOSURE TO ANY AND ALL OF THESE ISSUES?

A. The EPC contract between SCE&G and Westinghouse requires a specific comprehensive evaluation process for the selection of vendors and components, particularly important for safety related items. The Westinghouse Quality Management System ("QMS") is the basis for the evaluation and selection to the Westinghouse qualified supplier list. The QMS also provides for on-site supplier audits in accordance with ASME NQA-1 (American Society of Mechanical Engineers Standards and Performance Test Codes; NQA-1 is the Quality Assurance Requirements for Nuclear Facility Applications and Audits).

The Westinghouse QMS program is an exhaustive process of evaluation and approval of all suppliers of safety-related products and services. The suppliers are evaluated annually and audited every three years, even suppliers that carry the ASME national accreditation. Westinghouse maintains documentation on all acceptable suppliers.

Q. DOES THE QMS, ASME-NQA-1 OR ANY OTHER INDUSTRY CRITERIA PROVIDE ABSOLUTE PROTECTION FOR SCE&G?

A. No, there will never be total, all-encompassing assurances that components or supplies will be in perfect order. However, the SCE&G Engineering, Procurement and Construction ("EPC") contract with Westinghouse has established the necessary procedures, checklists and audits to minimize the exposure of the project to substandard or non-Q materials. In addition to the Westinghouse procedures, the EPC contract between SCE&G and Westinghouse provides for

certain goals and operating requirements that further function as incentives to Westinghouse to select and construct V.C. Summer Units 2 & 3, with only certified materials from the approved vender list of Westinghouse.

Q. ARE THERE OTHER FUNCTIONAL PROCESSES IN-PLACE TO ASSURE MATERIALS FOR V. C. SUMMER UNITS 2&3 MEET QUALIFICATION STANDARDS?

A. Yes, Westinghouse is a member of the Nuclear Industry Assessment Committee ("NIAC"). NIAC is an industry-wide initiative to share knowledge and results of supplier audits. The NIAC Shared Audit Program utilizes a standard assessment checklist based on the criteria of Code of Federal Regulations, 10 C.F.R 50, Appendix B; ANSI N45.2; ASME NQA-1; ASME NCA-4000 and/or NCA-3800.

Q. IS THE WESTINGHOUSE PROCESS SUFFICIENT TO ASSURE THE PUBLIC THAT ONLY QUALIFIED AND APPROVED SUPPLIERS AND MATERIALS WILL BE UTILIZED IN THE CONSTRUCTION OF V.C. SUMMER UNITS 2 & 3?

A. Yes, in my opinion, not only has Westinghouse provided proper assurances, the EPC Contract provides SCE&G with the final and absolute decision on suppliers and equipment. Article 5 of the EPC contract addresses SCE&G's rights to access and audit subcontractors' facilities, participate in subcontractor audits and to participate in observation and hold points during manufacturing. The EPC contract also provides SCE&G with authority to require subcontractors to change manufacturing processes to correct deficiencies and the final authority to "stop work" in order to properly resolve any issue.

Q. HAS SCE&G MET THE REQUIREMENTS OF THE BASE LOAD REVIEW ACT FOR THE SELECTION OF SUPPLIERS OTHER THAN SUPPLIERS OF MAJOR COMPONENTS?

A. Yes, in my opinion, the requirements of S.C. Code Ann. §55-33-250(5) have been met.

III. CONSTRUCTION SCHEDULE

Q. PLEASE DESCRIBE THE CONSTRUCTION SCHEDULE FOR V. C. SUMMER UNITS 2 & 3

A. The overall schedule as proposed by SCE&G in its Application will take approximately 4.5 years from the placement of the first "nuclear concrete" until the substantial completion of Unit 2. There will be an additional 3 years of construction until the "substantial completion" of Unit 3. This schedule does not include preconstruction activities such as issuing purchase orders for various long lead time manufactured components, nor does it include initial site clearing activities. From a "milestone" activity perspective, the V. C. Summer Unit 2 & 3 project will require approximately 10 years from the beginning of initial site clearing through fuel loading, start-up testing and commercial operation.

Q. DOES THIS SCHEDULE OFFER SUFFICIENT TIME TO COMPLETE ALL CONSTRUCTION ACTIVITIES WITHOUT ACCELERATED WORK SCHEDULES?

A. Yes, the nature of the AP1000 and the passive design offers many advantages over first generation commercially operating nuclear construction. By designing the AP1000 as a "modular" system of components and as a result of the passive

nuclear safety features, the plant itself will require significantly less valves, piping, cabling, pumps and seismic designed buildings.

Q. HOW DOES THE MODULAR DESIGN AFFECT THE SCHEDULE?

A. The passive modular design allows for a number of the components to be constructed off-site and shipped to the site for assembly rather than having to construct on site. The reduction in total equipment needed for the passive design also affects the schedule. In both cases, the effect to the schedule is to shorten the time of construction.

Q. IS THERE AN ENFORCEABLE GUARANTEE FOR DELIVERY OF THE TWO V. C. SUMMER UNITS?

A. Yes, the EPC contract stipulates that Unit 2 at V. C. Summer will be delivered April 1, 2016 and Unit 3 will be delivered January 1, 2019.

Q. WHAT HAPPENS IF THERE IS A DELAY IN THE CONSTRUCTION SCHEDULE?

A. The response to this question relies heavily on the "cause" and duration of the delay. There are significant contingencies built into the schedule to allow for some schedule deviation, however, there is considerable risk in a schedule of this duration.

Q. PLEASE EXPLAIN CONSIDERABLE RISK IN SCHEDULE DELAY.

A. In general, a delay in the schedule for any reason will impact the completion schedule and final cost.

Q. WHAT ARE THE MAJOR MILESTONES OF THE CONSTRUCTION OF V. C. SUMMER UNITS 2 & 3?

A. I have included as Exhibit MWC-2, a milestone schedule.

Q. WHAT ARE THE COMMERCIAL OPERATION DATES FOR UNIT 2 AND UNIT 3?

A. Unit 2 Commercial Operation is scheduled for April 1, 2016; Unit 3 is scheduled for January 1, 2019.

Q. IS THE SCHEDULE WORKABLE, MANAGEABLE AND REFLECTIVE OF ALL ACTIVITIES?

A. The current Schedule of Construction Activities labeled as Exhibit E of the Confidential Version of SCE&G's Application presents a thorough and comprehensive timeline of construction and start-up activities. SCE&G has assembled project documentation, procedures and scheduling tools to appropriately monitor construction activities. Keep in mind that this is an EPC contract and that Westinghouse/Shaw have overall schedule and budget responsibilities. The actual performance is the responsibility of Westinghouse/Shaw.

Q. WHAT LEVERAGE DOES SCE&G MAINTAIN OVER WESTINGHOUSE/SHAW TO ASSURE SOUTH CAROLINA RATE PAYERS THAT THE PROJECT WILL "COME IN" ON SCHEDULE?

A. There are a number of provisions in the EPC contract and externally that establish incentives for Westinghouse/Shaw to meet contractual obligations. First and foremost, the EPC contract has established delivery dates for both units. These completion dates trigger incentive and profit schedules for Westinghouse/Shaw. Secondly, delays on the part of Westinghouse/Shaw or the subcontractors that

impact the delivery date of either unit will trigger contract terms that will reduce profits available to Westinghouse/Shaw. An additional lever that SCE&G maintains over Westinghouse/Shaw is that the V. C. Summer units will be among the first or near the first of the new generation of units to be constructed in the US. Currently, Westinghouse/Shaw is considered by several of the surrounding utilities, i.e., Southern Company, Duke, etc., to be their EPC contractor as well. Any negative performance from Westinghouse/Shaw will be a considerable "black-eye" towards their ability to successfully negotiate a contract with another utility.

Q. IS THERE ANY RECOURSE AVAILABLE TO THE PUBLIC SERVICE COMMISSION OF SOUTH CAROLINA ("COMMISSION") SHOULD THE SCHEDULE BE SIGNIFICANTLY COMPROMISED?

A. Yes, per SC Code Ann. Section 58-33-275(E), if there is a *material and adverse deviation* from the approved schedules the Commission may disallow the additional capital costs that were the result of imprudence on the part of the utility considering the information available at the time.

Q. HAS SCE&G ESTABLISHED THE NECESSARY CONSTRUCTION SCHEDULES TO SATISFY THE REQUIREMENTS OF THE BASE LOAD REVIEW ACT?

A. Yes. In my opinion SCE&G has established considerable documentation that will allow it to successfully transition from each step of construction to the next. The Company's detailed schedule provides sufficient work task breakdown to monitor field activities and to compare against cost activities. Since Westinghouse/Shaw is

contracted through an EPC contract, the overall responsibility of performance lies squarely with Westinghouse/Shaw. However, this does not relieve SCE&G from its obligation, as owner and as agent for Santee Cooper, to continually monitor construction activities and costs associated with these activities. Nor does it relieve SCE&G from maintaining a close relationship with ORS to keep ORS abreast of schedules and cash flow, per Section 58-33-277(A) & (B).

Q. SCE&G IS REQUESTING IN PARAGRAPH 9 OF ITS APPLICATION THAT THE COMMISSION APPROVE A THIRTY (30) MONTH SCHEDULE CONTINGENCY. DO YOU AGREE WITH THIS REQUEST?

A. Yes, but with a condition. I recommend to the Commission that SCE&G be granted this contingency with the caveat that SCE&G must first come to ORS prior to making such a cost or schedule adjustment and that if ORS objects then the Company must file for approval for the changes to the construction schedule and schedule of capital costs with the Commission.

Q. SCE&G HAS REQUESTED IN PARAGRAPH 14 OF ITS APPLICATION THAT THE COMMISSION APPROVE SCE&G'S ABILITY TO USE PROJECT CONTINGENCIES IN A MANNER CONSISTENT WITH THE ACTUAL CONSTRUCTION. CONTINGENCIES AS ALLOCATED IN THE CONSTRUCTION AND CASHFLOW SECTIONS OF THE APPLICATION ARE AN ESTIMATE AT THIS TIME. DO YOU AGREE WITH ALLOWING SCE&G THE ABILITY TO MAKE THESE SHIFTS IN TIMING OF USE OF CONTINGENCIES?

A. Yes. Since SCE&G is required by the BLRA, S.C. Code Ann. Section 58-33-277 to make Quarterly reports of schedule and cash flow, any adjustments to the cost contingences should be reflected in the Quarterly reports. SCE&G must make the adjustments known in the Quarterly report in which they will apply, if different from the original Base Load Review Order.

Q. SCE&G HAS REQUESTED THAT THE CAPITAL COST SCHEDULE REFLECT A CONTINGENCY OF UP TO 24 MONTHS IF MANUFACTURING OR CONSTRUCTION CAN BE ACCELERATED. DO YOU AGREE WITH THIS REQUEST?

A. Yes. The ability to move up construction or the purchase of a capital cost items could very well present a cost savings to the final project cost. Allowing SCE&G to make this adjustment will be in the best interest of the customers of SCE&G. However, SCE&G must report this acceleration of cost or schedule in their Quarterly Report as soon as they become aware of this situation but not later than one quarter prior to the acceleration.

IV. CAPITAL COSTS

Q. WHAT IS THE REQUIREMENT OF SCE&G IN ITS BASE LOAD REVIEW APPLICATION FOR REPORTING CAPITAL COSTS AND PROVIDING FORECASTS OF THESE COSTS?

A. SCE&G is required under Section 58-33-250(2) of the Base Load Review Act to file "information showing the anticipated component of capital costs and the anticipated schedule for incurring them."

Q. WHAT IS THE DEFINITION OF CAPITAL COSTS AS DEFINED IN THE BASE LOAD REVIEW ACT?

A. The Base Load Review Act in Section 58-33-220(5) defines capital costs as "costs associated with the design, siting, selection, acquisition, licensing, construction, testing, and placing into service of a base load plant..." and any costs to expand or upgrade the transmission system to connect the plant to the transmission grid. Allowance for Funds Used During Construction ("AFUDC") is a specific capital cost item along with facilities or investments for the delivery, transportation, storage and handling of fuels.

Q. HAS SCE&G FULFILLED THE REQUIREMENTS OF THE BASE LOAD REVIEW ACT FOR CAPITAL COSTS?

A. Yes, in my opinion, SCE&G has submitted detailed capital cost forecasts for the construction period. Exhibit MWC-3 addresses the Capital Cost Components for V.C. Summer Units 2 & 3.

Q. WHAT IS THE ANTICIPATED CAPITAL COST SCE&G HAS FORECASTED FOR THE V. C. SUMMER UNITS 2 & 3?

A. SCE&G has forecasted its total cost, including Owner's Costs, AFUDC, Contingencies, Escalation and Transmission of $6.3 Billion for the construction of Units 2 & 3.

Q. IS THIS THE TOTAL COST OF UNITS 2 & 3?

A. No, V. C. Summer Units 2 & 3 will be a "joint owned" project. SCE&G will own 55% of the project and Santee Cooper will own 45% of the project. The $6.3 Billion represents the cost for SCE&G.

Q. CAN YOU PROVIDE A BREAKDOWN BY THE MAJOR COST CENTERS?

A. Yes, Exhibit MWC-4 provides a detailed report of the costs that SCE&G will incur through the duration of the project. The major breakdown is as follows:

Plant Costs	= [redacted]
Escalation and Contingencies	= [redacted]
Transmission	= $ 638,020,000
AFUDC	= $ 264,289,000
SCE&G Total Construction	= $6,313,376,000

Q. HOW HAVE THE DIRECT COSTS BEEN DEVELOPED?

A. There are eight (8) individual cost components that make up the Total Unescalated Cost for the Plant Cost Categories. These are (1) Fixed Cost with No Adjustment; (2) Firm with Fixed Adjustment A; (3) Firm with Fixed Adjustment B; (4) Firm with Indexed Adjustment; (5) Actual Craft Wages; (6) Non-Labor Costs; (7) Time and Materials; and (8) Owners Costs. There are also specific transmission projects that are required in order to connect the new generation to the transmission grid. These are fixed costs, as well.

Q. PLEASE EXPLAIN THE COST CONCEPTS OF FIXED WITH ADJUSTMENT, FIRM WITH FIXED ADJUSTMENT A, FIRM WITH FIXED ADJUSTMENT B, AND FIRM WITH INDEXED ADJUSTMENT.

A. **Fixed with No Adjustment** – These costs are fixed per the EPC Contract and escalation is not applied. Contingency risk for this cash flow is principally related to change orders and is predicted to be relatively low.

Firm with Fixed Adjustment A – These costs have a fixed escalation of a specified percentage applied as part of the EPC Contract. Contingency risk for this cash flow is principally related to change orders and is predicted to be relatively low.

Firm with Fixed Adjustment B – These costs have a fixed escalation of a specified percentage applied as part of the EPC Contract. Contingency risk for this cash flow is principally related to change orders and is predicted to be relatively low. Under the EPC Contract, this factor is expressed in two parts. One part is an inflation escalator equal to the adjustment percentage in "Firm with Fixed Adjustment A". The other is a small additional factor that is designated a nuclear industry administration adjustment to compensate Westinghouse for undertaking the project [redacted]

Firm with Indexed Adjustment – Escalation for this schedule of costs is applied periodically under the EPC Contract based on the Handy-Whitman All Steam Generation Plant Index, South Atlantic Region. Contingency risk for this cash flow is predicted to be relatively low.

Q. HOW ARE THE ADJUSTMENTS CALCULATED AND APPLIED?

A. The Fixed Adjustments have been established in the EPC Contract as [redacted]. The Indexed Adjustments use the Handy-Whitman All Steam Generation Plant Index, South Atlantic Region as the tool for making periodic cost adjustments.

Q. IS THE HANDY-WHITMAN INDEX A REASONABLE TOOL FOR CALCULATING COST ADJUSTMENTS?

A. Yes. Handy-Whitman is an industry standard for forecasting cost adjustments due to increases in material costs, etc. Using the South Atlantic Region package assures that costs are reflective of regional economic considerations. The Handy-Whitman Index is very appropriate for this project.

Q. THERE ARE FOUR (4) OTHER CATEGORIES OF COSTS. HOW ARE THESE ADJUSTED OR ESCALATED?

A. These four (4) categories are Actual Craft Labor, Non-Labor costs, Time and Materials activities, and Owners' Costs. These categories are not escalated or adjusted. They are paid at the actual costs when occurred. For planning purposes, these costs are escalated by the Handy-Whitman Index in order to establish a base estimate for planning purposes.

Q. HAS SCE&G APPROPRIATELY ADDRESSED COST CATEGORIES AND ESTABLISHED REASONABLE CAPITAL COST ESTIMATES, PRICING ADJUSTMENTS AND RISK?

A. SCE&G, through the EPC contract, has established cost controls for this project. The Company's use of Fixed Price contracting for a large portion of the nuclear package, i.e., steam generator, reactor vessel, reactor vessel internals, squib valves, regenerative heat exchanger, etc., has placed approximately 7% of the capital investment into a fixed price category with a very low probability of any cost adjustment. Approximately 22% of the nuclear package is contracted under Fixed and Fixed with Indexed Adjustments.

Q. HAS SCE&G ESTABLISHED APPROPRIATE FIXED ADJUSTMENTS?

A. SCE&G's negotiated fixed adjustment rate establishes a factor that will protect against price escalation in materials.

Q. WHAT COST CATEGORIES PRESENT OR EXPOSE SCE&G TO THE MOST SIGNIFICANT RISK FOR COST RUN-UPS?

A. The two (2) most significant cost categories that provide exposure to SCE&G are (1) the actual craft wages (labor costs) and (2) activities associated with permitting, obtaining NRC licensing, startup and transmission projects. These two categories are paid at actual cost. Labor makes up a significant individual component of these costs. Since the labor market is somewhat fluid at the present time, it will be important for SCE&G to maintain a constant vigil on the overall labor cost.

Q. BASED ON YOUR EXPERIENCE, REVIEW OF SCE&G'S EPC CONTRACT, THE COMPANY'S APPLICATION FOR BASE LOAD REVIEW AND YOUR ASSESSMENT OF THE CAPITAL INVESTMENT BUDGET, IS THE OVERALL COST OF V. C. SUMMER UNITS 2 & 3 REASONABLE?

A. Based on my review of the cost parameters, cost containment procedures, budget and schedule, the SCE&G budget is reasonable and justified.

V. RISK FACTORS

Q. SECTION 58-33-250 (8) REQUIRES THE COMPANY TO SUBMIT INFORMATION DETAILING THE RISK FACTORS ASSOCIATED WITH THE CONSTRUCTION OF THE BASE LOAD PROJECT. HAS SCE&G SUBMITTED SUCH INFORMATION?

A. Yes, Exhibit J of their Combined Application submits the required information.

Q. HAVE YOU REVIEWED THIS DATA AND CAN YOU PROVIDE A SUMMARIZATION OF THE INFORMATION?

A. Yes. The information in Application Exhibit J summarizes the robust process that SCE&G has worked through to provide as clear a picture into the future concerning possible areas that may impact construction, costs and schedules. The areas of risk in a project of this magnitude are many and they are constantly changing depending on world political and economic stability, local and regional workforce quality and skills, regulatory framework and licensing stability, design standardization and population growth parameters. As you can see, there are many areas of risk that must be addressed and mitigated.

Q. WHAT HAS SCE&G DONE TO MITIGATE RISKS ASSOCIATED WITH THIS PROJECT?

A. The entire Base Load Review Act, the NRC licensing process, the permit application process with State and Federal Agencies, the negotiation of a strong and thorough EPC contract and the hiring of professional staff are all steps SCE&G has navigated to reduce or minimize risk. A project of this magnitude of dollars and time from initial permitting and licensing to commercial operations presents a constant battle to contain and minimize risk. The "checks and balances" in the EPC Contract help to minimize risks associated with direct cost of the project during construction. The licensing process established by the Nuclear Regulatory Commission with its design reviews and certifications by professionals in the nuclear industry mitigates risks associated with design and

operational factors. This process of the Base Load Review Act is a process that addresses and minimizes risk. Hiring and training of qualified staff for operations is also a risk mitigation.

Q. PLEASE PROVIDE US WITH AN OPINION OF THE SIGNIFICANT AREAS OF RISK FOR THIS PROJECT?

A. At this point in time, prior to the initiation of major construction activities, I would submit that a sufficiently trained skilled labor force is a concern. Labor and workforce actions (strikes) are always difficult to foresee and mitigate. Another concern is the world economic and political situation. This risk would most likely manifest itself in delays in shipping of needed equipment packages being constructed overseas. I do not see licensing and permitting as a particularly vulnerable risk area. SCE&G has established the necessary procedures for submittal of permit applications and licensing requests. I certainly do not see the design being of a particularly vulnerable area of risk. SCE&G has proven itself to be a safe and reliable operator of nuclear facilities with its V. C. Summer Unit 1 in addition to its overall operating performance with its system of electric generation, transmission and distribution. I do not see this as being an area to be overly concerned with risk.

However, regardless of the nature of the individual risk component or the foresight to avoid risk, risk is ever present in this project. Only upon Commission approval of any cost overruns, which are a manifestation of un-avoided risk, could those costs be allowed to be recovered.

Q. DO YOU THINK THE BENEFITS OUTWEIGH THE RISKS?

A. In my opinion, based on experience, SCE&G's filings, and knowledge of the electric industry, I am convinced that the benefits of SCE&G's decision to add Units 2 & 3 to its base load fleet outweighs the risks.

VI. ENVIRONMENTAL ASSESSMENT AND RELATED INFORMATION

Q. HAS SCE&G FILED THE NECESSARY ENVIRONMENTAL DOCUMENTATION WITH THE NUCLEAR REGULATORY COMMISSION?

A. SCE&G filed its Environmental Report with the NRC on or about March 31, 2008, as a part of its filing for a COL.

Q. DOES THE ENVIRONMENTAL REPORT MEET ANY SPECIFIC REQUIREMENTS ESTABLISHED BY THE NRC?

A. Yes, the NRC has established a standard requirement implementing the provisions of Title 10 of the Code of Federal Regulations, Part 51 (10 C.F.R. § 51), "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions." The NRC regulations are in their NUREG 1555, Environmental Standard Review Plan.

Q. HAS SCE&G FULFILLED ITS OBLIGATION FOR FILING THE ENVIRONMENTAL REPORT TO THE NRC?

A. Based on my review of the COLA and the Environmental Report it appears the requisite filing has been made.

Q. HAS THE NRC APPROVED THE ENVIRONMENTAL REPORT AS COMPLETE?

A. No, as of October 17, 2008, the NRC has not awarded SCE&G a COL. The NRC continues to review the COLA and as a part of the COLA review, the Environmental Report. The Environmental Report will not be considered approved until the COL is issued.

Q. WILL THE PUBLIC HAVE AN OPPORTUNITY TO INTERVENE OR OFFER TESTIMONY CONCERNING THE ENVIRONMENTAL REPORT?

A. Yes, the NRC determined on July 31, 2008, that SCE&G's COLA contains sufficient information to docket the filing and begin formal technical review (Docket: 52-027 & 52-028). The Public will have 60 days from the date of Notice in the Federal Registry to file for intervention (Exhibit MWC-5).

Q. HAS SCE&G EVALUATED THE ENVIRONEMNTAL IMPACT ASSOCIATED WITH THE CONSTRUCTION AND OPERATION OF THE TWO NEW PROPOSED UNITS AT V. C. SUMMER?

A. Yes, SCE&G has evaluated the direct environmental impacts such as ground disturbance, stormwater runoff, water supply, evaporative cooling (water loss), and effects to wildlife. SCE&G has also considered the impact on the environment of increased traffic due to the large workforce, and the overall impact of operations.

Q. WHAT ARE THE RESULTS OF THE SCE&G ENVIRONMENTAL ASSESSMENT ("EA")?

A. The overall conclusion from the SCE&G EA is that the construction of V.C. Summer Units 2&3 will not create any increased short or long term

environmental impact above and beyond the minor impact that the current Unit 1 has on the local area. There are no Federally or State listed Endangered Species that inhabit the area or are transitional to the area. While, on occasion, the American Bald Eagle does inhabit this area in the Winter, the Bald Eagle is no longer listed as an Endangered Species.

SCE&G has made efforts to protect any cultural resources on the area, namely the General John Pearson Cemetery. Cultural resource studies have not identified any additional resources, including tribal lands or artifacts.

Q. HAS SCE&G EVALUATED THE IMPACT OF OPERATIONS ON THE AVAILABLE WATER RESOURCES OF THE AREA?

A. Yes. SCE&G developed the Monticello Reservoir in conjunction with its Fairfield Pumped Storage Project. This reservoir operates as the cooling water make-up and process water make-up for Unit 1 and will serve the same purpose for Units 2&3. The SCE&G Environmental Report for the COLA specifically addresses water use and consumptive loss. Based on information provided by the Company, under normal hydrologic conditions the consumptive loss due to plant operations will be minimal. The loss during normal hydrologic conditions will be less than 2% of the average flow rate in the Broad River. During extreme conditions, the loss of flow will be less than 8% of the minimum required flow as defined by the Federal Energy Regulatory Commission ("FERC") unless extreme conditions result in a natural flow less than the FERC minimum flow rate. (See Environmental Report appended to the COLA, Section 5.2)

Q. HAVE ALL PERMITTING ISSUES BEEN RESOLVED FOR THE CONSTRUCTION OF UNITS 2&3?

A. No. As a matter of fact, many of the permits have yet to be applied for or received. However, SCE&G has developed a comprehensive list of permits and corresponding state and federal agencies that must address these permit applications (See Environment Report of the COLA, Section 1, Tables 1.2-1, 1.2-2, 1.2-3, and 1.2-4)

Q. IN YOUR OPINION HAS SCE&G'S PERFORMED THE NECESSARY ENVIRONMENTAL REVIEW AND ESTABLISHED THE NECESSARY CONTROLS TO PROTECT SOUTH CAROLINA ENVIRONMENTAL COMMUNITY?

A. SCE&G has established a protocol to address the necessary permitting from state and federal agencies to protect the South Carolina environment. It will be the responsibility of the various agencies of the state to enforce the permitting and compliance activities.

VII. CONCLUSIONS

Q. WILL YOU PLEASE SUMMARIZE YOUR TESTIMONY, THE TESTIMONY OF THE PANEL AND THE CONCLUSIONS OF THE PANEL?

A. Certainly. Based on the team's review, SCE&G has fulfilled the statutory requirements for Base Load Review Act Application with respect to "Other Suppliers," Construction Schedule, Capital Costs, and Risk Factors. The overall capital investment including escalation, contingencies, transmission costs and

AFUDC for Units 2 & 3 of $6.3 billion is reasonable to provide the necessary base load generating resource to meet the needs to the customers of SCE&G. The schedule is reasonable and provides for some flexibility should work process warrant. SCE&G through its EPC Contract with Westinghouse/Shaw/Stone and Webster provides for a project with experienced nuclear credentials and has established schedules, procedures and staffing to accomplish the tasks to support commercial operation in 2016 and 2019.

SCE&G has used industry applied tools to properly evaluate the need for its next base load generation. SCE&G has also properly selected nuclear as the best economic decision to meet its base load need. Under the current environmental climate, nuclear is the most appropriate choice for the next base load addition to the SCE&G fleet. The team evaluated SCE&G's use of demand-side programs and energy efficiency in order to delay or replace the need for base load generation. While there may be some potential DSM opportunities that SCE&G may use to modify its overall load demand, there simply are insufficient DSM programs available to offset the base load requirements that SCE&G is facing in a 10-20 year planning horizon.

Q. DO YOU HAVE A RECOMMENDATION FOR THE PUBLIC SERVICE COMMISSION?

A. Yes, based on the areas of the Base Load Review Act addressed in our review, analysis and testimony, we conclude that the V.C. Summer Units 2 & 3 should be approved at the budget level in the SCE&G Application and the schedule for construction should be adopted.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes it does.

Designated Suppliers and Potential Suppliers

Component Name	Vendor / Alternate Vendors	Parent Company	Location	W. Qualified Supplier	Supplier to China AP 1000 Project	Supplier to Nuclear Fleet	Vendor Shop Visit by W SCM	ASME N	NOTES
Reactor Vessel Head	Doosan Heavy Industries & Construction Company	Doosan	Korea	X	X	X	X	Y	
Reactor Coolant Pumps	Curtiss-Wright/ Electro-Mechanical Corporation		Pennsylvania	X	X	X	X	Y	
Reactor Internals	Doosan Heavy Industries & Construction Company	Doosan	Korea	X	X	X	X		
	Major Tool & Machine, Inc		Indiana				X	Y	
	Precision Custom Components		Pennsylvania				X	Y	
	Westinghouse Electric, LLC		Pennsylvania	X	X	X	X	Y	
Turbine Generator	Toshiba Corporation		Japan	X		X		Y	
Transformers	Westinghouse Electric Supply Co.		Pennsylvania	X		X	X	Y	
Control Rod Drive Mechanism System	Curtiss-Wright/ Electro-Mechanical Corporation		Pennsylvania	X		X	X	Y	
Balance of Plant Pumps	Curtiss-Wright/ Electro-Mechanical Corporation		Pennsylvania	X		X	X	Y	
	Flowserve Corporation		Texas	X		X	X		
	The Weir Group PLC		Scotland/USA	X			X	Y	
	KSB		Germany	X			X	Y	
Containment Air Baffle	Ansaldo Camozzi	Camozzi Group	Italy	X		X	X	Y	
	Chicago Bridge & Iron Company		Texas	X					
	Joseph Oat		New Jersey	X		X	X	Y	
Tanks	Ansaldo Camozzi	Camozzi Group	Italy	X		X	X	Y	
	IHI Corporation		Japan	X		X	X	Y	
Pressurizer	Ansaldo Camozzi	Camozzi Group	Italy	X		X	X	Y	
Reactor Cooling Piping	Tioga Pipe Supply Company		PA, TN, TX	X		X	X	Y	
Containment Vessel	Ansaldo Camozzi	Camozzi Group	Italy	X		X	X	Y	
	Chicago Bridge & Iron Company		Texas/Illinios	X				Y	
	Northrop Grumman Newport News		Virginia						
Diesal Generators	Caterpillar Inc.		Illinios			X			
Variable Frequency Drive Unit for Reactor Coolant Pumps	Siemens Corporation		Germany	X	X	X	X	Y	
Cooling Towers	SPX Cooling Technologies, Inc. (Marley)		Kansas			X		Y	SPX purchased Marley in 2001 and changed the name to SPX in 2005
	Zurn Company (Wilkins)		California			X			

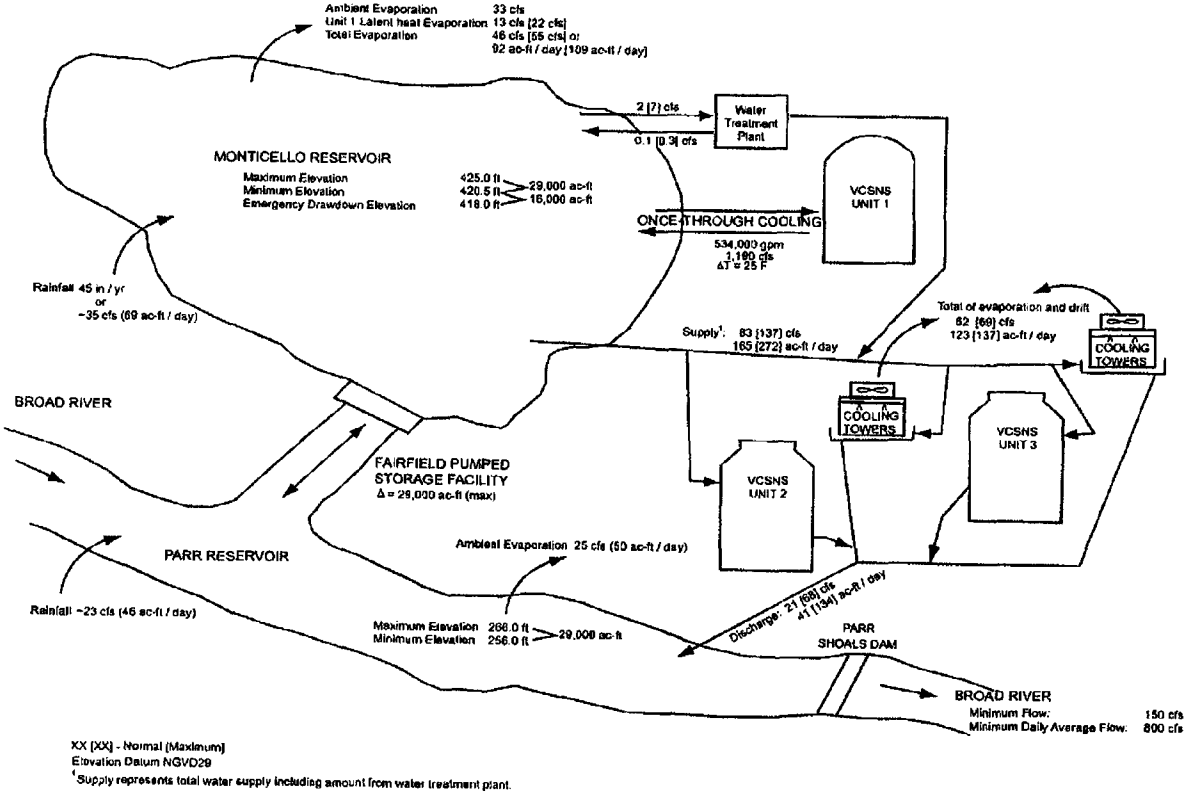
MWC-2 Exhibit MWC-2

Year	Construction Milestone Completion Activity
2008	Approve and Sign EPC Contract; Issue PO's for Steam Generators, Reactor Vessel Internals and Reactor Vessels
2009	Issue PO's for Turbine/Generators; Start site development; Start Erection of field offices, construction buildings, first aid facilities.
2010	Start excavation and foundation work of Unit 2; Receive various component materials at fabricators. Complete preparation for receiving the first module on site for Unit 2
2011	Complete Unit 2 Condenser shipment to fabricator; Receive Unit 2 Steam Generator tubing at fabricator; Ship Unit 2 Reactor Vessel Coolant Loop piping to site; Ship Unit 2 Control Rod Drive Mechanism to site.
2012	Complete girder fabrication for Unit 2 Polar Crane; Ship Unit 2 Reactor Integrated Head Package to site from fabricator; Set Nuclear Island structural module CA03 for Unit 2.
2013	Start concrete fill of Nuclear Island; Set Unit 2 Reactor Vessel; Set Unit 2 Steam Generator
2014	Set Unit 2 Pressurizer Vessel; Ship Unit 3 Steam Generator; Ship Unit 3 Reactor Coolant Pumps
2015	Complete Unit 2 Reactor Coolant System cold hydro; Activate DC power in Unit 2 Aux Bldg; Complete Unit 2 Hot Functional; Load Unit 2 Fuel.
2016	Unit 2 Substantial Completion; Set Unit 3 Reactor; Set Unit 3 Steam Generator
2017	Set Unit 3 Polar Crane; Start cable pulling in Unit 3 Aux Bldg.
2018	Activate Unit 3 DC power in Aux Bldg; Complete Unit 3 Hot Functional; Complete Unit 3 Fuel Loading
2019	Unit 3 Substantial Completion.

Exhibit MWC-3 REDACTED

Exhibit MWC-4 REDACTED

Exhibit MWC-5



APPENDIX A

MARK W. CRISP, P.E.
SENIOR CONSULTANT

EDUCATION:

BS, Civil Engineering, Georgia Institute of Technology, 1978
MBA, Finance & Accounting, University of Arkansas at Little Rock, 1980

REGISTRATIONS:

Registered Professional Engineer – Georgia
Registered Professional Engineer – Florida

PROFESSIONAL ACTIVITIES / HONORS:

Member: American Society of Civil Engineers; American Water Works Association; Water Environment Federation; Rural Water Association; National Hydropower Association

EXPERIENCE RECORD:

2001 - Present **Managing Consultant**

Areas of responsibility include all aspects of Utility Management including operations, site selection, permitting, design and construction. Specific areas of expertise include rate designs and cost of service studies, development of acquisition strategies, mergers, municipalization, planning and system forecasting for capital and O&M budgets.

Mr. Crisp has over thirty years of experience in the utility and power sectors. He has been involved in a significant number of domestic and international utility acquisitions, "green field" developments and regulatory reviews for State and Federal regulatory bodies. Mr. Crisp has provided consulting services to electric, water supply and wastewater utilities, local, state, federal and foreign governments, environmental protection organizations, domestic and international developers, electric utilities, and irrigation districts.

Mr. Crisp and his Team of consulting experts have recently completed engagements with the Georgia Public Service Commission reviewing the last 2 Integrated Resource Plans submitted by the Georgia Power Company. Both of these IRP's included provision for adding nuclear resources to the generation fleet. The latest of these IRP's (2007) will be the basis for the construction of the Units 3&4 at Plant Vogtle.

Mr. Crisp currently manages projects ranging in size from $10K to multi-million dollar regulatory and litigation efforts as well as his daily responsibilities to lead the growth of C. H Guernsey & Co.'s east coast operations.

1978 - 2001 **Various Positions leading to Senior Project Manager**

Mr. Crisp directed the Utility Consulting services function for a major utility consulting firm based in Marietta, Georgia, and was responsible for developing extensive capabilities in financial and economic decision-making, pro forma analysis, and acquisition strategies to support utility management requirements. Mr. Crisp evaluated complex technical issues related to the electric utility, environmental and water utility

markets and rendered them into a specific set of logical and responsive recommendations.

Mr. Crisp has been integrally involved in the privatization of utilities on military bases since the issuance of DRID #9. His experience includes testimony before the Office of Secretary of Defense, numerous industry focus meetings and the development of military utility inventories, asset valuations, and acquisitions analysis.

In addition to military privatizations, Mr. Crisp has completed a number of private sector privatizations and assisted utilities with "re-engineering" their utility to avoid privatization, cost of service analysis, rate design and O&M budget evaluations.

Mr. Crisp spent nearly twenty years with the Southern Company in all phases of that Utilities operation. During his tenure with Southern he completed major assignments including design and construction activities at Plant Vogtle Nuclear. These included such critical areas as piping and pipe hanger reviews, NRC license compliance and reporting, as well as craft management during construction and start-up. Prior to joining Southern Company, Mr. Crisp was employed with Arkansas Power Light, the predecessor to Entergy – Arkansas. In his capacity at AP&L, Mr. Crisp was involved in numerous State and NRC promulgated outage reviews of Arkansas Nuclear One ("ANO") following the Three Mile Island incident.

Expert Witness and Testimony

Georgia Public Service Commission

Maryland Public Service Commission

Federal Energy Regulatory Commission

United States Congress

Federal District Court of Washington D.C.

Federal District Court in the Northern District of Georgia

Federal District Court in the Northern District of Alabama

US Court of Appeals - 11th Circuit

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)
North Anna Power Station – Dominion Resources

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 – Chile S.A.
Mejionelles – Chile S.A.
Puerto Rican Electric Power Authority San Juan, Puerto Rico

Hydro-electric Generating Facilities
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

GEORGE W. EVANS
SENIOR CONSULTANT

EDUCATION:

1976 Master of Science, Applied Mathematics, Georgia Institute of Technology
1974 Bachelor of Science, Applied Mathematics, Georgia Institute of Technology,

PROFESSIONAL MEMBERSHIP: Institute of Electrical and Electronic Engineers

EXPERIENCE RECORD:

Mr. Evans has over twenty-five years of experience in the electric power utility industry. 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 and the computer simulation of electric power systems. As an expert witness in these areas, Mr. Evans has submitted testimony 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, and the Arkansas PSC. In addition, he has assisted in the development of expert testimony filed before the Public Utility Commission of Texas, the Michigan Public Service Commission and the New Jersey Board of Public Utilities.

Specific Experience Includes:

1997-Present
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
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:
GEMC - Produced a forecast of market clearing prices for electricity in the SERC region and estimated stranded costs.

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.

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.

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

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.

Programming Languages: C++ for Windows, C , FORTRAN and COBOL

Expert Testimony of George W. Evans

1. On Behalf of Golden Spread Electric Cooperative, Inc., Before the Federal Energy Regulatory Commission, Docket No. EL89-50-000, filed April 2, 1990. Subject matter: The effect of off-system sales on wholesale customers.
2. On Behalf of Bethlehem Steel Corporation, Before the Pennsylvania Public Utility Commission, Docket No. P-870235, filed March 18, 1992. Subject matter: Need for capacity and avoided costs of a Pennsylvania Utility.
3. On Behalf of the Georgia Public Service Commission Staff IRP Adversary Team, Before the Georgia Public Service Commission, Docket No. 4133-U and 4136-U, filed October 1992. Subject matter: Integrated resource planning and analysis of purchase power offers.
4. On Behalf of the State of Michigan Department of Attorney General, Before The Michigan Public Service Commission, Case No. U-10127, filed November 1992. Subject matter: Availability of MCV, the worth of the proposed CAPS on availability payments to MCV, and the costs to the rate payers from the proposed MCV Settlement.
5. On Behalf of the Georgia Public Service Commission Staff IRP Adversary Team, Before the Georgia Public Service Commission, Docket Nos. 4311-U, filed June 1993. Subject matter: Application for Certification of The Robins Combustion Turbine Project.
6. On Behalf of Nucor-Yamato Steel Company, Before the Arkansas Public Service Commission, Docket No. 93-132-U, filed November 1, 1993. Subject matter: AECC Hydro CCN and the need for a "buy-through" clause in interruptible contracts.
7. On Behalf of the Georgia Public Service Commission Staff IRP Adversary Team, Before the Georgia Public Service Commission, Docket No. 4895-U, filed May 1994. Subject matter: Application for Certification of The Florida Power Corporation Power Purchase and the Intercession City Combustion Turbine Project.

8. On Behalf of the State of Michigan Department of Attorney General, Before The Michigan Public Service Commission Case No. U-10685, filed March 1995. Subject matter: Authority to increase its rates for the sale of electricity.

9. On Behalf of the Georgia Public Service Commission Staff IRP Adversary Team, Before the Georgia Public Service Commission, Docket No. 5601-U and 5602-U, filed May 1995. Subject matter: Application for Approval of an Integrated Resource Plan and Commission Review of DSM Certificates.

10. On Behalf of The South Dakota Public Utilities Commission Staff, Before the South Dakota Public Utilities Commission, Docket No. EL95-003, filed June 1995. Subject matter: Modeling and assumptions utilized in the development of the IRP filed by Black Hills Power & Light.

11. On Behalf of the Residential Ratepayer Consortium, Before the Michigan Public Service Commission, Case No. U-10427-R, filed August, 1995. Subject Matter: Computation of Fermi 2 Replacement Power Costs.

12. On Behalf of the Georgia Public Service Commission Staff IRP Adversary Team, Before the Georgia Public Service Commission, Docket No. 4900-U, filed December 1995. Subject matter: Georgia Power Company's Application for Certification of the Mid-Georgia Cogeneration PPA.

13. On Behalf of the Residential Ratepayer Consortium, Before the Michigan Public Service Commission, Case No. U-10702-R, filed August 8, 1996, Subject Matter: Computation of Fermi 2 Replacement Power Costs.

14. On Behalf of the Georgia Public Service Commission Staff IRP Adversary Team, Before the Georgia Public Service Commission, Docket No. 6737-U, filed November 1996. Subject matter: Integrated Resource Planning and Certification of Supply-Side Resources.

15. On Behalf of Progress Energy Corporation, Destec Energy, Inc., and U.S. Generating Company,, Before the Alabama Public Service Commission, Docket No. 26115, filed October 1997. Subject Matter: Alabama Power's application for approval of the construction of an 800 MW combined cycle generating facility.

16. On Behalf of Progress Energy Corporation, Destec Energy, Inc., and U.S. Generating Company, Before the Mississippi Public Service Commission, Docket No. 97-UA-496, filed November 1997. Subject Matter: Mississippi Power Company's petition for approval for the construction of a 1000 MW combined cycle generating facility.

17. On Behalf of the State of Michigan Department of Attorney General, Before the Michigan Public Service Commission, Case No. U-11180-R, filed October 1998. Subject Matter: The Application of Consumers Energy Company for a reconciliation of power supply recovery costs.

18. On Behalf of NRG Energy, Inc., in an Arbitration between NRG Generating (U.S.), Inc., and NRG Energy, Inc., filed June 1998. Subject Matter: The market value of the disputed generating resource.

19. On Behalf of the Delaware Division of the Public Advocate, Before the Delaware Public Service Commission, Docket No. 99-328, filed February 2000. Subject Matter: Investigation into the July 1999 Outages and General Service Reliability

20. On Behalf of Holy Cross Energy, Before the Public Utilities Commission of the State of Colorado, filed July 2001, Docket No. 01A-181E. Subject Matter: Restructuring of Thermo QF Contracts

21. On Behalf of Golden Spread Electric Cooperative, Inc., Before the Federal Energy Regulatory Commission, filed October 2001, Docket No. EL02-1-000. Subject Matter: Dispute concerning the Commitment and Dispatch Agreement between Golden Spread and Southwestern Public Service Company.

22. On Behalf of Golden Spread Electric Cooperative, Inc., Before the Federal Energy Regulatory Commission, filed January 2002, Docket No. EL02-21-000. Subject Matter: Dispute concerning the Commitment and Dispatch Agreement between Golden Spread and Southwestern Public Service Company.

23. On Behalf of Lawton Cogeneration, LLC, Before the Corporation Commission of the State of Oklahoma, filed September 2002, Cause No. PUD 200200038: Establishment of Purchased Power Rates and a Purchase Power Contract with Public Service Company of Oklahoma Pursuant to PURPA.

24. On Behalf of Aquila, Inc., Intermountain Rural Electric Association, Inc., Holy Cross Energy and Yampa Valley Electric Association, Inc., Before the Federal Energy Regulatory Commission, filed April 2003, Docket Nos. EL02-25-000, EL02-76-000 and EL03-33-000: PSCo Fuel Clause.

25. On Behalf of Blue Canyon Windpower II, LLC, Before the Corporation Commission of the State of Oklahoma, filed May 2004, Cause No. PUD 200300633: For Establishment of Purchased Power Rates and a Purchase Power Contract with AEP - Public Service Company of Oklahoma Pursuant to PURPA.

26. On Behalf of Blue Canyon Windpower V, LLC, Before the Corporation Commission of the State of Oklahoma, filed May 2004, Cause No. PUD 200300634: For Establishment of Purchased Power Rates and a Purchase Power Contract with AEP - Public Service Company of Oklahoma Pursuant to PURPA.

27. On Behalf of the Staff of the Public Utilities Commission of Colorado, Before the Public Utilities Commission of the State of Colorado, filed July 2004, Docket No. 04A-050E: Review of the Electric Commodity Trading Operations of Public Service Company of Colorado.

28. On Behalf of Chermac Energy Corporation and Sleeping Bear, LLC, Before the Corporation Commission of the State of Oklahoma, filed June 2005, Cause No. PUD 200500059: Application for the establishment of purchased power rates and a PPA with Oklahoma Gas & Electric.

29. On Behalf of Lawton Cogeneration, LLC, Before the Corporation Commission of the State of Oklahoma, filed October 2005, Cause No. PUD 200200038: Remand proceeding on the Application for establishment of purchased power rates and a PPA with Public Service Company of Oklahoma.

30. On Behalf of Golden Spread Electric Cooperative et al, Before the Federal Energy Regulatory Commission, Docket No. EL05-19-002: Fuel Clause complaint against Southwestern Public Service Company.

31. On Behalf of Johns Manville, Inc. and others, Before the United States District Court for the Northern District of Alabama, Civil Action No.: 2:99-CV-2294-VEH-HGD: Damage Computations for Interruptible Customers of the Tennessee Valley Authority.

32. On Behalf of the Georgia Public Service Commission Public Interest Advocacy Staff, before the Georgia Public Service Commission, Docket No. 24505-U: Georgia Power Company's Application for Approval of its 2007 Integrated Resource Plan.

33. On Behalf of the Attorney General of Michigan, before the Michigan Public Service Commission, Case No. U-15001: Application of Consumers Power Company for Approval of a Power Supply Cost Recovery Plan and for Authorization of Monthly Power Supply Cost Recovery Factors for the Calendar Year 2007.

34. On Behalf of Golden Spread Electric Cooperative, Inc., before the 108th District Court of Texas, Cause No. 95,028-E: Contract Dispute concerning Denver City Energy Associates L.P.

WILLIAM R. JACOBS, JR. P.E.
SENIOR 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. He is assisting the Florida Office of Public Counsel in monitoring the development of four new nuclear units in the State of Florida. He will provide testimony concerning the prudence of expenditures for these nuclear units. 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.

1986-Present

Dr. Jacobs directs nuclear plant monitoring activities and has assisted 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.

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:

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

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.

Millstone 3 Nuclear Plant Non-operating Owners – Evaluated the 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.

Steel Dynamics, Inc. – Evaluated a 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 outage at Crystal River Unit 3 Nuclear Plant. Submitted expert testimony to the Florida Public Service Commission in Docket No. 970261-EI.

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 NRC required shutdown of the South Texas Project Nuclear Generating Station.

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

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.

Corn Belt Electric Cooperative/Central Iowa Power Electric Cooperative - Directed 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.

JERRY W. SMITH, P.E.
SENIOR CONSULTANT

EDUCATION:

Bachelors in Electrical Engineering
Auburn University, Auburn, Alabama, 1972

NRECA Management Certificate, 1990
Additional supervisory and management training through Auburn University-Montgomery and NRECA

REGISTRATIONS:

Registered Professional Engineer in the states of Alabama and Florida

PROFESSIONAL AFFILIATIONS AND MEMBERSHIPS

Institute of Electric and Electronic Engineers (IEEE)
National Society of Professional Engineers (NSPE)
Alabama Society of Professional Engineers (ASPE)

EXPERIENCE RECORD:

2002 - Present Senior Consultant, C. H. Guernsey & Company, Oklahoma City, Okla.

Smith has 35 years of experience in rural electric generation, transmission and distribution programs as engineer, manager and consultant assisting public utility clients find solutions to problems in generation and transmission planning, strategic planning, management training, cost of service and rate design, financial forecasting, emergency planning, and expert testimony.

Mr. Smith has testified before the Florida, Georgia and Maryland Public Service Commissions.

1996 - 2002 Senior Utility Consultant, Jackson Thornton Utility Group, Montgomery Alabama

Mr. Smith worked with electric cooperatives and municipals, trade associations, telecommunications providers, and natural gas districts in the areas of strategic planning, cost of service and rate design, financial forecasting, organizational development, human resources, management training, and other management consulting services. Mr. Smith served as Executive Vice President of Continuum Education & Training, LLC (CET), a wholly-owned subsidiary of Jackson Thornton. As well as managing CET, Mr. Smith was a principal instructor.

1984 - 1996 Executive Vice President and General Manager, 1986-96, West Florida Electric Cooperative Association, Graceville, Florida

Mr. Smith was responsible for the management of a 22,000 member electric cooperative with 4,300 miles of distribution line and 120 employees. He worked to develop a professional staff in all key areas of the cooperative's operation. Major accomplishments include establishment of two new full-service district offices; a functioning marketing, public relations, and economic development department; a functioning human resources, safety and loss control department including a major rewrite of the board and personnel policies; several new member programs such as budget billing, bank drafts, Project Share, Good Cents home program, Rural TV, DBS, ERC loans, sales of appliances, grills, surge protection devices, and other retail items; 24-hour dispatch center using computer-assisted outage response system. He also

implemented apprentice training for linemen, meter and substation technicians, and established an employee meter-reading program using hand-held computers.

1972 – 1984 Alabama Electric Cooperative, Inc., Andalusia, Alabama

Mr. Smith was employed by Alabama Electric Cooperative (AEC), a generation and transmission cooperative providing wholesale power to cooperatives, municipals, and two large industrial customers located in central and south Alabama as well as the Florida panhandle. He was responsible for all system generation and transmission planning, including wholesale rate design.

While at AEC, Mr. Smith held the positions of Project Engineer, Planning Engineer, and Manager of System Planning. He established the cooperatives' first database for system studies; was project manager for the design, purchase, and installation of the cooperative's first Energy Control Center in 1979; testified before the Florida Public Service Commission; served as chairman of an NRECA ad hoc committee for establishment of a G&T database; served on the Conservation Subcommittee of the Florida Electric Coordinating Group; and was a member of the Southeastern G&T Regional Planning Task Force.

SPECIFIC CONSULTING EXPERIENCE:

Project Manager – Tombigbee Units #2 and 3 (Electrical)

As Project Manager of the Tombigbee Units #2 and 3 (Electrical), I was responsible for working with the in-house team and the outside consultants who studied the need for the base load plant; prepared the engineering design; prepared the procurement specifications, requests for proposals, contracts, etc.; coordinated and witnessed the installation, checkout and in-service of the generating plant electrical systems (e.g., generator and switchgear, relaying, etc.), the 230 kV step-up substation, the 230 kV switching station, the 230-115-46 kV substations. I also assisted in the negotiations with the local IOU for an interconnection of their 230 kV line into our substation.

Various Planning Projects as Manager of System Planning at PowerSouth Energy

As Manager of System Planning at PowerSouth Energy (formerly AEC), I was responsible for a number of projects:

1. Planning the first 230 kV interconnection with South Mississippi EPA.
2. Studying a number of additional interconnections with Alabama Power Company in Alabama and Gulf Power Company in Florida.
3. Studying joint generation and transmission projects with South Mississippi EPA, Oglethorpe Power Corporation, and Seminole Electric Cooperative.
4. Project Manager for the study, design, procurement, installation and initial operations of the first Energy Control Center at PowerSouth.

Project Manager – "Short-Term Improvements to Transmission Capacity Limitations"

As Senior Consultant for C.H. Guernsey, I served as the Project Manager of this research and development project, I coordinated a study of the available (and soon to be available) methods to improve the short-term capacity of transmission lines. The study was performed under a contract

with the Cooperative Research Network, a subsidiary of the National Rural Electric Cooperative Association in Washington, DC.

Project Manager – "Design of an Emergency Restoration Plan Template"

As Senior Consultant for C.H. Guernsey, I served as the Project Manager of this research and development project, I coordinated the development of a comprehensive planning template to be used by cooperative utilities to prepare both business continuity plans (BCP) and emergency restoration plans (ERP). The development of these templates was performed under a contract with the Cooperative Research Network, a subsidiary of the National Rural Electric Cooperative Association in Washington, DC.

ZHEN ZHU, Ph.D.
SENIOR CONSULTING ECONOMIST

EDUCATION:

Ph.D., Economics, University of Michigan, 1994
M.A., Economics, Bowling Green State University, 1987
B.A., Business Administration, People's University of China, 1985

EXPERIENCE RECORD:

2000-Present C. H. Guernsey & Company, Oklahoma City, Okla.

Dr. Zhu is a Consulting Economist specializing in the areas of natural gas market modeling, gas price and underground storage forecasting, load forecasting, financial analysis of merger potential and other market analyses. He has performed various studies regarding corporate merger activities, stock market and foreign exchange market volatility, and financial market deregulation. Dr. Zhu has been instrumental in successfully modeling the storage injections and withdrawals from the U.S. natural gas reservoirs and the impact of these net supply changes on natural gas prices. This family of storage, physical and financial models includes estimates of spot market prices and provides two-week future and longer-term gas price forecasts. Dr. Zhu and other GUERNSEY economists have received national recognition for successfully modeling the prices of natural gas in the physical market and at many trading hubs used in pricing natural gas in today's markets.

Dr. Zhu is also an Associate Professor of Economics at the University of Central Oklahoma.

SPECIFIC EXPERIENCE:

Natural Gas Consulting Experience:

Dr. Zhu has developed and maintains natural gas futures contract pricing models and natural gas storage models. He has also developed and maintains natural gas pricing models for multiple delivery points for a large Texas-based electric distribution cooperative and several other cooperatives.

Dr. Zhu developed and maintains the GUERNSEY LDC, DisCo, and GenCo stock price indices, has developed fuel cost and hedging strategies for utilities, and developed and maintains load forecast models.

Dr. Zhu has also been involved in cost of capital analysis, inventory forecast system development, merger intervention projects for gas and electric utilities and integrated resource planning projects. Dr. Zhu has presented expert testimony before the Oklahoma Corporate Commission on fuel cost issues and expert testimony before the Georgia Public Service Commission on issues related to integrated resource planning.

Previous Professional Experience:

Dr. Zhu has served as an assistant Professor of Economics at The University of Oklahoma, a Research Fellow of Financial Research Institute at the University of Missouri, and as an Instructor and Teaching Assistant in the Department of Economics at the University of Michigan.

SELECTED RECENT PUBLICATIONS AND PROFESSIONAL PAPERS

"Commodity Convenience Yield and Risk Premium Determination: The Case of the U.S. Natural Gas Market." With Song Zan Chiou Wei, *Energy Economics*, Vol. 28, issue 4, page 523-34, 2006.

"Asymmetric Price Responses, Market Integration, and Market Power: A Study of the U.S. Natural Gas Market," with Dr. Don Murry. Forthcoming in *Energy Economics*.

"The forecasting performance of fundamental natural gas price models, hedging strategies and the average cost of gas: A study of the U.S. natural gas market," with Scott Linn, *Review of Futures Markets,* Vol. 14, issue 4, pp. 485-518, Spring 2006.

"An Empirical Analysis of U.S. Natural Gas Market Power," with Don Murry, Proceedings of 24th International Association of Energy Economists Meetings, July 2004.

"Storage Announcement and Natural Gas Futures Market Volatility," with Scott Linn, *Journal of Futures Market,* March 2004, v. 24, iss. 3, pp. 283-313.

"Enron Online and Informational Efficiency in the U.S. Natural Gas Market." with Don Murry, *The Energy Journal*, v. 25, iss. 2, 2004.

"Equality of Interest Rates Revisited: The Multi-Country Evidence," with Chiou Wei Song Zan, *International Economic Journal*, June 2004, v. 18, iss. 2, pp. 245-57.

"Economic Modeling Refutes Some Common Gas Market Assumptions," *UE Perspectives*, Vol. 1, No. 6 (The Williams Company), February 2002.With Donald A. Murry, Ph.D.

"Forecastibility of Natural Gas and Its Implications for Hedging," with Scott Linn, Financial Research Institute, University of Missouri, Columbia, Missouri, November 2002.

"Public News and Energy Market Response: The Case of Natural Gas Market," with Scott Linn, Financial Management Association Meetings, San Antonio, Texas, October 17-18, 2002.

"Time-Varying Forward Bias and the Expected Excess Returns," *Journal of International Financial Markets, Institutions and Money,* 2002.

"Sources of Export Fluctuations: Empirical Evidence From Taiwan and South Korea, 1981-2000," with Chiou Wei Song Zhang, *Journal of Asian Economies*, 2002.

"Are Long-Term Bond Yields Excessively Volatile?" *Journal of Economic Studies,* Vol. 28, *No.* 4, pp 433-445, 2001.

"The Effect of Exchange-Rate Risk on Exports: Some Additional Empirical Evidence," *Journal of Economic Studies*, Vol. 28, No. 2, pp 106-121, 2001.

"Recession Should Have Little Effect on Gas Prices," *The Competitive Edge*, Vol. 3, No. 3; (C. H. Guernsey & Company), 2001. With Donald A. Murry, Ph.D.

"Gas Market Trends Create Opportunities for Low-Cost, Risk-Averse Strategy," *The Competitive Edge,* Vol. 3, No. 1 (C. H. Guernsey & Company), 2001. With Donald A. Murry, Ph.D.

"Generation Companies Exhibit Growth and Volatility," *The Competitive Edge,* Vol. 2, No. 2; (C.H. Guernsey & Company), 2000.

"Correlations in Returns and Volatilities in Pacific-Rim Stock Markets," with Nick Tay, *Open Economies Review*, Spring 2000.

"Team Performance, Market Characteristics, and Attendance of Major League Baseball: A Panel Data Analysis," with David Pan, Trent Gabert and Jeffery Brown, *The Mid-Atlantic Journal of Business*, Vol. 35, # 2 and 3, June/September, 1999, 77-92.

"The Relation between Congressional Spending and Tenure with An Application to Term Limits," with Bob Reed, Eric Schansberg, James Wilbanks, *Public Choice,* Vol. 94, 1998, 85-104.

"Stock Prices and the Foreign Exchange Rate in a Structural Model with an Application to France," *Journal of Economic Integration*, Vol. 13, No. 1, March 1998, 89-107.

"The Random Walk of Stock Prices: Evidence from a panel of G-7 Countries," *Applied Economics Letters,* No. 5, 1998, 411-413.

"Short-Term Interest Rates and Inflation in the Long Run," *Applied Economics Letters*, No. 5, 1998, 445-448.

"Aggregate Merger Activity: New Evidence on the Wave Hypothesis," with Scott Linn, *Southern Economic Journal,* Vol. 64, No. 1, July 1997, 130-146.

"Dynamic Inconsistency and Exchange Rate Target Zones," *International Economic Journal,* No.1, 1997, 15-38.

"Persistent Exchange Rate Misalignment, Non-Economic Fundamentals and Exchange Rate Target Zones," *International Review of Economics and Finance,* Vol. 5, No. 1, 1996, 1-19.

PROFESSIONAL ACTIVITIES / HONORS:

McGraw-Hill Irwin Distinguished Paper Award, Southwestern Society of Economists, 2006.
Marquis' Who's Who in American Education, 2003.
Research Fellow, Financial Research Institute, University of Missouri, 2001, 2002.
Hauptman Fellow, University of Central Oklahoma, 2001.
Distinguished Researcher Award, College of Business, University of Central Oklahoma, 2002.
Marquis'Who's Who in America: Finance and Industry, 1999
ODE Professor of the Year, 1997-1998, University of Oklahoma
Member, American Finance Association, International Association for Energy Economists