THE OFFICE OF REGULATORY STAFF

CORRECTED DIRECT TESTIMONY & EXHIBIT

OF

GARY C. JONES, P.E.

OCTOBER 14, 2016

DOCKET NO.2016-223-E

Petition of South Carolina Electric & Gas Company for Updates and Revisions to Schedules Related to the Construction of a Nuclear Base Load Generation Facility at Jenkinsville, South Carolina
CORRECTED DIRECT TESTIMONY & EXHIBIT OF

GARY C. JONES, P.E.

ON BEHALF OF

THE SOUTH CAROLINA OFFICE OF REGULATORY STAFF

DOCKET NO. 2016-223-E

IN RE: PETITION OF SOUTH CAROLINA ELECTRIC & GAS COMPANY FOR UPDATES AND REVISIONS TO SCHEDULES RELATED TO THE CONSTRUCTION OF A NUCLEAR BASE LOAD GENERATION FACILITY AT JENKINSVILLE, SOUTH CAROLINA

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

A. My name is Gary C. Jones, P.E. I am President of Jones Partners, Ltd., a private consulting engineering firm in the electrical power generation field. My business address is 1555 North Astor Street, Apt. 22W, Chicago, Illinois, 60610-5765.

Q. WHAT IS THE NATURE OF YOUR BUSINESS?

A. As a consultant, I provide professional engineering and consulting services to clients in the electric power industry.

Q. PLEASE STATE YOUR EDUCATIONAL BACKGROUND AND EXPERIENCE.

A. I received a Bachelor of Science degree in Engineering Science from Tennessee Technological University in Cookeville, Tennessee, where I also participated in the Co-Operative Education Program with two one-year assignments at the Oak Ridge National Laboratory in Oak Ridge, Tennessee. I worked for thirty-two years at Sargent & Lundy, LLC, ("S&L") an international architect-engineering and consulting engineering firm in the electric power industry based in Chicago, Illinois. I held engineering positions of increasing levels of responsibility working on the design, procurement, licensing,
construction support and start-up of nuclear power plant projects, culminating in the position as Senior Vice President and one of the owners of the firm for the last sixteen years of my tenure. I led the engineering activities associated with the design of six nuclear power plants at three nuclear power plant stations, including the LaSalle County and Braidwood plants for Commonwealth Edison (now Exelon) and the Marble Hill station for Public Service Indiana. I also led the engineering activities associated with the restarts of the LaSalle County Station Units 1 and 2 and the D.C. Cook Plant after these plants were shut down due to operation concerns. I served for two years as head of the Mechanical Department at S&L. I also led the engineering activities associated with services to numerous operating nuclear power plants, including modifications, technical and economic studies, licensing support, procedure and process development and other consulting services.

Among the most significant assignments on international projects were leading the design review of the first indigenous Chinese nuclear power plant, Qin Shan Unit 1, and participating as a senior member in the design review of the Korean nuclear power plants Yonggwang Units 3 and 4.

Upon my retirement from S&L, I established a private consulting practice, Jones Partners, Ltd., where I continued working in the nuclear power industry for two and a half years until I accepted a position at the International Atomic Energy Agency ("IAEA") in Vienna, Austria. There I was a Senior Engineering Safety Officer in the Engineering Safety Section of the Department of Nuclear Safety and Security. My assignments included developing international safety standards and performing safety reviews of nuclear power
plants. My most significant assignment was leading the safety review of the fifteen operating nuclear power plants in the Ukraine.

Following the completion of my assignment at the IAEA, I returned to private practice as a consultant to the power industry and continue that work today. I am a licensed professional engineer in the States of Missouri and South Carolina. Additional details of my work experience are provided in my resume which I have included as Exhibit GCJ-1.

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE PUBLIC SERVICE COMMISSION OF SOUTH CAROLINA ("COMMISSION" or "PSC")?

A. Yes. I provided written and oral testimony associated with Docket No. 2012-203-E to update the schedule and budget for the South Carolina Electric & Gas Company ("SCE&G" or the "Company") construction of V.C. Summer Units 2 & 3 ("the Units" or "the Project"). I also presented at allowable ex parte briefings to update the Commission on the construction status of Units.

Q. WHAT IS YOUR ASSIGNMENT FROM THE SOUTH CAROLINA OFFICE OF REGULATORY STAFF ("ORS")?

A. My assignment is to assist ORS in its monitoring and tracking of the construction schedule and budget related to SCE&G’s construction of the Units. I began my assignment with ORS in August 2011.

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

A. The purpose of my testimony is to provide on behalf of ORS a technical review of specific areas in SCE&G’s request for updates and revisions to its capital cost schedule.
and construction schedule for the Units as delineated in its petition before the PSC in Docket No. 2016-223-E ("Petition"). The specific areas which I will address are:

- The current construction status of the Project;
- The Engineering, Procurement and Construction Contract ("EPC Contract") updated capital cost schedule;
- The EPC option premium;
- The EPC amendment costs;
- The EPC Change Orders;
- The revised construction schedule provided by SCE&G in the update filing, which includes the Base Load Review Act ("BLRA") milestones;
- The Owners Cost changes; and
- The Sensitivity Analysis (Exhibit JML-1) of Mr. Lynch's testimony.

To the extent that negotiations between ORS, the Company and other parties result in a settlement, Allyn Powell will address the settlement and its impact on ORS's findings in her testimony.

Q. PLEASE DESCRIBE THE CURRENT STATUS OF CONSTRUCTION.

A. Overall, as of June 30, 2016, the Project is reported to be 22.4% complete based on the total estimated direct construction labor man-hours. There has been significant progress on the Project since this was reported in SCE&G's Quarterly Report for the quarter ending June 30, 2016. As of August 15, 2016, 123 of 167 Unit 2's and 66 of 167 Unit 3's Shield Building panels have been fabricated at Newport News Industrial and shipped to the site. The Unit 2 Main Steam and Feedwater piping penetration through the Shield Building has
been set in place and the large reinforced concrete panels that permanently support this
penetration assembly are nearing completion. In the Unit 2 Auxiliary Building, modules
CA05, CA03 and CA02 have been set inside the containment vessel. This means that all
of the major Unit 2 structural modules (known as “Super Modules”) have now been set in
place. Preparations continue in support of installing the Unit 2 Reactor Pressure Vessel in
the third quarter of 2016. Work continues to progress in the Unit 2 Annex Building,
although still hampered by late identified design changes and shortages of materials.

In Unit 3, the large Turbine Building modules CH80 and CH82 have been set in the
plant and work is well underway to set module CH 81 and the condensers. In the Auxiliary
Building, CA20, Sub-assemblies 1 & 2 have now been set in place, completing setting of
the entire CA20 module.

The Consortium (consisting of Westinghouse Electric Company (“WEC” or
“Westinghouse”) and Chicago Bridge & Iron (“CB&I”)) has been restructured. Fluor
Corporation (“Fluor”) has been hired by Westinghouse as the sub-contracted construction
manager for the Project. CB&I, which was previously in charge of construction, has exited
the Consortium via Westinghouse’s purchase of CB&I subsidiary Stone and Webster and
SCE&G’s release of CB&I.

In April 2016, Fluor assumed direct responsibility for craft labor on the Project after
working with Westinghouse since January 2016. The evolution of this transition has been
slower than anticipated, and as such the full impact of Fluor’s process improvements has
not yet been realized. However, there are significant process and procedural changes that
are underway, which include implementing: more streamlined and effective construction
work packages to expedite work in the field; changes in the procurement areas to better ensure that construction commodities are available when required and do not delay construction; changes in the welding programs to expand the qualification levels of the welders, expedite the availability of welding commodities, and accelerate the welding production; and changes in the field engineering support to reduce turn-around time on design change requests and reduce construction delays.

These changes and other process improvements must be promptly implemented, in addition to significantly increasing the construction labor force, if the increased production levels required to support the Project schedule are to be obtained.

Q. PLEASE DESCRIBE SCE&G’S PETITION.

A. SCE&G filed this Petition to revise the construction schedules and capital cost schedules approved by the Commission in Order No. 2015-661. The primary reasons for filing the Petition are:

- To increase the estimated costs of the Units to reflect the impact of changes to the construction and capital cost schedules on the Project. The largest portion of the increase is $781.1 million in EPC Contract cost increases, comprised of:

  o $137.5 million in costs resulting from an amendment to the EPC Contract executed on October 27, 2015 (“Amendment” or “EPC Amendment”),
  
  o $505.5 million in costs resulting from SCE&G’s decision (pending PSC approval) to exercise an option in the EPC Amendment that moves many of the EPC Contract costs to a fixed cost category (“Option”),
1. $85.5 million resulting from a reversal of the credit for liquidated damages previously granted to SCE&G’s customers in Order No. 2015-661, and
2. $52.5 million in increases due to Change Orders.

- To increase the estimated costs of the Units to reflect anticipated changes in the Owners Cost by approximately $20.8 million;
- To increase the estimated cost of the Units by $45 million due to a combination of AFUDC and Escalation;
- To increase the cost of Transmission infrastructure by $4.3 million due to modifications in the switchyard configuration;
- To change the construction schedule, including a change to the guaranteed substantial completion dates ("GSCDs") for the Units as agreed to by SCE&G in the Amendment, which reflect delays primarily incurred due to late fabrication, delivery and erection of structural modules and Shield Building panels associated with the Nuclear Island and other delays associated with construction; and
- To advise the Commission of changes to the EPC Contract associated with the withdrawal of CB&I from the Project, leaving WEC as the sole member of the Consortium, and the retention of Fluor by WEC as the sub-contracted construction manager of the Project.

The culmination of these changes is a delay of the GSCD of Unit 2 by about 2 and 1/2 months (from June 19, 2019 to August 31, 2019) and a delay of the GSCD of Unit 3 by about 2 and 1/2 months (from June 16, 2020 to August 31, 2020) from the GDSDs
approved by Commission Order No. 2015-661. This delay also results in changes to many
of the approved BLRA milestone dates.

With regard to costs, the SCE&G portion of the gross construction costs in future
dollars will increase by approximately $852 million, increasing the overall gross
construction cost in future dollars specified in Commission Order No. 2015-661 from
approximately $6.827 billion to approximately $7.679 billion.

Q. HOW DOES THIS PETITION DIFFER FROM PRIOR PETITIONS FILED BY
THE COMPANY?

A. This cost modification request differs from past requests in two important aspects.
First, although the Company presents the changes as an amendment to the EPC Contract,
the entire structure and nature of the EPC Contract has been changed. Second, there are
substantive differences in SCE&G's approach to justify major cost increases associated
with this Petition.

Q. PLEASE DISCUSS THE MAJOR CHANGES TO THE EPC CONTRACT AS A
RESULT OF THE AMENDMENT.

A. A major change to the EPC Contract resulting from the Amendment was the
withdrawal of CB&I from the Consortium and the sale of Stone and Webster, CB&I’s
nuclear construction subsidiary, to WEC. The Amendment included the terms and
conditions for CB&I’s exit, as well as new provisions limiting its liability and releasing
CB&I from corporate guarantees on the Project. Therefore, WEC is now solely responsible
for the execution of the EPC Contract. WEC subsequently contracted with Fluor to manage
the construction of the Project as a sub-contractor reporting directly to WEC.
This contractual ownership change is a positive step forward in completing the Project. The commercial relationship between WEC and CB&I had deteriorated to the point that it was jeopardizing the completion of the Units. I view CB&I’s exit as a necessary change.

In addition, there were several improvements to the EPC Contract structure which include:

- The resolution of current disputes. ORS supports the concept of resolving outstanding disputes and the amount for resolution is discussed separately below. Disputes were diverting attention and generating non-productive work for the Project team;

- The extension of equipment warranties to address coverage beyond the currently proposed GSCDs;

- The increase in liquidated damages associated with not meeting the currently proposed GSCDs;

- Tightening the definition of a “change in law,” which had been the subject of many disputes in the past;

- Establishing the Dispute Resolution Board (“DRB”) and defining the boundaries and terms within which it will operate;

- No interim lawsuits filed prior to the completion of the Units. This will better ensure the Project team remains focused on Project completion, rather than being diverted into supporting litigation;
• Upgrading the contractual basis of the design to Design Control Document, Revision 19 to agree with the licensing basis of the plant;

• Revising the construction milestone payment schedule to better align with Project priorities. While this should be an improvement to the EPC Contract, WEC and SCE&G have not yet been able to agree on the details of this payment schedule and SCE&G has been making monthly payments, subject to a true up to invoices, until the final payment schedule is agreed upon. ORS is concerned that this matter has not been brought to a timely resolution as provided for in the Amendment. This dispute was submitted to the DRB in August 2016, and may be the first issue addressed by the DRB on this Project.

There are also changes to the EPC Contract structure that cause ORS concern. With regard to the federal production tax credit completion incentive, ORS prefers an incentive structure that would only provide the full incentive if the current production tax credit expiration dates are met, and would be reduced on a graduated scale if Congress extends the expiration dates.

ORS is also concerned about the level of price surety offered by the Option. Although ORS has received assurances from SCE&G and WEC executive management that WEC will abide by its commitment to complete the Project for the stated price, the avenues of recourse available to SCE&G should WEC demand additional funding are limited.
ORS is concerned about WEC’s ability to absorb potential financial losses that
SCE&G’s sensitivity studies identify as possible if productivity and production are not
significantly improved. The potential financial impacts identified in the sensitivity study
are in the hundreds of millions of dollars. Under the revised EPC Contract structure
outlined in this Petition, those costs would have to be borne by WEC or its parent company
Toshiba. WEC has assured ORS that it recognizes the potential risk regarding the Units
and Southern Company’s Vogtle project, which has a similar contract, and is prepared to
proceed. WEC asserts it can complete both projects on schedule and understands the
reputational damage that could occur in the world market if WEC fails to deliver or reneges
on the South Carolina or the Georgia contracts.

ORS also has concerns about the relationship and co-operation between SCE&G
and WEC in the context of a “fixed price” contract. Historically, fixed price contracts have
been more adversarial and confrontational than other methods of contracting. Although the
DRB is designed to handle conflicts and disputes expeditiously, it is not intended to be the
preferred means to resolve all contract issues.

In addition, “fixed price” contracts have generally resulted in reduced participation
and influence by the owners of the construction project. The sentiment and approach
adopted by the contractor is generally, “we have guaranteed you the project for this price;
leave us alone and we will deliver.” This is not an acceptable approach. ORS regards
SCE&G’s participation as essential to the satisfactory completion of the Project.

In response to ORS’s concerns, ORS has been assured by SCE&G and WEC
executive management that they expect to have a co-operative and collegial relationship
for the remainder of the Project. However, such a relationship has yet to be fully
demonstrated since the Amendment was signed. More specifically, SCE\&G and WEC have
not been able to negotiate a mutually acceptable milestone payment schedule and have had
a continuing conflict over the format of Change Order proposals. Recent Change Order
proposals have been “fixed price” proposals, and in some recent cases WEC is attempting
to limit its pricing disclosures in Change Orders, resulting in a lower level of detail than
was previously available. This lower level of detail makes it difficult for ORS to assess the
price and construction methodology. It is critical to ORS’s review process that future
Change Order proposals be supported by adequate price disclosure by WEC.

Q. PLEASE DISCUSS THE EPC CONTRACT OPTION.

A. The largest cost increase ($505.5 million) in this Petition is associated with the
Option. The premium associated with electing the Option is calculated by taking the
difference between the cost WEC can charge to complete the Units under the Option and
the corresponding price that was embedded in the schedules underlying Order No. 2015-
661. The documentation provided to justify the Option cost is primarily based on either
(1) establishing a comparison of the additional costs of the Option to forecasts of costs that
WEC would charge if the Project proceeded under the previous contractual basis; or (2) a
subjective analysis of the fixed price contract with little objective evidence of what the
actual cost savings from those subjective benefits would be. The Company focuses its
assessment of the value of the Option on the risk reduction achieved via the transfer of
price risk to WEC. The presumed reduction in day-to-day scope changes and the resulting
distraction of the dispute resolution process are cited as key benefits of the Option.
However, no attempt was made to quantify these benefits. While I can agree that these benefits could accrue to the Project and that these benefits could reduce the friction and distraction caused by continuing adversarial negotiations over scope changes, it is difficult to assign a monetary benefit to these changes; and therefore, it is not possible to quantify their contribution to the value of the Option.

Perhaps the best justification for the Option is provided in the sensitivity studies offered in the testimony of Dr. Joseph M. Lynch, which indicate that SCE&G believes several hundreds of millions of dollars will be saved by exercising the Option compared to continuing on the basis of current contract terms. This will be discussed later in my testimony.

However, since the start of the Project, WEC has not consistently demonstrated its ability to meet contractual commitments. The benefit to the ratepayers from the Option is only as good as WEC’s financial ability and willingness to stand behind the EPC Contract. Based on our previous experience in the Project, ORS has little confidence in WEC’s assurances that it will be able to deliver on its “fixed price” commitment.

While ORS understands the calculation of the $505.54 million for the Option as it relates to EPC Contract costs, the Option was not constructed in such a way that a listing of itemized costs total the premium. Rather, it represents an overall agreement that takes into account both the costs to complete the project and a value WEC has assigned to its risk associated with fixing these costs. As such, ORS does not have sufficient documentation to justify a specific list of costs making up the Option. However, ORS does recognize that there are benefits to the Option, but only to the extent that SCE&G
guarantees its ratepayers that the Option will truly fix the cost of the Project for those items and scopes included in the Option and that any additional EPC Contract costs (other than for changes in law or other very specific items such as force majeure events) will not be borne by SCE&G ratepayers. Absent such a guarantee from SCE&G, ORS could not support the $505.5 million cost associated with the Option.

Q. PLEASE DISCUSS THE COSTS ASSOCIATED WITH THE AMENDMENT TO THE EPC CONTRACT.

A. The Amendment includes $137.5 million in costs to resolve outstanding disputes. While there have been previous amendments to the EPC Contract, those amendments were based on detailed estimates of additional scopes of work to be done or previously completed work that caused additional costs. This Amendment is different in that it served as a comprehensive settlement that substantially changed the structure of the EPC Contract. It changed the structure of the Consortium itself, revised bonus and liquidated damages provisions, revised GSCDs, clarified definitions, resolved most outstanding disputes and offered SCE&G the ability via the Option to fix many of the EPC Contract costs. As such, it did not credit specific amounts to specific items.

For ORS to perform a thorough review of the Petition, ORS expects: 1) SCE&G and WEC to be in agreement on the cost and schedule, 2) that formalized agreements in the form of executed Change Orders to the EPC Contract will be in place, and 3) that detailed, auditable estimates to back up changes will be provided. In lieu of signed Change Orders, signed interim agreements which form the basis of future Change Orders are also acceptable.
However, for the majority of the costs associated with the Amendment in this Petition, such detailed formalized agreements or Change Orders do not exist. Instead, the major costs for the Amendment are based on resolving previous disputes which have been categorized by SCE&G as follows: (1) claims that could be reasonably specifically quantified by estimates or have defined costs, or (2) claims that have been asserted by the Consortium, but have not been specifically quantified by defined costs or estimates. SCE&G’s Mr. Kochems presented direct testimony to the effect that the claims that could be reasonably quantified have an approximate value of $224.4 million (see Chart B on page 9). However, ORS has concerns regarding the basis for these values as detailed in the following paragraphs.

The first component identifies $8.7 million of withheld payments in dispute due to poor labor productivity, inefficiency and delay costs, and, as part of the negotiation; these costs were credited to WEC. The full credit for this amount is not supported because the Consortium did not attain the stated productivity, performed substantially below the targeted labor productivity rates and was responsible for significant project delays in several areas, including module fabrication and delivery. Therefore, ORS cannot support providing a 100% credit to WEC. This same argument can be applied to the $3.6 million applied to the excess escalation due to delay.

The second component addressed is $45.9 million in disputes arising from regulatory revisions and changes in law. Many of the Consortium claims in this area were not justified, and represented an overreach by the Consortium. These claims were based on a very aggressive interpretation by WEC of the change in law provisions of the EPC...
Contract. In many cases, the Consortium maintained that meeting the requirements specifically stated in the Final Safety Analysis Report represented a change in law, or that the Nuclear Regulatory Commission’s ("NRC") practice of rigorous and literal interpretation of codes and standards represented a change in law. Neither of these cases can be logically considered a change in law and should not be accepted as such. Therefore, ORS cannot support accepting all of the claims by the Consortium for disputes associated with regulatory revisions and changes in law and crediting their full value.

The third component involves $47.5 million in claims addressing work charged to the Target Price category of the EPC Contract when it should have been charged to the Firm Price category. ORS is aware that many of these disputes involved working on-site to correct or complete sub-modules that were shipped to the site with defects or were incomplete, or were transferred to the site because they could not be completed at the fabrication facility in time to meet construction needs. Module fabrication was originally assigned to the firm price portion of the contract; therefore, ORS agrees with SCE&G’s original assertion that the work done on-site should also have been assigned to the Firm Price cost category of the EPC Contract, and the additional costs the Consortium assigned to the Target Price category was not appropriate. Therefore, ORS cannot support accepting the entire $47.5 million value identified for this work.

The fourth component identifies $27.5 million for producing as-built drawings versus the Consortium’s plan to produce only as-designed drawings. However, the EPC Contract clearly states that as-builts will be provided. As-built drawings are also required...
by NRC regulations and by the Final Safety Analysis Report. Therefore, ORS cannot
support accepting this value as justification for the increased costs in the Amendment.

The fifth component is $66.0 million dollars for extending the warranties on plant
equipment to provide coverage for two years beyond the actual GSCDs. ORS recognizes
that there is value in the warranty extensions and commends SCE&G for including this
item in the Amendment, especially as some components will be installed after their original
manufacturer warranty has expired due to the construction delays. There is no detailed
estimate that provides the basis for this cost, and the best estimate available was provided
verbally to SCE&G during a meeting with the Consortium. Therefore, although ORS
supports the inclusion of extended warranties and recognizes there is a cost associated with
this extension, based on the documentation available ORS cannot assign a value of $66.0
million to this item.

The sixth component of $60.3 million is associated with the resolution of disputes
related to Change Orders which SCE&G had accepted, and on which the Consortium had
begun construction, but SCE&G had not yet paid. These include cyber security on-going
work, site layout changes associated with Phases 1 and 2, Shield Building panel mitigation
which expanded the fabrication facilities at Newport News Industrial, and the on-going
costs of changes to health care required by the changes in federal law. The justification for
these changes appears to be adequately defined and appropriate.

The seventh component of $4.3 million is associated with expanding the security
for the off-site water treatment complex, providing fuel loading software and adding a
secondary chemistry laboratory. The justification for these items appears to be reasonable and appropriate.

The eighth and final component is a $39.4 million credit to SCE&G for 90% of $78.8 million in disputed invoices already paid; assuming a 50-50 split would have ultimately resulted. Although this approach seems a reasonable compromise to resolve a dispute, it is not an adequate basis for ORS to support including a specific amount as justification for the cost increase.

With regard to those claims and disputes that Mr. Kochems defines in his direct testimony as not specifically quantifiable, it is not possible for ORS to make an informed judgment about the reasonableness of these costs. Mr. Kochems identifies these costs as "worth millions of dollars;" however, ORS cannot verify any specific amount.

In reviewing the specific examples cited by Mr. Kochems, ORS makes the following observations:

As part of the Amendment, Mr. Kochems advises that WEC agreed to identify and label subcomponents so that they could be specifically identified during plant operations and maintenance. This was cited as a large scope of work involving over 35,000 components and subcomponents. However, ORS agrees with the original SCE&G position which maintained that this scope was already included in the base EPC Contract. This level of identification is an industry practice that has been in effect for at least twenty years and has been applied on every plant with which I am familiar. SCE&G was correct to expect this practice to be employed by WEC from the beginning and without additional cost.
Another example stated was that the Amendment resolved a dispute with WEC regarding timely access to technical manuals to assist SCE&G with developing plans and procedures to operate the plant. This was certainly an obligation in the original EPC Contract, and it should not be cited as a basis for increased costs.

The third example cited was WEC’s agreement to provide the design and construction of the Annex Building walls and doors and the Auxiliary Building doors to meet the NRC 2009 Aircraft Impact Assessment Rule. ORS agrees with SCE&G’s original position on this issue which was that these changes were included in the cost increases associated with Order No. 2012-844. Therefore, ORS does not support the inclusion of this item as a basis for increased costs.

The final specific example addresses the elimination of calendar-based progress payments and cites the $67.6 million in progress payments that SCE&G had withheld for contested progress payments. Again, ORS agrees with the original SCE&G position that these payments were not justified because WEC was the cause of unwarranted delays in the Project that resulted in the prolongation of these payments beyond the originally intended intervals. ORS is in agreement that the elimination of these calendar-based payments is a definite benefit to the Project and commends SCE&G for removing these from the revised EPC Contract. The next important step is to negotiate the construction milestone-based payment schedule.

While there are certainly other unquantified benefits to the Amendment that provide value to the project, such as revising the definition of “change in law” to help prevent future contract disputes, there is no way to assign a dollar amount to these benefits.
Based on the documentation provided by SCE&G, ORS has determined that $64.6 million of the value claimed by SCE&G can be supported by the documentation provided. These amounts, however, were not presented individually for approval but as part of the justification for a larger settlement. ORS has insufficient support under our normal review processes to justify the approval of the total approximately $137.5 million requested by SCE&G related to the EPC Contract Amendment. However, ORS does agree that the Amendment added value to the Project that it is difficult to quantify and, in the context of a larger settlement that included both the Option and a guarantee from SCE&G that the Option will truly fix the cost of the Project and that any additional EPC Contract costs (other than changes in law or other very specific items such as force majeure events) will not be borne by SCE&G ratepayers, ORS could support the inclusion of costs associated with the Amendment.

Q. PLEASE ADDRESS THE COSTS INCLUDED IN THE CHANGE ORDERS.

A. The total requested increase associated with the eleven Change Orders identified in the Petition is approximately $52.5 million. ORS's review supports the inclusion of $32.6 million for these Change Orders. When evaluating Change Orders, ORS expects that the documentation supporting them will include signed Change Orders, signed agreements with detailed documentation that will form the basis for future Change Orders, or at the very least a mature level of detailed documentation supporting a Change Order that is nearly ready to be signed. In evaluating the documentation submitted at the time of the Petition against the ORS expectations, ORS found the support for Change Orders to be generally insufficient. In many cases, the justifications prepared by WEC were
significantly and unilaterally modified by SCE&G. In other cases justifications were based
solely on SCE&G estimates without formal input from WEC. During our review,
documentation supporting the bases of these estimates was lacking and was by no means
as rigorous and detailed as ORS expected to be presented for review.

In response to numerous ORS requests for information, SCE&G provided
additional documentation, and in some cases, SCE&G subsequently obtained draft Change
Orders or proposals from WEC that provided minimally acceptable bases for reviewing
these Change Orders. Many of these came at a very late date as ORS was close to filing
testimony. This is not an acceptable practice. Going forward, it is the position of ORS that
until a Change Order has been agreed to by both parties, the costs associated with it should
not be included in BLRA cost forecasts. This position will ensure that the necessary level
of detail is provided to justify the cost and will ensure that WEC and SCE&G agree on the
scope, schedule and cost.

I will now address the ORS assessment of each of the Change Orders below.

1) Plant Layout Security, Phase 3 (Approximately $29.6 million)

The requested cost of approximately $29.6 million is based on an internal
estimate prepared by SCE&G. A proposal from WEC was subsequently received
by SCE&G on July 29, 2016, and has been reviewed by ORS; however, SCE&G
has not yet completed its review and negotiations. The fixed price quoted by WEC
in its proposal is approximately $17.4 million (SCE&G’s 55% share); however, the
completion date does not support the GSCD for Unit 2, and these changes must be
completed before the Unit is completed. It appears that the scope is now well
defined; however, the final design and a final schedule have not yet been developed. The need to accelerate the schedule may increase the cost. Therefore, although ORS recognizes that the cost and schedule are not yet finalized, ORS finds there is sufficient definition to the scope and that the cost will in all probability be higher than that currently included in the WEC proposal. On the basis that ORS finds this estimate is likely lower than the final cost of the Change Order, ORS can support the approval of $17.4 million for this Change Order. ORS is concerned, however, that the types of changes necessary to accelerate the schedule are still unknown and could result in a change in methodology that ORS has not yet evaluated.

2) Plant Security Systems Integration (Approximately $7.1 million)

The requested cost of approximately $7.1 million was based on an internal estimate prepared by SCE&G. A proposal which included a detailed technical description was received on July 24, 2016 from WEC which reduces this estimate to approximately $6.3 million. However, the completion schedule proposed by WEC is beyond the need date required by SCE&G and a final schedule will not be available until an on-site summit is held with SCE&G. ORS reviewed the proposal and technical description and determined that the basis was adequately defined. However, the costs will in all probability increase when the schedule is accelerated or when an alternate approach is developed to accommodate the needed completion date. Therefore, ORS supports the inclusion of $6.3 million for this Change Order.

3) Service Building, Third Floor (Approximately $6.9 million)
SCE&G has provided adequate technical justification for the late addition of the third floor in the Service Building. The need to consolidate the Operations Service Center into one facility in the Service Building, rather than separate facilities in each unit’s Auxiliary Building, and the need for added space required for maintenance shops, engineering support, outage planning and other plant support services justify this addition. However, SCE&G has now decided that the entire scope of the Service Building (all three floors) will be removed from the scope of the EPC Contract and the Service Building will be built under SCE&G’s direct supervision through a separate contracted organization. This means that this entire scope of work will be transferred to the Owner’s Cost, and will be removed from the EPC Contract. Therefore, this should no longer be evaluated as a Change Order and should be removed from the costs for Change Orders and assessed under the Owner’s Cost.

4) **Training Staff Augmentation (Approximately $4.4 million)**

SCE&G has requested that WEC provide ten (10) AP1000 Senior Reactor Operator certified operations training instructors to supplement its training staff from May 2016 through December 2017 to assure that SCE&G meets the required date for having an adequate number of certified operators available to run the plant. Although this cost estimate has been developed by SCE&G with no formal proposal yet submitted by WEC, there are already similar WEC instructors in place and the cost was developed based on extrapolating existing costs for the required duration. Therefore, ORS supports SCE&G’s requested amount for this Change Order.
5) Escrow – Software and Documentation (Approximately $3.0 million)

ORS agrees with SCE&G that it is necessary to establish this escrow account to assure that access to software and important plant documentation is available should access through WEC not be available in the future. The technical scope has been adequately defined and an estimate has been provided by WEC naming an independent third party repository for this information. The technical requirements were completed under the previous EPC Contract, so this is a well-defined scope. Although no formal Change Order has been executed, ORS believes that the cost information is well developed. Therefore, ORS supports SCE&G’s requested amount for this Change Order. ORS further recommends that SCE&G be required to continue to update the escrowed information should delays occur that extend construction beyond the scope included in the Change Order.

6) Corrective Action Program Interface–“CAP-I” (Approximately $679,000)

The scope and costs associated with this change represent an extension of an on-going program already in place through the revised completion dates of the Project. Therefore, although the cost is based on an estimate from SCE&G without a formal executed estimate or Change Order from WEC, the cost represents merely an extension of known work. Therefore, this estimate is acceptable to ORS and ORS supports the requested amount.

7) Classroom Simulator (Approximately $451,000)

ORS has assessed SCE&G’s justification for adding this classroom simulator and agrees that it is a necessary addition to the plant in order to assure
that the regular plant simulator is available to fulfill its main functions
associated with operator training. This PC based system allows students,
instructors, maintenance personnel, plant engineers and procedure writers to
accomplish needed tasks without tying up the Plant Reference Simulator. The stated
cost also includes a four year maintenance agreement. ORS supports the requested
amount.

8) PMP Analysis (Approximately $182,000)

The cost represents a compromise reached between WEC and SCE&G to share on
a 50-50 basis the cost of updating the Probable Maximum Precipitation (“PMP”) analysis. A detailed WEC estimate has been provided and a draft Change Order is
in process. This work was required to implement an NRC requirement to update
the PMP analysis to reflect changes to the plant site layout and address changes
required as a result of Fukushima recommendations. ORS supports the requested
amount.

9) ITAAC Maintenance (Approximately $98,000)

This change represents an extension of on-going work through the revised
completion dates. SCE&G estimated the cost of maintaining the Inspection Testing
Analysis Acceptance Criteria (“ITAAC”) program required by the NRC based on
extrapolating the existing cost. ORS supports the requested amount.

10) Primavera® Access (Approximately $45,000)

Again this represents an extension of software license fees already held by
SCE&G to the revised completion dates. SCE&G has estimated these costs by
extrapolating current costs. ORS supports the requested amount.
11) Transmission Structure Redesign/Wetlands (Approximately $5,000)

This request represents a redesign due to a revision of wetland boundaries that subsequently required the relocation of two transmission structures.

ORS supports the requested amount.

In summary, ORS does not support the approval of item 3 (Service Building Third Floor Addition) as an EPC Contract Change Order for the reasons stated above but instead recommends considering the request along with Owner’s Costs. ORS supports the approval of Change Orders in the amount of $32.6 million, as described above.


A. SCE&G seeks the reversal of the $85.5 million liquidated damages related to the previous EPC Contract, which was credited to ratepayers in Commission Order No. 2015-661. The justification for this reversal is that the terms of the EPC Contract have now changed. The GSCDs that were the basis for claiming the liquidated damages have now changed and the liquidated damages associated with this future date have been substantially increased.

While ORS is concerned that this credit has been reversed, ORS understands the credit may not have been enforceable due to the outstanding disputes and since it could be argued that SCE&G did not actually incur the damages. The Amendment also includes liquidated damages provisions greater than the previous provisions, giving ratepayers the opportunity to gain credit for at least this amount in liquidated damages should the revised
GSCD’s not be met. As it reflects the amended contract, ORS supports the reversal $85.5 million in liquidated damages.

Q. **PLEASE DISCUSS THE REVISED GSCDS.**

A. In its Petition, SCE&G states that the revised GSCDs are August 31, 2019 for Unit 2 and August 31, 2020 for Unit 3 per the Amendment. The causes for the additional delays are provided by SCE&G in its filing and testimony and are supported by ORS. ORS finds that the completion dates for the Units will be extended to at least these dates, and, in all likelihood, will extend beyond the revised GSCDs. At this time, it does not appear that the GSCDs will extend beyond the 18 month duration allowed by the Commission; however, this will be better known later this year when Fluor completes its review of the construction schedule. The most serious concern is that further delay of Unit 3 could jeopardize the federal production tax credits for this unit if the credits are not extended by Congress beyond their current December 31, 2020 expiration date. This would involve the loss of over $1 billion in tax credits.

SCE&G explained in its testimony the reasons for its confidence in meeting the revised GSCDs. ORS does not share this confidence. SCE&G still does not have a reliable schedule for the Project, and will not have a reliable schedule until Fluor completes its review and works through the resource-loaded integrated schedule which is due in the fourth quarter of 2016. SCE&G asserted that this revision to the schedule is just a routine update that is part of the on-going regular day-to-day activities on a nuclear power plant project. I do not agree with this characterization. Although schedule modifications and refinements are a regular activity on nuclear projects, the wholesale change-out of the
construction contractor is not a regular event. The schedule changes that may result from this major revision to how the Project work is done and the updating of time frames assigned to each portion of work do not represent a business-as-usual process, and the impacts of this change need to be recognized as a major event. Fluor's review of and revision to the schedule represent a significant milestone for the Project.

Although the basic logic and sequencing of precursor and successor events and the level of detail presented in identifying the tasks and work scope in the current revised schedule appear sound, the assigned durations and the labor hours assigned to these tasks are highly questionable in that they appear to be too low. These values are still based on durations and hours determined by the previous construction contractor, and have proven to be unreliable. Targeted productivity has not been achieved and performance factors for each of the crafts have been significantly below expectations and goals. This strongly suggests that the durations and hours assigned to tasks within the schedule are not accurate and need to be increased in many cases. This also basically means that the Project will either (1) take longer, or (2) will require significant improvements in efficiency and productivity and/or will require considerably more resources than are currently anticipated. It must also be noted that these are not strictly linear relationships. Limitations on accessibility in certain areas and work sequencing may limit the numbers of construction staff that can be productively assigned to the Project. This impact will only be manifested when the resource-loaded integrated schedule is fully developed by Fluor.

ORS understands that the revised EPC Contract provides improved incentives to the contractor to complete the Project on schedule; however, ORS's experience has been
that WEC has not been able to maintain construction schedules or achieve forecasted productivity increases. Based on the lack of reliability in WEC’s past performance, ORS is not confident that WEC can fulfill its new commitment. SCE&G also appears to demonstrate a lack of confidence in the current schedule through the base case assumptions in the sensitivity study provided in Dr. Lynch’s direct testimony. These base case assumptions utilize a significantly lower productivity factor than has been provided as the basis for the revised schedule. This further bolsters ORS’s skepticism about the reliability of the current schedule.

Notwithstanding, ORS supports the process and procedure improvements that are being implemented by Fluor to improve the efficiency and productivity of the construction work force. However, it is not clear at this point whether these improvements will result in the significant productivity and production improvements that are required in order to meet the GSCDs.

It should also be noted that this lack of certainty surrounding the schedule has hampered ORS’s review of almost all other areas of the Project. Without having an adequate measure of the timing of activities, it is difficult for ORS to evaluate areas such as Owners Costs and Escalation. Many of these costs are related to the timing of the need for specific personnel. It is also difficult to evaluate Change Orders, particularly Change Orders where WEC is having difficulty meeting SCE&G’s need date, without an adequate understanding of the certainty of the schedule. Additionally, with neither schedule of construction activities nor milestone payment schedule available, it is difficult for ORS to evaluate the timing of the information in Exhibit 2 to the Petition. In the context of an
overall guarantee from SCE&G that the Option will truly fix the cost of the Project and that any additional EPC Contract costs (other than changes in law or other very specific items such as force majeure events) will not be borne by SCE&G ratepayers, ORS’s concerns regarding the potential impacts of this schedule uncertainty are somewhat diminished.

ORS recognizes that the change to the “fixed price” EPC Contract is designed to shift the risk of meeting the revised GSCD’s to WEC. However, ORS must consider what happens to the Project if these dates are not met and WEC is not able to shoulder the large financial burden that Dr. Lynch’s sensitivity studies predict that WEC would incur under such a scenario. WEC executive management assured SCE&G and ORS that WEC will abide by the terms of the EPC Contract and absorb the losses that are forecasted. WEC cited its need to fulfill the terms of the contract in order to secure future business and the reputational damage it would suffer if it were to default as the prime motivations for completing the Project under the currently proposed terms. However, ORS remains skeptical for reasons previously outlined in the discussion of the Option.

In summary, ORS recommends that the Commission approve the proposed revised GSCDs, recognizing that these are contractual dates and accurately reflect what is included in the Amendment, subject to certain conditions discussed below regarding the BLRA milestone schedule.

Q. PLEASE DISCUSS THE REVISED BLRA MILESTONE SCHEDULE.

SCE&G provided proposed revisions to the BLRA milestone schedule and the status of milestones already completed in Exhibit 1 of the Petition and in Mr. Byrne’s direct
testimony as Exhibit SAB-2. The revised dates reflect the impact of changing the GSCDs and other adjustments. ORS is concerned regarding the impact of Fluor’s fully resource-loaded integrated project schedule on the BLRA milestone schedule. While the BLRA milestone schedule is generally consistent with the current Project schedule logic, ORS is concerned that, within only a few months of an Order being issued in this Petition, the Project schedule reflecting Fluor’s input may substantially alter the dates in the BLRA milestone schedule. WEC has acknowledged that the current Project schedule is not achievable without substantial improvements in both production and productivity. As such, ORS has concerns regarding the accuracy of the BLRA milestones within the schedule filed in this Petition. If the Commission chooses to approve this schedule, ORS recommends that the Commission require SCE&G to report on the results of Fluor’s review and revision to the resource-loaded integrated project schedule when complete. ORS further recommends that the Commission require SCE&G to include in its quarterly reports data regarding both production and productivity as compared to what is forecasted in Fluor’s revised fully resource-loaded integrated construction schedule, as well as construction progress towards the milestone payments that are contained in the milestone payment schedule.

Q. **DID YOU ALSO REVIEW THE OWNER’S COST UPDATE REQUEST?**

A. Yes, I reviewed the Owner’s Cost filing submitted in the amount of approximately $20.8 million in this Petition and in Mr. Kochems’s testimony along with additional supporting documentation furnished by SCE&G. The level of detail provided and the approach utilized by SCE&G in developing its projected costs were reviewed by ORS and
found to be sufficient. In addition, I ensured the estimated cost numbers were properly allocated and categorized.

As detailed in Mr. Kochems’s testimony, the primary costs of approximately $15.6 million are attributable to the changes to the GSCDs and the increased duration of the SCE&G staff assigned to the Project. The SCE&G labor costs represent approximately $11 million of this total and the non-labor portion contributes approximately $4.6 million. These non-labor costs include the extension of the NRC Resident Inspectors, continuing NND facilities rental and maintenance, continuing costs for software and equipment associated with testing, continuing training, continuing costs for computers, telephones and other office equipment and supplies and the addition of the senior consultants who will comprise the DRB which was added as a result of the contract Amendment.

A new cost component identified as “Schedule Improvement” in line 4 on Chart D in Mr. Kochems’s testimony addresses the staffing of the Project Management Organization, primarily by contractors on the planned second shift. This second shift and these additional staff are essential elements to aid in meeting the revised GSCDs.

The final component of the Owner’s Cost involves a reduction of approximately $2.8 million due to a comprehensive review of NND and corporate staffing across all relevant cost centers.

Based on the ORS review of the information provided by SCE&G, it is concluded that the requested increased amount of approximately $20.8 million should be approved by the Commission. It should also be noted that SCE&G will need to increase this value once it has determined a well-defined basis for the cost of removing the Service Building from
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1 the EPC scope and transferring it Owner’s Cost, as discussed in my testimony on the
2 Service Building, Third Floor Change Order.

3 Q. PLEASE DISCUSS YOUR REVIEW OF THE ESCALATION AND ALLOWANCE
4 FOR FUNDS USED DURING CONSTRUCTION ("AFUDC") COSTS.
5 A. In its Petition, SCE&G requested cost increases of approximately $3 million for
6 escalation costs and $42 million for increases in AFUDC. Each of these costs is derived
7 from the other cost components discussed above and their final value depends on the final
8 values determined for the above components. The increase in escalation cost is primarily
9 driven by the increases in the Owner’s Cost. The original estimate also included some
10 escalation for transmission costs, which have since been removed at SCE&G’s request.
11 ORS’s review verified the values of $2.3 million for escalation and $42.4 million for
12 AFUDC cited in Mr. Kochens testimony. ORS recognizes, however, that this is an
13 estimate and may change with shifts of items between cost categories and based on the
14 revised milestone payment schedule, when issued. As such, there is still some uncertainty
15 regarding this calculation.

16 Q. COULD YOU PLEASE DISCUSS YOUR REVIEW OF THE SENSITIVITY
17 ANALYSIS PROVIDED IN THE DIRECT TESTIMONY OF DR. JOSEPH M.
18 LYNCH?
19 A. The portion of Dr. Lynch’s testimony which I will address is a sensitivity study that
20 assesses the efficacy of SCE&G’s decision to exercise the Option by comparing the
21 projected costs of the Option against those of completing the Project under the previous
22 terms and conditions. This study is designated Exhibit No. JML-1 in Dr. Lynch’s
testimony. Dr. Lynch uses four different labor rates and six different performance factor scenarios to compare these options. He also provides the basis of the ratios he utilizes for field non-manual labor/direct labor (0.74) and indirect labor/direct labor (0.66) and compares them with current ratios (1.22 and 1.21, respectively) to establish that those he uses in his study are conservatively lower and that using the current rates would make the “fixed price” option even more attractive.

Dr. Lynch’s assumptions and the scenarios selected are appropriate and meaningful. His selections of the “Base Case” for labor growth rates (2.9%) and “Most Likely” range for performance factors (1.5 to 2.0) cases are reasonable and the boundaries selected for the other cases also represent reasonable limits and are appropriately represented. The results demonstrate that for any reasonable scenario, the “fixed price” option is a good deal for SCE&G. For the purpose here, I will confine my remarks to only the “Base Case/“Most Likely” case presented by Dr. Lynch.

Referring to the “Cost-to-Complete the Units” chart on page 8 of Dr. Lynch’s testimony and using the second from the bottom line, at a performance factor of 1.5 the cost to complete is about $3.7 billion compared to the “fixed price” amount of $3.345 billion. At a performance factor of 2.0, the cost to complete is approximately $4.2 billion. This indicates that SCE&G expects WEC to lose from $355 million to $855 million on this Project irrespective of penalties or bonuses. If the labor growth rates are higher than the base case the losses would be even higher. This is a cause for concern.

If WEC is in fact willing to absorb losses and meet the obligations of the EPC Contract, then this is a good deal for both SCE&G and its ratepayers compared to the
alternative. However, the benefits to the ratepayer are not so apparent if WEC does not
meet its obligations. If WEC were to succeed in demands for additional funds to complete
the Project, the ratepayers would bear the burden, not SCE&G. To the extent that SCE&G
guarantees the Option, shielding ratepayers from WEC’s potential failure to meet the terms
of the contract, ORS would agree that the Option has value to ratepayers.

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

A. Yes, it does.
GARY C. JONES  
Curriculum Vitae  

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EXPERTISE:  
Power Plant Design  
System Design and Engineering  
Safety Reviews  
Project Management  
Engineering Management  
Quality Improvement  
Safety Standards Development  
Construction Cost and Schedule Monitoring  
Project Development  
Reengineering  
Business Management  
Executive Consulting  
Resource Allocation  
International Business  
Application of Safety Standards  
Expert Testimony  

PROFESSIONAL EXPERIENCE:  

December 2008 – Present  
JONES PARTNERS, LTD., Chicago, IL, USA  
President  
Leader of a private energy consulting firm currently providing confidential consulting services to the prime contractor as part of a team of nuclear industry experts with regard to an on-going arbitration on a large nuclear power plant under construction in Europe and providing construction monitoring and budgetary oversight consulting services to the South Carolina Office of Regulatory Staff. Also preparing and delivering expert testimony to an international arbitration tribunal and to the South Carolina Public Service Commission.  
Provided consulting engineering services in Vienna in 2009 to the International Atomic Energy Agency (IAEA) on the final report on the safety review of Ukrainian nuclear power plants and served in July 2011 as part of the team in Cairo to perform a safety compliance review the Egyptian Request for Proposal for their first nuclear power plant.  
Instructor at American Society of Mechanical Engineers (ASME) seminars on new nuclear power plant system design in June 2009 in Atlanta, GA, June 2010 in Bethesda, MD, June 2011 in Columbia, SC and June 2012 in Augusta, GA.  

July 2006 – November 2008  
INTERNATIONAL ATOMIC ENERGY AGENCY, Vienna, Austria  
Senior Engineering Safety Officer  
Team leader in the development, review and revision of international nuclear safety standards and in assisting IAEA Member States in the application of these safety standards to their nuclear facilities through workshops, training courses, missions, conferences, seminars, scientific visits and other means. Project Manager of a multi-million
dollar European Commission funded program to assess the compliance of the 15 Ukrainian nuclear power plants with IAEA Safety Standards.

2004 - July 2006 JONES PARTNERS, LTD., Chicago, IL, USA

President
Leader of a private energy consulting and real estate investment firm.

1971 - 2003 SARGENT & LUNDY, LLC, Chicago, IL

1988-2003 Sr. Vice President/Owner

- Led a multi-million dollar global consulting organization to perform high level, quality driven consulting assignments in the development, assessment, design, construction and operation of power facilities.

- Led the engineering and design for the restart of nuclear power plants and directed staff in all disciplines associated with plant restart, providing licensing interface and analytical support for submissions to the Nuclear Regulatory Commission.

- Provided the full range of architect-engineering services to support the on-going operation of nuclear power plants including safety review, licensing and regulatory support, corrective action programs and procedure and test review.

- Served as Mechanical Department Manager and executive in charge of all mechanical discipline resources in the company including standards, software, recruitment, project staffing, training, quality performance and budget.

- Developed strategies and resources to increase business creating a profitable, respected organization; ensured financial performance, technical compliance and human resource management and development.

- Directed the assessment and implementation of the Sargent & Lundy conversion from a partnership to a Limited Liability company; managed the development and implementation of regional offices.

- SELECTED LEADERSHIP ROLES INCLUDE:

  o Served as interim Mechanical and Structural Chief Engineer for Commonwealth Edison Company Nuclear Division responsible for oversight and corporate engineering at all nuclear power plants.

  o Senior review board member for the Dresden Integrated System Inspection.

  o Independent safety review for Peoples Republic of China's first indigenous nuclear power plant, Qin Shan, including visits to the PRC and interface with the Shanghai Nuclear Engineering Design Institute.

  o Independent design review of Korea Electric Power Corporation/Korea Power Engineering Company Yonggwang 3 and 4 nuclear power plant.

  o Developed industry standards, guidelines and software applications in conjunction with the Electric Power Research Institute.
Remediation and decommissioning studies and assessments for Savannah River and Argonne National Laboratory environmental cleanup of nuclear and hazardous wastes.

Root cause investigations to determine reasons for failure and recommendations for fixes of various power plant systems including diesel generators, pumps, valves and other major components and systems.

Development and implementation of new business strategies, processes, standards and procedures as Executive Director of Nuclear Services.

Company-wide Malcolm Baldrige self-assessment and the Total Quality Management implementation in addition to special post-implementation assessment teams.

1976-1988  
**Associate/Project Manager, Sr. Mechanical Project Engineer**
- Planned, coordinated and monitored performance for full scope engineering and design projects for Commonwealth Edison’s Braidwood and Indiana’s Marble Hill nuclear stations.
- Managed 1,500 engineering personnel assigned to projects.
- Project Manager for Design Basis Verification Program at TVA’s Watts Bar Nuclear power plant.
- Led the mechanical Nuclear Steam Supply System process and physical engineering and design for Commonwealth Edison’s dual unit LaSalle nuclear power station.
- Served as principal technical interface and author of the LaSalle County Station Final Safety Analysis report.

1971-1976  
**Mechanical Engineer**
- Performed engineering duties for multiple nuclear power plants.

1966-1967  
1968-1969  
**OAK RIDGE NATIONAL LABORATORY, Oak Ridge, TN, USA**

Cooperative Education Assignments

- Radioisotopes Division
- Reactor Operations Division

**EDUCATION:**

- Bachelor of Science, Engineering Science – Mechanical and Nuclear Tennessee Technological University in Cookeville, TN
- University of Michigan Executive Program

**REGISTRATIONS:**

- Professional Engineer – Missouri and South Carolina

**ASSOCIATIONS:**

- American Nuclear Society Life Member
- American Society of Mechanical Engineers Life Member
• Founder, Past President and Past Vice President of the Engineers Without Borders-USA-Chicagoland Professional Chapter
• Past member of the Great Lakes Region Technical Advisory Committee of Engineers Without Borders-USA
• Founding Board Member of SALUTE, Inc., a non-profit organization assisting military service personnel and their families