

COMMONWEALTH OF PUERTO RICO
PUBLIC SERVICE REGULATORY BOARD
PUERTO RICO ENERGY BUREAU

2019 JUN 19 AM 10:42

IN RE: REVIEW OF THE PUERTO
RICO ELECTRIC POWER
AUTHORITY INTEGRATED
RESOURCE PLAN

NO. CEPR-AP-2018-0001

SUBJECT: PREPA's Motion for Leave to
File Attachments Inadvertently Omitted
from June 14th Filing and to Remove
Copies of Personal Information

**PREPA'S MOTION FOR LEAVE TO FILE ATTACHMENTS
INADVERTENTLY OMITTED FROM JUNE 14th FILING
AND TO REMOVE COPIES OF PERSONAL INFORMATION**

TO THE HONORABLE PUERTO RICO ENERGY BUREAU:

COMES NOW the Puerto Rico Electric Power Authority ("PREPA") and respectfully submits, to the honorable Puerto Rico Energy Bureau (the "Energy Bureau"), PREPA's Motion for Leave to File Attachments Inadvertently Omitted from June 14th Filing and to Remove Copies of Personal Information.

1. On June 17, 2019, PREPA discovered that, due to an inadvertent error in the process of copying and printing materials for the June 14th filing, the following documents mistakenly were not included: (a) PREPA Exs. 3.01, 4.01, 5.01, and 6.01, which are the *curriculum vitae* ("CVs") of PREPA witnesses Messrs. Ortiz, Filsinger, Lee, and Bacalao; and (b) PREPA Ex. 3.02, which is a copy of PREPA Governing Board Resolution 4676. Copies of PREPA Exs. 3.01, 3.02, 4.01, 5.01, and 6.01 are attached hereto.

2. PREPA respectfully requests leave to file those five documents and to have the documents treated as filed *nunc pro tunc* as of June 14, 2019. No one will be unfairly prejudiced by the addition of those five documents or by treating them as filed on June 14th. The CVs are not substantive evidence on the subject matter of the proposed Integrated Resource Plan, although they are part of the referenced witnesses' testimony and show their experience and

training. Resolution 4676 is a public document. Finally, the same five documents already were filed by PREPA in its February 13, 2019, filing in this same docket.

3. On June 17, 2019, PREPA discovered that copies of the driver's licenses of PREPA witnesses Messrs. Filsinger and Lee were attached to their testimony attestations in the June 14th filing. The driver's licenses are personal information and there is no reason for them to be part of the record in this docket.

4. PREPA respectfully requests that the copies of the driver's licenses be removed (and discarded) from the Energy Bureau's hard copies of the June 14th filing and from the Bureau's web site pages that have posts of copies of the testimony in the June 14th filing. If the Bureau wishes PREPA to supply replacement ".pdfs" that omit the driver's licenses, PREPA promptly can do so.

WHEREFORE, the Puerto Rico Electric Power Authority respectfully requests that the Honorable Puerto Rico Energy Bureau grant the foregoing Motion; approve filing of PREPA Exs. 3.01, 3.02, 4.01, 5.01, and 6.01 *nunc pro tunc* to June 14, 2019; remove (and discard) the referenced copies of driver's licenses from the hard copy and electronic record; and, enter such other relief as is warranted.

RESPECTFULLY SUBMITTED,

IN SAN JUAN, PUERTO RICO, THIS 19th DAY OF JUNE, 2019

PUERTO RICO ELECTRIC POWER AUTHORITY



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TSPR No. 9311

Senior Attorney

Puerto Rico Electric Power Authority

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JOSÉ F. ORTIZ

BOARD MEMBER ASSIGNMENTS

Chairman of the Committee created by the governor to seek, procure, commit and disburse the America Recovery and Reinvestment Act funds. This was composed of mayors and government agencies directors. Total funding appropriated was \$ 7,200 MM. 2009-2013

Chairman of the Board for the Puerto Rico Infrastructure Financing Authority to provide financing and project delivery to government initiatives such as: Construction and rehabilitation of 130 schools, build the sports facilities and infrastructure for the Central America 2010 games, and the upgrade and expansion of the Puerto Rico Medical center. Investment of \$1,500 MM. 2009-2012

Chairman of the Board for the Puerto Rico Energy and Power Authority, a \$ 5,000 MM budget corporation. Supporting the executive staff to convert the generation units to natural gas including the supply deals negotiation and infrastructure financing and construction. Support the development of private investment (PPAs) to build and operate renewable energy projects for a total of 2,000 Mw-hr by 2015. 2011-2013

Board Member of the Water Utilities Council of the American Water Works Association. The Council, composed of senior officials, has been charged with setting legislative and regulatory priorities and positions for AWWA and ensuring they are represented effectively in Washington to benefit water consumers. 2011-2013

Board member of several Non for Profit organizations like schools, HOAs and American Cancer Society

SENIOR EXECUTIVE

28 years of successful experience providing fiscal, strategic, and operations leadership in public corporations, manufacturing and real estate development

Dynamic result-oriented leader with strong track record of performance in turnaround and pace organizations. Utilize keen analysis and insights, team approach to drive organizational culture change. Superior interpersonal skills, capable of resolving multiple and complex (human resources, financial, public policy and operational) issues and motivating staff to peak performance. Excellent relations with local and federal public and elected officials. Additional areas of expertise include:

- Investors and Rating Agencies presentations
- Profitability and Cost Analysis
- Billing Collections and Cash Management
- Contracts Negotiations
- Tax exempt Bonds issue deals
- Collective bargaining
- Finance, Budgeting and Cost Management
- Public Relations and Media Affairs
- Federal and local legislature bills
- Government Relations and Regulations
- Real Estate valuation and consulting
- Team Building and Performance Improvement

PROFESSIONAL EXPERIENCE

Puerto Rico Electric Power Authority

Chief Executive Officer

July 2018 to Present

A public corporation of the Puerto Rico Government

Responsible for guaranteeing customers an electric service of the highest quality at the lowest possible cost and in proportion adapted to their needs

Wyndham Worldwide Corporation

Global Hospitality Industry Leader

Vice President Development, Strategic Development and Sourcing

April 2013 to July 2018

Resort Real Estate development through timeshare projects permitting and construction and; hotel facilities renovation. Enhanced the resort assets value reducing the cost of utilities through alternate energy sources, sewer system re-layout and public services contracts negotiation. Improve the community relations and HOA administration. Strategize to resolve or minimize disparities and litigation.

Puerto Rico Aqueduct and Sewer Authority

A public corporation of the Puerto Rico Government with a budget of \$1,100MM

Executive President

2007 to 2013

Obtained investment grade rating after 14 years and issued \$3,100 MM in bonds between 2008 and 2012. Negotiated 3 Consent Decrees with EPA to address non-compliance for over 20 years which eliminated \$20 MM in fines and assured long term compliance. Improvement of cash collections, improve client services standards by 70% and increased the number of clients. Revamp internal procedures and controls, reorganization and reallocate staff members, in order improve the operations.

Executive Director of Infrastructure

2004 to 2007

Responsible for the development of the Capital Improvement Plan (CIP). This investment involved approximately \$2.3 billion for the design and construction of new water treatment plants and sanitary improvements to existing facilities to optimize the potable water and sanitation systems.

CSA Group

The largest Hispanic full project delivery consulting firm in the United States

Program Management Director

1998 to 2004

Strategized and managed the implementation of a \$1,200MM water and wastewater infrastructure development program for the Puerto Rico Government to achieve environmental compliance and to support the 20 years land development projections.

Colgate-Palmolive

Engineering Manager

1996 to 1998

Managed the expansion of a toothbrush manufacturing facility, the products and machinery transfer and start-up. Support the day to day operations by maintaining and upgrading the utilities, injection molding, manufacturing and packaging equipment.

Unilever

Engineering manager

1988 to 1996

Managed the expansion of a high end fragrances manufacturing facility, the products and machinery transfer and start-up. Support the day to day operations by maintaining and upgrading the utilities, manufacturing and packaging equipment for fragrance and cotton swabs business. And operation of an Industrial wastewater plant. Developed a "Zero Discharge" plant program.

Other experience

Manufacturing operations and plant engineering with pharmaceutical and electronic industry

Real Estate valuation and development consulting (partial private practice) from 1995 to 1998

EDUCATION

Bachelor's degree in Sciences of Electrical Engineering - University of Puerto Rico **1984**

Master's degree in Business Administration (Finance) - University of Turabo **1991**

AWARDS

2012 Distinguished by the University of Turabo with the President's Medal

2008 Distinguished with the George Warren Fuller Award of the American Water Works Association for the contribution to the improvement of the services and water quality in Puerto Rico

2008 Distinguished as Person of the Year by the Caribbean Business newspaper

1999 Distinguished by the College of Engineers and Land Surveyors as Engineer of the Year

LICENCES

Professional Engineer **9707**

Real Estate Appraiser (Inactive) **1995**



TODD W. FILSINGER

EDUCATION

M.B.A.
University of Colorado
1990

B.S.
Mechanical Engineering
Colorado State University
1986

PROFESSIONAL
CERTIFICATIONS

Registered Professional
Engineer in Colorado

Accredited Senior Appraiser
American Society of
Appraisers
Public Utility Property

General Property Appraiser

SUMMARY

Todd W. Filsinger is recognized globally as an executive leader, market expert, and turn-around specialist in the energy sector, having assisted clients in nearly every major restructuring of energy companies over the last 25 years.

Mr. Filsinger provides high-level strategy, economic evaluation, expert testimony, forecasting and complete interim-management solutions to energy, oil and gas industrial and manufacturing companies. As an interim executive leader hired to turn companies around and lead them through difficult situations, Mr. Filsinger has guided several utilities through industry restructuring, developed complex strategies for utilities and renewable energy companies, developed critical investment/divestment strategies for several large independent power producers, and has been involved with the restructuring of a majority of oil and gas entities and merchant power companies. He has also led and managed some of the largest trading operations in the United States. He has developed power, oil and gas market forecasts that have been utilized in critical financings and restructurings. Notably, Mr. Filsinger served as the Lead Energy Advisor to the debtors during the recent bankruptcy restructuring of Energy Future Holdings, including its wholesale and retail power companies (Luminant and TXU Energy). He also served as the Interim Chief Executive Officer and Interim Chief Financial Officer for Hawkeye Growth, and as the Chief Operating Officer, Chief Commercial Officer and as an Energy Restructuring Advisor for Calpine Corporation. Previously, Mr. Filsinger led PA Consulting Group's Global Energy Practice from 2002 through 2010. Mr. Filsinger has assisted commodity-based businesses, and helped both regulated and merchant utilities across the United States in the areas of strategy, regulatory compliance and filings, asset divestiture and capital allocation techniques.

PROFESSIONAL EXPERIENCE

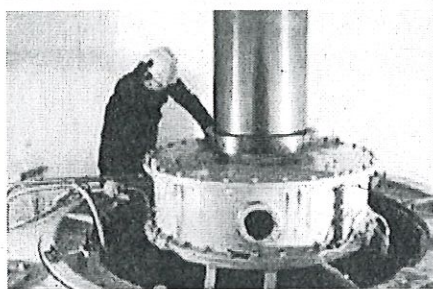
Filsinger Energy Partners, 2010 – present

Senior Managing Director

Mr. Filsinger is the founding partner of Filsinger Energy Partners. In this role, he has specialized in oil and gas and power market issues, including:

- Litigation regarding:
 - Appraisals
 - Property tax disputes
 - Bankruptcy restructurings
 - Section 1603 tax code grants
 - Fraudulent conveyance disputes
- Market forecasts and appraisals in support of disclosure statements, financings, end-of-lease transactions and property tax matters
- Interim management and executive roles
- Restructuring strategy and analysis for geothermal assets
- Environmental impact analysis related to the potential Clean Power Plan, Mercury and Air Toxics Standards, Coal Combustion Residuals, Section 316(b) compliance, Regional Haze regulations, and other regulations
- Development of a distribution and transmission company, including detailed strategy, management, development, customer acquisition, capital planning, budgeting and rate level development
- Identification of and implementation of operational improvements
- Development of deregulation strategies
- Regulated rate development, rate cases and stranded cost cases





PROFESSIONAL HIGHLIGHTS

*Chief Financial Advisor
Puerto Rico Electric Power
Authority
2017 – Present*

*Lead Energy Advisor
Energy Future Holdings
2013 – 2017*

*Interim Chief Executive Officer
Interim Chief Financial Officer
Hawkeye Growth
June – November 2010*

*Chief Operating Officer
Chief Commercial Officer
Energy Restructuring Advisor
Calpine Corporation
2005-2008*

*Co-Chair, Green Investment
Bank Coalition
2008-2010*

*Member of President
Barack Obama's
Energy Transition Team
2008-2009*

*Head of
PA Consulting Group's
Global Energy Practice
2002-2010*

Mr. Filsinger's notable roles at Filsinger Energy Partners have included:

Chief Financial Advisor to the Puerto Rico Electric Power Authority (PREPA), 2017-Present

Mr. Filsinger reports to PREPA's Governing Board and is responsible for:

- Financial oversight, management and reporting of PREPA
- Cash management and approval of PREPA expenditures
- Implementing transformation and fiscal plans
- Restructuring, fiscal and transformation plans and budgeting, including throughout the Title III proceedings

Lead Energy Advisor to Energy Future Holdings, Chapter 11 Restructuring, 2013 – 2017

- Independently developed EBITDA and market price forecasts for all of the debtors' entities, including Luminant's power plants, TXU Energy's retail operations, and Oncor's regulated transmission and distribution business
- Supported executive "insider" compensation plan development and approval throughout the bankruptcy proceedings, including the evaluation of incentive metrics

Headed development of a multi-region power strategy for a U.S. Independent Power Producer, 2010

- Developed market outlooks and repowering and divestiture recommendations for a fleet of coal- and natural gas-fired assets located throughout the United States

Interim Chief Executive Officer, Chief Financial Officer, Hawkeye Growth, 2010

- 220-million-gallon per year ethanol production company
- Managed and turned around the company, ultimately selling to a strategic buyer

PA Consulting Group, 1999 – 2010

As an internationally recognized turn-around specialist in the energy sector, Mr. Filsinger served in executive leadership roles for several energy companies via his consulting practice at PA Consulting Group, where his responsibilities included leadership and oversight of operating and financial goals for PA's Global Energy activities. He managed over 130 consultants within the Global Energy practice and service teams ranging from market experts to financial advisors. He was also responsible for offices across the United States, Europe, India, China, New Zealand and South America.

As a member of PA Consulting Group, Mr. Filsinger's corporate roles and duties included:

Interim Chief Operating Officer, Calpine Corporation, 2008

Mr. Filsinger oversaw all aspects of Calpine Corporation's operations including strategy, forecasting, analytics, power, commercial, environmental health and safety, engineering, and project development. He worked closely with the CFO in the development of the annual budgets, budgets-to-actuals and short- and long-term forecasts.

Interim Executive Vice President of Commercial Operations, Calpine Corporation, 2007

Appointed as the head of Calpine Commercial Operations, Mr. Filsinger's roles included oversight of trading, origination and structuring activities, budget management, fleet optimization and dispatch. He was also responsible for \$10 to \$20 billion in annual revenue and all company operations including power and commercial aspects. He further implemented critical employee retention programs during a very volatile time. Calpine had consistently missed budget, yet under Mr. Filsinger's leadership, the organization turned around and consistently exceeded its revenue and gross margin projections.

Energy Restructuring Advisor, Calpine Corporation, 2005 – 2008

After filing for bankruptcy status in 2005, Calpine Corporation secured Mr. Filsinger as an advisor to the CEO during the restructuring of Calpine Corporation.

R.W. Beck, 1986 – 1999

For R.W. Beck, Mr. Filsinger was an independent engineer serving as analyst, partner and senior director. He worked with regulated and unregulated entities in the development of strategies, the design of deregulated market strategies, and capital project decision processes.

North Branch Power

As a member of R.W. Beck, Mr. Filsinger also worked for the North Branch Power in West Virginia. He helped to mitigate plant problems, participating in leading the facility to commercial operation, power purchase agreement negotiations and plant sales processes.

ADDITIONAL EXPERIENCE**Member of President Barack Obama's Energy Transition Team, 2008-2009**

Mr. Filsinger advised President Barack Obama's transition team on energy issues, particularly those that needed to be addressed in the stimulus bill for the energy sector.

Co-Chair, Green Investment Bank Coalition, 2008-2010

Following President Obama's transition activities, Mr. Filsinger developed a coalition across the energy sector including renewable energy companies, infrastructure companies (transmission, distribution and smart grid), and regulated and merchant energy players. The Coalition developed a strategy and plan to develop a green investment vehicle (with a target of \$500 billion over 20 years) in the anticipated energy bill put before Congress. The Coalition crafted legislation that was subsequently incorporated into the Waxman/Markey Energy Bill. A version was also included in the Senate Bill.

INDUSTRY PRESENTATIONS/TELEVISION APPEARANCES

A list of Mr. Filsinger's recent courses, seminars and selected presentations are noted below:

- University of Texas Law School's Gas and Power Institute, 2017
- Skadden, Arps, et al. Energy & Project Finance Seminar, 2004-2011, 2013-2017
- Platts Global Power Markets Conference, 2007, 2008, 2014-2017
- Infocast Events, 2001-2005, 2008, 2013-2017
- Western Power Summit, 2016
- EPIS's 18th Annual Electric Market Forecasting Conference, 2015
- University of Texas School of Law 2015 Renewable Energy Law Conference, 2015
- UBS Access Conference Call, 2015
- Houlihan Lokey's Annual Energy Conference, 2014
- Gulf Coast Power Association Spring Conference, 2014
- American Society of Appraisers, 2012
- UBS 2012 Natural Gas, Electric Power, MLP and Coal Conference, 2012
- University of Texas – Wind, Solar and Storage Conference, 2012
- UT Renewables Conference 2011
- University of Michigan State of the Power Markets 2009-2011
- UBS Customer Conference 2009-2010
- EEI Financial Conference 2010
- CSPAN, "Washington Journal Edition," December 2009
- Shearman & Sterling/PA Power Markets Seminar 2004, 2005, 2008
- Japan Industries Conference on Investing in US Assets 2005, 2008

- Goldman Sachs Annual Power and Utility Conference 2006, 2007
- Lehman Brothers High Yield Bond and Syndicated Loan Conference 2003, 2005, 2006
- AIRA (Association of Insolvency & Restructuring Advisors) Annual Conference 2005
- NAPCO (North American Power Credit Association) 2005
- Société Générale Annual US Power Conference 2003, 2005
- Credit Suisse First Boston Leveraged Finance Independent Power Producers and Utilities Conference 2003, 2005
- CoBank Energy Industry Update and Portfolio Management, and Executive Forum 2004
- Royal Bank of Scotland North American Energy Offsite Conference, 2004
- Exnet Conference on Utility Restructuring 2003, 2004
- FERC Western Energy Infrastructure Conference 2003

PUBLICATIONS

- "Projects & Money: Shuttering Coal to Stoke Gas, Nuclear," Power Intelligence, January, 15, 2013
- "Energy & Utilities Sector Roundtable" Financier Worldwide, December 2012
- Platts Insight: "The Future of the US Power Market: An Integrated Solution," April 2010
- "Energy & Utilities Sector Roundtable" Financier Worldwide, Issue 58, October 2007
- "Merchant Asset Value Recovery: Turning the Corner on the Power Market Business Cycle" Managing Global Energy Risk, November 2005
- "Forecasting Recovery of Merchant Asset Values: Boom/Bust Sends Shockwaves through Power Industry" Turnaround Management Association, November 2004
- "Merchant Energy Road to Recovery: The Outlook from Inside of the Tunnel" The Journal of Structured and Project Finance, Fall 2003
- "Power Generation and Industry Cycles: Lessons from Other Industries" PA Viewpoint article, 2002
- "The Impacts of Electric Industry Deregulation and Restructuring on Electric Generating Facility Valuation and Ad Valorem Assessments," Presented at the Institute for Professionals in Taxation Conference, 2001

MATTHEW LEE

YEARS OF EXPERIENCE

28

EDUCATION

- > B.S., Mechanical Engineering, Colorado School of Mines, 1992

AREAS OF EXPERTISE

- > Project development
- > Due diligence
- > Contract review/negotiations
- > Feasibility analyses
- > Contract compliance
- > Technical valuation assistance
- > Financial modeling
- > Construction monitoring
- > Performance testing

AFFILIATIONS

- > American Economic Association
- > American Society of Mechanical Engineers (ASME)

PUBLICATIONS

- > "Municipal Environmental Compliance Manual," 1995, collaborative author.
- > American Public Power Association's "Environmental Compliance Manual," annual regulatory updates.
- > White Paper, "The Equator Principles," 2003.

EMPLOYMENT HISTORY

- > Consultant, Filsinger Energy Partners 2015-Present
- > Vice President, Galena Advisors (POWER Engineers), 2011-2014
- > Chief Operating Officer, Refined Energy Holdings, LLC, 2005-2011
- > Principal, Energy Development Group, 1999-2003
- > Managing Director, E3 Consulting 1999-2006
- > Project Manager, R.W. Beck 1993-1999

EXPERIENCE SUMMARY

Matt Lee is a mechanical engineer with extensive business expertise. He has managed the development, design, permitting, and financing of power, petrochemical, and infrastructure projects. He has provided consulting services for private debt and equity placements, project financings, public offerings, purchasers and sellers of energy assets, and municipalities. His experience includes traditional and renewable forms of generation, gas and electric distribution, plant performance testing, economic modeling, operational reviews, technical due diligence, and valuations. He has been responsible for contract negotiations and has held key roles in negotiations with NGOs and state and federal regulatory officials.

Mr. Lee has served in leadership positions in development companies and consultancies. Mr. Lee served as the Chief Operating Officer of Refined Energy Holdings, a gasification and alternative energy company. REH's flagship project, the Power County Advanced Energy Center, was a fully permitted coal gasification to nitrogen fertilizer complex to be located in Power County, Idaho. It is one of the few successfully permitted coal-based projects in the United States and had received the endorsement of the Sierra Club as well as the Idaho Conservation League. Matt assisted with the sale of the Project's development rights in 2013 to a New York based private equity group. During his tenure at REH, Matt led the technology review, design, and permitting for the Project, and was responsible for negotiations with concerned NGO's and state and federal regulatory officials.

Mr. Lee was a founder and a principal with the Energy Development Group, where he provided both technical and commercial expertise for over 3,400 MW of permitted combined cycle generation, and preliminary design support for an additional 1,100 MW.

Mr. Lee began his career with the U.S. Environmental Protection Agency reviewing major petrochemical plants throughout the United States. From there, he moved to R.W. Beck and E3 Consulting where he provided advisory services for energy and infrastructure projects to energy industry lenders, power plant developers, electric utilities, municipalities, and other industries.

Project Feasibility Studies:

Mr. Lee has been involved with energy-related project evaluations and feasibility analyses as a consultant with Filsinger Energy Partners, POWER Engineers (Galena Advisors), R.W. Beck, and E3 Consulting, and energy development companies Refined Energy Holdings and Energy Development Group. The following is a sampling of project feasibility analyses with which he was involved:

- Confidential Geothermal Projects Chile - Mr. Lee was part of a team engaged to perform feasibility and financial due diligence studies for multiple geothermal development projects in Chile. The Study was

supported by the Clean Technology Fund through the Inter-American Development Bank.

- Korean Taean Power Plant Upgrade Analysis – Evaluated two potential upgrade options for two coal-fired units at the Taean Power Plant in Korea. Mr. Lee was responsible for the development of a comparative financial model for the upgrade contractor, Doosan.
- Power County Advanced Energy Center – Fully permitted coal-based gasification to nitrogen fertilizer project located in Power County, Idaho. Mr. Lee was responsible for technology selections, design, and permitting of the project. In addition, he established strategic teaming relationships with key technology providers, led negotiations with NGOs and government officials, and worked with the leadership team to structure and execute key commercial agreements. Development rights to the project were sold to a private equity group in 2013.
- Tangkuban Perahu Geothermal Plant – Mr. Lee was part of a team engaged to perform a feasibility study of a 110 MW flash geothermal power plant in West Java, Indonesia. The Study was supported by a grant from the US Trade and Development Agency (USTDA). Mr. Lee was responsible for developing a financial model to evaluate the financial and economic performance of the plant.
- Kern Oil and Refining Company – Provided acquisition review and an expansion feasibility assessment of an independent oil, refining, and marketing company located in Bakersfield, California. Kern Oil and Refining Company investigated the sale of their assets in Bakersfield. Mr. Lee led the technical and contractual review of the project. Ultimately, the refinery was acquired by NTR Energy.
- Jebro Refinery Wyoming – Mr. Lee Provided an energy audit and a regulatory and financial feasibility assessment for a proposed combined heat and power project at an asphalt refinery in Cheyenne, Wyoming.
- Olkaria 1 Geothermal Power Plant – Mr. Lee was part of a team engaged to perform a feasibility study for the 45 MW Olkaria 1 power plant, located at the Olkaria geothermal field in the Rift Valley, Africa. The plant had experienced normal wear and tear over the 32 years of operation. Mr. Lee developed a financial model to evaluate the financial and economic performance of the project's alternatives.
- CF Industries Donaldsonville Expansion – REH was selected by CF Industries to be a 50 percent partner in the Donaldsonville expansion. The expansion contemplated the retrofit of 50 percent of their ammonia production capacity to petroleum coke gasification-based production. Mr. Lee led the technical coordination and feasibility assessment work with the CF joint venture team.
- South Maui Renewable Resources – Mr. Lee was responsible for assisting SMRR with power purchase agreement negotiations, ancillary service value estimates, and performing a financial feasibility assessment for a proposed firm-PV solar project on the Island of Maui. The PV project was designed to be firm using micro turbines, and he created a project pro forma with specific characteristics of the solar energy resource to predict the dispatch of the micro-turbines.
- African Transmission Line Feasibility Assessment – Mr. Lee is part of a team engaged by GRIDCo, Ghana's Electrical Transmission Provider, to perform a feasibility study pursuant to a USTDA grant. The purpose of the feasibility study is to assist GRIDCo in determining the technical and economic viability of a new 330 kilovolt (kV) double-circuit power transmission line between Aboadze, Domunli and Prestea, Ghana.

- Resort Energy Ventures - Project Manager responsible for a feasibility study for a combined heat and power (CHP) project at the Grand Wailea Resort on the Island of Maui. His team conducted an assessment of the resort's energy needs and developed a CHP system that would decrease its dependence on the local electric utility and realize substantial near-term cost savings. The team provided the resort with preliminary engineering and cost estimates for the CHP system as well as a bid package to allow the resort to move forward with final design and installation of the project through an EPC contract.
- TDX North Slope Generating, LLC - Project Manager for a study to validate the resource plan being developed for the system providing power to the Alaska's North Slope oil fields at Prudhoe Bay. TDX owns gas- and diesel-fired generation and the distribution system serving the oil drilling operations, oil pumping system, and worker housing along the coastal plain of the Arctic Ocean at the mouth of the Sagavanirktok River.
- Blue Mesa Energy – Feasibility assessments for five wind energy developments in New Mexico, Nebraska, and Montana. Mr. Lee provided financial modeling and advisory services to the joint venture in support of project funding requirements.
- SR Solar, LLC – Mr. Lee performed feasibility studies for roof-top solar projects in the Northeastern region of the United States. SR Solar formed a strategic alliance with confidential cosmetic manufacturer to investigate multiple projects at manufacturing facilities in New Jersey and Kentucky.

Project Development Related Roles: Project Design, Teaming, and Acquisitions

Refined Energy Holdings:

Mr. Lee was the Chief Operating Officer of Refined Energy Holdings and led the company's project design function, coordinated with strategic partners, and led the technical review of potential acquisitions. His projects include the Power County Advanced Energy Center, a fully permitted coal-based gasification to nitrogen fertilizer project located in Power County, Idaho. Mr. Lee was responsible for technology selections, design, and permitting of the project. In addition, he established strategic teaming relationships with key technology providers, led negotiations with NGOs and government officials, and worked closely with the leadership team to structure and execute key commercial agreements. Other REH projects (described above) included the Kern Oil and Refining Company acquisition review, CF Industries Donaldsonville Expansion, and various renewable energy projects.

Energy Development Group:

Mr. Lee was a principal with Energy Development Group and led technical development for the company. With colleagues at E3 Consulting, he provided preliminary design, electrical interconnection applications, air, water, and wastewater permitting, water rights appropriation, community involvement, and zoning support. He was involved in the following projects:

- Payette Energy Center – 300 MW combined cycle development project in Payette, Idaho.
- American Falls Energy Center – 600 MW combined cycle development project near American Falls, Idaho.
- Gallup Energy Center – 600 MW combined cycle development project near Gallup, New Mexico.
- Cambray Energy Center – 160 MW simple cycle combustion turbine project near Deming, New Mexico.

- Iberville Energy Center – 600 MW combined cycle development project in Iberville Parish, Louisiana.
- Caddo Parish Energy Center – 750 MW combined cycle development project in Caddo Parish near Shreveport, Louisiana.
- Pointe Coupee Energy Center – 750 MW combined cycle development project in New Roads, Louisiana.
- Barton Shoals Energy Center – 1,200 MW and 600 MW combined cycle development projects near Barton Shoals, Alabama.
- Linfield Energy Center – 600 MW combined cycle development project in Limerick, Pennsylvania.

Project Development Support Services:

Mr. Lee has been involved with energy-related project development as a consultant with POWER Engineers (Galena Advisors), R.W. Beck and E3 Consulting. His role varied from leading the permitting of new generation to advising debt and equity on project feasibility. The following is a sampling of projects with which he was involved:

- Buffalo Power Company – 1,100 MW IGCC project near Glenrock, Wyoming.
- SilvaGas Biomass Gasification – Technical support for multiple biomass gasification projects.
- Kinder Morgan Jackson Power Plant – Simple cycle and combined cycle power plant, Michigan.
- Haines Light & Power – Permitting assistance for five diesel-electric generating units utilized by Haines Light & Power, Haines, Alaska.
- Kodiak Electric Association – Permitting assistance for 13 diesel-electric generating units in Kodiak, Alaska.
- Guam Power Authority, Multiple Projects – Permitting assistance for combustion turbine generating units, medium-speed diesel generating units, large slow-speed diesel generating units, and heavy oil Rankine generating units.
- Alaska Electric Light & Power – Permitting assistance for two combustion turbine electrical generating units.
- Confidential Client – ERC review for non-attainment area permitting, California.
- Alcan Pot Line Expansion – Permitting assistance for a new aluminum pot line at a large aluminum smelter, Kentucky.
- Caribbean Utilities Company – Air dispersion modeling evaluation for new and existing medium speed diesel electric generating units, Grand Cayman.

Project Financing Support Services

While at POWER Engineers, R.W. Beck, E3 Consulting, and as an Independent Contractor, Mr. Lee provided engineering and business services to developers, financiers, purchasers, sellers, and investors of energy related projects. Generally, the purpose of the engagement was to support a transaction (debt or equity). The technical and business conclusions and recommendations would be used to qualify the technical risks of a project. The following is a representative sample of Projects with which Mr. Lee has been involved:

- sPower Solar Portfolio – Mr. Lee assisted with the contract reviews on behalf of AES Corporation in assessing the acquisition of sPower's utility

scale solar assets. The transaction support included the evaluation 1.3 GWs of operating and “under-construction” projects as well as an additional 5.0 GW in varying stages of development.. The buyer closed on the transaction in 2017.

- TerraForm Solar Portfolio – Mr. Lee assisted with the contract reviews on behalf of AES Corporation assessing the acquisition of TerraForm Power’s utility scale solar assets. The transaction support included the evaluation 910 MWs of solar power projects, nearly all of which were under long-term power purchase agreements.
- UPPCO Utility Acquisition – Mr. Lee led the Independent Engineering review of the UPPCO utility assets on behalf of equity and debt investors. He was responsible for a financial assessment of the utility’s assets and operations, preparation of a bankable assessment report, and developing a resource plan for the utility. The deal with Balfour Beatty Infrastructure Partners closed in 2014.
- Bottle Rock Power – Mr. Lee was responsible for the financial assessment to support the acquisition activities of a new binary geothermal power plant and its operational merger with an existing plant.
- AES Eastern Coal Fired Assets – Multiple pulverized coal projects located in up-state New York (Somerset, Greenidge, Cayuga, and Westover).
- Excel Energy’s Comanche 3 Project – 750 MW pulverized coal expansion project, Pueblo, Colorado.
- Confidential 49 MW Geothermal Plant (California) – Independent Engineering review of a new 49 MW geothermal plant.
- Batesville Generating Facility – 810 MW combined cycle plant near Batesville, Mississippi.
- Elwood Generating Station – 1,400 MW simple cycle plant near Chicago, Illinois.
- Cogentrix Richmond Plant and Rocky Mount Plant – 360 MW of Coal-fired stoker cogeneration plants near Richmond, Virginia, and Rocky Mount, North Carolina.
- Kiowa Project – 1200-MW combined cycle power plant project, Oklahoma.
- Baconton Generating Station – 190 MW simple cycle combustion turbine power plant in Baconton, Georgia.
- Lindsay Hill Project – 845 MW combined cycle power plant, Alabama.
- Rathdrum Power Project – 268 MW combined cycle power plant project near Rathdrum Idaho.
- Brookfield Renewable Power (Nevada) – Independent Engineering review for the potential purchaser of a geothermal power plant for a 15 MW geothermal plant in the northwest United States.
- Frontier Generating Station – 830 MW combined cycle power plant project, Texas.
- Gateway Generating Station – 845 MW combined cycle power plant in Texas.
- Gregory Power Plant – 401 MW cogeneration project, Texas.
- Sweeney Cogeneration – 330 MW cogeneration project in Texas.
- Aquila LDC Divestiture – three local distribution companies: Minnesota Gas, Michigan Gas Utilities, Missouri Gas Operations.
- Encana Gas Storage Divestiture – four gas storage projects including Suffield, Countess, Wild Goose, and Salt Plains (210 Bcf total storage).
- Pine Prairie Gas Storage – 24 BCF natural gas storage project, Louisiana.
- Iroquois Pipeline System – 375-mile, 24- and 30-inch natural gas pipeline project, New York and Connecticut.

- Baytown, Texas Brine Company, Texas – Salt crystallization and brine pipeline project on behalf of lenders.
- TQM Pipeline – 130-mile, 24-inch diameter natural gas pipeline, Quebec, Canada.
- Maritimes & Northeast Pipeline – 630-mile, 24- and 30-inch natural gas pipeline, Canada & United States.
- Mississauga, Canada – 100-MW combined cycle combustion turbine electrical generation.
- Ottawa Health Sciences Centre – 68 MW combined cycle combustion turbine electrical generation plant, Canada.
- Windsor-Essex, Canada – 62 MW combined cycle combustion turbine electrical generation unit.
- Kingston Cogeneration Project – 100 MW combined cycle combustion turbine electrical generation unit, Ontario, Canada.
- West Windsor Cogeneration Project – 102 MW combined cycle combustion turbine electrical generation unit, Ontario, Canada.
- West Java Power Project – 400 MW pulverized coal-fired facility in Indonesia.
- Clay County Power Project – 320 MW single-cycle power plant using General Electric Frame 7 EA technology, Illinois.
- De Pere Power Company – 170 MW simple cycle combustion turbine electrical generation unit, Wisconsin.
- Grayling Generating Station – 36 MW traveling grate stoker, wood-fired power plant that has supplemented its wood supply by combusting tire chips, Wisconsin.
- Genesee Power Station – 35 MW traveling grate stoker, wood-fired power plant, Michigan.

Asset Valuation and Restructuring Advisory Services

While at E3 Consulting, Mr. Lee provided asset valuation and restructuring services to debt holders. Notable projects include:

- Southaven Power, LLC – Mr. Lee managed E3 financial advisory services to the lending institutions of Southaven Power, LLC, which had defaulted on its loan when PG&E National Energy Group, the facility's power off taker, declared bankruptcy in July 2003. E3 had been responsible for reviewing the business and power marketing function of Southaven Power, providing updated power market assessments, building an independent valuation model, and advising the lending institutions with regard to the project's cash flow forecasts.
- Mirant Americas Generation, LLC – Mr. Lee assisted E3 Consulting with restructuring services to the Official Committee of Unsecured Creditors of Mirant Americas Generation, LLC ("MAGI"). MAGI was an affiliate of Mirant Corp, which filed for Chapter 11 Bankruptcy protection in July 2003. MAGI owned and operated about 10,000 MW of coal, oil, and natural gas generating assets in five regions of the United States. As the Committee's Energy Consultant, E3's primary role includes advising the Committee on various aspects of the Company's business plans and current operations, and developing asset cash flow models based on an independent market assessment and plant-specific analyses.



Nelson Bacalao

Senior Manager, Consulting

Career Highlights

Dr. Bacalao is the Senior Consulting Manager of Siemens PTI Houston Office. He has over 30 years of extensive experience in providing technical and strategic consulting services to utilities, independent system operators, governments, regulators, independent project developers, and the financial community, in domestic as well as international assignments for the energy industry. He combines a rigorous academic training in engineering and business with utility, government and consulting experience in the technical, economic, and regulatory aspects of utility systems. Dr. Bacalao core competencies are in the area of Transmission and Distribution, with recent year's emphasis in the integration of renewable generation.

Dr. Bacalao regularly provides consulting advice on short and long term Transmission and Distribution planning, integration of renewable generation, generation interconnections, due diligence evaluation and/or assessment of transmission and distribution utilities for banks, investors and utility management for more than 30 transmission and distribution companies in 11 countries. His assignments typically include one or more of the following tasks: (a) system studies including load flow, stability and reliability, (b) inventory and condition assessment of T&D assets, (c) estimation of production costs and impact of new generation (usually renewable) and/or new transmission facilities, (d) formulation of expansion options and selection of optimal Capital Expenditures (CapEx) plan, (e) estimation of operating and maintenance costs (OpEx), (f) Revenue estimation, evaluation of rate structure and assessment on return on investments, and (g) formulation of medium and long-term strategic plans.

Given the difficulty of transmission planning in deregulated electric sectors and the special intermittent nature of renewable generation, Dr. Bacalao has developed strong transmission planning experience under uncertainty. He has performed or supervised over 10 of these studies for systems including voltages up to 765 kV. In these studies Dr. Bacalao conducted or managed the system evaluations including the formulation of transmission expansion options, load flow and stability studies, and, most importantly, the risk evaluations to determine minimum "regret option" and hedging strategies to be followed by the interested parties.

Dr. Bacalao has managed or participated in feasibility evaluations and technical due diligence analyses of numerous electric generation projects including open and combined cycle plants, hydroelectric projects, wind turbine generation, photovoltaic and large diesel plants. These studies have included: (a) definition of optimal plant size, (b) system impact studies and feasibility (transmission interconnection definition), (c) estimation of capital expenditures and construction time, (d) definition of project financing strategy, (e) projection of fuel and non fuel costs, and (f) production of projected financial pro forma statements.

Dr. Bacalao has solid experience in regulation for the energy industry, with emphasis on grid codes reviews, transmission tariff formulation and periodic reviews. He has provided these types of services to regulators, investors and utilities in countries as diverse as the USA, Puerto Rico, Guyana, Mexico, Turkey, Malawi, Belize, Venezuela and South Africa.

- 2006 – Present Siemens PTI: Senior Manager Consulting: Network Services.
- 2005 TRC Management Solutions, Executive Consultant
- 1999 – 2004 Stone & Webster Management Consultants, Inc., Executive Consultant
- 1996 – 1999 Placer Dome, Inc., Business Analyst, Corporate Development Group

Experience

Siemens Power Technologies International (Siemens PTI) - Network Consulting

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- 1993 – 1996 CVG Electrificación del Caroní, Advisor to the Vice-President of Planning
- 1992 – 1993 Ingeniería Bucros, Partner and Manager of Special Projects
- 1991 – 1992 Venezuelan Investment Fund, Manager of National Investments
 - Privatization of the Power Sector (on leave from EDELCA)
- 1981 – 1991 CVG Electrificación del Caroní (EDELCA), Manager Special Studies Department
- 1986 – 1996 Simón Bolívar University (Caracas, Venezuela), Associate Professor

Dr. Bacalao's areas of expertise include:

- Transmission Planning
 - Load Forecasts
 - System Assessment (load flow and stability) and Reinforcements Determination (PSS®E)
 - Generation Interconnection Studies / System Interconnection Studies
 - Capital Expenditure Determinations
 - Operating Expenditures Evaluation
 - Uncertainty and Risk Considerations (Monte Carlo Evaluations / Trade Off Risk)
 - Financial and Economic Model Formulation
 - Black Start Studies
 - System reliability studies.
- Generation Planning
 - Generation Transmission Deliverability Studies
 - System Impact Studies
 - Capital and Operating Expenditures Estimation
 - Hydroelectric, WTG and PV Modeling.
 - Financial and Economic Modeling
 - Due Diligence Evaluations
- Production Costing
 - Hydro-Thermal Dispatch Forecasts
 - Estimation of renewable (intermittent PV & WTG) generation impacts on ancillary services as frequency regulation, load following and reserves.
- Distribution Planning
 - Asset Inventory and Distribution System Model Creation / Update
 - Area Based Load Forecast
 - Evaluation of Current and Forecasted System Conditions using PSS®SINCAL
 - Capital Expenditure Evaluations
 - Operating Expenditure Evaluations
 - Reliability Studies
 - "Smart Grids" Technology
 - Financial and Economic Modeling
 - Due Diligence Evaluations
- Power System Restructuring
 - Cost of Service Studies

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- Grid Code Reviews
- Transmission tariff formulation, including recovery of ancillary services costs.
- Regulatory Support

Education

- Advanced Managerial Program (PAG-VII) (one year MBA level program), Instituto de Estudios Superiores en Administración (IESA), Caracas, Venezuela, 1990
- PhD in Electrical Engineering, University of British Columbia, Vancouver, BC, Canada, 1987
- Master Engineering (Electrical), Rensselaer Polytechnic Institute, Troy, NY, 1980
- Electrical Engineer, Universidad Simón Bolívar, Caracas, Venezuela, 1979

Professional Memberships

Dr. Bacalao is a Member of the Institute of Electrical and Electronics Engineers (IEEE), and of the Colegio de Ingenieros de Venezuela.

Publications and Technical Papers

1. "Considerations on the use of HVDC for CREZ Transmission," 2009 Power System Conference & Exposition, Seattle Washington (Co-authors: R. Nadira, Wayne Galli, Michael Hudson)
2. "Measuring the Performance of Distribution Utilities - A Top-Down/Bottom-Up Approach," in *Proc. 2006 IEEE PES Latin American T&D C&E*, Caracas, Venezuela (co-authors: R. Nadira and N. Bacalao).
3. "Strategic Assessment of Supply Options in Power Systems with Significant Supply Uncertainty," in *Proc. Probabilistic Methods Applied to Power Systems (PMAPS-2004)*, September 12-16, 2004, Iowa State University, Ames, IA, pp. 867-872 (co-authors: R. Nadira, H. Fendt, C. Dortolina, and J. Di Bella).
4. "Supply Risk Analysis in Electricity Markets from the Perspective of a Large Customer," in *Proc. 2004 IEEE PES General Meeting*, Denver, CO, June 2004, pp. 180-185, vol. 1 (co-authors: H. Fendt, R. Nadira, C. Dortolina, and J. Di Bella).
5. "PCAP Program Adapted for Islanding Studies: Integrated Resource Planning in Developing Countries - A Novel Approach," presentation in panel session of IEEE PES General Meeting, Denver, 2004 (co-authors: C. Dortolina and M.P. De Arizón).
6. "Evaluation of Transmission Tariff Methods in Restructured Power Markets," in *Proc. IEEE 2003 PES General Meeting*, Toronto, ON, Canada, July 2003, vol. 2 (co-authors: R. Nadira, H.M. Merrill, and C. Dortolina).
7. "Evaluation and Design for Compact Transmission Lines," 4th Jornadas Hispano-Lusas, Oporto-Portugal, July 1995 (co-author: M.P. De Arizón).
8. "A Model for the Synchronous Machine using Frequency Response Measurements," IEEE, San Francisco, CA, 1994 (co-author: M.P. De Arizón).

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9. "Study for the Insulation Level Optimisation of 230 kV and 115 kV Substations," IEEE, Latincon 1992 (co-author: M.P. De Arizón).
10. "A New Methodology for the Optimisation of Insulation Levels in 230 kV and 115 kV Substations," CIGRE, Argentina, 1991 (co-author: M.P. De Arizón).
11. "Transient Stability Studies for the Venezuelan Bulk Transmission System Considering HVDC links," Erlac-Cigre Foz de Iguazu, Brazil, 1988 (co-authors: G. Pesse, J.M. Aller, M.P. De Arizón and A. Negrin).
12. "Optimal Tuning of Power System Stabilizers," IV Power System Congress, Puerto La Cruz, Venezuela, 1986.
13. "Fast Stability Simulations Based on Frequency Responses," IV Power System Congress, Puerto La Cruz, Venezuela, 1986.
14. "Modeling of an HVDC Link in a Load Flow and Stability Program," IV Power System Congress, Puerto La Cruz, Venezuela, 1986.



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Appendix A

REPRESENTATIVE CONSULTING ASSIGNMENTS

This appendix provides description of selected projects that Dr Bacalao has either directly conducted and/or directed.

The Appendix is separated by areas:

- Transmission Planning Studies
- Generation Planning and Evaluation Studies
- Distribution Planning & Assessment Studies.
- Studies for Specification and Tests for Transmission Equipment.
- Regulatory and Contract Reviews.

Transmission Planning Studies

- Renewable Integration Generation Study. Puerto Rico Electric Power Authority – This study determined the maximum amounts of renewable generation that could be safely and economically integrated in the island of Puerto Rico. The study evaluated the reliability of the system considering the performance during steady state, short term stability and long term dynamics. The study covered the impacts on the dispatch considering the characteristics of the Puerto Rico Generating fleet and determined possible levels of renewable curtailment at different penetration levels. Dr Bacalao was the manager of the study and lead technical consultant.
- Integrated Resource Plan (IRP) and Reliability Assessment. Puerto Rico Electric Power Authority (PREPA) – As a continuation of the study above; This study

produced an IRP for PREPA selecting the optimal generation expansion plan taking into consideration the need to integrate renewable generation and very importantly the location of the generation resources to maintain the reliability of the system. The study consisted in formulation of various expansion options and futures for those variables not under PREPAS control (e.g. demand growth, natural gas availability, etc) which then were evaluated using production cost models (PROMOD) and the critical dispatches verified with steady state, dynamic stability and long term dynamics simulations. Dr Bacalao was the manager of the study and lead transmission consultant.

- Oncor System Impact Studies – Oncor Electric Delivery, Inc. Dr. Bacalao has managed multiple system impact studies (SIS) for the interconnection of new generation to the ONCOR system. The studies include modify the base case to stress the area where the project is located, steady state contingency analysis with and without the project and stability analysis. As a result of the analysis system reinforcements are identified.
- FERC 754 – Oncor Electric Delivery, Inc. Dr. Bacalao managed a study mandated by FERC for the determination of critical substations in ONCOR system. The study first evaluated for each substation that met an importance criteria defined by voltage and number of lines, the impact in the stability of the system of losing the entire substation after a three phase short-circuit cleared remotely. The study looked at angular instability, the number of generators that would trip offline and undamped oscillations. Based on this study critical substation were identified for its protection to be enhanced to minimize the possibility of the need for a remote clearing of a fault. In addition the study evaluated the Critical Clearing Time for a single line to

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ground, again followed by losing the entire substation. Dr Bacalao was the manager of the study.

- PREPA –Renewable Generation Wheeling Study. PREPA the Utility serving the island of Puerto Rico will provide transmission wheeling service to renewable generation in the island. In this study the impact of the renewable generation intermittency in the operational costs was evaluated using PROMOD®IV and rates were formulated for the recovery of various costs including load following, frequency regulation and reserve. The study also proposed various wheeling rates structures which were simulated in detail with the help of PSS®E and used for the selection of the optimal structure for the island. As part of this work Dr. Bacalao participated in the drafting all associated regulations including modifications for the Grid Code to account of interconnection of third parties (renewable intermittent generation) and produced the wheeling regulations as well as all tariff schedules.
- CREZ Transmission Optimization Study. This project evaluated the options for delivering approximately 18,000 MW of wind turbine generation (WTG) in the plains of West Texas to the load. The study covered multiple alternatives including HVDC, 345 kV, 500 kV and 765 kV as well as series compensation. Dr. Bacalao advised Lone Star Transmission (NextEra group company) on the benefits and risks of the alternatives advanced by that company and other stakeholders using Trade-Off Risk methods and production costing (PROMOD®IV) to evaluate impact.
- CREZ: Reactive Optimization Study. This study selected the optimal reactive compensation for the recommended CREZ system (see above) and fine-tuned the system design for construction. The study was conducted by ERCOT with the participation of the Transmission Owners and Dr Bacalao represented Lone Star Transmission during the study, including review of results and the evaluation of impacts to Lone Star's 345 kV lines and recommendations of options that the

client could take to address the identified system impacts.

- Plains & Eastern – Grain Belt Express Study. These are two very large HVDC links developed by Clean Line Transmission to deliver 3,800 MW of Wind Turbine Generation (WTG) each to the load from the SPP region (OK & KA) to the TVA system and to AEP in PJM. The study objective was to evaluate the steady state and dynamic stability impacts on SPP system as part of the “wires to wires” interconnection procedure. As the project has no impact during normal conditions (N-0) new methods had to be developed to give assurances to the SPP members that all impacts had been accounted,
- Risk analysis of the transmission interconnection between the central and southern regions in Peru. The scope of the work included: (1) determination of the maximum capacity of the corresponding link, (2) technical and cost analysis of feasible technologies available to solve the congestion constraint on the link, and (3) trade-off risk analysis for the feasible options (including analysis of scenarios, for different combinations of plans, uncertainties and attributes).
- Amaila Falls Interconnection Study. 2011 Guyana Power and Light (GPL). This study evaluated the interconnection of a large hydroelectric plant (Amaila Falls) to the Guyana Power System. The study included steady state impacts, short circuit and stability as well as the definition of reinforcements in the medium and long term.
- Technical Assistance for the Bini à Warak Power Plant, Cameroon— for Ministry of Energy and Water Resources (MINEE), Cameroon. Financial and technical advisory assistance for the development of a 75MW hydroelectric power plant at Bini à Warak (the Project). The study included the formulation of various transmission options in order to increase the deliverability to markets and minimize the possibility of spilling energy while balancing the capital investments. An approximate energy dispatch was conducted

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as part of this evaluation.

- Belize Electricity Limited Transmission Planning and Reliability Study, Belize— for Belize Electricity Limited (BEL). Reliability assessment of current Belize system and alternatives considering reinforcements, in order to improve overall system reliability and reduce impact of outages in key reliability indices (SAIDI, SAIDI, CAIDI) and energy not served tracked by the Regulator. Alternatives were selected by balancing the cost of energy not served versus the carrying value of the candidate investments.
- Medium and long term transmission planning of UETCL transmission system for the interconnection of the 250 MW Bujagali Hydroelectric project. Load flow, stability and short-circuit studies were conducted as well as detailed economic and risk assessment of options.
- Nicaragua – Polaris. System Impact study for the San Jacinto Geothermal plant in Nicaragua. The study included load flow, short circuit and stability considering the entire Central American interconnection.
- MERAM – Development of Short Medium term distribution expansion plan for the MERAM region in Turkey
- Evaluation of modifications of the transmission system serving the Sacramento and Yolo Counties in California to determine ways to move several substations from one control area to another and achieve physical separation at the 115 kV level.
- Studies in support of the development of the Loring Cogeneration Project in Northern Main. These studies included evaluation of reliability benefits to the transmission system, economic analysis and help in the preparation of presentations to the Public Utilities Commission.
- System impact study for 6 large Combined Cycle plants for several investors. Evaluation of the power deliverability of several sites in different NERC regions in the US and support during discussions with the host transmission companies.
- Due Diligence analysis of a large generation portfolio in the Southeast United States. Power deliverability of 9 plants to selected markets. Review of interconnection contracts and two PPA's with cities.
- Evaluation of interconnection options between EdeC (serving the city of Caracas), and EDELCA, a large hydroelectric producer. Load flow, short circuit and stability), as well as carrying out "top down" pricing analysis for the economic evaluation of the postulated interconnection options.
- Feasibility study of a 400 kV substation ("La Canoa".) Technical and economic feasibility studies were carried out to select both the optimal substation layout and its operating voltage (400 kV or 230 kV).
- Transmission expansion study of a 115 kV network (in Venezuela). By means of load flow and short circuit simulations, the project recommended the construction of a new 400/115 kV substation. In addition, preliminary substation specifications were prepared for the purpose of estimating its likely cost.
- Technical and economic feasibility studies of a major interconnection project between Venezuela and Brazil. This included voltage and technology selection (HVAC-400 kV vs. HVDC \pm 500 kV), preliminary route selection, preliminary line design, cost evaluation and economic selection of the best alternative.
- Selection of the best alternative (765 kV, 400 kV or 230 kV) for the reinforcement of the transmission system between the central and the western regions of the Venezuelan power system.

Generation Planning & Evaluation Studies.

- Technical assessment of the Shiroro (600 MW) hydroelectric plant and Egbin (1,230 MW) thermal power plants in Nigeria. Both plants were inspected and evaluated. Their condition in terms of performance and reliability was assessed and the required investments to bring the plants to acceptable

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operating conditions were determined. An O&M and capital expenditure budget was produced for the economic evaluation of the plants. Also for Shiroro the hydrological conditions at the plant's site were evaluated and the expected ranges of future production determined.

- Development of a Cogeneration Gas Fired Project. This was a long term effort to develop a Cogeneration project in Northern Maine. Major contributions to the effort included the production of project profiles and analysis for several clients, an analysis of the regulatory situation and drafting of proposals, maintenance of the financial model and production of a minimum regret study to show the advantages of the project.
- Evaluation of 4 Combined Cycle projects under construction in Arizona, New York, Michigan and Massachusetts. Evaluation of market conditions and financial costs to evaluate their feasibility over the long term.
- Puerto Quetzal Power Project (Guatemala). Technical review and assessment of a new barge mounted generation plant (124 MW) consisting of 7 internal combustion engines as well of the existing two barges (2 x 55 MW). The scope of services included a review and assessment of the project design and engineering, contracts and agreements, testing requirements, permits and environmental considerations, expected revenue under the PPA and merchant sales, operating costs projection, capital expenditures and economic projections (pro forma). The study included extensive sensitivity valuations including the formulation of possible market scenarios for the "merchant" part of the project.
- Repowering of the Metlac Hydroelectric plant. This plant was nearing the end its commercial life and in this project based on a detailed investigation of the hydrological potential at the site various opportunities for repowering were investigated. These opportunities ranged from major changes to the catchment structures and completely replacing the power house to repairing the existing units and resolving existing

bottlenecks that prevented the optimal use of the plant.

- Independent technical audit report on Eletrobolt project (Brazil). In this study the capital, O&M, schedule and pro-forma financial were reviewed.
- Evaluation of the financial feasibility of the Tocomá hydroelectric project in Venezuela. This task included assessing of the risks of a 1200 MW project from a private investor perspective. The overall objective was to assess the project's bankability.
- Independent economic evaluation of the Uribante Caparo hydroelectric complex (Venezuela) the economic merits of the continued investment in the project were reviewed assessing the expected return as well as the risks associated with the postponement.

Distribution Planning & Assessment Studies.

- Formulation of the 5 year and long term distribution master plan for KCETAS the distribution company servicing the city of Kayseri in Turkey providing service to over 550,000 customers and a peak demand of 320 MW. This 2 years project included all elements of planning; spatial load forecasting, creation of geographical accurate (GIS) models for the network, evaluation of short / medium and long term impacts, near-optimal location of new substations, formulation of feeders reinforcements or addition, formulation of loss reduction investment and selection of reactive compensation. The plan was used for both system expansion guide and tariff formulation.
- Formulation a long term capital and operating expenditures forecast for three large distribution companies in Turkey. A 30 years forecast was produced using hybrid (bottom up – top down) approach for Ayedaz, Sedas and Baskent distribution companies serving over 6 million customers in total. This plan was used as part of an investment decision during the privatization.
- SSJID Distribution Function Study. This multi-year study (2004 to present) consists in

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the evaluation and formulation of a detailed plan for SSJID to provide retail electric distribution service to the cities of Manteca, Ripon and Escalon in California. The project initiated with the assessment of system condition, creation of a network model and the formulation of a basic plan for the provision of the service separated from the incumbent utility as well as the capital expenditure forecast. Over the years this initial plan has been refined as SSJID nears the moment leading to the take over of service. The impact on the key reliability indices of energy not served, SAIDI and SAIFI were evaluated prior and post separation.

- Feasibility of the Annexation of the Distribution system serving the cities of Woodland, West Sacramento and Davis. Assessment of system condition and Formulation of long term operating and capital expenditure forecast. Similar project as the SSJID project above.
- Independent Technical review of the asset condition, operating and capital expenditures of the National Distribution Company in Uganda (UETCL). Formulation of independent forecasts. This project was done in behalf of an investor that eventually took operation and it was followed by the review of performance and investment plants at the first anniversary of the take over in support of investments decision. The analysis was largely top-down but it was supported by punctual bottom-up verifications.
- Independent technical audit report for the privatization of Turkey Authorization Area 22. Review of capital and operating expenditure forecast.
- Short term and medium term (3-5 year) expansion plans for the distribution system of the City of Kabul in Afghanistan. A detailed load flow model of the medium voltage system was created based on field information and load estimations. A prioritized list of system upgrades and costs was made. The impact on the 110 kV network of the incorporation the new load was performed.
- Independent technical audit report for the privatization of Sakarya-Bolu (Turkey Authorization Area 12). Review of capital and operating expenditure forecast.
- Belize Electricity Limited (BEL) Distribution Planning Study. This work included the following: (1) preparation of a load forecast at the distribution level, (2) development of an immediate to short term distribution plan that identifies a prioritized list of system upgrades and investments that are necessary to reduce technical losses to economic values, (3) analysis and recommendations for optimal sizes transformers, (4) recommendations about required reactive compensation, (5) definition of the need for distribution substations in the main load center and preparation of the guidelines to assist BEL in the decision process for the installation of future distributions substations.
- Independent Review of Interconexión Eléctrica S.A. (ISA)'s 500 kV Expansion Project (293.3 km of single-circuit 500-kV transmission lines plus two new substations, Primavera and Bacatá).
- Independent Technical review of the distribution and generation assets of ENEL (Nicaragua). Review of asset condition and formulation of capital and operating expenditure forecast. Also in the case of distribution the assessment included quality of service and electric losses.
- Independent Technical review of the asset condition, operating and capital expenditures of CEMAR (Brazil), ELFEC (Bolivia), Empresas Emel (Chile) and DELSUR (El Salvador). Formulation of independent forecasts.
- Independent Technical review of DEORSA & DEOCSA (Guatemala) Capital Expenditure Plan.
- Independent engineering review of Eastern Electricity (UK). Review and assessment of: condition of assets, technical and commercial performance, operations and maintenance practices, system expansion plans, and historical and projected capital and O&M expenditures.

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- Auditing of the 1999 actual capital expenditures of PG&E in company's distribution system. Review of capital and operating expenditure forecast. Also a benchmarking study of PG&E distribution business as a whole was performed using a peer group of 25 large utilities.
- Independent Technical Review of PG&E Quality of Service. A review of PG&E's reliability and response during emergencies was conducted and metrics to assess performance were produced.

Studies for specification and tests of transmission equipment.

- Insulation Coordination for the CREZ 345 kV Lone Star Lines. This study included the determination of line parameters under various proposed designs and then the evaluation of expected Transient Recovery Voltages (TRV) at the substation breakers and electromagnetic switching transients in 345 KV lines associated with the CREZ project. The study recommended breaker ratings, size and location of arresters and minimum line insulation levels.
- Electrical design of the third 400 kV line between Guri and El Tigre substations in Venezuela. The design included insulator selection, right of way selection, insulator string selection, tower window design (minimum distance to mass), and shield wire positioning.
- Selection of the electrical characteristics of the third 765 kV line in Venezuela. This study included the selection of the insulator string by means of insulation coordination studies, shield wire positioning to improve lightning protection on mountainous terrain.
- Expansion study for the Santa Teresa 400 kV substation in Venezuela. This study produced the preliminary specifications for the expansion, including the recommended solution to several physical problems produced by the crowding of the land around the substation.
- Technical assessment and field tests of the distribution network of a large alumina plant in Venezuela.
- Evaluation of the feasibility of performing single-phase re-closing in the Venezuelan 400 and 765 kV systems, and selection of neutral reactor compensation to ensure secondary arc extinction.
- Transient overvoltage evaluation of the 765 kV lines. The pre-insertion resistors were selected to minimize switching overvoltages.
- Insulation coordination of 230 kV and 115 kV substations. This work reviewed for all the substation layouts standardized by the client utility, the likely transformer over-voltages and the ability to reduce its BIL by the combined use of line and transformer arresters.
- Evaluation of recurrent faults due to early insulation aging of the capacitive voltage transformers at the San Geronimo 400 kV substation in Venezuela.
- Investigation of the faults that lead to the destruction of the 765 kV transformers number 14, 16 and 19 at Guri in Venezuela.
- Investigation of the 1992 Venezuelan system blackout. Evaluation of incidents leading to the event and recovery actions. This work detected several areas and practices that needed improvement as well as the main cause of the collapse.
- Commissioning field tests for the PK8 765 kV line breakers, 765 kV transformers and 765 kV reactors. These tests included modeling of the expected response (over-voltages) and direct measurement of the transients upon switching.
- Field tests of the 765 kV Static VAR Compensators (SVCs) in the Venezuelan interconnected network.
- Review of the specifications for 765 kV transformers. This work lead to the creation of a new test protocols.
- Tuning of the Guri Hydroelectric Plant (10,000 MW) power stabilizers to improve the damping of power oscillations in the

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Venezuelan interconnected network.

Representative Regulatory and Contract Review Experience:

- Dr. Bacalao was the manager of the Guyana Power and Light grid code development that consisted in the development of the following main documents; (1) the Planning Code that defines the criteria and procedures employed by GPL in evaluating the need for transmission system to maintain reliability and is necessary that all stakeholders observe and subscribe to as minimum requirements, (2) the Interconnection Code that defines the requirements and processes that any Independent Power Producers (IPP) or GPL Generation Projects must comply with to interconnect new (or modified) generation to the GPL System, (3) the Operational Code that includes the criteria, procedures and information requirements necessary to execute the operational planning, the generation dispatch, (4) the Minimum Technical Requirements (MTRs) which must be complied with by any new generation facility that will interconnect to GPL's system to ensure that it contributes its fair share to the system reliability and secure operation, and (5) the Metering Code that defines the standards and conditions for all active and reactive power entering or exiting the transmission system and distribution systems to be metered using one or more metering systems.
- Dr Bacalao participated in the development of Siemens a draft distribution code which specified the general conditions under which the distribution licensees (or concessionaires) in Turkey were to design, operate and maintain their electricity distribution systems. The purpose of the distribution code was to establish uniform technical standards and procedures for the planning, operation and maintenance of the distribution system.
- Dr Bacalao provided independent consultant services for auditing and validating WMECO Electric's Service Quality Performance for the categories of System Average Interruption Duration Index ("SAIDI") and System Average Interruption Frequency Index ("SAIFI") for the calendar year 2006.
- Regulatory and market review of the Turkish Electric Sector for an interested investor. This review included the new tariff formulation rules, quality of service regulation, electricity market regulation, electricity laws and current and forecasted conditions in the wholesale market.
- Formulation of Electricity tariffs for the Belize Electricity Company (BEL). This formulation included generation, transmission and distribution tariffs. A long term generation and transmission plan for BEL was produced.
- Restructuring of the Electric Sector Regulation (Cost & Tariff Study), FUDELEC Venezuela. This project created the guidelines and the procedures for the implementation of the Venezuelan Electricity Law including the design of the wholesale market rules, formulation of electricity tariffs for transmission and distribution as well as the transition regime.
- Strengthening of the Regulatory Function for the National Electricity Council (Malawi). This project had 3 main technical deliverables: (i) Tariff formulation guidelines for Generation Transmission and Distribution, (ii) Quality of Service Standards for Transmission and Distribution and (iii) an Integrated Resource Planning Model (IRP).
- ESKOM Transmission OpEx and CapEx review. Extensive benchmarking was conducted for assessing the costs and practices and we performed a partial bottom up calculation by defining an ideal organization.
- Mayakán and PEMEX Gas 5th year Tariff Review. We reviewed the adequacy and reasonableness of the costs incurred in the first 5-year term (capital and operating) and the projected costs for the next 5-years as well as proposed an efficiency factor X for adjustment in the RPI-X formula.
- Loma de Níquel Smelter Electricity Tariff formulation and negotiation. Formulation and

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Siemens Power Technologies

negotiation of the electric tariff for a nickel project, using a profit sharing design.

- Venezuelan Interconnection Agreement. Formulation and negotiation of capacity obligation rules for the generation and transmission pool in Venezuela.
- Restructuring Plan for the Venezuelan Electric Sector. An overall strategy for the restructuring and privatization of the Venezuelan Electric Sector was developed.
- Turkey Distribution Code. Preparation of a draft distribution code that specifies the general requirements for the distribution licensees for designing, operating and maintaining their electricity distribution systems.

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Siemens Power Technologies International



GOVERNMENT OF PUERTO RICO

Puerto Rico Electric Power Authority

Governing Board

RESOLUTION 4676

**To approve the IRP's Action Plan and authorize the CEO to file said IRP before
the Puerto Rico Energy Bureau**

WHEREAS: The Puerto Rico Electric Power Authority (PREPA) is a public corporation and an instrumentality of the Government of Puerto Rico created by Act No. 83 of May 2, 1941, as amended (Act No. 83). PREPA was created to provide electrical energy in a reliable way contributing to the general welfare and sustainable future of the people of Puerto Rico, maximizing benefits and minimizing social, environmental and economic impacts. In addition, it provides a service based on affordable, fair, reasonable and non-discriminatory cost that is consistent with environmental protection, non-profit, focused on citizen participation and its clients.

WHEREAS: On March 18, 2014, PREPA's Governing Board approved Resolution No. 4129, ordering the commencement of the development of a critical path for the improvement of PREPA's future taking into consideration, but not limited to, the following aspects: its current and future economic situation; its existing generation, transmission, and distribution infrastructure; the electrical industry's transformation, and the development of renewable energy and other technologies; new ways to operate and design electrical grids; the costs, risks and volatility of the energy supply resources and the economic dispatch of resources; the risks to clients; local and federal environmental regulations already in place and those about to be approved; the Government's public policy regarding preference of resources, and the economic growth of Puerto Rico.

WHEREAS: Also, on March 27, 2014, PREPA's Governing Board approved Resolution No 4132 for PREPA to begin the modernization of generation units and development of new units, through the development of projects aimed at achieving a safe and reliable system, as well as a financial structure that benefits clients, while complying with environmental regulations.



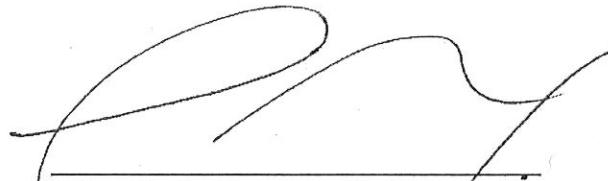
- WHEREAS: Act No. 57 of May 27, 2014, as amended (Act No. 57), known as the "Puerto Rico Energy Transformation and Relief Act", ordered PREPA to prepare an Integrated Resource Plan (IRP), which requires a detailed planning process with ample citizen participation, while considering all the reasonable resources necessary to supply the demand for electric service during a 20-year period. Act No. 57 establishes the minimum requirements with which said IRP must comply.
- WHEREAS: As stated in Act No. 57, PREPA is required to periodically update the IRP to show current and future system conditions. In the aftermath of Hurricanes Irma and María, PREPA's situation under PROMESA Title III proceedings, and the announcement by the Governor of the privatization of PREPA's generation fleet and the concession of the Transmission and Distribution areas, an update of the IRP has become a necessity. This was discussed and coordinated with the Governing Board's Infrastructure Committee on February 21, 2018.
- WHEREAS: New technologies, such as storage and microgrids, along with increased renewables, must be integrated along with the design of PREPA's Fiscal Plan under PROMESA, which requires an updated IRP.
- WHEREAS: On April 27, 2018, through Resolution No. 4606, the Governing Board authorized PREPA's Chief Executive Officer to execute a Contract with Siemens Industry, Inc., for the development of the updated IRP.
- WHEREAS: After significant stakeholder engagement from a diverse group of participants, including federal and local government regulators, environmental groups, industry groups, power producers, the Puerto Rico Energy Bureau (PREB) and the Fiscal Oversight Management Board, Siemens has delivered the finalized and updated IRP.
- WHEREAS: The IRP provides a road map for PREPA's development into the next 20 years. It also contains a five-year Action Plan, in Chapter 10 of the Report, scoping out system improvements that will bring greater resiliency, compliance with environmental law and regulations, and greater fuel diversification, in accordance with the strategic vision established by the Governing Board.

WHEREAS: According to Act No. 57, the Chief Executive Officer shall file PREPA's IRP before the Puerto Rico Energy Board for its consideration and approval.

THEREFORE: In compliance with Act No. 83, supra, PREPA's Governing Board determines to:

1. Approve the IRP's Action Plan, as indicated in Chapter 10, as it complies with PREPA's vision for a more resilient, reliable, and economic electrical system.
2. Authorize the Chief Executive Officer to file the IRP before the Puerto Rico Energy Bureau, in accordance with the CEPR-AP-2018-0001 Order.

Approved in San Juan, Puerto Rico, on the eleventh day of February two thousand nineteen.



Eduardo Arosemena-Muñoz
Secretary of the Board