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1. SUMMARY OF RESEARCH INTEREST

a) Computational algorithms for power system analysis

- Development of computationally efficient algorithms for power system analysis.
- Modelling of power system components, with special emphasis on intermittent renewable power sources and their associated controls using computational tools.

b) Power system stability analysis

- Evaluate the impact of intermittent renewable power sources and associated controls on small signal stability, voltage stability, and transient stability of power systems.
- Propose efficient techniques for stability analysis considering uncertainties.

c) Power system optimization

- Research on the state of the art of computational techniques for optimization in power systems.
- Propose techniques for optimization in power systems.

d) Microgrids and Smart Grids

- Research on the state of the art of the configurations, challenges, applications, control schemes, and optimization procedures of microgrids and smart grids
- Evaluate and propose demand side management strategies.

2. EDUCATION

a) Ph.D. in Electrical and Computer Engineering September 2009-June 2014
University of Waterloo, Waterloo, ON, Canada

- **GPA:** 93/100.
- **Relevant courses**: Power Systems, Sustainable Distributed Power Generation, Power System Computer Application, Special Topics in Power Systems and High Voltage Engineering, Distribution Systems Engineering, Energy Processing, Principles of Operations Research. In addition, I took the following optional courses aimed at improving my teaching skills: Classroom Strategies, Designing Exams, Academic Interview Skills, and Effective Lesson Plans.

- **Thesis topic:** Affine Arithmetic based Methods for Voltage and Transient Stability Assessment of Power Systems with Intermittent Sources of Power.
- **Thesis supervisors:** Prof. Claudio Cañizares, Prof. Kankar Bhattacharya.

b) Bachelor of Electrical Engineering September 1995 – October 2001
Universidad de Los Andes, Mérida, Venezuela

- **CUM-LAUDE**, ranking first amongst 35 graduates.
- **Final project:** Design of a Control Scheme for a Crane Based on Programmable Logical Controllers.
- **Final project supervisor:** Prof. Pedro Mora.

3. RESEARCH AND INDUSTRY EXPERIENCE

a) Post doctorate Researcher June 2014-june 2015
Electrical and Computer Department, University of Waterloo, Waterloo, ON, Canada

- Develop mathematical models of industrial electrical loads, based on field measurements of the main variables that affect the industrial processes, as well as the electrical parameters. These models were developed using Matlab®.
- Build optimization models for the automatic operation of industrial loads, aimed at minimizing demand and/or energy costs. These optimization models included restrictions associated with the industrial processes, storage units, distribution system components, and the requirements of operators. The models were developed in the context of smart grids and microgrids, using GAMS®

b) Graduate Student Researcher September 2009 – December 2013
Electrical and Computer Department, University of Waterloo, Waterloo, ON, Canada

- Research the impact of wind power on the stability of power systems using modal analysis, PV curves and time domain simulations.
- Develop computationally efficient tools using Matlab for stability assessment of power systems with intermittent sources of power.
- Develop optimization models using GAMS®

c) Chief of Research and Project Laboratory July 2007 - August 2009
Electrical Engineering School**,** Universidad de Los Andes, Mérida, Venezuela

- Developed computational tools for power system analysis, specifically for power flow analysis considering under load tap changers, short circuit analysis, and PV curve computation based on continuation power flow methods.
- Participated on the discussion of a methodology for the joint expansion of generation and transmission of the Venezuelan electric power system.
- Supervised and co-supervised undergraduate final projects. These projects were based on distributed generation modeling and control, transient and voltage stability assessment of the Venezuelan electric power system using simulation tools such as Matlab®, Neplan®, DIgSILENT Power Factory®, Maple®, and PSAT. Suggestions aimed at improving the system security resulted from this research.

d) Chief of High Voltage Laboratory October 2007-August 2009

Electrical Engineering School, Universidad de Los Andes, Mérida, Venezuela

- Researched on atmospheric conditions that affect electrical insulators performance, aimed at improving maintenance schedules.

Project Engineer November 2002 - December 2003

Oil Refinery Center Paraguaná , Falcón, Venezuela

- Supervised projects regarding substations and control schemes of the oil refinery, design specifications, and maintenance schedules.
- Maintained safe and clean working environment by enforcing procedures, rules, and regulations.

4. TEACHING EXPERIENCE

a) Associate Professor February 2016-to date

Electrical Engineering School, Universidad de Los Andes, Mérida, Venezuela

- Chief of the Department of Electrical Power.
- Taught the undergraduate courses Transmission systems and Power Systems.
- Taught the graduate course Advanced Topics of Power Systems II.
- Supervised and served as evaluation committee member of undergraduate final projects.
- Supervisor of Graduate Thesis.

b) Aggregate Professor December 2011-February 2016

Electrical Engineering School, Universidad de Los Andes, Mérida, Venezuela

- Teaching Assistant of ECE-106 Physics for Electrical Engineering 2 and ECE-140 Linear Circuits from September 2010 to December 2013, Electrical and Computer Engineering Department, University of Waterloo, Waterloo, ON, Canada.
- Proctoring, marking, tutoring, laboratory supervision and occasional lecturing, along with other duties assigned by the instructor department chair, or graduate officer.
- Taught the undergraduate courses Transmission systems and Power Systems at the Universidad de Los Andes, Mérida, Venezuela
- Taught the graduate course Advanced Topics of Power Systems II at the Universidad de Los Andes, Mérida, Venezuela.
- Supervised and served as evaluation committee member of undergraduate final projects at the Universidad de Los Andes, Mérida, Venezuela.
- Served as evaluation committee member of graduate projects at the Universidad de Los Andes, Mérida, Venezuela.

c) Assistant Professor September 2007 – August 2009

Electrical Engineering School, Universidad de Los Andes, Mérida, Venezuela

- Taught the following undergraduate courses: Electrical Machines Laboratory I, Electrical Machines Laboratory II, Fundamentals of Electrical Engineering for Mechanical Engineering, and Transmission Systems.
- Supervised and served as a evaluation committee member of undergraduate final projects.
- Prepared students in the use of simulation tools such as MATLAB®, MAPLE®, NEPLAN® and DIgSILENT POWER FACTORY®.

d) Instructor Professor January 2004 – August 2007

Electrical Engineering School, Universidad de Los Andes, Mérida, Venezuela,

- Taught the following undergraduate courses: Electrical Machines Laboratory I, Electrical Machines Laboratory II, Fundamentals of Electrical Engineering for Mechanical Engineering
- Served as a evaluation committee member of undergraduate final projects.

5. PUBLICATIONS

[1] J. Muñoz, C. Cañizares, K. Bhattacharya, and A. Vaccaro, "An Affine Arithmetic Based Method for Voltage Stability Assessment of Power Systems with Intermittent Sources," *IEEE Trans. on Power Syst*., accepted July 2013, 13 pages.

[2] J. Muñoz, C. Cañizares, K. Bhattacharya, and A. Vaccaro, "Affine Arithmetic Based Methods for Voltage and Transient Stability of Power Systems with Intermittent Generation Sources," in *Proc. 2013 Bulk Power System Dynamics and Control Symposium*, accepted June 2013, 12 pages.

[3] J. Muñoz, C. Cañizares, K. Bhattacharya, and A. Vaccaro, "Comparative Stability Analysis of DFIG-Based Wind Farms and Conventional Synchronous Generators," in *Proc. Power System Conference and Exposition (PSCE), 2011 IEEE/PES,* pp. 1-7, Mar. 2011

[4] J. Muñoz, "Efectos de los Generadores Eólicos en la Estabilidad de los Sistemas de Potencia," (spanish) Universidad de Los Andes, Junio, 2011.

[5] J. Muñoz, "Modelado de FACTS en la solución de Flujos de Potencia," (spanish), Universidad de Los Andes, May. 2007.

6. TECHNICAL REPORTS

a) J. Muñoz, C. Cañizares, K. Bhattacharya, ¨Measurement and Validation Report for Flakeboard Company, Ltd, Department of Electrical and Computer Engineering, University of Waterloo, Waterloo ON, Canada, October 2014.

Brief description: Flakeboard's Medium Density Fiberboard (MDF) manufacturing plant is located in Sault Ste. Marie, Ontario. A single Load Tap Changer (LTC) type transformer connects a 115 kV supply line to the whole plant, whose main loads are comprised of two refiners, plus other loads to support the MDF manufacturing process. A Utilidata's AdaptiVolt system was installed in this plant, aimed at achieving energy savings by minimizing the plant operating voltage. Data collected of the main process and electrical variables during the Measurement and Verification (M&V) period were used in this report to

perform energy savings and loss-of-opportunity analyses associated with the AdaptiVolt system. Linear Regression Models of the plant were obtained using Matlab, and a statistical analysis was conducted to determine the expected energy savings and the loss off opportunity.

b) J. Muñoz, C. Cañizares, K. Bhattacharya, ¨Optimization for Integram Windsor Seating Compressed Air System, Department of Electrical and Computer Engineering, University of Waterloo, Waterloo ON, Canada, October 2014.

Brief description: This report presents the application of an Optimal Industrial Load Management (OILM) model to the compressed air systems of Integram Windsor Seating, located in Tecumseh, Ontario, Canada. This plant uses two compressed air systems in the manufacturing process of automotive seats. Measurements of the main electrical and operational variables were used to estimate accurate models of these compressor systems, using a Least Square Regression technique. These models were then used in an OILM model to estimate the optimal dispatch of the compressors and the optimal system operating pressure, aimed at reducing energy consumption while satisfying necessary operating constraints. Matlab and GAMS were used to build the proposed models.

7. PRESENTATIONS/CONFERENCES

a) **Optimal Power Flow with Security Restrictions and Intermittent Sources of Energy,** VII technical-scientific workshop of the Engineering Faculty, JCTFI, Universidad de Los Andes, Mérida, Venezuela, November 2016.

b) **Optimal Location and Sizing of SVCs using Particle Swarn Optimization and Considering Intermittent Sources of Energy,** VII technical-scientific workshop of the Engineering Faculty, JCTFI, Universidad de Los Andes, Mérida, Venezuela, November 2016.

c) **Reactive Compensation Study for Venezuelan West Power System,** VII technical-scientific workshop of the Engineering Faculty, JCTFI, Universidad de Los Andes, Mérida, Venezuela, November 2016.

d) **Affine Arithmetic Based Methods for Voltage and Transient Stability Assessment of Power Systems with Intermittent Generation Sources,** Bulk Power Systems Dynamics and Control IX Symposium, IREP, Rethymnon, Greece, August 2013.

e) **An Affine Arithmetic Based Method for Voltage Stability Assessment of Power Systems with Intermittent Generation Sources**, Smart Electricity Grids-Operation, Communications and Information Management-Workshop, University of Waterloo, NSERC, Waterloo ON, Canada, April 17 2012

f) **Comparative Stability Analysis of DFIG-Based Wind Farms and Conventional Synchronous Generators**, Power Systems Conference and Exposition (PSCE), 2011 IEEE/PES, Phoenix, AZ, USA, March 20-23, 2011

8. RESEARCH TOPICS ON PROGRESS WITH UNDERGRADUATE AND GRADUATE STUDENTS

a) Optimal Power Flow using Robust Optimization.

Brief description: The objective of this work is to propose an algorithm based on Robust Optimization for solving the problem of optimal power flow considering uncertainties associated with wind power. Matpower® and Matlab® are being used to develop the algorithm.

b) Design of a Primary Control Strategy for a Grid-Isolated Microgrid.

Brief description: This work is intended to propose a control strategy for voltage and frequency regulation in an isolated microgrid under fast output power variations due to intermittent sources of power and/or loads. Matlab® and Simulink® are being used to perform the simulations.

c) Study and simulation of dynamic and control models of solar-photovoltaic panels

Brief description: This study is focused on proposing an algorithm to include the dynamic and control models of solar-photovoltaics in the solution of the differential-algebraic equations of a power system, using the trapezoidal method. This algorithm is being developed using Phyton®.

d) Study and simulation of dynamic and control models of solar-photovoltaic panels

Brief description: Similar to the previously described research work, this study is focused on proposing an algorithm to include the dynamic and control models of variable-speed wind turbines in the solution of the differential-algebraic equations of a power system, using the trapezoidal method. This study is also being developed using Phyton®.

e) Affine Arithmetic based method for transient stability assessment of large-size power systems

Brief description: This work is intended to propose a computationally efficient algorithm based on Affine Arithmetic for solving the differential-algebraic equations of large-sized power systems including wind power plants. This algorithm is being developed using Matlab®.

f) Economical dispatch in microgrids using robust optimization

Brief description: This study is focused on developing an algorithm for solving the economical dispatch problem in microgrids using robust optimization and considering typical microgrid configurations. This algorithm is being developed using Matlab® and GAMS®.

g) Feasibility Study of the Implementation of Reactive Power Compensation in Part of the Western Power System of Venezuela

Brief description: This study has been completed and a paper has been submitted for review in a magazine. It was carried out using Matpower® and Matlab®.

h) Voltage Stability Study of the Transmission System of Merida, considering the transmission line ¨Vigia I-Merida III¨, the Generating plant ¨Don Luis Zambrano¨, and the Hydroelectric plant ¨La Vueltosa¨

Brief description: This work has been recently completed, and a paper is being prepared to be submitted to a magazine. It was carried out using PSAT® and Matlab®.

i) **Optimal Location and Sizing of SVCs Using Particle Swarm Optimization and Considering Intermittent Sources of Energy**

Brief description: This study has been recently completed, and a paper was prepared and submitted for review in a magazine. The algorithm was programmed using Matlab®.

9. AWARDS, FELLOWSHIPS AND SCHOLARSHIPS

a) **Graduate Research Studentship** 2011 – 2014
University of Waterloo, Waterloo, ON, Canada

b) **University of Waterloo Graduate Scholarship** Fall 2010, Spring 2010
University of Waterloo, Waterloo ON, Canada

c) **"Luis Maria Ribas Dávila" Order for outstanding academic achievement** November 2001
Faculty of Engineering, Universidad de Los Andes, Mérida, Venezuela

Recognition diplomas for outstanding academic achievement in Calculus 10, Calculus 20, Calculus 30, Special Mathematics, Statistics, Physics 20, Digital Programming, Systems of Representation 10, Chemistry 11, Industrial Relations, Report Writing, Bachelor final project October 2001
Faculty of Engineering, Universidad de Los Andes, Mérida, Venezuela

d) **Recognition Diploma for earning the third highest GPA in Electrical Engineering in 2000** June 2001
Faculty of Engineering, Universidad de Los Andes, Mérida, Venezuela

Recognition Diploma for outstanding academic achievement at the commemoration of the 35th anniversary of the School of Electrical Engineering July 1999
Faculty of Engineering, Universidad de Los Andes, Mérida, Venezuela

e) **"Luis Maria Rivas Dávila" Medal and Diploma for Outstanding Academic Achievement** October 1996
Faculty of Engineering, Universidad de Los Andes, Mérida, Venezuela

f) **FUNDACITE scholarship for outstanding academic achievement** 1993-1995
Government Funding, Mérida, Venezuela

10. PROFESSIONAL AFFILIATIONS

Institute of Electrical and Electronics Engineers (IEEE).
Professors Association, Universidad de Los Andes (APULA).