Proposal to

The Louisiana Public Service Commission
For
Professional Consulting Services

In the Matter of the

REQUEST TO INITIATE THE INTEGRATED RESOURCE PLANNING PROCESS PURSUANT TO THE GENERAL ORDER NO. R-30021 (Corrected) DATED APRIL 20, 2012

DOCKET NO.: I-34715

February 8, 2018

Submitted by:

Global Energy & Water Consulting, LLC
4539 Woodvalley Dr., Suite 100
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TABLE OF CONTENTS

A. TECHNICAL SECTION

PART I. Business Organization

To achieve the goals laid out in the RFP concerning Southwestern Electric Power Company's second full IRP process docketed as I-34715, Global Energy & Water Consultants, LLC has organized a team ("Global Team" or "GEWC", used interchangeably) consisting of Mr. Mark W. Crisp, PE and Mr. George Evans. The names, addresses, phone numbers and email addresses of the two individuals follow:

Global Energy & Water Consultants, LLC

Mr. Mark W. Crisp, PE
4539 Woodvalley Drive, Suite 100
Acworth, Georgia 30101
(404) 395-1255
Email: mark.crisp@globalewc.com

Mr. George Evans
358 Cross Creek Trail
P.O. Box 2449
Robbinsville, North Carolina 28771
(828) 479-4814
Email: GeorgeEvans@EvansPowerConsulting.com

No branch offices or other subordinate elements will perform or assist in performing any of the work under this proposal.

The Global Team is well versed in the Louisiana Public Service Commission's Integrated Resource Planning process as well as IRP process across the country. The experiences we have gained from our national engagements afford us the opportunity to share the positive lessons learned and avoid recycling of redundant pitfalls. We are also very knowledgeable of acquisition of power supply resources, Market Based Mechanisms, Energy Efficiency and Distributed Generation and how these components integrate within an electric utility. Our consulting team we propose for this engagement is not purely a consulting organization. The Global Team is made of experts that have spent significant time under the employ of electric utilities, as well as, actual developers of the Strategist®, PROMOD®, Optimizer® and other such commercially available planning tools. We will provide more in-depth discussion of this experience throughout our proposal response.

PART II. Project Summary

In general and in abbreviated terms the Louisiana Public Service Commission (Commission" or "LPSC") is requesting proposals from outside independent technical consultants to work closely with the LPSC to evaluate the second integrated resource planning process of Southwestern Electric

Power Company ("SEPCO"). This engagement has very specific criteria for the technical consultants to address or confirm that SWEPCO has met including the General Order No. R-30021 (Corrected) dated April 20, 2012, the Commission's Market Based Mechanisms Order, 1983 General Order, as well as, specific inputs to the IRP Model such as the current resources of SWEPCO and their operating characteristics, the integration and performance of Energy Efficiency ("EE") and Distributed Generation ("DG") within the SWEPCO model, load and fuel forecasts, particularly the accuracy of the previous forecasts, the inclusion or exclusion of purchased power contracts, and the performance of the transmission system to move resources within and from outside of the SWEPCO territory. Critical to the transmission issue will be the identification and characterization of any transmission constraints or "bottlenecks" by SWEPCO or MISO and what actions MISO is planning within its planning horizon for the expansion of transmission.

The Global Team has completed many reviews and analyses of IRP's from across the US. We have been engaged to determine if the IRP's filed by utilities meet the requirements of the regulatory agency and if the selected plan is appropriate for the utility and the ratepayers. Our analyses include considerable effort to validate the IRP inputs including EE and DG, as well as, the load forecast, fuel price forecast, the existing resource fleet dispatch, required reserve margins, and environmental considerations effecting resource selection. We have also included an economic analysis, where requested, to determine if the utility can carry out the resource addition based on its financial ratings, ability to secure financing and the impacts to ratepayer tariffs. Our analysis also includes engaging the utility operating personnel to determine the ability of the new resource to maintain efficiency and reliability within the service territory.

The new electric utility horizon includes many new issues that have not been critical in past years. Today the industry is faced with significant pressure on the retirement of older or less efficient resources or resources that are no longer economical under increased environmental scrutiny. There is also the new process that is coming of age for some utilities that have nuclear generation assets or are minority owners of nuclear assets. Many of these nuclear assets are in the process of evaluation for shutdown and decommissioning. This also plays into the IRP process as the power output from these nuclear units must be replaced as they are shutdown.

In some cases we have also been engaged to either review or develop an Interconnection Study in order to determine the ability to connect the proposed new resource to the grid and the resiliency of the grid to operate with the new resource. Each of these analyses has also included the requisite economic analysis the cost to upgrade the grid to provide the necessary resilience and reliability, if in fact the grid is currently incapable or limited by design characteristics to establish the interconnection.

Our Team is well structured to provide necessary utility/PSC/Ratepayer facilitation and information guidance to aid in the dissemination of IRP information, solicitation of ratepayer comments and concerns, and provide for dialog with the utility/PSC/Ratepayer. For reference purposes, we have included with this proposal a copy of our last IRP Report for the Arizona Commerce Commission as an example of our IRP analysis and facilitation report performed for three (3) of the largest load serving utilities in Arizona. Critical to this analysis will be a two-fold, does the IRP adequately analyze the utilities current supply-side resources including EE products, and does

the IRP clearly identify the proper next generation resource to add to the utilities fleet, including renewable options? Also, has the utility adequately explored the non-build option of energy-by-wire option? Is there a product or products available "from the market" that will meet the utilities need(s) providing the necessary energy and capacity, reserves, reliability, efficiency, and environmentally sensitive option?

The Global Team possesses the experience and expertise to assume the lead role in in tandem with the Staff of evaluating and analyzing the filed IRP and to ascertain whether the IRP is in compliance with the reporting requirements of the IRP Rules as codified in Docket No. R-30021 ex parte, *Development and Implementation of Rule for Integrated Resource Planning for Electric Utilities* (Decided at the Commission's March 21, 2012 Business and Executive Session).

The Global Team provides our suggested Work Plan in PART III, below but will be prepared to modify the final work plan, schedule and work products in a collaborative manner with Staff, as necessary, once we have reviewed the SWEPCO filing and communicate with Staff throughout the project as we progress. Global's final work product will include a recommendation to either support the IRP selected by SWEPCO or suggest necessary improvements to the SWEPCO plan and provide specific conclusions as to why the IRP's should be modified. In the event an IRP is not recommended, the Global Team with Staff's concurrence will provide the basis for this position and provide possible solutions.

PART III. Work Plan

The Global Team proposes to accomplish the requirements of the project through the following set of tasks:

1. Review SWEPCO's filing of their IRP for compliance with the *IRP Rules as codified in Docket No. R-30021 ex parte,* Development and Implementation of Rule for Integrated Resource Planning for Electric Utilities *(Decided at the Commission's March 21, 2012 Business and Executive Session).*

2. Review any and all pre-filed testimony of SWEPCO, Intervenors, and Staff.

3. Prepare and submit data requests to Staff for submission to SWEPCO based on our review of the IRP documentation, and pre-filed testimony or other information available either public or confidential (Following proper execution of Non-Disclosure Agreements ("NDA") or Confidentiality Agreements ("CA").

   Work Product – Electronic copies of all submitted data requests

4. Develop an initial report for Staff summarizing the Team's initial review of the IRP and identifying potential weaknesses and missing information.

   Work Product – Initial Report on findings

5. Discuss the initial report with Staff via teleconference.

6. Review responses to data requests and prepare and submit any required follow-up data requests.

   Work Product - Electronic copies of all responses to data requests and all follow-up data requests

7. Review the IRP for compliance with the eleven factors that we have developed over years of IRP analyses that we have found to be typical points of concern:

   a. The total cost of electric energy services;
   b. The degree to which the factors that affect demand, including demand management, have been taken into account;
   c. The degree to which supply alternatives, such as self-generation (DG), have been taken into account;
   d. Uncertainty in demand and supply analyses, forecasts, and plans, and whether plans are sufficiently flexible to enable the load-serving utility to respond to unforeseen changes in supply and demand factors;
   e. The reliability of power supplies, including fuel diversity and non-cost considerations;

f. The reliability of the transmission grid based on issues identified by MISO that may affect the ability of SWEPCO to provide an interconnection or to import energy by wire;
g. The environmental impacts of resource choices and alternatives. *The Global Team has significant environmental quality expertise, water and air, with Ms. Katie Paisley, PE. Her expertise will be focused on issues regarding retirements, environmental compliance costs and permitting new resources*;
h. The degree to which the load-serving utility considered all relevant resources, risks, and uncertainties;
i. The degree to which SWEPCO's plan for future resources is in the best interest of its customers;
j. The best combination of expected costs and associated risks for SWEPCO and its customers; and
k. The degree to which SWEPCO's resource plan allows for coordination among the regional utilities in MISO-South with other load-serving entities.

8. Prepare and submit all data responses requested of Staff by other parties.

   Work Product – Electronic copies of all data responses requested of Staff

9. Organize and facilitate public/intervenor workshops, if necessary, relative to this IRP Assessment and support Staff involvement therein.

   Work Product – Workshop agendas, author notices and participant invitations

10. Submit a summary report to Staff of workshop findings.

    Work Product – Provide summary workshop report to Staff.

11. Provide draft Staff Report to Staff.

    Work Product – Provide draft Staff Report.

12. Author and finalize the Staff Report and recommendations regarding the structural competency of the IRP, its findings and the selected resource addition, and does the IRP fulfill the requirement that it is reasonable and in the public interest?

    Work Product – Final Staff Report

13. If necessary, develop testimony, appear before the Commission, testify, comment and participate, as appropriate, on behalf of Staff and the Commission should this IRP filing become contentious.

    Work Product – Provide testimony and appear at meetings, hearings and Commission Open Meetings as required.

14. Provide technical support to Staff involvement in meetings, hearings and Commission Open Meetings.

    Work Product – Technical support to Staff

15. Develop and provide to Staff a complete set of workpapers, indexed in orderly form, supporting the development of all findings of facts and recommendations and summarizing the work plan, schedule and procedures used. Workpapers will include computer discs, electronic files, printouts and any other medium by which data and narratives are obtained and retained.

    Work Product – Complete set of workpapers

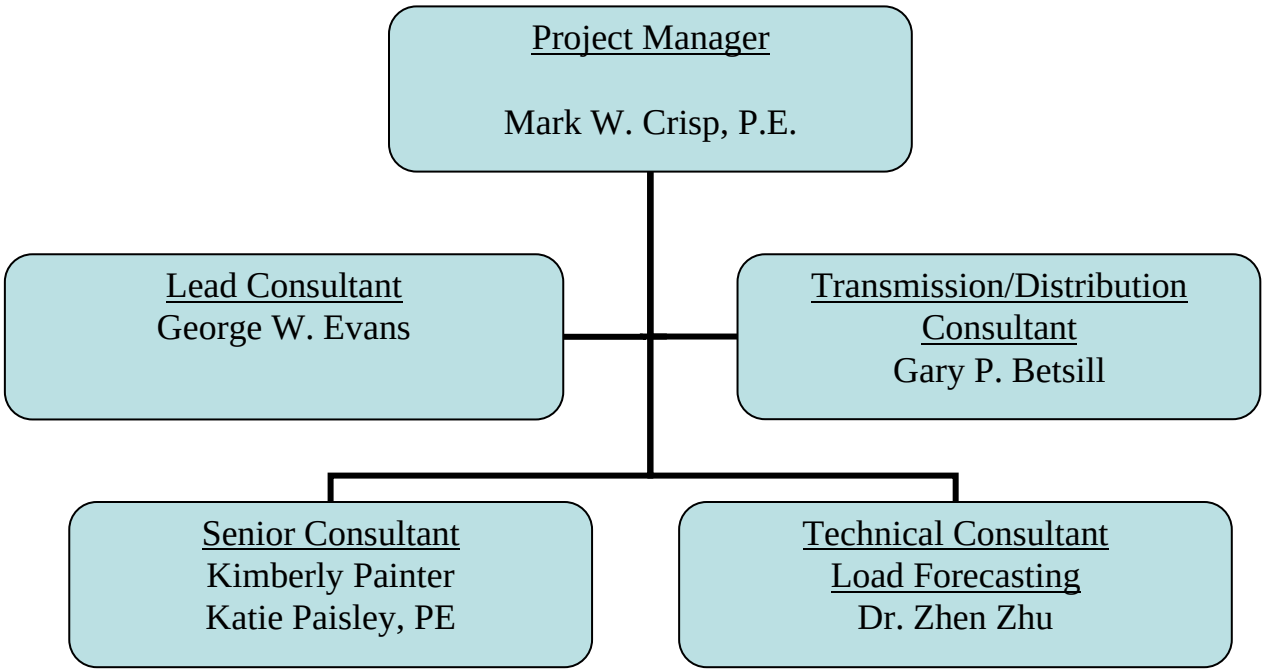
16. Monthly Progress Reports and Teleconference – The Global Team will prepare and submit a monthly progress report at the end of each calendar month and hold a briefing teleconference with Staff to discuss the engagement progress. Each progress report will include at least the following information:
    a. A comparison of actual progress in the work plan to planned progress in the previous month.
    b. The identification of any problems or potential problems that may impede progress with an assessment of probable impacts and recommended solutions.

    Work Product – Monthly progress reports

The person-hours assigned to each task are shown in PART VI. A timeline showing the tasks and major milestones follows:

PART IV. Management Summary

Mr. Mark W. Crisp, PE, a Managing Consultant with Global Energy & Water Consulting, Inc., will serve as the Project Manager of the Global Team for this assignment. The President of Evans Power Consulting, Inc., Mr. George Evans, will serve as Lead Consultant. Mr. Zhen Zhu, Ph.D a noted utility economist is an integral component of the Global Team. Zhen will provide expertise in load forecasting and natural gas pricing. Natural gas continues to be the marginal cost fuel used to weigh the economic value of one added resource versus the next alternative resource. Dr. Zhu will also be available should our analysis require financial analysis of integration costs of wind, solar, etc. Mr. Gary Betsill a Consultant with Global Energy & Water Consulting, LLC, will be available as our Transmission and Distribution Consultant, if needed. The RFP continues to require a review of *the reliability of the transmission grid (Section3.1.B.6.).* We have not included any time in our proposal for Mr. Betsill. Our experience with the Commissions Biennial Transmission Assessment has provided us with confidence that Global can examine the Seventh BTA for comparison to the 6th BTA in terms of reliability and projects status with the use of minimal time. Ms. Katie Paisley, PE, President and Managing Consultant with Global Energy & Water Consulting, Inc., will serve as the Environmental and Air Quality Emissions Consultant on the project, reporting to Mr. Evans and Mr. Crisp. Ms. Paisley will provide the review of all compliance activities and regulatory costs should any of the IRP's recommend new resources or present projects that are required by local, state or federal environmental law to bring an existing unit or plant into compliance. Ms. Kimberly Painter, will serve as Technical Consultant on the project.



Mr. Evans will oversee the scheduling and control of the work performed, ensuring that all tasks are completed as scheduled. Mr. Crisp will ultimately be responsible for each phase of work and assumes responsibility for completion of the project on time and within budget. We have included three (3) additional resources that may or may not be necessary for this project. Ms. Katie

Paisley is included in the event that environmental or permitting issues become an issue or if unit retirement plays a part in the IRP. We have also included our Dr. Zhen Zhu a noted energy economist and Load and Fuel forecast expert. In many of our recently completed IRP engagements we have identified load forecast as a source of concern in that the utilities have consistently incurred significant deviations from the actuals in their year over year forecasts. In addition to these two resources we have also included our Gary Betsill, our Transmission and Distribution ("T&D") expert. Mr. Betsill's 30 years of experience with the Southern Company operating system provides our tem and our clients with unparalleled insight into the challenges with T&D in today's market. We do not see significant opportunities for these individuals in this engagement but they are available, if needed. If they are needed, their cost will be carried with our fixed price proposal.

Mark W. Crisp, P.E. (Managing Consultant). Mr. Crisp provides consulting services for Global Energy & Water Consulting, LLC in the areas of nuclear and fossil power generation, hydropower generation, power supply contracting, utility management, power plant environmental, construction and project management. He has 35 + years of experience in the electric utility industry. His experience encompasses engineering, construction, and operation of nuclear, coal-fired and hydroelectric generating facilities. He has been involved in a significant number of projects, domestic and international, in the electric industry. Mr. Crisp has provided consulting services to international power developers, electric utilities and local, state, provincial, federal and foreign governments. Mr. Crisp has been responsible for project management activities during the construction and or acquisition of over 20,000 MW of electric generating capacity. Mr. Crisp has provided relevant testimony before the Arizona Corporation Commission, the Georgia Public Service Commission, Connecticut Public Utilities Regulatory Agency, the Maryland Public Service Commission, the Mississippi Public Service Commission, the Public Service Commission of South Carolina, the Utah Public Service Commission, the FERC, the NRC, US Congress and numerous state and federal courts.

George W. Evans (Lead Consultant) Mr. Evans will provide expertise in Integrated Resource Planning, purchased power issues, the use and application of production cost models, financial models and resource optimization models. Prior to forming his own firm, Mr. Evans served the electric utility industry for ten years at Energy Management Associates, the producer of PROMOD III, PROVIEW and Strategist. He has over thirty years of experience and has filed expert testimony on 39 occasions, before the public utility commissions in Pennsylvania, Georgia, Michigan, Arkansas, South Dakota, Colorado, Illinois, Mississippi, Alabama, Delaware, South Carolina, Utah and Oklahoma; and also before the FERC, and in both state and federal court. He is an expert in the computer modeling of electric power systems and the use of PROMOD IV, Strategist, POWERSYM, EGEAS, ELFIN and ENPRO.

Garp P. Betsill (Consultant) – Mr. Betsill has over 32 years of experience with transmission, distribution, metering and substation maintenance.

Katie Paisley, PE (Managing Consultant**)** Ms. Paisley has 10 years' experience in utility engineering and consulting. Ms. Paisley has advanced degrees in environmental sciences in the area of environmental and air quality, water resources, NEPA documentation, watershed

management planning, and utility cost of service, environmental assessment, and GIS. Ms. Paisley's experience includes numerous state and private projects. Mr. Paisley's primary role in this project will be the analysis of environmental costs associated with new project development, new or existing environmental laws and criteria associated with air quality emissions at power generating facilities, as well as, unit retirement studies.

Zhen Zhu, Ph.D. (Senior Consultant) will provide support in the areas of Fuel Price Forecast and Load Forecast. 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. Dr. Zhu developed and maintains the LDC, DisCo, and GenCo stock price indices; 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 and merger intervention projects for gas and electric utilities.

PART V. Prior Experience

IRP Assignment for the Arizona Corporation Commission

Mr. Crisp and Mr. Evans served as the lead consultants for our Global Team in Docket No. E-00000A-11-0113, the initial IRP review under the revised IRP Rules of Arizona Administrative Code Title 14, Chapter 2.

Project Manager – Mark W. Crisp
Lead Consultant – George Evans
Final Report – December 11, 2012

IRP Assignments for the Georgia Public Service Commission Staff:

Mr. Crisp and Mr. Evans served as testifying witnesses on behalf of the Georgia Public Service Commission Staff in the following Integrated Resource Planning Dockets:

Docket No. 17687-U — Georgia Power Company's Application for Approval of its 2004 Integrated Resource Plan

Project Manager – Mark Crisp
Completion Date – April 2004

Docket No. 17688-U — Savannah Electric and Power Company's Application for Approval of its 2004 Integrated Resource Plan

Project Manager – Mark Crisp
Completion Date – April 2004

Docket No. 24505-U — Georgia Power Company's Application for Approval of its 2007 Integrated Resource Plan

Project Manager – Mark Crisp
Key Participants – George Evans
Completion Date – April 2007

Reference:

Ms. Sheree Kernizan
Unit Director
Georgia Public Service Commission
244 Washington Street, SW
Atlanta, GA 30334
(800) 282-5813
shereek@psc.state.ga.us

IRP Assignments for the South Dakota PUC Staff:

Mr. Evans presented expert testimony on behalf of the South Dakota PUC Staff concerning the Integrated Resource Plans of Otter Tail Power Company and Black Hills Power:

Docket No. EL09-018	The Integrated Resource Plan of Black Hills Power, Inc. Project Manager – George Evans Completion Date – July, 2010
Docket No. EL10-011	The Integrated Resource Plan of Otter Tail Power Company Project Manager – George Evans Completion Date – April, 2011

Reference:

Mr. Jon Thurber
Utility Analyst
South Dakota PUC
State Capitol Building
500 East Capitol Avenue
Pierre, SD 57501
(605) 773-5797
Jon.Thurber@state.sd.us

IRP Assignment for the South Carolina Office of Regulatory Staff:

Mr. Evans and Mr. Crisp presented expert testimony concerning the IRP of South Carolina Electric & Gas on behalf of the South Carolina Office of Regulatory Staff:

Docket No. 1008-196-E — Application of SCE&G for the Construction and Application of a Nuclear Facility
Project Manager – Mark Crisp
Key Participants – George Evans
Completion Date – December, 2008

Reference:

Mr. John Flitter
Director
South Carolina Office of Regulatory Staff
1401 Main Street, Suite 900
Columbia, S.C. 29201
(803) 737-0811
jflitter@regstaff.sc.gov

IRP Assignment for the South Carolina State Energy Office:

Mr. Evans analyzed and compared the Integrated Resource Plans of each of the five electric utilities in South Carolina for the South Carolina State Energy Office.

Project Manager – George Evans
Completion Date – April, 1998

Reference:

Mr. John F. Clark
Policy and Planning
State Energy Office
1201 Main Street - Suite 820
Capital Center - AFFINITY Building
Columbia, SC 29201

PART VI. Personnel

The Global Team consists of the following personnel:

Mr. Mark W. Crisp, P.E. - Managing Consultant	Global Energy & Water Consulting, LLC
Mr. George Evans- President	Evans Power Consulting, Inc.
Mr. Gary P. Betsill, Consultant	Global Energy & Water Consulting, LLC
Ms Katie Paisley, PE	Global Energy & Water Consulting, LLC
Ms. Kimberly Painter	Global Energy & Water Consulting, LLC
Dr. Zhen Zhu-Technical Consultant	Global Energy & Water Consulting, LLC

The Global Energy & Water Consulting LLC personnel will be stationed in Acworth, Georgia (Suburban Atlanta), and Mr. Evans will be stationed in Robbinsville, North Carolina while engaged in the work performed under this contract. The Global Team brings together the very best in expertise and experience. While each individual may not be required for more than a small piece of the analysis, we are presenting each individual so that there is no confusion as to personnel during the performance of this engagement.

The periods of time, hours and percent time that each individual will devote to the project are shown in the following table. Resumes for Mr. Evans and Mr. Crisp as the lead consultants and primary contacts are included in Attachment. We have also included resumes for Zhen Zhu, Gary Betsill, Kimberly Painter and Katie Paisley.

This proposal was prepared by Mr. Crisp and Mr. Evans.

Mr. Crisp and Mr. Evans will testify in the case. Mr. Evans has presented expert testimony on over 40 occasions, which are listed following his resume. Mr. Crisp has testified on 25 occasions, as described in his resume. In addition to their expert witness and testimony before state regulatory bodies, Mr. Evans and Mr. Crisp have provided expert witness and testimony before the Federal Energy Regulatory Commission, Nuclear Regulatory Commission, Federal District Courts and Circuit Courts of Appeal as well as, before the United States Congress.

PART VII. Conflicts of Interest

None of the members of the Global Team has worked in a professional capacity for or with SWEPCO or any affiliation of SWEPCO. Our Team has not worked in any capacity that would present or even imply a perception of conflict in this case.

PART VIII. Authorized Negotiators

The person(s) authorized to negotiate the proposed contract is:

PRIMARY
Mr. Mark W. Crisp, P.E.
Global Energy & Water Consultants, Inc.
4539 Woodvalley Drive, Suite 100
Acworth, Georgia 30101
(404) 395-1255
Email: mark.crisp@globalewc.com

And / Or

ALTERNATIVE
Mr. George Evans
Evans Power Consulting, Inc.
358 Cross Creek Trail
P.O. Box 2449
Robbinsville, North Carolina 28771
(828) 479-4814
Email: GeorgeEvans@EvansPowerConsulting.com

B. COST SECTION

Labor costs and travel expenses are itemized in the following table. Rates per hour for each member of the Global Team are:

Mark W. Crisp, P.E.	$220 per hour
George Evans	$220 per hour
Gary P. Betsill	$180 per hour
Katie Paisley, PE	$180 per hour
Kimberly Painter	$150 per hour
Dr. Zhen Zhu	$180 per hour

There are no costs included for supplies or other direct costs. Travel costs are billed at actual costs and will be limited by the Travel Policy and Procedures Memorandum of the Division of Administration of the State of Louisiana. Estimated travel costs are included in the total cost, as itemized in the following table. Labor costs are our fully loaded direct costs.

The total estimated labor cost for the project is $110,360. However, the Total Labor cost includes $17,600 for Task 13 which is development of testimony. This may be excluded if the case is not contested. The Total Labor also includes $3,520, $7,040 and $6,160 for Tasks 9-11. This may also be excluded if public meetings are not necessary. If it is determined that Tasks 9-11 & 13 are not necessary then the Total Labor cost is reduced to $76,040. The estimated travel costs for two trips for both Mr. Evans and Mr. Crisp is $4,000, primarily for attendance at hearings if the case is contested. Otherwise, there should be no Travel Costs. The total budgeted cost including all labor and estimated travel expenditures for a contested case is $110,360; for an uncontested case $72,040.

PROPOSAL TO THE LOUISIANA PUBLIC SERVICE COMMISSION

REQUEST TO INITIATE THE INTEGRATED RESOURCE PLANNING PROCESS PURSUANT TO THE GENERAL ORDER NO. R-30021 (Corrected) DATED APRIL 20, 2012 Docket No: I-34715
Global Energy & Water Consulting LLC
Assignment of Personnel, Estimated Project Man-hours & Costs

		Hours					Labor Charges $							
	TASKS as DEFINED in PROPOSAL WORK PLAN	Mark W. Crisp P.E.	George Evans	Katie R. Paisley, PE	Gary P. Betsill	Total	Mark W. Crisp P.E.	George Evans	Katie R. Paisley, PE	Gary P. Betsill	Total		Travel Expenses	Total Charges
Task 1	Review SWEPCO's filing of their IRP for compliance with the *IRP Rules as codified in Docket No. R-30021 ex parte,* Development and Implementation of Rule for Integrated Resource Planning for Electric Utilities *(Decided at the Commission's March 21, 2012 Business and Executive Session).*	24	24	8	0	56	$5,280	$5,280	$1,440	$0	$12,000		$0	$12,000
Task 2	Review any and all pre-filed testimony of SWEPCO, Intervenors, and Staff.	12	12	8	0	32	$2,640	$2,640	$1,440	$0	$6,720		$0	$6,720
Task 3	Prepare and submit data requests to Staff for submission to SWEPCO based on our review of the IRP documentation, and pre-filed testimony or other information available either public or confidential (Following proper execution of Non-Disclosure Agreements ("NDA") or Confidentiality Agreements ("CA").	15	15	4	0	34	$3,300	$3,300	$720	$0	$7,320		$0	$7,320
Task 4	Develop an initial report for Staff summarizing the Team's initial review of the IRP and identifying potential weaknesses and missing information.	8	8	0	0	16	$1,760	$1,760	$0	$0	$3,520		$0	$3,520
Task 5	Discuss the initial report with Staff via teleconference.	8	8	0	0	16	$1,760	$1,760	$0	$0	$3,520		$0	$3,520
Task 6	Review responses to data requests and prepare and submit any required follow-up data requests.	12	12	4	0	28	$2,640	$2,640	$720	$0	$6,000		$0	$6,000
Task 7	Review the IRP for compliance with the eleven factors that we have developed over years of IRP analyses that we have found to be typical points of concern: a. The total cost of electric energy services; b. The degree to which the factors that affect demand, including demand management, have been taken into account; c. The degree to which supply alternatives, such as self-generation (DG), have been taken into account; d. Uncertainty in demand and supply analyses, forecasts, and plans, and whether plans are sufficiently flexible to enable the load-serving utility to respond to unforeseen changes in supply and demand factors; e. The reliability of power supplies, including fuel diversity and non-cost considerations; f. The reliability of the transmission grid based on issues identified by MISO that may affect the ability of SWEPCO to provide an interconnection or to import energy by wire; g. The environmental impacts of resource choices and alternatives. The Global Team has significant environmental quality expertise, water and air, with Ms. Katie Paisley, PE. Her expertise will be focused on issues regarding retirements, environmental compliance costs and permitting new resources; h. The degree to which the load-serving utility considered all relevant resources, risks, and uncertainties; i. The degree to which SWEPCO's plan for future resources is in the best interest of its customers; j. The best combination of expected costs and associated risks for SWEPCO and its customers; and k. The degree to which SWEPCO's resource plan allows for coordination among the regional utilities in MISO South with	16	32	0	0	48	$3,520	$7,040	$0	$0	$10,560		$0	$10,560
Task 8	Prepare and submit all data responses requested of Staff by other parties, if needed.	8	8	0	0	16	$1,760	$1,760	$0	$0	$3,520		$0	$3,520
Task 9	Organize and facilitate public/intervenor workshops, if necessary, relative to this IRP Assessment and support Staff involvement therein.	8	8		0	16	$1,760	$1,760	$0	$0	$3,520		$1,940	$5,460
Task 10	Submit a summary report to Staff of workshop findings.	16	16	0	0	32	$3,520	$3,520	$0	$0	$7,040		$1,940	$8,980
Task 11	Provide draft Staff Report to Staff.	12	16	0	0	28	$2,640	$3,520	$0	$0	$6,160		$0	$6,160
Task 12	Author and finalize the Staff Report and recommendations regarding the structural competency of the IRP, its findings and the selected resource addition, and does the IRP fulfill the requirement that it is reasonable and in the public interest?	16	16	0	0	32	$3,520	$3,520	$0	$0	$7,040		$0	$7,040
Task 13	If necessary, develop testimony, appear before the Commission, testify, comment and participate, as appropriate, on behalf of Staff and the Commission should this IRP filing become contentious.	40	40	0	0	80	$8,800	$8,800	$0	$0	$17,600		$0	$17,600
Task 14	Provide technical support to Staff involvement in meetings, hearings and Commission Open Meetings.	16	16	0	0	32	$3,520	$3,520	$0	$0	$7,040		$0	$7,040
Task 15	Develop and provide to Staff a complete set of workpapers, indexed in orderly form, supporting the development of all findings of facts and recommendations and summarizing the work plan, schedule and procedures used. Workpapers will include computer discs, electronic files, printouts and any other medium by which data and narratives are obtained and retained.	4	4	0	0	8	$880	$880	$0	$0	$1,760		$0	$1,760
Task 16	Monthly Progress Reports and Teleconference – The Global Team will prepare and submit a monthly progress report at the end of each calendar month and hold a briefing teleconference with Staff to discuss the engagement progress. Each progress report will include at least the following information: a. A comparison of actual progress in the work plan to planned progress in the previous month. b. The identification of any problems or potential problems that may impede progress with an assessment of probable impacts and recommended solutions.	16	16	0	0	32	$3,520	$3,520	$0	$0	$7,040		$0	
		231	**251**	**24**	**0**	**506**	**$50,820**	**$55,220**		**$0**	**$110,360**		**$3,880**	**$114,240**

ATTACHMENT 1 - PROJECT TEAM RESUMES

Mark W. Crisp, PE
Managing Consultant

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

Mr. Crisp, teaming with longtime partner Mr. George Evans, has most recently completed the review, analysis and acknowledgment of the IRP's submitted to the Arizona Corporation Commission for the first review under the newly approved IRP Rules in Arizona. This analysis included the review of IRP's submitted by Arizona Public Service, Tucson Electric, UNS Electric, Inc., and Arizona Electric Power Cooperative, Inc.

Reference for Arizona Corporation Commission:

Mr. Rick Lloyd
Electric Specialist – Project Manager for 2012 IRP Project
rlloyd@azcc.gov
602-542-0819

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

Prudence Review of Costs Incurred by Duke Energy Carolina, LLC to Develop the W. S. Lee III Nuclear Plant and Request to Cancel the Project

Prudence review included the review and analysis of fourteen (14) annual IRP's Duke filed with the

North Carolina Commission from 2005 to 2017.

Project Manager – Mark W. Crisp, PE
Lead Consultant – Mark W. Crisp & George Evans
Completion Date – October 2017 – January 2018

Reference:

Ms. Lucy Edmundson
Staff Attorney
Public Staff – North Carolina Utilities Commission
4326 Mail Service Center
Raleigh NC 27699-4300
(919) 733-6110
lucy.edmondson@psncuc.nc.gov

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

Mr. Crisp and the Global Team provided expert analysis along with testimony in Docket 13-754 to determine the cost overruns and the effects on ratepayers as well as disallowances in Xcel's rate case filing.

Project Manager – Mark W. Crisp, PE
Lead Consultant – Mr. Mark Crisp and Dr. William Jacobs
Completion Date – July 2014

Reference:

Ms. Kate O'Connell
Manager, Energy Regulation and Planning
Minnesota Department of Commerce
85 7th Place East, Suite 280
Saint Paul, MN 55101
651-539-1815

IRP Assignments for the Georgia Public Service Commission Staff:

Mr. Crisp and Mr. Evans served as testifying witnesses on behalf of the Georgia Public Service Commission Staff in the following Integrated Resource Planning Dockets:

Docket No. 17687-U Georgia Power Company's Application for Approval of its 2004 Integrated Resource Plan

Project Manager – Mark W. Crisp, PE
Lead Consultant – George Evans
Completion Date – April 2004

Docket No. 17688-U Savannah Electric and Power Company's Application for Approval of its 2004 Integrated Resource Plan

Project Manager – Mark W. Crisp, PE
Lead Consultant – George Evans
Completion Date – April 2004

Docket No. 24505-U Georgia Power Company's Application for Approval of its 2007 Integrated Resource Plan

Project Manager – Mark W. Crisp, PE
Lead Consultant – George Evans
Completion Date – April 2007

Reference:

Ms. Sheree Kernizan
Unit Director
Georgia Public Service Commission
244 Washington Street, SW
Atlanta, GA 30334
800-282-5813
shereek@psc.state.ga.us

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

- City of Ocala, Florida
- Utility Privatization for Marine Corps and Navy Bases throughout California, Arizona and Nevada

Mr. Crisp is an engineering graduate of the Georgia Institute of Technology ("Ga. Tech").

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

Abbreviated List of Testimony and Filings before State Regulatory Bodies

Arizona Commerce Commission DOCKET NO. E-00000A-11-0113, December 2012
Review and Analysis of the Integrated Resource Plans of Arizona Public Service Company, Tucson Electric Power Company, UNS Electric, Inc., and Arizona Electric Power Cooperative, Inc.

Arizona Commerce Commission DOCKET NO. E-00000V-13-0070, December 2014
Review and Analysis of the Integrated Resource Plans of Arizona Public Service Company, Tucson Electric Power Company, UNS Electric, Inc., and Arizona Electric Power Cooperative, Inc.

South Carolina Office of Regulatory Staff DOCKET NO. 2008-196-E, October 2008
Review and Determination of Approval of a Combined Application of SCE&G for the Construction and Operation of Units 2 & 3 at V.C. Summer Nuclear Facility

South Carolina Office of Regulatory Staff DOCKET NO. 2009-293-E, September 2009
Update of Construction Progress and Request for Updates and Revisions to Schedules Related to the Construction of V.C. Summer Units 2 & 3 Nuclear Base Load Generation Facility

South Carolina Office of Regulatory Staff DOCKET NO. 2010-376-E, February 2011
Petition of South Carolina Electric & Gas Company for Updates and Revisions to Schedules Related to the Construction of V.C. Summer Units 2 & 3 Nuclear Base Load Generation Facility

Minnesota Department of Commerce, Energy Resources Division, DOCKET NO. E002/CI-13-754, July 2014,
Investigation into Xcel Energy's Monticello Nuclear Plant Life Cycle Management/Extended Power Uprate Project and Request for Recovery of Cost Overruns

City of Miami, Florida Office of the City Attorney, DOCKET NO. 52-040 & 52-041, May 2017
Affidavit Before the Nuclear Regulatory Commission ("NRC") In the Matter of Florida Power & Light's Turkey Point Unit 6 & 7 Combined Operating License

Utah Division of Public Utilities, DOCKET NO. 10-035-124, May 2011
In the Matter of the Application of Rocky Mountain Power For Authority to Increase its Retail Electric Utility Service rates in Utah and for Approval of its Proposed Electric Service Schedules and Electric Service Regulations.

Mississippi Public Utilities Staff, DOCKET NO. 2010-UA-374, July 2013
Entergy Mississippi, Inc. Application for Approval of Accounting Treatment for Grand Gulf 3; "Costs Incurred in Connection with Generation Resource Planning, Evaluation, Monitoring, and Development of Activities Related to Grand Gulf 3"

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

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

Staff of the Georgia Public Service Commission, DOCKET NO. 17688-U, April 2004
Savannah Electric and Power Company's Application for Approval of its 2004 Integrated Resource Plan

Staff of the Georgia Public Service Commission, DOCKET NO. 24505-U, April 2007
Georgia Power Company's Application for Approval of its 2007 Integrated Resource Plan

Global Energy & Water Consulting, LLC
Power Plant Experience

Nuclear Power Generating Facilities

Plant Vogtle – Georgia Power Company (Southern Nuclear)
Plant Hatch – Georgia Power Company (Southern Nuclear)
Plant Farley – Alabama Power Company (Southern Nuclear)
Palo Verde – Arizona Public Service and Joint Owners
North Anna Power Station – Dominion Resources
Bellefonte – Tennessee Valley Authority
V. C. Summer – South Carolina Gas & Electric
W. S. Lee – Duke Energy Carolinas, LLC
Monticello – Excel Energy
Prairie Island 1 & 2 – Excel Energy

Coal-fired Generating Facilities

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

Hydro-electric Generating Facilities (Domestic)

Wallace Dam – Georgia Power Company
Sinclair Dam – Georgia Power Company
Rocky Mountain Pumped Storage Project – Georgia Power Company
Bartlett's Ferry Dam – Georgia Power Company
Oliver Dam – Georgia Power Company
Jackson Dam – Georgia Power Company
Allatoona Dam – U.S. Army Corps of Engineers
Buford Dam – U.S. Army Corps of Engineers
Carter's Dam – U.S. Army Corps of Engineers
Hartwell Dam – U.S. Army Corps of Engineers
Richard Russell Pumped Storage Project – U.S. Army Corps of Engineers
Strom Thurmond Dam – U.S. Army Corps of Engineers
West Point Dam – U.S. Army Corps of Engineers
W. F George Dam – U.S. Army Corps of Engineers
Jim Woodruff Dam – U.S. Army Corps of Engineers
Wolf Creek Dam – U.S. Army Corps of Engineers
Center Hill Dam – U.S. Army Corps of Engineers

Texoma Dam – U.S. Army Corps of Engineers
Dennison Dam – U.S. Army Corps of Engineers
Amistad Dam – International Boundary Waters Commission
Falcon Dam – International Boundary Waters Commission

Hydro-electric Generating Facilities (International)

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

Renewable Energy Projects (Domestic)

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

Renewable Energy Projects (International)

Haiti Reconstruction
Lagos, Nigeria WTE
Nigeria Transitional Gas Power Plant

Testimony or Affidavits and Expert Witness

State of Arizona Corporation Commission
State of Connecticut Public Utilities Regulatory Authority
State of Georgia Public Service Commission
State of Mississippi Public Service Commission
State of Maryland Public Service Commission
State of Minnesota Public Utitlites Commission
State of North Carolina Public Service Commission
State of South Carolina Public Service Commission
State of Utah Public Utilities Commission

Federal Energy Regulatory Commission
Nuclear Regulatory Commission
United States Congress
Federal District Court of Washington D.C.
5th Circuit Court of Appeals – Washington DC
Federal District Court in the Northern District of Georgia
Federal District Court in the Northern District of Alabama
US Court of Appeals - 11th Circuit

GEORGE W. EVANS
LEAD CONSULTANT

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

PROFESSIONAL MEMBERSHIP: Institute of Electrical and Electronic Engineers

EXPERIENCE:

Mr. Evans is currently the President of Evans Power Consulting, Inc. He has served the electric power utility industry for thirty-five years. His primary areas of expertise include market price forecasting, integrated resource planning, the analysis of purchased power, system operations, net power costs, interruptible rates, the optimal scheduling of generator maintenance, the computer simulation of electric power systems, the integration of renewable generation and demand-side management. As an expert witness in these areas, Mr. Evans has submitted expert testimony on 52 occasions, before the public utility commissions in Alabama, Arkansas, Colorado, Delaware, Georgia, Michigan, Mississippi, Nevada, Oklahoma, Pennsylvania, South Carolina, South Dakota, and Utah; and also before the FERC, and in both state and federal court. He is an expert in the computer modeling of electric power systems and the use of PROMOD IV, Strategist, GRID, POWERSYM, EGEAS, ELFIN and ENPRO.

Specific Experience Includes:

2011-Present Evans Power Consulting, Inc.

Michigan Environmental Council – Presented expert testimony concerning the economic operation of the coal fleets of DTE Electric Company and Consumers Energy Company. Developed an hourly after-the-fact process to evaluate the cost-effectiveness of the coal fleets.

Michigan Environmental Council – Presented expert testimony on the Integrated Resource Plans of DTE Electric Company and Consumers Energy Company.

South Carolina Office of Regulatory Staff – Testified for staff on the proposed portfolio of Demand-Side Programs proposed by South Carolina Electric & Gas, Duke Energy Progress and Duke Energy Carolinas; and performed annual reviews of the DSM programs and the DSM rate riders of the three companies.

Utah Department of Public Utilities – Testified for staff in two PacifiCorp rate cases concerning net power costs, testified on PacifiCorp's application to install Selective Catalytic Reduction Systems on two coal units, and performed a review of PacifiCorp's thermal maintenance practices and procedures.

Arizona Corporation Commission – Evaluated the 2012 and 2014 Integrated Resource Plans of Arizona Public Service Company, Tucson Electric Power Company, UNS Electric, Arizona Electric Power Cooperative, and the Salt River Project; and presided over public meetings concerning the IRPs.

1997-2011 Slater Consulting

Utah Department of Public Utilities – Testified in two PacifiCorp rate cases concerning the appropriate level of net power costs, including wind integration costs and other issues.

South Dakota PUC – Testified on the Integrated Resource Plans of Black Hills Power and Otter Tail Power, and the validity of a coal fired generation addition and a wind generator addition.

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

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

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

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

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

1989-1997 GDS Associates, Inc.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

1980-1989 Energy Management Associates, Inc. - now known as 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: Visual Basic, C++ for Windows, C , FORTRAN and COBOL.

ZHEN ZHU, PH. D.
MANAGING ECONOMIST

Dr. Zhu is a Consulting Economist specializing in the areas of load forecasting, financial analysis, natural gas market modeling, gas price and underground storage forecasting, 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 has 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's ability to successfully model natural gas pricing at major hubs has greatly improved forecasting of generating resource additions based on operating cost forecasts.

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

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 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.

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

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.

KATIE PAISLEY, P.E.
CONSULTANT

EDUCATION: Master of Science, Water Resources and Environmental Fluid Mechanics, Civil Engineering – Georgia Institute of Technology, 2005

Bachelor of Science, Civil Engineering – Georgia Institute of Technology, 2004

REGISTRATION Professional Engineer, Florida, Alabama, and Georgia

PROFESSIONAL ACTIVITIES/HONORS:

American Water Works Association - Water Resources Committee, Water for People Liaison
American Society of Civil Engineers, National Society of Collegiate Scholars, Tau Beta Pi, Gamma Beta Phi (Recording Secretary), Golden Key, Chi Epsilon, Briaerean Honor Society

EXPERIENCE RECORD: Mrs. Paisley is an engineering consultant with a background in civil and environmental engineering, including water and air quality, hydrology, hydraulics, water resources, fluid mechanics, and open channel flow. Mrs. Paisley serves in two capacities with the Global Energy and Water Consulting. She is the President of the Firm and Managing Consultant. In this dual role, Mrs. Paisley is responsible for the Company as a whole yet is intimately involved at the project level due to her experience and expertise in utility planning and operations. Mrs. Paisley will be primarily responsible for air and water quality issues and costs should the filed IRP's include new generation resources or uprates to existing resources. She will also provide support should any existing resources require the additional of emissions control equipment such as scrubbers, select catalytic reduction or other greenhouse gas emission controls. She is also quite experienced in water resources planning, natural systems analysis, and permitting. For water resources projects, Mrs. Paisley's responsibilities have included engineering analysis and design; supervising and coordinating the work of teams of engineers and technical personnel; quality control; coordinating with clients; preparing client and subcontractor agreements and budgets; performing planning studies; report writing; preparing final contract documents; and maintaining client service and satisfaction.

KIMBERLY H. PAINTER
CONSULTANT

Ms. Painter is a Senior Consultant with over twenty years of experience in the electric utility industry.

EDUCATION

M.S. - Management, 1984; Concentration: Economics
Georgia Institute of Technology

B.S. - Business, 1982; Major: Finance
Virginia Polytechnic Institute and State University

PROFESSIONAL HISTORY

Senior Consultant, February, 1992 to present

Southern Engineering Company, March, 1991 to February, 1992
Financial Analyst

Energy Management Associates, Inc., June, 1984 to March, 1991
Lead Consultant

PROJECT EXPERIENCE

Ms. Painter has performed or is currently contributing to a number of important assignments at the forefront of the electric utility industry, including:

- Determination of Production Cost Damages to City of Austin Electric Department and City Public Service of San Antonio due to the extended outage of South Texas Project from January, 1993 through May, 1994 - Simulated entire ERCOT electric system (using primarily publicly available data) using PROMOD III, thereby capturing the outage effects on interchange as well as native load and utility-owned generation.

- Assessment of the Supply-Side Risk of DSM for the Canadian Electrical Association - Used PROMOD III to determine the risk to Canadian electric generating supply if demand-side management projections do not materialize as planned.

- Idaho Power Company Average Electric Rate Projection - Projected average electric rates for a major industrial customer.

- Long-Run Avoided Cost Projection - Utilized PROMOD III to determine the New York Power Pool long-run avoided costs for a large nonutility generator.

While consulting with Energy Management Associates, Inc. and Southern Engineering Company, Ms. Painter was either in charge of or responsible for a large portion of the following projects:

- Cleveland Electric Company/Toledo Edison Company Merger - Determined the relative attractiveness of Toledo Edison, the client utility, to Cleveland Electric, with emphasis on the benefits obtainable from combining loads, generation, purchase and sales opportunities.

- Alternative Rate Strategies - Economic evaluation of alternative rate recovery mechanisms and development of a bargaining strategy to assist a major west coast utility's recovery of investment in a nuclear facility.

- Customized Rate Design Subroutine - Developed a customized rate design subroutine for the Financial Analysis Module of PROSCREEN II. The subroutine allows complete flexibility in the allocation of expense and rate base items based on a variety of cost allocation methodologies.

- Load Forecast Critique - Reviewed and critiqued the forecasting methodologies and data of four cotenant utilities of a southern nuclear facility.
- Generation Planning Studies - Produced generation expansion plans under a variety of fuel price/inflation scenarios for San Diego Gas & Electric Company and Cincinnati Gas & Electric Company.

- CFB Conversion Study - Performed a feasibility study for a non-utility generator to determine the feasibility of converting an existing oil-fired facility to a circulating fluidized bed facility for a municipal electric system.

- Pumped Storage Planning Critique - Critiqued a long-range plan of a utility's decision to participate in the development of a large pumped storage facility. Also developed a recommended approach to re-evaluate the decision on whether to complete or cancel the project in 1990.

- Southern California Edison Company/San Diego Gas & Electric Company Attempted Merger - Performed financial modeling and analysis of the proposed merged company in preparation of filing requirements before the California PUC.

GARY P. BETSILL
TRANSMISSION AND DISTRIBUTION CONSULTANT

Mr. Betsill brings over 32 years of experience with Georgia Power, as well as experience with transmission, distribution, metering and substation maintenance.

Education

AA, Pre-medicine, Clayton Junior College, Morrow, GA, 1977
BS, Industrial Engineering, Southern Technical Institute, Marietta, GA 1983
Attended Georgia Power Electric Operations School, 1982

Experience

President / Chief Operating Officer, Barrett Utilities and Construction Company, Inc. (BUCC), Griffin, Georgia 2007 – Present
BUCC provides distribution solutions that include new construction, joint trench, trench-less installation, maintenance, sports lighting, storm restoration and preparedness consultation. Leading teams as large as 600 across the Southeast for hurricane and ice storm restoration, we bring experience and knowledge to bear on your system and processes. Restorations performed for PEPCO, Entergy, CP&L, FP&L, Gulf Power Company, Florida Power Corp., Alabama Power Company, and Georgia Power Company.

Distribution Manager (Retired), Georgia Power Company, Jonesboro, Georgia 2005 - 2006
Distribution Manager for Metro South region (busiest region in Southern Company, serving over 12,000 new customers in 2006 and over 330,000 existing customer in Coweta, Fayette, Fulton, Clayton, Henry, Butts and Monroe Counties). Retired after 33 years.

Distribution Operations Manager, Georgia Power Company, Smyrna, Georgia 2002 - 2005
Responsible for distribution system in the Metro West region which serves over 152,000 customers with revenue of $312,082,473 annually. Supervised engineering and construction functions within region; ultimately responsible for reliability, maintenance, and overall operation of the distribution system in Cobb, Cherokee, Douglas, Fulton and Paulding counties.

Engineering Supervisor I, Georgia Power Company, Jonesboro, Georgia 1999 - 2002
Responsible for engineering staff of fastest growing region (over 140,000 customers). Duties included Hartsfield-Jackson Atlanta International Airport, Ford Motor Company, Delta Airlines corporate facilities as well as coordination with MARTA. Major functions included coordination of two work schedules, coordination and implementation of joint trench construction. Metro South has taken the lead in utilization of joint trench opportunities, billing our partners over $800,000 in 2000. With minimal staff, department was within top three on all measured categories. Region added 6518 customers in 2000, nearly 1000 more than closest competitor.

Operating Superintendent I, Georgia Power Company, Milledgeville, Georgia 1996 – 1999

Reported to area manager serving Milledgeville area (over 37,000 customers from 44 megawatts to residential) - extensive system surrounding two major lakes. Interfaced with generation at three facilities. Responsible for engineering, construction and customer satisfaction for area. Distribution covered all phases of work. Responsible for monitoring and system switching from distribution class stations and switching within transmission class stations, and overall system operation and reliability.

Operating Supervisor II, Georgia Power Company, Bainbridge, Georgia 1993 - 1996
Reported to Power Delivery Manager. Served Southwest Region with 37,000+ customers varying from 40 megawatts to residential. Responsible for engineering, construction, and customer satisfaction. Distribution covered all phases of work. Responsible for monitoring and system switching from distribution class stations and switching within transmission class stations. Overall system operation fell to this position. Safety is number one!

Operating Supervisor I, Georgia Power Company, Baxley, Georgia **1**989 - 1993
Reporting to area manager, I was responsible for distribution engineering and construction for the Baxley area. Additional duties include responsibility for the transmission system on a district wide basis. For the first year in this position the District Substation Test and Substation Maintenance functions reported to this position. Other responsibilities include budgeting and construction forecasting, and the Power Marketing Engineer for the District.

Operating Supervisor I, Georgia Power Company, McRae, Georgia 1987 - 1989
Responsible for the Distribution engineering and construction for the McRae area; reported to area manager. Responsibilities included budgeting and construction forecasting.

Quality Circle Coordinator, Georgia Power Company, Macon, Georgia 1984 - 1987
Responsible for management of Division Quality Circle program including direction to 15 facilitators who worked with 50 quality circles throughout the Macon Division. This position was responsible for program expansion as well as providing educational services related to the Quality Circle program. In addition, I performed as administrative assistant to Administrative Services Manager. Duties included departmental budgets, corporate plan, departmental performance indicators and Division Environmental Representative. Developed and implemented administrative services performance indicators that became a state-wide standard.

Estimate Clerk, Georgia Power Company, Jonesboro, Georgia 1974 -1984
Promoted to Field Estimator in 1979. After completion of degree in 1983, promoted to engineering associate. Since 1979, was responsible for a service area with a minimum of 4000 customers. Duties included engineering and field coordination of construction for a distribution system, receipt and handling of customer requests and complaints, providing required electrical service to residential, commercial and industrial customers, and coordination and placement of distribution class capacitors and maintenance of Capacitor Reporting System. Previously responsible for 3-system voltage conversions (12 to 25 kv). During supervisor's absence, was in charge of engineering department.

Management Services Organization, Georgia Power Company, Atlanta, Georgia 1983
Temporary three month assignment to this department. Performed duties of staff analyst evaluating company-wide personnel requests.

Professional Activities / Honors

Member: Executive Board Member of the Bainbridge/Decatur County "Keep America Beautiful, Board member City of Milledgeville Downtown Beautification, Board member for Baldwin Baseball Association, current holder of Coast Guard Captains license.