

Gustavo Valverde

POWER SYSTEMS · SMART GRIDS · STABILITY AND CONTROL · RENEWABLE ENERGY · DISTRIBUTED ENERGY RESOURCES

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Education

University of Costa Rica

San José, Costa Rica

MASTER OF BUSINESS ADMINISTRATION (FINANCES)

Jan. 2019 - Oct. 2021

- Graduate School of Business Administration.
- Finance, MBA program.
- Dissertation: Risk Budgeting for the Investment Portfolio of the Central Bank of Costa Rica.
- Supervisor: Adj. Prof. Mario Ramos.

University of Manchester

Manchester, UK

PH.D. IN ELECTRICAL POWER SYSTEMS

Oct. 2008 - Mar. 2012

- School of Electrical and Electronic Engineering
- PH.D. Thesis: Uncertainty and State Estimation of Power Systems
- Supervisor: Prof. Vladimir Terzija
- Sponsored by EPSRC and University of Costa Rica

University of Manchester

Manchester, UK

M.Sc. IN ELECTRICAL POWER ENGINEERING (AWARDED WITH DISTINCTION)

Sept. 2007 - Sept. 2008

- School of Electrical and Electronic Engineering
- M.Sc. Dissertation: Quasi Steady State Dynamic Simulator
- Supervisor: Prof. Francois Bouffard
- Sponsored by University of Costa Rica

University of Costa Rica

San José, Costa Rica

B.S. IN ELECTRICAL ENGINEERING

Mar. 2001 - Apr. 2006

- School of Electrical Engineering
- Major in Electrical Energy and Power Systems
- Supervisor: Prof. Eddie Araya

Employment

Swiss Federal Institute of Technology, ETH Zürich

Zürich, Switzerland

SENIOR SCIENTIST AND LECTURER

Jun. 2023 - present

- Research activities on direct control of electric vehicles, heat pumps, and electric water heaters. Formulation and coding of a) an MIQP optimization to centrally control the flexible loads of 50 houses and b) a price-based MILP optimization of the EV's charging times.
- Lecturer for the Master's degree programme in Energy Science and Technology, and Electrical Engineering and Information Technology. My courses are Power System Analysis, co-taught with Prof. G. Hug (Autumn Semester, 2023) and Power System Dynamics and Control, as sole lecturer (Spring Semester, 2024).

University of Costa Rica

San José, Costa Rica

ASSOCIATE (2018-19) AND FULL PROFESSOR (2020-2023)

Jul. 2018 - May 2023

- Courses: Power System Modeling, Power System Analysis, Power Systems Stability and Control, Electric Machinery, Power Distribution, Integration of Renewable Energy and Energy Storage Systems.
- Research activities on power system modeling and simulation, smart grids, renewable energy integration, stability and control, distributed energy resources, coordination of T&D.
- Principal investigator of industrial projects funded by Governments, international banks and system operators.
- Coordinator of Power Quality Monitoring Campaign in Costa Rica (2018-2021).

Swiss Federal Institute of Technology, ETH Zürich

Zurich, Switzerland

POSTDOCTORAL RESEARCHER

Jul. 2017 - Jul. 2018

- Coordination of distributed energy resources to provide voltage support to transmission networks.
- Use of smart meter data for voltage control of LV systems.
- Research project partially funded by SCCER FURIES, and supervised by Prof. Gabriela Hug.

University of Costa Rica

San José, Costa Rica

INVITED (2013-15) AND ASSOCIATE PROFESSOR (2015-17)

Mar. 2013 - Jun. 2017

- Research activities on power system monitoring, voltage control and stability of T&D
- Development activities on open source software integration for distribution network analysis (OpenDSS, QGIS)
- Courses: Electrical Machines, Power Distribution.
- Head of the Power Systems Group (2016-2017)
- Coordinator of consultancy services and Continuing Education Courses (Nov. 2013-Jun. 2017)

Montefiore Institute at the University of Liege

Liege, Belgium

POSTDOCTORAL RESEARCHER

Mar. 2012 - Feb. 2013

- Corrective control of distribution networks with high penetration of distributed generation in a Smart Grid perspective
- Development of centralized voltage controllers inspired of Model Predictive Control theory
- Fortran programming of controllers, hydro and wind-driven generator models for RAMSES, a power system simulator developed at ULg
- Collaborative work to study impact of distribution network voltage control on transmission systems
- Research project funded by FNRS (Belgium) and supervised by Prof. Thierry Van Cutsem

University of Manchester

Manchester, UK

TEACHING ASSISTANT

Sep. 2009 - Dec. 2011

- Proposal of power system analysis courseworks for B.Sc. and M.Sc. students at UofM
- Lab. Assistant in Power System Modeling, Analysis and Protection M.Sc. modules

University of Costa Rica

San José, Costa Rica

INSTRUCTOR

Mar. 2006 - Jul. 2007

- Instructor on Electrical Machine Lab. Courses
- Training program for academic career

CNFL Power Utility

San José, Costa Rica

JUNIOR POWER ENGINEER, DATA ANALYSIS

Jan. 2006 - Apr. 2006

- Measurement campaign of CNFL customers' consumption patterns
- Analysis and characterization of customer demand profile
- Report writing on energy efficiency opportunities for utility customers

Editorial Work

IEEE Transactions on Power Systems

USA

ASSOCIATE EDITOR

2023 - present

- Editor-in-Chief: Jovica Milanovic, University of Manchester.

IEEE Transactions on Sustainable Energy

USA

ASSOCIATE EDITOR

2021 - present

- Editor-in-Chief: Badrul H. Chowdhury, University of North Carolina at Charlotte.

Journal of Modern Power Systems and Clean Energy

China

ASSOCIATE EDITOR

2019 - 2022

- Editor-in-Chief: Yusheng Xue, State Grid Electric Power Research Institute.

External activities

2023 **IEEE PES Chapter**, Treasurer

Switzerland

2022 **IEEE PES TF on BTM DER: Estimation, Uncertainty Quantification and Control**, Collaborator

International

2018 **IEEE PES TF on Voltage Control for Smart Grids**, Collaborator

International

2018 **External Examiner for PhD defenses in Cyprus, Chile and Switzerland**, Collaborator

International

Publications

Journal papers and book chapters

GOOGLE SCHOLAR CITATIONS: 3170, H-INDEX: 20, I-10 INDEX: 32.

- O. Pereira, M.J. Parajeles, B. Zuniga, J. Quiros and G. Valverde. Hosting Capacity Estimation of BTM Distributed Generation, accepted for publication in IEEE Transactions on Power Systems, Oct. 2023.
- A. Srivastava, J. Zhao, G. Valverde, et al. Behind-the-Meter Distributed Energy Resources: Estimation, Uncertainty Quantification, and Control, submitted to IEEE Transactions on Smart Grid, Sept. 2023.
- F. Escobar, J.Garcia, J. Viquez, P. Aristidou, and G. Valverde, Coordination of DER and Flexible Loads to Support Transmission Voltages in Emergency Conditions, in IEEE Transactions on Sustainable Energy. vol. 13, no. 3, pp: 1344 - 1355, Jul. 2022.
- O. Pereira, J. Quiros and G. Valverde, Phase Rebalancing of Distribution Circuits Dominated by Single-phase Loads, in IEEE Transactions on Power Systems, vol. 36, no. 6, pp. 5333-5344, Nov. 2021.
- S. Karagiannopoulos, G. Valverde, P. Aristidou and G. Hug. Clustering Data-driven Local Control Schemes in Active Distribution Grids, in IEEE Systems Journal, vol. 15, no. 1, pp. 1467-1476, Mar. 2021.
- F. Escobar, J. García, J. Viquez, G. Valverde and P. Aristidou. A Combined High-, Medium-, and Low-Voltage Test System for Stability Studies with DERs, in Electric Power System Research, vol. 189, p.106671, Dec. 2020.
- G. Valverde, et al. IEEE Power and Energy Society's Task Force: Review of Challenges and Research Opportunities for Voltage Control in Smart Grids, in IEEE Transactions on Power Systems, vol. 34, no. 4, pp. 2790 - 2801, Jul. 2019.
- G. Valverde, D. Shchetinin and Gabriela Hug. Coordination of Distributed Reactive Power Sources for Voltage Support of Transmission Networks, in IEEE Transactions on Sustainable Energy, vol. 10, no. 3, pp: 1544 - 1553, Jul. 2019.
- A. Guzman, A. Arguello, J. Quiros-Tortos and G. Valverde. Processing and Correction of Secondary System Models in GIS, in IEEE Transactions on Industrial Informatics, vol. 15, no. 6, pp: 3482 - 3491, Jun. 2019.
- G. Valverde, P. Aristidou and T. Van Cutsem, Chapter 13: "Enhancement of Transmission System Voltage Stability through Local Control of Distribution Networks" in Book: Dynamic Vulnerability Assessment and Intelligent Control of Sustainable Power Systems, 2018.
- H. Soleimani, G. Valverde, P. Aristidou, M. Glavic and T. Van Cutsem, Chapter 14: "Operation of Distribution Systems within Secure Limits using Real-time Model Predictive Control" in Book: Dynamic Vulnerability Assessment and Intelligent Control of Sustainable Power Systems, 2018.
- A. Arguello, J.D. Lara, J.D. Rojas and G. Valverde. Impact of Rooftop PV Integration in Distribution Systems Considering Socio-economic Factors, in IEEE Systems Journal, vol. 12, no. 4, pp: 3531 - 3542, Dec. 2018.
- Z Zhang, LF Ochoa and G. Valverde. A Novel Voltage Sensitivity Approach for the Decentralized Control of DG Plants, in IEEE Transactions on Power Systems, vol. 33, no. 2, pp: 1566 - 1576, Mar. 2018.
- G. Valverde, A. Arguello, R. Gonzalez and J. Quiros-Tortos. Integration of Open Source Software for Studying Large-Scale Distribution Networks, in IET Gen. Trans. and Dist., vol. 11, no. 12, pp: 3106 - 3114 Sep. 2017.
- J. Quiros-Tortos, G. Valverde, A. Arguello, L.F. Ochoa. Geoinformation is power: Using GIS to Assess Rooftop PV in Costa Rica, in IEEE Power & Energy Magazine, Issue on Distribution System Integration of Renewable Energy, Mar/Apr. 2017.
- P. Aristidou, G. Valverde and T. Van Cutsem. Contribution of Distribution Network Control to Voltage Stability: A Case Study, in IEEE Transactions on Smart Grid, vol. 8, no.1, pp: 106-116, Jan. 2017.
- G. Valverde and E. Araya. Long-term voltage stability assessment using Quasi-Steady State Simulation in Matlab, in Revista de Ciencia y Tecnología, vol. 30, no.1, pp: 24-40, 2014.
- E. Caro and G. Valverde, Impact of Transformer Correlations in State Estimation Using the Unscented Transformation, in IEEE Transactions on Power Systems, vol. 29, no.1, pp: 368-376, Jan. 2014.
- G. Valverde and Thierry Van Cutsem. Model predictive control of voltages in active distribution networks, in IEEE Transactions on Smart Grids, vol. 4, no. 4, pp: 2152-2161, Dec. 2013.
- G. Valverde, A. Saric and V. Terzija. Stochastic Monitoring of Distribution Networks Including Correlated Input Variables, in IEEE Transactions on Power Systems. vol. 28, no. 1, pp: 246-255, Feb. 2013.
- G. Valverde, A. Saric and V. Terzija. Probabilistic Load Flow with non-Gaussian Correlated Random Variables using Gaussian Mixture Models, in IET Generation, Transmission and Distribution. vol. 6, no. 7, pp: 701-709, Jul. 2012.
- G. Valverde, E. Kyriakides, G. Heydt and V. Terzija. Non-linear Estimation of Synchronous Machine Parameters using Operating Data, in IEEE Transactions on Energy Conversion, vol. 26, no.3, pp: 831-839. Sep. 2011.
- G. Valverde, S. Chakrabarti, E. Kyriakides and V. Terzija. A Constrained Formulation for Hybrid State Estimation, in IEEE Transactions on Power Systems, vol. 26, no. 3, pp: 1102-1109, Aug. 2011.
- V. Terzija, G. Valverde, D. Cai, P. Regulski, V. Madani, J. Fitch, S. Skok, M. Megovic and A. Phadke. Wide-Area Monitoring, Protection, and Control of Future Electric Power Networks, in Proceedings of the IEEE, vol. 99, no.1, pp. 80-93, Jan. 2011.
- G. Valverde and V. Terzija. Unscented kalman filter for power system dynamic state estimation, in IET Generation, Transmission and Distribution, vol. 5, no.1, pp: 29-37, Jan. 2011.
- G. Valverde y E. Araya. Inestabilidad Oscilatoria de Tensión Debido a los Motores de Inducción, en Revista Ingeniería, vol. 18, no.1, pp: 65-75, 2008.

Conference Publications

GOOGLE SCHOLAR CITATIONS: 3170, H-INDEX: 20, I-10 INDEX: 32.

- J. Sancho, F. Escobar, and G. Valverde "Revisiting the Tripping Logic of the DERA Model for Power System Stability Studies", submitted to *Power System Computational Conference (PSCC)*, Paris, France. 2024.
- F. Escobar, and G. Valverde "Predictive Control of TN-DN Boundary Bus Voltages with Long-Term Stability Constraints", in *IEEE Innovative Smart Grid Technologies (ISGT)*, Washington, USA. Jan., 2023.
- J. Sancho, F. Escobar, J. García, and G. Valverde "Comparison of Ride-Through Characteristics in Aggregate and Detailed Models of DERs", in *IEEE URUCON*, Uruguay. Nov., 2021.
- J. García, J. Viquez, F. Escobar, J. Íncer, G. Valverde and P. Aristidou "Disaggregated DER Modelling Framework for Ancillary Service Provision and Coordination", in *Hawaii International Conference on System Sciences (HICSS)*, USA. Jan., 2021.
- T. Zufferey, G. Hug and G. Valverde "Unsupervised Disaggregation of Water Heater Load from Smart Meter Data Processing", in *Mediterranean Conference on Power Generation, Transmission, Distribution and Energy Conversion*, Paphos, Cyprus, Nov., 2020.
- M.J. Parajeles, R. Ramírez and G. Valverde, "Use of Smart Inverters for Provision of Voltage Support to Medium and High Voltage Networks", in IEEE Global Power, Energy and Communication Conference, Izmir, Turkey, Oct., 2020.
- T. Zufferey, G. Hug and G. Valverde "Disaggregation of Cold Appliance Loads from Smart Meter Data Processing", in *IEEE Transmission and Distribution Conference and Exposition LA*, Montevideo, Uruguay. Oct., 2020.
- L. Vargas, J. Quirós and G. Valverde "Voltage Regulation of Active Distribution Networks Considering Dynamic Control Zones", in *IEEE Transmission and Distribution Conference and Exposition LA*, Montevideo, Uruguay. Oct., 2020.
- A. Arguello, and G. Valverde "Distribution Network Voltage Controller in Presence of Lost Voltage Measurements", in *IEEE Transmission and Distribution Conference and Exposition LA*, Montevideo, Uruguay. Oct., 2020.
- F. Escobar, J. García, J. Viquez, P. Aristidou and G. Valverde "A Combined High-, Medium-, and Low-Voltage Test System for Stability Studies", in *PSCC*, Porto, Portugal. Jun., 2020.
- A. Arguello, G. Gómez, J. Quirós-Tortós and G. Valverde "Distribution Network Element Model Parameters: Creation of Database", in *IEEE CONCAPAN*, San Salvador. Set., 2018.
- G. Valverde, T. Zufferey, S. Karagiannopoulos and G. Hug. Estimation of voltage sensitivities to power injections using smart meter data, in *IEEE ENERGYCON*, Cyprus, Jun., 2018.
- M.J. Parajeles, J. Quirós-Tortós and G. Valverde. Assessing the performance of smart inverters in large-scale distribution networks with PV systems, in *IEEE PES Innovative Smart Grid Technologies*, Quito, Ecuador, Set., 2017.
- D. Leiva, C. Araya, G. Valverde and J. Quirós-Tortós. Statistical Representation of Demand for GIS-based Load Profile Allocation in Distribution Networks, in *IEEE PowerTech*, Manchester, UK. Jun., 2017.
- A. Guzmán, J. Quirós-Tortós, and G. Valverde. Efficient Connectivity Identification of Large Scale Distribution Network Elements in GIS, in *IEEE PowerTech*, Manchester, UK. Jun., 2017.
- R. Gonzáles, A. Arguello, J. Quirós-Tortós and G. Valverde. Statistical Analysis of Residential Harmonic Spectrum in Costa Rica, in *IEEE CONCAPAN*, San José, Costa Rica. Nov., 2016.
- J. Quirós-Tortós, A. Arguello and G. Valverde. Statistical Analysis of Residential Demand Behaviour in Costa Rica: Creation of Load Profiles, in *IEEE CONCAPAN*, San José, Costa Rica. Nov., 2016.
- P. Quesada, A. Arguello, J. Quirós-Tortós and G. Valverde. Distribution Network Model Builder for OpenDSS in Open Source GIS Software, in *IEEE PES Transmission and Distribution Latin America*, Morelia. Sept., 2016.
- R. Gonzáles, A. Arguello, G. Valverde and J. Quirós-Tortós. OpenDSS based Distribution Network Analyzer in Open Source GIS Environment, in *IEEE PES Transmission and Distribution Latin America*, Morelia. Sept., 2016.
- A. Arguello and G. Valverde. Estimation of lost voltage measurements in distribution networks, in *North American Power Symposium*, Pullman WA, Sept. 2014.
- G. Valverde and J.J. Orozco. Reactive Power Limits in Distributed Generators from Generic Capability Curves, in *IEEE Power and Energy Society General Meeting*, Washington DC, Jul. 2014.
- G. Valverde and T. Van Cutsem. Control of dispersed generation to regulate distribution and support transmission voltages, in *IEEE PowerTech*, Grenoble, Jun. 2013.
- T. Van Cutsem and G. Valverde. Coordinated voltage control of distribution networks hosting dispersed generation, in *CIREN: 22nd International Conference on Electricity Distribution*, Stockholm, Jun. 2013.
- G. Valverde, J. Quirós-Tortós and V. Terzija. Comparison of Gaussian mixture reductions for probabilistic studies in power systems, in *IEEE Power and Energy Society General Meeting*, July 2012.
- G. Valverde, E. Kyriakides and V. Terzija, A Non-linear Approach for On-line Parameter Estimation of Synchronous Machines, in *Power Systems Computation Conference (PSCC)*, Stockholm, Sweden, paper no. 189, pp. 1-7, Aug. 2011.
- G. Valverde, E. Kyriakides, G. Heydt, and Terzija, V. On-Line Parameter Estimation of Saturated Synchronous Machines, in *IEEE Power and Energy Society General Meeting*. Detroit, USA, Jul. 2011.
- G. Valverde, A. Saric and V. Terzija. Iterative Load Re-allocation for Distribution State Estimation, in *IEEE PowerTech*, Trondheim, Jun. 2011.
- G. Valverde and V. Terzija. PMU-based multi-area state estimation with low data exchange, in *IEEE Conference on Innovative Smart Grid Technologies Europe*. Gothenburg, Sweden, Oct. 2010.
- V. Terzija, D. Cai, G. Valverde, P. Regulski, A. Vaccaro, M. Osborne and J. Fitch. Flexible wide area monitoring, protection and control applications in future power networks, in *10th International Conference on Developments in Power System Protection*, Manchester UK, Mar. 2010.
- G. Valverde, D. Cai, J. Fitch and V. Terzija. Enhanced state estimation with real-time updated network parameters using SMT, in *IEEE Power and Energy Society General Meeting*. Calgary, Canada, Jul. 2009.
- S. Chakrabarti, E. Kyriakides, G. Valverde and V. Terzija. State Estimation Including Synchronized Measurements, *IEEE PowerTech*. Bucarest, Rumania, Jun. 2009.

Honors & Awards

INTERNATIONAL AND LOCAL

2022	National Award of Technology 2022 , Costa Rican Ministry of Science and Technology	<i>Costa Rica</i>
2021	Outstanding Journal Reviewer , IEEE Transactions on Power Systems	<i>USA</i>
2021	Excellent Associate Editor Award , Modern Power Systems and Clean Energy	<i>China</i>
2020	Outstanding Paper Award , 2nd IEEE Global Power, Energy and Communication Conference	<i>Turkey</i>
2016	Outstanding Engineer Award , IEEE PES Chapter Costa Rica	<i>Costa Rica</i>
2014	Outstanding Journal Reviewer , IEEE Transactions on Power Systems	<i>USA</i>

Professional Affiliations

2017	IEEE Power and Energy Society , Senior Member	<i>International</i>
2008	IEEE Power and Energy Society , Member	<i>International</i>
2006	CFIA Costa Rica , Registered Electrical Engineer	<i>Local</i>

Research, teaching, and software

Research

POWER SYSTEMS, SMART GRIDS, AND RENEWABLE ENERGY INTEGRATION

- Control of large and small-scale renewable energy sources via aggregators or virtual plants.
- Data-driven control of power systems and data processing for power system planning and operation.
- Coordination of DERs with OLTCs, capacitor banks for DN voltage control
- Coordination of flexible loads and distributed energy resources (DERs) for voltage and frequency support of transmission network voltages.
- DER hosting capacity calculation in MV and LV circuits.
- Large-scale distribution network simulations from geographical information systems. Integration of open source software (QGIS+OpenDSS) for analysis of distribution networks. Identification and correction of errors in geographical information systems.
- Power system stability and control: voltage stability (short and long term analysis) and frequency stability.
- Monitoring and state estimation of transmission and distribution networks, parameter estimation of synchronous machine and transmission lines, WLS, Kalman filters, clustering analysis, distribution network load allocation
- Modeling and simulation of large-scale and small-scale PV systems, wind turbines, and energy storage systems.

Teaching at University of Costa Rica and ETH Zurich

UNDER, GRADUATE AND CONTINUING EDUCATION COURSES ON:

- Electric Machines: Magnetic circuits, transformers, steady state models of synchronous generators and motors, asynchronous generators and motors, DC machines.
- Power System Modeling: Overhead transmission lines and cables, line parameters, active and reactive power flows in transmission lines, short circuit currents in LR circuit, short circuit currents in synchronous machines, three-phase fault calculations, symmetrical components, unbalanced faults. Simulations in PSS/e.
- Power Distribution: Overhead and underground distribution lines, Carson equations, Kron reduction, three-phase and single-phase transformers, LTC, voltage regulators. Power flow calculation in radial distribution circuits, Volt-VAR control. Use of GIS data to build distribution circuit models. Simulations in OpenDSS.
- Power System Analysis: Power flows, economic dispatch, OPF, SCOPF, voltage and frequency control, AVRs, governors, model of synchronous machines in dynamic studies, small-signal and transient stability. Simulations in PSS/e and RAMSES. Use of Xpress and Gurobi (in Python) for optimization problem solving.
- Integration of Renewable Energy Systems: Introduction to technologies, PV systems, wind turbines, batteries, power electronics (PWM, PLL, p-q Theory, Park and Clarke transformations, control loops), models of renewable energy in power system dynamic studies, integration of renewables to power grids, DER integration, flexible loads and aggregators.
- Power System Dynamics, Stability and Control. Models of transmission lines, transformers, induction motors, synchronous machines, excitation and turbine controllers. Small signal stability, transient stability, voltage stability and frequency stability. Use of PSS/e for simulations and Python scripting. This course is only offered for Continuing Education.

Power System Software

TOOLS:

- PSS/e, PowerWorld, IPSA Power, ETAP, OpenDSS, ARTERE, RAMSES, Matlab/SIMULINK, MatPower, PowerSystems.jl and PowerSimulationsDynamics.jl.

Other Software Packages and Tools

EXPERIENCE:

- Optimization tools: HSL Fortran Packages, Matlab Optimization Toolbox, TOMLAB, Gurobi, Xpress, CPLEX, Pyomo.
- QGIS (+Python), AutoCAD, CorelDRAW, Microsoft Visio, Inkscape, \LaTeX , Microsoft Office, OpenOffice, Overleaf

Programming Languages

EXPERIENCE WITH:

- Python, Fortran, Matlab, Julia, Matlab, C (basic).
- Willingness to learn and use other languages

Research and Consultancy Projects

Settings of Synchrochecks for the Costa Rican Power System

San Jose, Costa Rica

PRINCIPAL INVESTIGATOR

Aug. 2022 - Feb. 2023

- Funded by ICE, the Transmission System Operator of Costa Rica
- Definition of maximum acceptable standing angle in opened transmission lines
- Proposal of methodology in Python compatible with the PSS/e software
- Simulation of the central american power system model

Energy Storage Systems to Improve the Resiliency of Distribution Networks

San Jose, Costa Rica

PRINCIPAL INVESTIGATOR

Apr. 2022 - Sept. 2022

- Funded by InterAmerican Bank of Development
- Analysis of BESS applications for Costa Rican distribution networks
- Financial assessment of BESS in distribution networks
- Simulation of BESS in a large-scale distribution network

Strategies for Energy Loss Reduction in Power Utilities

San Jose, Costa Rica

PRINCIPAL CONSULTANT

Jul. 2021 - Nov. 2021

- Funded by Costa Rican Ministry of Energy and Environment
- Diagnosis of technical and non-technical energy losses in Costa Rican power utilities.
- Development of strategies for energy loss reduction in power distribution networks.
- Proposal of standardized power loss estimation for all the power utilities in Costa Rica.

Location of Fast EV Stations in Honduras

Tegucigalpa, Honduras

PRINCIPAL INVESTIGATOR

Jan. 2021 - June. 2021

- Funded by German Technical Cooperation GIZ
- Proposal of optimal locations of EV stations in Honduras.
- GIS-based analysis of MV circuits, motorways and main cities.
- Impact of EVs in Distribution Circuits.

Power Quality Monitoring Campaign

San José, Costa Rica

PRINCIPAL INVESTIGATOR

Aug. 2018 - Dic. 2020

- Funded by Regulatory Agency of Public Services.
- Nation-wide Power Quality Campaign
- Monitoring of 3000 service points including single-phase and three-phase services
- Calculation of power quality indices and reports for the Regulatory Agency of Public Services

Estimation of DER Hosting Capacity

San José, Costa Rica

PRINCIPAL INVESTIGATOR

Jul. 2020 - Dec. 2020

- Funded by Costa Rican Institute of Electricity
- Estimation of DER hosting capacity of Costa Rican distribution circuits
- In coordination with eight DSOs and the TSO
- Software development (Python+QGIS+OpenDSS) for use of local power utilities
- Analysis of Medium (MV) and Low Voltage (LV) systems
- Clustering of Distribution Feeders of Costa Rica

Smart Grid Roadmap for Costa Rica

PRINCIPAL INVESTIGATOR

- Funded by World Bank Group
- Diagnosis of Smart Grids Advances and Barriers in Costa Rica.
- Proposal of Smart Grid Roadmap for 2021-2031.

San José, Costa Rica

May. 2020 - Apr. 2021

Impact of Electric Vehicles in Distribution Feeders

RESEARCH ASSOCIATE

- Funded by German Technical Cooperation GIZ and Costa Rican Ministry of Energy and Environment
- Software development (Python+QGIS+OpenDSS) for use of local power utilities
- Impact of EVs in MV and LV circuits
- TCO assessment to compare electric vehicles and conventional vehicles.

San José, Costa Rica

Jul. 2019 - Feb. 2020

Continuing Professional Education

INTERNATIONAL INSTRUCTOR

- Course 1: Stability and Control of Modern Power Systems
- Course 2: Power System Analysis
- Course 3: Modeling, Simulation and Analysis of Distribution Systems
- Course 4: Integration of Renewable Generation and Energy Storage

Latin America

Jan. 2019 - Jul. 2021

Impact of Behind-the-meter Distributed Generation in Distribution Feeders

PRINCIPAL INVESTIGATOR

- Funded by World Bank Group
- Impact evaluation of small scale DG in MV and LV circuits
- Software development (Python+QGIS+OpenDSS) for use of local power utilities

San José, Costa Rica

Jan. 2017 - Jul. 2017

Insertion of Electric Vehicles and Integration with Distributed Generation and Energy Storage Systems

ASSOCIATE INVESTIGATOR

- Funded by GIZ Costa Rica
- Model to predict EV adoption from 2018 to 2032
- Analysis of promotion of EV technology and impact on national adoption

San José, Costa Rica

Jan. 2017 - Jul. 2017

Performance Indicators for Assessing Distribution Networks and Power Plants

PRINCIPAL CONSULTANT

- Consultancy work in collaboration with two associate researchers for the Ministry of Environment and Energy.
- Review and assessment of international performance indicators
- Proposal of a list of performance indicators applicable for Costa Rican DNs and power plants
- Identification and cost estimation of non-available information required to apply the proposed indicators

San José, Costa Rica

Aug. 2016 - Nov. 2016

BAC Solar - Rooftop PV Feasibility Project Calculator - Web Application

PRINCIPAL CONSULTANT

- Consultancy work in collaboration with three programmers to develop a web application for BAC San José Bank
- Project funded by The Costa Rica-USA Foundation for Cooperation in collaboration with The Energy Sector Direction
- Estimation of rooftop PV production based on SolarGIS irradiance database for Costa Rica and PV Watt model from NREL
- Java programming of PV production estimator and financial calculator (ROR, NPV, Payback period)
- Technical support to web application designers
- Testing and validation of web application

San José, Costa Rica

Jun. 2016 - Aug. 2016

Technical and Financial Assessment of Distributed Generation in CNFL

PRINCIPAL INVESTIGATOR

- Funded by The Costa Rica-USA Foundation for Cooperation
- Work in collaboration with six research associates for the Ministry of Environment and Energy
- Identification of DG technologies more appropriate for concession area of CNFL
- Estimation of CNFL customers with opportunity to install rooftop PV systems
- Financial impact assessment of rooftop PV on CNFL due to reduced energy sales
- Impact assessment of high PV penetration in MV and LV circuits using GIS data and OpenDSS

San José, Costa Rica

Apr. 2015 - Nov.2015

Emendation of National Technical Standards

San José, Costa Rica

ASSOCIATE ENGINEERING CONSULTANT

Oct. 2014 - Mar. 2015

- Consultancy work in collaboration with three engineers for the Regulatory Agency of Public Services
- Adaptation and emendation of the Power Quality National Standard based on ANSI and IEEE Standards
- Emendation of the National Standard for Electric Utility Meters
- Update of National Standard for Electricity Commercialization

DN's Construction Standard

San José, Costa Rica

CO-PRINCIPAL INVESTIGATOR

Nov. 2013 - Jul. 2015

- Consultancy work in collaboration with four engineers for the Regulatory Agency of Public Services
- Evaluation of distribution construction manuals currently used by the Costa Rican power utilities
- Development of 800+ pages catalogue of Distribution Construction Standards to be used by power utilities in Costa Rica
- Development of Excel database to estimate investment costs of new distribution construction projects.