



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

SIEMENS

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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.

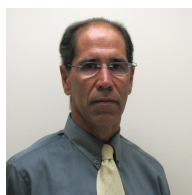
Publications and Technical Papers

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

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

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

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 KCETAŞ 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 Ayedás, 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

- 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 loses.
 - 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

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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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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