Attachment V

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

New York Independent System Operator, Inc.	**)**	**Docket Nos. EL15-37-002**
	)	**ER16-___-000**

AFFIDAVIT OF ZACHARY G. SMITH

Mr. Zachary G. Smith declares:

1. I have personal knowledge of the facts and opinions stated herein.

2. I serve as Director – Transmission Planning for the New York Independent System Operator, Inc. ("NYISO"). My business address is 10 Krey Boulevard, Rensselaer, New York 12144.

3. I received a B.S. and M.S. in Electrical Engineering from Michigan Technological University. I joined the Transmission Planning department at the NYISO as an Engineer in 2004. In March 2009 I was promoted to Manager of Transmission Studies and to Director of Transmission Planning in July 2013. I serve as Vice-Chair of the Northeast Power Coordinating Council (NPCC) Task Force on Coordination of Planning and as Vice-Chair of the ISO/RTO Council Planning Committee, and am a member of the Eastern Interconnection Planning Collaborative (EIPC) Technical Committee, the Steering Committee for the Eastern Interconnection Reliability Assessment Group (ERAG), and the Northeast Joint Interregional Planning Committee.

4. My current responsibilities include oversight and implementation of numerous transmission planning processes and initiatives for the New York State transmission system, including public policy transmission planning, interregional planning, and reliability compliance studies for the North American Electric Reliability Corporation (NERC), NPCC, and New York State Reliability Council (NYSRC). As part of my responsibility to ensure reliability compliance, I oversee all reliability analysis of generator deactivation notices.

5. In response to the Commission's February 19, 2015, order in Docket No. EL15-37-000 directing the NYISO to establish tariff requirements to enable it to administer reliability-must-run service in New York ("RMR Order"), I participated in the development of the NYISO's October 19, 2015, compliance filing ("Compliance Filing").

6. Specifically, I participated in the development of the Compliance Filing, including especially its cost allocation component which is described in Part X of the filing letter. I made presentations at stakeholder meetings and led stakeholder discussions on Compliance Filing matters. My work, and work performed under my supervision and subject to my direction, contributed to various components of the Compliance Filing, including its cost allocation proposals.

7. I have reviewed Part X of the NYISO's filing letter. The statements therein are true and correct to the best of my knowledge, information, and belief.

8. This concludes my affidavit.

7. I have reviewed Part X of the NYISO's filing letter. The statements therein are true and correct to the best of my knowledge, information, and belief.

8. This concludes my affidavit.

ATTESTATION

I am the witness identified in the foregoing affidavit. I have read the affidavit and am familiar with its contents. The facts set forth therein are true to the best of my knowledge, information, and belief.

Zachary G. Smith

Subscribed and sworn to before me
this 19th day of October 2015

Notary Public

My commission expires: 2/12/2018

CARL F. PATKA
Notary Public - State of New York
No. 4962209
Qualified in Albany County
My Commission Expires Feb. 12, 2018

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

New York Independent System Operator, Inc.	**)**	**Docket Nos. EL15-37-002**
	)	**ER16-___-000**

AFFIDAVIT OF SHAUN JOHNSON

Mr. Shaun Johnson declares:

1. I have personal knowledge of the facts and opinions herein and if called to testify could and would testify competently hereto.

2. I am the Director of the Market Mitigation and Analysis Department for the New York Independent System Operator, Inc. ("NYISO"). My business address is 10 Krey Boulevard, Rensselaer, NY 12144.

3. I have worked in the energy industry for over 12 years, working for both the NYISO and NRG Energy, Inc. I received a Bachelors of Arts in Economics from the State University of New York, Albany.

4. My current responsibilities include implementing the NYISO's market power mitigation measures and assisting the NYISO's and the independent Market Monitoring Unit's efforts to administer the NYISO's Market Monitoring Plan (including with respect to the NYISO's implementation of market power mitigation measures.)

5. In response to the Commission's February 19, 2015 Order in Docket No. EL15-37-000 directing the NYISO to establish tariff requirements to enable it to administer reliability-must-run service in New York ("RMR Order"), I participated in the development of the NYISO's October 19, 2015 compliance filing ("Compliance Filing").

6. Specifically, I reviewed the RMR Order, participated in the development of the components of the Compliance Filing related to the identification of "distinctly higher" net present value non-generator solutions, RMR Generator participation in the ISO-Administered Markets, and market power mitigation which are described in Parts IV.I, VI, and X.A and B of the filing letter. I made presentations at two stakeholder meetings on these matters and the NYISO's related analyses, and led related stakeholder discussions. My work, and work performed under my supervision and subject to my direction, forms the basis of the aforementioned components of the Compliance Filing.

7. I have reviewed Parts IV.I, VI, and X.A of the filing letter. The statements therein are true and accurate to the best of my knowledge, information, and belief.

8. This concludes my affidavit.

ATTESTATION

I am the witness identified in the foregoing affidavit. I have read the affidavit and am familiar with its contents. The facts set forth therein are true to the best of my knowledge, information, and belief.

Shaun Johnson

Subscribed and sworn to before me
this 19th day of October 2015

Notary Public

My commission expires: August 8, 2016

GLORIA KAVANAH
Notary Public, State of New York
No. 4941412
Qualified in Schenectady County
Commission Expires 8/8/2016

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

New York Independent System Operator, Inc.	**)**	**Docket Nos. EL15-37-002**
	)	**ER16-___-000**

AFFIDAVIT OF LORENZO P. SEIRUP

Mr. Lorenzo P. Seirup declares:

1. I have personal knowledge of the facts and opinions herein and if called to testify could and would testify competently hereto.

2. I am the Supervisor of Market Mitigation and Analysis – Installed Capacity for the New York Independent System Operator, Inc. ("NYISO"). My business address is 10 Krey Boulevard, Rensselaer, NY 12144.

3. I received a Bachelor of Science degree in Mathematics from Rensselaer Polytechnic Institute. Since 2012, I have been actively involved in the NYISO's administration of the ICAP market power mitigation rules and in its market power analyses. My ICAP market administration responsibilities have included performing determinations under buyer-side mitigation rules, calculating Going-Forward Costs, identifying and evaluating possible withholding, and implementing the monthly supply-side mitigation measures (*i.e.*, the Pivotal Supplier tests). Apart from capacity market power mitigation administration, I assist in the development of new, and revisions to the existing, market rules and perform periodic reviews of capacity market auctions.

4. My current responsibilities include supervising and coordinating operation of ICAP mitigation staff and activities; ensuring administration, implementation and enforcement of the applicable ICAP[1] market provisions of the Market Monitoring Plan,[2] administering the NYISO's supplier-side and buyer-side capacity market power mitigation measures, which are set forth in Services Tariff Section 23; conducting market power analyses; and reviewing market data to determine whether market performance is consistent with a competitive market.

5. In response to the Commission's February 19, 2015, order in Docket No. EL15-37-000 directing the NYISO to establish tariff requirements to enable it to administer reliability-must-run service in New York ("RMR Order"), I participated in the development of the NYISO's October 19, 2015, compliance filing ("Compliance Filing").

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[1] Capitalized terms that are not otherwise defined herein shall have the meaning specified in the NYISO's Market Administration and Control Area Services Tariff ("Services Tariff").

[2] The Market Monitoring Plan is NYISO Market Administration and Control Area Services Tariff ("Services Tariff") Section 30, Attachment O.

6. Specifically, I reviewed the RMR Order, participated in the development of the components of the Compliance Filing related to the compensation of RMR Generators under proposed Rate Schedule 8 to the Services Tariff including the elements of Availability and Performance Rates (*i.e.,* RMR Avoidable Costs, Variable Costs, and incentive payments), Owner Developed Rates, Capital Expenditures, Additional Costs, toggling and "Clawback" requirements, penalties, and consideration of issues regarding and rules related to uneconomic retention and repowering pursuant to agreements of units needed for reliability, which are described in Parts V.A through V.E, IX.A and X.B of the filing letter. I made presentations at stakeholder meetings on these matters and led related stakeholder discussions. My work, and work performed under my supervision and subject to my direction, forms the basis of the aforementioned components of the Compliance Filing.

7. I also provided an affidavit in support of the NYISO's Compliance Report submitted June 17, 2015 in Docket No. EL13-62-003.[3]

8. I have reviewed Parts V.A through V.E, IX.A, and X.B of the Compliance Filing concerning the matters identified in paragraph 6 above, which are true and accurate to the best of my knowledge, information, and belief.

9. This concludes my affidavit.

[3] *New York Independent System Operator, Inc.*, Compliance Report in Docket No. EL13-62-002 at Attachment III (June 17, 2015)

ATTESTATION

I am the witness identified in the foregoing affidavit. I have read the affidavit and am familiar with its contents. The facts set forth therein are true to the best of my knowledge, information, and belief.

Lorenzo P. Seirup

Subscribed and sworn to before me
this 16 th day of October 2015

Notary Public

My commission expires: August 8, 2016

GLORIA KAMINSKI
Notary Public, State of New York
No. 4941412
Qualified in Schenectady County
Commission Expires 8/8/2016

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

New York Independent System Operator, Inc.) Docket No. EL15-37-002 and ER16-___-000

AFFIDAVIT OF
CHRISTOPHER D. UNGATE

Mr. Christopher D. Ungate declares:

1. I have personal knowledge of the facts and opinions herein and if called to testify could and would testify competently hereto.

I. Purpose of this Affidavit

2. The purpose of this Affidavit is to estimate the normal maximum annual amount of capital expenditures for Reliability Must Run ("RMR") agreements for nuclear plants and pulverized coal-fired plants in support of the New York Independent System Operator, Inc.'s (the "NYISO") "Compliance Filing" to which this Affidavit is attached.

II. Qualifications

3. I am a Senior Principal Management Consultant with Sargent & Lundy LLC ("Sargent & Lundy" or "S&L") and have over forty years of experience in electric utility operations, planning, and consulting. Prior to joining S&L in 2006, my professional work experience included management of generation resource planning for a 30,000 megawatt ("MW") portfolio of nuclear, coal, hydro and gas generation, providing annual power supply plans, monthly cost forecast updates, and system reliability analyses; hydro operations business planning; re-engineering and process improvement initiatives in utility planning and operations; and laboratory and prototype testing for hydro and thermal generating plants.

4. My consulting practice at Sargent & Lundy focuses on the areas of utility planning, economic modeling and analysis for the assessment of power generation technologies, project development, asset transactions, operational reviews, and facility modifications and refurbishment projects. I also perform due diligence reviews of new technology development, new projects, modification and refurbishment of existing facilities, asset transactions, and operational assessments.

5. My resume is provided in Exhibit CDU-1.

III. Capital Expenditures to Maintain Viability of RMR Generators

6. The proposed Availability and Performance Rate ("APR") for RMR generators includes both avoidable costs and availability and performance incentives. Avoidable costs are costs that could be avoided if a unit were either (1) to cease supplying energy and capacity for a period of one year or more while retaining the ability to re-enter such markets, or (2) to retire permanently. Avoidable costs include Capital Expenditures ("CapEx") necessary to keep the unit viable; Fixed Costs, including maintenance costs, that are necessary to provide the RMR service; and Other costs that would be avoided if the unit was deactivated.

7. At the request of the NYISO, Sargent & Lundy estimated an appropriate limit on CapEx for Reliability Must Run (RMR) agreements for nuclear and coal-fired plants. The fixed CapEx component of the APR payment would need to cover non-discretionary capital projects. We reviewed studies we have conducted for other clients and other internal sources of data. Our data showed that the CapEx limit should vary by technology.

a. Nuclear: For older nuclear units, few capital projects could be deferred, even in the short-term, because of safety and regulatory concerns. The appropriate limit of a 600 MW Nuclear Unit was about $20 million/year.

b. Coal: In the short-term (approximately three years or less), many types of capital projects for coal units may be deferred. While the performance of the coal units would degrade in the short term, the units could still be viable. In the longer term, spending on capital projects would necessarily increase to keep the unit viable. Based on a high-level analysis of capital spending projects on older coal units, we estimated the CapEx limits for a 600 MW Coal Unit to be about $2.0 million/year for no more than three years of capital project deferral, and otherwise about $8.0 million/year.

8. CapEx costs for gas-fired or oil-fired steam electric generating units would fall into the same general range as CapEx costs for coal-fired units, although on average coal-fired units would be somewhat higher than oil-fired units, which in turn would be somewhat higher than gas-fired units. CapEx for coal-fired units would be somewhat higher than oil-fired or gas-fired steam electric generating units because costs for coal plants include spending on items such as pulverizers, electrostatic precipitators (ESP), baghouses, and solid fuel handling facilities, which might account for roughly 10% of the total.

9. The estimates for CapEx limits we provided do not include any allowance for large capital projects for regulatory compliance, such as cooling towers, or flue gas desulphurization ("FGD") or selective catalytic reduction ("SCR") equipment for reducing emissions. We would not expect that the owner of an older nuclear, coal, oil, or

gas steam electric generating plant slated for retirement would consider such an investment without assurance of long term cost recovery.

III. The NYISO's Proposed Limits on Annual Capital Expenditures

10. The NYISO considered when the proposed tariff should include the authority to approve large amounts of CapEx, and when it is appropriate to present it to the Federal Energy Regulatory Commission ("FERC") for its determination. CapEx above the NYISO proposed annual limits would require explicit approval from the FERC to be incorporated into the APR.
11. The NYISO is proposing a $25 million limit on annual CapEx for nuclear units, and a $10 million limit per unit on annual CapEx for all other types of generation.
12. Sargent & Lundy finds these limits are in alignment with our findings. The proposed limits provide a reasonable threshold for distinguishing between CapEx associated with non-discretionary capital projects required to maintain viability that would be approved by the NYISO, and large capital projects required for regulatory compliance, such as cooling towers, or FGD or SCR equipment, that would be approved by the FERC.

This concludes my Affidavit.

ATTESTATION

I am the witness identified in the foregoing affidavit. I have read the affidavit and am familiar with its contents. The facts set forth therein are true to the best of my knowledge, information, and belief.

Christopher D. Ungate

Subscribed and sworn to before me
this 12th day of October 2015

Notary Public

My commission expires: 8/25/2019

VICKI LAWSON
STATE OF TENNESSEE NOTARY PUBLIC
COUNTY OF HAMILTON

CHRISTOPHER D. UNGATE
Senior Principal Management Consultant
Sargent & Lundy Consulting

EDUCATION

University of Tennessee, Master of Business Administration, 1984 Massachusetts Institute of Technology, M.S. Civil Engineering, 1974 Massachusetts Institute of Technology, B.S. Civil Engineering, 1973

REGISTRATIONS

Professional Engineer - Tennessee

EXPERTISE

Utility Planning
Technology Evaluation
Market Analysis Decision
Analysis
Asset Valuation and Due Diligence Generation
Portfolio Analysis
Risk Analysis
Expert Witness

RESPONSIBILITIES

Mr. Ungate is accountable for Sargent & Lundy offerings in the Utility Planning business segment. He develops and evaluates integrated resource plans and associated analyses to identify and evaluate the optimum power supply options. He reviews and evaluates power supply planning and procurement options such as generation options available in the region (potential greenfield or plant expansion options), the viability of siting and permitting new nuclear, coal, gas, wind, solar, biomass or other alternative generation, the prospects for purchase of existing assets, and the potential for partnering with other load serving entities or power generators. He also assesses the potential and/or required renewable energy resource options, the state of transmission planning and upgrade programs, recent wholesale prices in the Client's load zone, and the fuel market and transportation capacities. He assures consistency with the Client's long-term plans and objectives and Client-specific economic factors (such as standard inflation, inflation, discount, or escalation rates).

Mr. Ungate develops models and analyses utilized in the assessment of power generation technologies, project development, asset transactions, operational reviews, and facility modifications and refurbishment projects. He bases the models on appropriate economic, project, operating, and client-specific inputs related to base-case scenarios, as well as associated sensitivity analyses. He also reviews existing models and analyses to determine if they are reasonable and appropriate, and to evaluate or develop resulting conclusions and recommendations. He also performs system reliability studies, load forecasting, and market evaluations in support of utility planning or other Client needs. He evaluates and develops plans to optimize the utilization of renewable energy resources with thermal generating units. He also performs due diligence reviews of new technology development, new projects, modifications and refurbishment of existing facilities, asset transactions, and operational assessments.

EXPERIENCE

Mr. Ungate has over 35 years of experience in engineering and planning for electric utilities. Since joining Sargent & Lundy in 2006, his assignments have included:

UTILITY PLANNING

- **Maui Electric Company**
  - Conducted a Generation Asset Assessment Study to review the condition of Maui Electric's generating facilities and the impact of the expected changes in usage resulting from increasing amounts of intermittent renewable resources. Each unit's remaining useful life and performance was assessed given the expected operational demands. Operational and maintenance adjustments were proposed to maximize the performance and useful life of the units.

- **Grand Haven Board of Light and Power and Zeeland Board of Public Works**
  - Prepared individual Integrated Resource Plans for two Michigan municipal utilities as part of a single study. Parts of the study related to their location in Ottawa County Michigan were common to both utilities. Integrated resource strategies were developed that included equipment maintenance and replacement recommendations and a recommended resource portfolio for the next twenty years. Potential resource options included existing and new non-renewable generation facilities, renewable energy resources, energy conservation and demand reduction programs, and long-term power purchase agreements or shared ownership options in large economies-of-scale facilities. Risk analysis was performed to evaluate how portfolio options performed under varying fuel and market prices, and environmental regulatory scenarios.

- **Tennessee Valley Authority**
  - Supported preparation of the Need for Power and Alternatives sections of the Integrated Resource Plan. Developed Need for Power and Alternatives sections for Environmental Impact Statements for Sequoyah Nuclear Plant Relicensing and Bellefonte Nuclear Plant Unit 1 that were prepared concurrently.

- **PSEG**
  - Developed the need for power and energy alternatives analyses to satisfy the NUREG 1555 requirements for Environmental Reports associated with an Early Site Permit Application for a new nuclear plant project. Responded to NRC questions on need for power and alternatives at the environmental site audit. Prepared responses to Requests for Additional Information.

- **Oklahoma Municipal Power Authority**

  - Reviewed the analysis of power supply options completed by OMPA staff, including a review of the annual revenue requirements derived by the OMPA power supply planning model, assessment of various options for power purchase agreements, analysis of power plant self-build and joint ownership options, evaluation of a potential transmission upgrade, and analysis of the impact of long-term changes in fuel prices and environmental regulations.

- **SaskPower**
  - Supervised a review of corporate resource planning processes. Processes and work products were compared to state-of-the-art utility industry examples and gaps identified. Recommendations for process improvements were prepared.

- **Tennessee Valley Authority**
  - Developed the need for power analysis to satisfy the NUREG 1555 requirements for Environmental Reports associated with a Combined Operating License Application for a new nuclear plant project.

PLANNING AND MARKET STUDIES

- **New York Independent System Operator**
  - Estimated the cost of new entrant peaking units used in the updating of demand curves for the NYISO capacity market in 2007, 2010 and 2013. Estimated going forward costs of existing generation used in determining need for market power mitigation. Estimated cost of new entry for proposed projects used to determine need for buyer side mitigation. Assisted in development of technical assessment process supporting a determination of whether a generator could transfer interconnection service rights when proposing to repower a generating unit.

- **New England Power Generators Association**
  - Estimated the cost of new entrant peaking units in New England for a NEPGA proposal to revise the basis for capacity payments in ISO-NE.

- **GenOn Energy**
  - Estimated the cost of new entrant peaking and combined cycle units in two PJM zones to support GenOn's comments on PJM's CONE pricing proposal. Made presentation to and answered questions from participants in FERC Settlement Conference held to develop an agreement on the value of CONE.

- **Eskom**
  - Surveyed major equipment suppliers with capabilities to support a large coal-fired project in Africa to assess the potential effect of current and projected production capacity, resource availability, and transportation requirements on project schedule, quality, and costs.

- **EPB**
  - Conducted seminars on selected generation, transmission and electricity market topics to prepare senior management on current trends and issues.

- **Confidential Client**
  - Led the preparation of a business plan for a client considering whether to develop a fleet of generating plants based on small modular nuclear reactor technology.

- **Confidential Client**
  - Estimated potential market volume for a cable manufacturer exploring entering the utility market.

DUE DILIGENCE STUDIES

- **Confidential Client**
  - Reviewed the operating history, environmental and regulatory requirements, contractual agreements, and technical and financial model inputs for two natural gas fired plants in support of a potential sale.

- **Seven States Power Corporation**
  - Reviewed the performance history, environmental and regulatory requirements, contractual agreements, and operations and maintenance activities and plans for two natural gas fired combined cycle plants in support of a potential acquisition.

- **Confidential Client**
  - Reviewed the operating history, environmental and regulatory requirements, and contractual agreements, and identified potential operational limitations, plant upgrades, and expected operating life for four coal or natural gas fired cogeneration plants in support of a potential transaction.
- **National Economic Research Associates**
  - Forecast capital and operations and maintenance (O&M) costs for an existing coal plant as input to an appraisal of the plant's market value being conducted by NERA. The scope of work included the review of any necessary environmental retrofits, upgrades, etc. as required for compliance with federal or state environmental regulation and the investments required for ongoing operations assuming a remaining useful life of 20 years.

ALTERNATIVES ANALYSIS

- **NV Energy**
  - Developed simple and combined cycle natural gas fired capacity expansion options at six brownfield sites in Clark County, NV, to support development of the Integrated Resource Plan. Factors considered in the development of options included emissions, water availability, transmission constraints, natural gas availability, and the shape and amount of space available at the site.

- **San Miguel Electric Cooperative**
  - Conducted study of generation alternatives to meet federal and state requirements for justification of new coal project.

- **CPS Energy**
  - Developed cost and performance assumptions for alternative technologies for use in integrated resource planning studies. Compared published estimates of costs for new nuclear plants.

- **Entegra Power Services**
  - Conducted a planning study of adding 300 MW of natural gas-fired peaking capacity to an existing power station in the southwest US. Estimated capital costs, operating performance, and operations and maintenance (O&M) costs for three aeroderivative combustion turbine models with and without selective catalytic reduction (SCR), and two frame combustion turbine models without SCR.

- **South Mississippi Electric Power Association**

- Reviewed renewable energy alternatives for this G&T cooperative in anticipation of future Renewable Portfolio Standard requirements. Directed the evaluation of responses to an RFP for renewable energy and capacity.

- **Department of Energy and Sandia Renewable Energy Laboratory**
  - Updated the 2003 report, "Assessment of Parabolic Trough and Power Tower Solar Technology Cost and Performance Forecasts" with the Dish technology.

- **Oklahoma Gas & Electric**
  - Contributed to the analysis of generating alternatives for a study of how to reduce carbon emissions from the OG&E generating portfolio.

RISK ANALYSIS

- **Various Clients**
  - Analyzing the risks associated with the cost, schedule, and performance impacts of proposed projects.

- **Globeleq**
  - Identified and quantified key drivers of increases in capital estimates for coal fired power plants.

- **American Electric Power**
  - Identified and compared key characteristics of new nuclear plant technologies. Assessed the risk of each technology relative to client objectives.

- **Allegheny Energy**
  - Developed a comprehensive risk analysis model to determine the expected outage days, generation and costs for a fleet of supercritical coal-fired units based on a high level condition assessment. The objectives were to assess the impacts of the risk issues and associated mitigation projects and to provide support for the development of capital spending plans.

- **Confidential Client**
  - Led a due diligence study of a potential investment in temporary power services to countries with developing economies based on diesel engine technology.

Prior to joining Sargent & Lundy, Mr. Ungate had over 30 years of experience at the Tennessee Valley Authority in a variety of engineering and planning assignments. Examples of assignments include the following:

POWER SUPPLY PLANNING

- Directed supply planning for 30,000 MWs of nuclear, coal, gas, renewable, and hydro generation, and determined peak season power purchase requirements. Directed the preparation of power supply plans, and the valuation of capacity additions, major projects, product offerings, and bulk power transactions. Plans provided the basis for purchase and sale decisions; fuel purchase and inventory decisions; and hedging strategies for the commodity book.

- Led environmental controls optimization study to determine least cost approach to meeting CAIR/CAMR requirements for TVA's 15,000 MW coal generation portfolio. Alternatives included mothballing of units; increased allowance purchases; modified capital improvement programs; re-powering; and replacement with capacity and energy purchases from gas-fired units. Developed approach that resulted in reduction of projected end of period debt by more than $1 billion.
- Provided cost analysis for product pricing for industrial customers. Determined analytical approach and oversaw analyses to determine value of interruptible products, standby power, customer co-generation, long vs. short term contracts, and dispersed power products.

BUSINESS AND STRATEGIC PLANNING

- Directed business planning for portfolio of 109 conventional hydropower units at 29 sites and four pumped storage units. Portfolio supplies 10-15% of company sales with 5000 MWs of capacity. Forced outage rates, recordable injury incident rates, and reportable environmental events were increasing over the previous six years. Developed a five year business plan to increase resources to facilitate the transition to a process management maintenance strategy, and to integrate plant modernization and automation projects to change technology and workflow at the plants.

- Directed the first reassessment of the operating policies of Tennessee Valley Authority reservoirs since the system was designed in the 1930's. Stakeholders were concerned about water quality issues affecting the reservoirs and about the adverse impact of lake levels on property values and recreation-oriented businesses. Led initiative to redefine operating policies, examine environmental concerns, expand public interest and support, and more effectively meet the needs of multi-state customer base. Directed the development of an operating scheme that preserved hydropower value while improving summer lake levels for recreation and increasing minimum flows for water quality.
- Developed competitive analysis for an electric utility. Customers seeking choice of energy suppliers created need for a credible competitive analysis for electric utility monopoly. Price to customers was above competitive energy suppliers. Loss of customer load would create the risk of not recovering the high fixed costs of generation built to serve former customers. Quantified the competitive threat, and identified the circumstances under which loss of customers was most likely.

PROJECT ENGINEERING

- Directed 40-50 engineers, technicians and building trades conducting laboratory and prototype testing of thermal and hydro plant performance problems. Responsible for daily operating management, laboratory safety, quality assurance, human resources, technology acquisition and facilities management.

- Conducted field tests and physical modeling studies on the effects of thermal generating plants on rivers and reservoirs. Contributed to preparation of several environmental statements impacting authorizations for plant operations and discharge.

MEMBERSHIPS

Board of Examiners, Tennessee Quality Award, 1997-99

PUBLICATIONS

"Baseload Generation Capital Cost Trends," Electric Power Conference, May 2007.

"Resolving Conflicts in Reservoir Operations: Some Lessons Learned at the Tennessee Valley Authority," American Fisheries Society symposium, 1996.

"Tennessee Valley Authority's Clean Water Initiative: Building Partnerships for Watershed Improvement," Journal of Environmental Planning and Management, 39(1), 1996.

"'Equal Consideration' at TVA: Changing System Operations to Meet Societal Needs," Hydro Review, July 1992.

"Reviewing the Role of Hydropower in TVA Reservoir Operations," with Douglas H. Walters, Waterpower '91, An International Conference on Hydropower, Denver, Colorado, 1991.

"TVA's Lake Improvement Plan: Reviewing the Operating Objectives of TVA's Reservoir System," National Conference on Hydraulic Engineering, Nashville, Tennessee, July 1991.

"Tennessee River and Reservoir System Operation and Planning Review, Final Environmental Impact Statement," with TVA staff, December 1990.

"Field and Model Results for Multiport Diffuser Plume," with Charles W. Almquist and William R. Waldrop, American Society of Civil Engineers Specialty Conference on Verification of Mathematical and Physical Models, University of Maryland, August 1978.

"Mixing of Submerged Turbulent Jets at Low Reynolds Number," with Gerhard Jirka and Donal R. F. Harleman, M.I.T. Ralph M. Parsons Laboratory, Report No. 197, February 1975.