Curriculum Vitae

(September 2017)

Ph.D. SALVADOR CEBALLOS

Tecnalia Research and Innovation
Energy and Environment Division
Derio 48190, Basque Country, Spain

Date and Place of Birth: 03/03/1978, Santander,
Cantabria, Spain

Current Professional Address: Tecnalia Research and Innovation,
División de Energía y Medioambiente,
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Education

  - **M.S. degree in Physics,** specialization in electronics, University of Cantabria, Santander, Spain
    June 2001 (Best Academic Record).
  - **M. Eng. in Electronic Engineering,** University of the Basque Country, Leioa, Spain
    June 2002
  - **Ph.D. Degree in Electronic Engineering**, University of the Basque Country, Bilbao, Spain
    March 2008
    Title: "Mejora en la fiabilidad y en el control de la tensión del punto neutro en convertidores de fijación por diodos de tres niveles"
    "Improvements on the reliability of neutral-point-clamped converters and development of control algorithms to control the neutral-point voltage"
    Supervisor: Josep Pou, José Luis Martín
    Qualification: Cum Laude (with Honors, Outstanding Ph.D. Thesis Award)

Work Experience

  - **Industrial experience**:
    October 2002 – to date:
      - Researcher in Tecnalia Research and Innovation (formerly Robotiker)
    Tasks:
      - Design of printed circuit boards based on FPGAs and DSPs for control of power converters.
      - Development of firmware for DSPs (TMS320F2812).
      - Design of control algorithms and modulation strategies for power converters (two-level, neutral-point-clamped NPC, active neutral-point-clamped ANPC, and modular multilevel converters MMC) for renewable energy applications (solar, wind, wave energy), energy storage systems and

VSC-HVDC transmission systems.

Languages

- Spanish (mother tongue)
- English (fluent in reading, intermediate in writing and speaking)

Research Projects

- **Project: Electrical machines and power electronic converters for renewable energy applications**
  Institution: Departamento de industria, comercio y turismo, Basque Country Government
  Duration: 2003-2005
  Number of researchers of Tecnalia: 10

- **Project: Advanced power converter topologies to improve the efficiency and power quality of grid connected converters**
  Institution: Ministerio de Educación y Ciencia of Spain
  Duration: 2004-2007
  Number of researchers of Tecnalia: 3

- **Project: Electronic equipment for an efficient integration of renewable energy resources into the electrical system**
  Institution: Departamento de industria, comercio y turismo, Basque Country Government
  Duration: 2005-2006
  Number of researchers of Tecnalia:: 4

- **Project: Development and integration of microgrids into the distribution electrical grid**
  Institution: Ministerio de Educación y Ciencia of Spain
  Duration: 2005-2009
  Number of researchers of Tecnalia: 4

- **Project: High reliability power converters for renewable energy applications: Wind energy**
  Institution: Ministerio de Educación y Ciencia of Spain
  Duration: 2006-2007
  Number of researchers of Tecnalia: 7

- **Project: Advanced technologies for the generation, conversion and distribution of electrical energy**
  Institution: Departamento de industria, comercio y turismo, Basque Country Government
  Duration: 2006-2008
  Number of researchers of Tecnalia: 5

- **Project: Integrated Wind Turbine Design (UpWind)**
  Institution: European Commission FP6
  Duration: 2006-2011
  Number of researchers of Tecnalia: 3

- **Project: Singular and Strategic project: Small wind turbines**
  Institution: Ministerio de Educación y Ciencia of Spain
  Duration: 2007-2010
  Number of researchers of Tecnalia: 4

- **Project: Singular and Strategic project: Development and integration of microgrids in the electrical system**
  Institution: Ministerio de Educación y Ciencia of Spain
  Duration: 2007-2010
  Number of researchers of Tecnalia: 4

- **Project: Study of low-voltage energy converters for cost reduction and reliability improvement in wind energy systems (CEBATE)**

Institution: Ministerio de Ciencia y Tecnología of Spain
Duration: 2007-2010
Number of researchers of Tecnalia: 4

- **Project: Components for Ocean Renewable Energy Systems (CORES)**
Institution: European commission FP7
Duration: 2008-2011
Number of researchers of Tecnalia: 5

- **Project: Singular and Strategic project: Grid2025**
Institution: Ministerio de Educación y Ciencia of Spain
Duration: 2009-2010
Number of researchers of Tecnalia: 6

- **Project: Impact of integrating wind turbines in the electrical grid (EOLO)**
Institution: Departamento de Educación, Universidades e Investigación Basque Country Government
Duration: 2009-2011
Number of researchers of Tecnalia: 1

- **Project: EMAITEK: Power Converters**
Institution: Basque Government
Duration: 1/2010-12/2010
Number of researchers of Tecnalia: 12

- **Project: Wide band gap semiconductors for rational for power converters**
Institution: Ministerio de Educación y Ciencia of Spain
Duration: 2010-2014
Number of researchers of Tecnalia: 6

- **Project: HiPRwind –High Power, High Reliability Offshore Wind Technology**
Institution: European Commision FP7
Duration: 2010-2015
Number of researchers of Tecnalia: 8

- **Project: Development of a deep water wind turbine**
Institution: Ministerio de Ciencia e Innovación of Spain
Duration: 2010-2012
Number of researchers of Tecnalia: 11

- **Project: Electrical evacuation systems for offshore wind farms**
Institution: Departamento de Industria, Comercio y Turismo, Basque Country Government
Duration: 1/2011-12/2011
Number of researchers of Tecnalia: 8

- **Project: Study of implementation of renewable energy through microgrids on the Pyrenees area (RURALGRID)**
Institution: Dirección de Política Científica, Basque Country Government
Duration: 2012-2013
Number of researchers of Tecnalia: 5

- **Project: Topologies and control of power electronic converters for offshore high voltage DC energy transmission (CONNECT-DC)**
Institution: Ministerio de Ciencia e Innovación of Spain, co-financed Departamento de Educación, Universidades e Investiación, Basque Country Government
Duration: 2012-2015
Number of researchers of Tecnalia: 4

- **Project: POW2SHIP –Power converters to feed ships at docks: "Cold Ironing".**
Institution: Basque Country Government
Duration: 2013-2014
Number of researchers of Tecnalia: 4

- Project: BestPahts –Beyond state-of-the-art technologies for re-powering ac corridors & multi-terminal HVDC systems
Institution: European Commission FP7
Duration: 2014-2018
Number of researchers of Tecnalia: 5

- Project: MARINEL –New offshore self-installable substation
Institution: Basque Country Government
Duration: 2014-2017
Number of researchers of Tecnalia: 10

- Project: FUTURE GRIDS 2020 –New developments for 2020 smart grids: HVDC transmission systems and low voltage smart grids
Institution: Basque Country Government
Duration: 2015-2016
Number of researchers of Tecnalia: 10

- Project: HVDC LINKS –HVDC links for offshore energy transmission
Institution: Basque Country Government
Duration: 2016-2018
Number of researchers of Tecnalia: 5

Industry Projects

- Project: New technologies for wind energy generation: electrical generators and power converters
Company: Gamesa Eólica
Duration: 2003-2007
Number of researchers of Tecnalia: 5

- Project: Very fast linear reactive power compensator
Company: Arteche
Duration: 2005-2007
Number of researchers of Tecnalia: 3

- Project: Development of a neutral-point-clamped converter for research purposes
Company: Technical University of Catalonia
Duration: 01/2007-12/2007
Number of researchers of Tecnalia: 1

- Project: Analysis to endow fixed speed asynchronous generators with fault-ride-through capabilities
Company: Acciona
Duration: 2008-2009
Number of researchers of Tecnalia: 3

- Project: Technologies for the development of new photovoltaic devices
Company: Jema, Fagor
Duration: 2009-2010
Number of researchers: 6

- Project: Development of a four leg (3 phases+ neutral) STATCOM
Company: confidential
Duration: 2009-2011
Number of researchers: 5

- Project: Development of a medium voltage 1.5 MW flexible grid emulator based on the neutral-point-clamped converter.
Company: Tecnalia Research and Innovation
Duration: 2010-2015
Number of researchers: 6

- Project: Development of an active neutral-point-clamped converter for research purposes
Company: University of New South Wales
Duration: 08/2013-04/2014
Number of researchers: 5

- Project: Development of a modular multilevel converter for research purposes
Company: University of New South Wales
Duration: 11/2014-11/2015
Number of researchers: 10

- Project: Multilevel convertes for PV applications. Analysis of topologies and modulation techniques
Company: Jema
Duration: 1/2017-6/2018
Number of researchers: 3

Courses for Industries

- Course: "Modulation strategies for three-phase power converters"
Authors: Salvador Ceballos
Company: Elson Electrónica
Number of hours: 10

- Course: "Modulation strategies for three-phase power converters"
Authors: Salvador Ceballos
Company: Fagor Automoción
Number of hours: 4

- Course: "Control algorithms for oscillating water column devices"
Authors: Salvador Ceballos
Company: This course was given under the frame of MARINET European project. People from more than 10 companies, research institutions and universities attended the course.
Number of hours: 20

Patents

- Title: Voltage balancing compensator for NPC converters
Inventors: Jordi Zaragoza, Josep Pou, Salvador Ceballos, Pedro Ibañez, and Carles Jaén
Application nº: P200700739
Country: Spain
Date: 16/03/2007

- Title: Grid voltage synchronization method for power electronic converters
Inventors: Eider Robles, Salvador Ceballos, Josep Pou, Igor Gabiola, and Pedro Ibañez
Application nº: P200801786
Country: Spain
Date: 13/06/2008
(Licensed to a company)

Visiting Research Appointments

- Cork University College, Cork, Ireland
Hydraulic and Maritime Research Center
Invited by: Prof. Tony Lewis, Dr. Raymond Alcorn
Visit duration: 01/05/2008 – 31/04/2009 (one year)
Sponsor: Basque Country Government, Tecnalia Research and Innovation
Project: Components for Ocean Renewable Energy Systems

- University of New South Wales, Sydney, Australia
Australian Energy Research Institute
Invited by: Prof. Vassilios Agelidis, Prof. Josep Pou
Visit duration: 15/11/2014 – 15/05/2015 (six months)
Sponsor: Basque Country Government, Tecnalia Research and Innovation, European Commission (People-Marie Curie Actions)
Project: Power Electronics Solutions for Offshore DC Transmission Systems

- SINTEF Energy, Trondheim, Norway
Invited by: Dr. Salvatore D'Arco
Visit duration: 20/03/2017 – 15/05/2017
Sponsor: European Commission (FP7 program)
Project: Best-Paths: Beyond the state of the art technologies for re-powering AC corridors & multi-terminal HVDC systems

Scholarships and Fellowships

- Scholarship grant for a research stay (predoctoral)
Sponsor: Fundación de centros tecnológicos Iñaki Goenaga
Destination: Robotiker-Tecnalia Technology Center, Zamudio, Basque Country, Spain
Grant Period: from 01/10/2002 to 31/09/2003 (one year)

- Scholarship grant for a research stay (predoctoral)
Sponsor: Fundación de centros tecnológicos Iñaki Goenaga
Destination: Robotiker-Tecnalia Technology Center, Zamudio, Basque Country, Spain
Grant Period: from 01/10/2003 to 31/09/2005 (two years)

- Beneficary of the Torres Quevedo's financial support for hiring young researchers (predoctoral)
Sponsor: Ministerio de Educación y Ciencia of Spain
Destination: Robotiker-Tecnalia Technology Center, Zamudio, Basque Country, Spain
Grant Period: from 01/09/2005 to 31/08/2007 (two years)

- Fellowship grant for a research stay (postdoctoral)
Sponsor: BIZKAIA:XEDE
Destination: Cork University College, Hydraulic and Maritime Research Center, Cork, Ireland
Grant Period: from 01/05/2008 to 31/04/2009 (one year)

- Fellowship grant for a research stay (postdoctoral)
Sponsor: Basque Country Government, Tecnalia Research and Innovation, European Commission (People-Marie Curie Actions)
Destination: University of New South Wales, NSW, Australia
Grant Period: from 15/11/2014 to 15/05/2015 (six months)

Refereed Journal Papers

[1] J. Andreu, I. Martínez de Alegría, I. Kortabarria, U. Bidarte, and S. Ceballos, "Matrix Converter Protection: Active and Passive Strategy Considerations," *WSEAS Trans. on Power Considerations*, vol. 1, nº 10, pp. 1698-1706, Oct. 2006.

[2] J. Pou, J. Zaragoza, P. Rodríguez, S. Ceballos, V. Sala, R. Burgos, and D. Boroyevich, "Fast-processing modulation strategy for the neutral-point-clamped converter with total elimination of the low-frequency voltage oscillations in the neutral point," *IEEE Trans. Ind. Electron.*, vol. 54, nº 4, pp. 2288-2294, Aug. 2007.

[3] J. Zaragoza, J. Pou, S. Ceballos, J. L. Villate, and I. Gabiola, "Hybrid modulation technique for the neutral-point-clamped converter," *Przeglad Elektrotechniczny* (Poland), vol. 83, pp. 48-53, Oct. 2007.

[4] S. Ceballos, J. Pou, E. Robles, I. Gabiola, J. Zaragoza, J. L. Villate, and D. Boroyevich, "Three-level converter topologies with switch breakdown fault-tolerant capability," *IEEE Trans. Ind. Electron.*, vol. 55, nº 3, pp. 982-995, March 2008.

[5] S. Ceballos, J. Pou, J. Zaragoza, J. L. Martín, E. Robles, I. Gabiola, and P. Ibáñez, "Efficient modulation technique for a four-leg fault-tolerant neutral-point-clamped inverter," *IEEE Trans. Ind. Electron.*, vol. 55, nº 3, pp. 1067-1074, March 2008.

[6] J. Andreu, J. M. De Diego, I. Martínez de Alegría, I. Kortabarria, J.L. Martín, and S. Ceballos, "New Protection Circuit for High Speed Switching and Start-UP of a Practical Matrix Converter," IEE*E Trans. Ind. Electron.*, vol. 55, nº 8, pp. 3100-3114, Aug. 2008.

[7] J. Zaragoza, J. Pou, S. Ceballos, E. Robles, C. Jaén, and M. Corbalan, "Voltage-balance compensator for a carrier-based modulation in the neutral-point-clamped converter," *IEEE Trans. Ind. Electron.*, vol. 56, nº 2, pp. 305-309, Feb. 2009.

[8] J. Zaragoza, J. Pou, S. Ceballos, E. Robles, P. Ibañez, and J. L. Villate, "A comprehensive study of a hybrid modulation technique for the neutral-point-clamped converter," *IEEE Trans. Ind. Electron.*, vol. 56, nº 2, pp. 294-304, Feb. 2009.

[9] P. Lezana, J. Pou, T. Meynard, J. Rodríguez, S. Ceballos, and T. Richardeau, "Survey on fault operation on multilevel converters," *IEEE Trans. Ind. Electron.*, vol. 57, nº 7, pp. 2207-2218, July 2010.

[10] S. Ceballos, J. Pou, E. Robles, J. Zaragoza, and J. L. Martín, "Performance evaluation of fault-tolerant neutral-point-clamped converters," *IEEE Trans. Ind. Electron.*, vol. 57, nº 8, pp. 2709-2718, Aug. 2010.

[11] E. Robles, J. Pou, S. Ceballos, I. Gabiola, and M. Santos, "Grid sequence detector based on a stationary reference frame," *EPE Journal*, vol. 20, nº 2, pp. 57-63, Aug. 2010.

[12] E. Robles, S. Ceballos, J. Pou, J. L. Martin, J. Zaragoza, and P. Ibañez, "Variable-frequency grid sequence detector based on a quasi-ideal low-pass filter stage and a phase-locked loop," *IEEE Trans. Power Electron.,* vol. 25, no. 10, pp. 2552-2563, Oct. 2010.

[13] J. Zaragoza, J. Pou, A. Arias, C. Spiteri, E. Robles, and S. Ceballos, "Study and experimental verification of control tuning strategies in a variable speed wind energy conversion system," *Renewable Energy – Elsevier,* vol. 36, pp. 1421-1430, June 2011.

[14] J. Pou, J. Zaragoza, G. Capella, I. Gabiola, S. Ceballos, and E. Robles, "Current balancing strategy for interleaved voltage source inverters," *EPE Journal,* vol. 21, no. 1, pp. 29-34, Jan.-March 2011.

[15] S. Ceballos, J. Pou, J. Zaragoza, E. Robles, J. L. Villate, and J. L. Martín, "Fault-tolerant neutral-point-clamped converter solutions based on including a fourth resonant leg," *IEEE Trans. Ind. Electron.*, vol. 58, no. 6, pp. 2293-2303, June 2011.

[16] E. Robles, J. Pou, S. Ceballos, J. Zaragoza, J. L. Martín, and P. Ibañez, "Frequency-adaptive stationary-reference-frame grid voltage sequence detector for distributed generation systems," *IEEE Trans. Ind. Electron.*, vol. 58, no. 9, pp. 2552-2563, Sep. 2011.

[17] J. Pou, J. Zaragoza, S. Ceballos, M. Saeedifard, and D. Boroyevich, "A carrier-based PWM strategy with zero-sequence voltage injection for a three-level neutral-point-clamped converter," *IEEE Trans. Power Electron.*, vol. 27, no. 2, Feb. 2012.

[18] E. Robles, S. Ceballos, J. Pou, F. Salcedo, and M. Santos, "Tuning of controllers in grid-connected multilevel converters," *International Review on Modelling and Simulations (IREMOS),* vol. 5, no. 3, June 2012.

[19] A. Madariaga, I. Martínez de Alegría, J. L. Martín, P. Eguía, and S. Ceballos, " Current facts about offshore wind farms," *Renewable and Sustainable Energy Reviews*, vol. 16, no. 5, pp. 3105-3116, June 2012.

[20] A. Madariaga, J. L. Martín, I. Zamora, I. Martínez de Alegría, and S. Ceballos, "Technological trends in electric topologies for offshore wind power plants," *Renewable and Sustainable Energy Reviews*, vol. 24, pp. 32-44, Aug. 2013.

[21] S. Ceballos, J. Rea, I. Lopez, J. Pou, E. Robles, and D. O'Sullivan, "Efficiency optimization in low inertia wells turbine-oscillating water column devices," *IEEE Trans. Energy Conversion*, vol. 28, no. 3, pp. 553-564, Sep. 2013.

[22] G. Konstantinou, J. Pou, S. Ceballos, and V. G. Agelidis, "Active Redundant sub-module configuration in modular multilevel converters," *IEEE Trans. Power Delivery*, vol. 28, no. 4, pp. 2333-2341, Oct. 2013.

[23] S. Burusteta, J. Pou, S. Ceballos, I. Marino, J. A. Alzola, and V. G. Agelidis, "Capacitor voltage balancing in a three-level-converter-based energy storage system," *EPE Journal,*vol. 23, no. 4, pp. 14 – 22, Oct. 2013

[24] A. Madariaga, J. L. Martín, I. Zamora, S. Ceballos, and O. Anaya-Lara, "Effective Assessment of Electric Power Losses in Three-Core XLPE Cables," *IEEE Trans. Power Systems*, vol. 28, no. 4, pp. 4488-4495, Nov. 2013**.**

[25] I. López, J. Andreu, S. Ceballos, and I. Martínez de Alegría, "Review of wave energy technologies and the necessary power-equipment," *Renewable and Sustainable Energy Reviews*, vol. 27, pp. 413-434, Nov. 2013.

[26] G. J. Capella, I. Gabiola, J. Pou, J. Zaragoza, S. Ceballos, and V. G. Agelidis, "Minimum signal modulation scheme based on a single carrier for interleaved operation of parallel phase legs in voltage source converters," *IET Power Electronics*, vol. 7, nº 5, pp. 1305-1312, May 2014.

[27] M. Mirhosseini, J. Pou, V. G. Agelidis, E. Robles, and S. Ceballos, "A Three-Phase Frequency-Adaptive Phase-Locked Loop for Independent Single-Phase Operation," *IEEE Trans. Power Electron.,* vol. 29 no. 12, pp 6255- 6259, Dec. 2014.

[28] J. Pou, S. Ceballos, G. Konstantinou, V.G. Agelidis, R. Picas, and J. Zaragoza "Circulating Current Injection Methods Based on Instantaneous Information for the Modular Multilevel Converter," *IEEE Trans. Ind. Electron.,* vol. 62, no. 2, pp. 777-788, Feb. 2015.

[29] G. J. Capella, J. Pou, S. Ceballos, G. Konstantinou, J. Zaragoza, and V.G. Agelidis, "Enhanced Phase-Shifted PWM Carrier Disposition for Interleaved Voltage Source Inverters," *IEEE Trans. Power Electron.,* vol. 30 no. 3, pp. 1121- 1125, March 2015.

[30] G. J. Capella, J. Pou, S. Ceballos, J. Zaragoza, and V. G. Agelidis, "Current Balancing Technique for Interleaved Voltage Source Inverters with Magnetically-Coupled Legs Connected in Parallel," *IEEE Trans. Ind. Electron.,* vol. 62, no. 3, pp. 1335- 1344, March 2015.

[31] R. Darrus, J. Pou, G. Konstantinou, S. Ceballos, R. Picas, and V. G. Agelidis, "A modified voltage balancing algorithm for the modular multilevel converter: Evaluation of staircase and phase-disposition PWM," *IEEE Trans. Power. Electron.,* vol. 30, no. 8, pp. 4119- 4127, Aug. 2015.

[32] R. Picas, S. Ceballos, J. Pou, J. Zaragoza, G. Konstantinou, and V. G. Agelidis, "Closed Loop Discontinuous Modulation Technique for Capacitor Voltage Ripples and Switching Losses Reduction in Modular Multilevel Converters," *IEEE Trans. Power Electron.,* vol. 30, no. 9, pp. 4714- 4725, Sept. 2015.

[33] S. Ceballos, J. Rea, E. Robles, I. López, J. Pou, and D. O'Sullivan, "Control Strategies for Combining Local Energy Storage with Wells Turbine Oscillating Water Column Devices," *Renewable Energy*, vol. 83, pp. 1097-1109, Nov. 2015.

[34] R. Picas, J. Zaragoza, J. Pou, S. Ceballos, and J. Balcells, "New Measuring Technique for Reducing the Number of Voltage Sensors in Modular Multilevel Converters," *IEEE Trans. Power Electron.*, vol. 31, no. 1, pp. 177- 187, Jan. 2016.

[35] R. Darrus, J. Pou, G. Konstantinou, S. Ceballos, and V. G. Agelidis, "Controllers for Eliminating the AC Components in the Circulating Current of Modular Multilevel Converters," *IET Power Electronics,* vol. 9, no. 1, pp. 1- 8, Jan. 2016.

[36] J. C. C. Henriques, R. P. F. Gomes, L. M. C. Gato, A. F. O. Falcao, E. Robles, and S. Ceballos, "Testing and control of a power take-off system for an oscillating-water-column wave energy converter," *Renewable Energy*, vol. 85, pp. 714-724, Jan. 2016

[37] I. López, S. Ceballos, J. Pou, J. Zaragoza, J. Andreu, I. Kortabarria, and V. G. Agelidis, "Modulation Strategy of Multiphase Neutral-Point-Clamped Converters," *IEEE Trans. Power Electron.*, vol. 31, no. 2, pp. 928- 941, Feb. 2016.

[38] G. Konstantinou, J. Pou, S. Ceballos, R. Darrus, and V. G. Agelidis, "Switching Frequency Analysis of Staircase Modulated Modular Multilevel Converters and Equivalent PWM Techniques," *IEEE Trans. Power. Delivery,* vol. 31, no. 1, pp. 28- 36, Feb. 2016.

[39] G. Konstantinou, J. Pou, G. J. Capella, K. Song, S. Ceballos, and V. G. Agelidis "Interleaved Operation of Three-Level Neutral Point Clamped Converter Legs and Reduction of Circulating Currents under SHE-PWM," *IEEE Trans. Ind. Electron.*, vol. 63, no. 6, pp. 3323- 3332, Jun. 2016.

[40] G. Konstantinou, J. Pou, S. Ceballos, R. Picas, J. Zaragoza, and V. G. Agelidis, "Control of Circulating Currents in Modular Multilevel Converters through Redundant Voltage Levels," *IEEE Trans. Power Electron.,* vol. 31, no. 11, pp. 7761- 7769, Nov. 2016.

[41] G. Konstantinou, J. Pou, D. Pagano, and S. Ceballos, "A Hybrid Modular Multilevel Converter with Partial Embedded Energy Storage," *Energies*, vol. 9, no. 1012, 2016.

[42] A. M. Y. M. Ghias, J. Pou, P. Acuña, S. Ceballos, A. Heidari, and V. G. Agelidis, "Elimination of Low-Frequency Ripples and Regulation of Neutral Point Voltage in Stacked Multicell Converters," *IEEE Trans. Power Electron.*, vol. 32, no. 1, pp. 164- 175, Jan. 2017.

[43] R. Picas, J. Zaragoza, J. Pou, and S. Ceballos, "Reliable Modular Multilevel Converter Fault Detection with Redundant Voltage Sensor," *IEEE Trans. Power Electron.*, vol. 32, no. 1, pp. 39- 51, Jan. 2017.

[44] I. López, S. Ceballos, J. Pou, J. Zaragoza, J. Andreu, E. Ibarra, G. Konstantinou, "Generalized PWM-Based Method for Multiphase Neutral-Point-Clamped Converters With Capacitor Voltage Balance Capability," *IEEE Trans. Power Electron.*, vol. 32, no. 6, pp. 4878- 4890, Jun. 2017.

[45] A. Perez-Basante, S. Ceballos, G. Konstantinou, J. Pou, J. Andreu, and I. Martínez de Alegría, "(2N+1) Selective Harmonic Elimination-PWM for Modular Multilevel Converters: A Generalized Formulation and A Circulating Current Control Method," accepted for publication. *IEEE Trans. Power Electron.*

Books

[1] R. Alcorn and D. O'Sullivan, "Electrical Design for Ocean Wave and Tidal Energy Systems," contribution to chapter 2, "Electrical generators in ocean energy converters", *Institution of Engineering and Technology (IET)*, 2013.

[2] A. Poullikkas, "Renewable Energy: Economics, Emerging Technologies and Global Practices," contribution to chapter 7, "Evaluation methodologies and input data for offshore wind power plant electric topology assessment," *New York Nova Science Publishers*, 2013.

[3] C. Mendoza, "Offshore Wind: Technologies, Ecological Risks and Prospects," contribution to chapter 4, "Effective Techno-economic Evaluation Method for Offshore Wind Novel Proposals," *New York Nova Science Publishers*, 2015.

[4] Miguel Castilla, "Control Circuit in Power Electronics: Practical Issues in Design and Implementation," contribution to chapter 10, "Multilevel Converters: Topologies, Modulation and Control", *Institution of Engineering and Technology (IET)*, 2015.

Other Journal Papers

[1] S. Ceballos, J. García-Tejedor, and P. Ibañez, "Multilevel Converters: Description and Applications," (in Spanish) *Automática e Instrumentación*, nº 376, pp. 57-61, July 2006.

[2] S. Ceballos, P. Ibáñez, and J. García-Tejedor, "Fault-tolerant multilevel converters for wind applications," (in Spanish) *TecnoEnergía*, nº 69, pp. 29-34, Oct. 2008.

[3] J. Pou, J. Zaragoza, A. Arias, E. Robles, S. Ceballos, P. Ibañez, C. Jaen, M. Corbalán, and R. Pindado, "Matlab-Simulink simulation platform for self-learning on wind generation systems," (in Spanish) *EOLUS*, vol. 44, pp. 22-27, July 2009.

[4] S. Ceballos, "MMC Emulation: Research on VSC HVDC Transmission Test Rig Systems," VSC-HVDC Newsletter, vol. 4, no. 5, pp. 2-3, May 2016.

Conference Papers

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Other Contributions to Conferences and Workshops

- **Activity: Organizer of a special session for a conference**
  Special session title: "Fault-tolerant power electronic converters"
  Organizers: José Rodríguez, Josep Pou, and Salvador Ceballos
  Conference: IEEE International Symposium on Industrial Electronics (ISIE)
  Date: 4–7 June 2007
  Place: Vigo, Spain

- **Activity: Organizer of a special session for a conference**
  Special session title: "Multilevel converters"
  Organizers: Josep Pou, José Rodríguez, and Salvador Ceballos
  Conference: IEEE International Symposium on Industrial Electronics (ISIE)
  Date: 30 June – 2 July 2008
  Place: Cambridge, UK

- **Activity: Invited speaker for a lecture on the master "Energy and Power Electronics"**
  Special Session Title: "Modulation Techniques for Neutral-Point-Clamped Converters"
  Speaker: Salvador Ceballos
  Date: March 2012
  Place: Bilbao, Spain

- **Activity: Invited speaker for a lecture on a technical conference sponsored by EVB**
  Special Session Title: "Control of Neutral-Point-Clamped Converters"
  Speaker: Salvador Ceballos
  Date: June 2012
  Place: Madrid, Spain

- **Activity: Invited speaker for a lecture on the master "Energy and Power Electronics"**
  Special Session Title: "Control of power electronic converters for Oscillating water columns"
  Speaker: Salvador Ceballos
  Date: Nov. 2012
  Place: Bilbao, Spain

- **Activity: Invited speaker for a plenary session in the International Conference on Renewable Energies and Power Quality (ICREP 2013)**
  Special Session Title: "Voltage-Source Converters for HVDC Systems"
  Speaker: Salvador Ceballos
  Date: 22 March 2013
  Place: Bilbao, Spain

- **Activity: Invited speaker for a plenary session in the XIV International Conference on Electrical Equipment (IEEC 2015)**
  Special Session Title: "HVDC –Current situation and trends"
  Speaker: Javier García-Tejedor, Salvador Ceballos
  Date: 7-8 October 2015
  Place: Bilbao, Spain

- **Activity: Organizer of a special issue for the IET Power Electronics, vol. 9, nº 12**
  Special issue title: "Hybrid Multilevel converters: Topologies, Modulation and Control"
  Organizers: Josep Pou, Georgios Konstantinou and Salvador Ceballos
  Date: October 2016

Ph.D. Thesis Assessments

- **Thesis: "Grid Connection and Control of Multipole Synchronous Wind Turbines"**
  Ph.D. Student: Eider Robles
  Director: Dr. Josep Pou and Dr. José Luis Martín.
  University: Basque Country University, Bilbao, Spain
  Defense: 23/06/2010
  Activity: External examiner

- **Thesis: "Modulation Strategies for the Neutral-Point-Clamped Converter and Control of a Wind Turbine System"**
  Ph.D. Student: Jordi Zaragoza
  Supervisors: Dr. Josep Pou
  University: Technical University of Catalonia, Catalonia, Spain
  Defense: Nov. 2011
  Activity: Ph.D. committee member

- **Thesis: "Study on Full Direct Current Offshore Wind Farm"**
  Ph.D. Student: Iñigo Martínez de Alegría
  Supervisors: Dr. Jose Luis Martín and Dr. Haritza Camblong
  University: Basque Country University, Bilbao, Spain
  Defense: March 2012

Activity: Ph.D. committee member

- **Thesis: "Methodology to Evaluate Offshore Wind Power Plant Electric Topologies"**
  Ph.D. Student: Ander Madariaga
  Director: Dr. Jose Luis Martin and Dr. Inmaculada Zamora
  University: University of the Basque Country, Basque Country, Spain
  Defense: Jan. 2013
  Activity: Ph.D. committee member

- **Thesis: "Design and Analysis of a Novel Multilevel Active-Clamped Power-Converter"**
  Ph.D. Student: Joan Nicolas Apruzzesse
  Director: Dr. Sergio Busquets and Dr. Josep Bordonau
  University: Technical University of Catalonia, Catalonia, Spain
  Defense: Sept. 2013
  Activity: External examiner

- **Thesis: "Analysis and development of a new multilevel converter topology for medium voltage, high power applications"**
  Ph.D. Student: Mikel Mazuela Larrañaga
  Director: Dr. Igor Baraia
  University: University of Mondragón, Basque Country, Spain
  Defense: June 2015
  Activity: External examiner

- **Thesis: "Energy Conversion Scheme for Offshore DC Wind Turbines"**
  Ph.D. Student: Manex Barrenetxea Iñara
  Director: Dr. Igor Baraia
  University: University of Mondragón, Basque Country, Spain
  Defense: June 2016
  Activity: External examiner

- **Thesis: "Análisis de los modos de conducción de un convertidor Trans-qZSI. Caracterización, modelización y studio comparative de la topología bidireccional. Diseño y validación experimental.**
  Ph.D. Student: Ane Miren Florez Tapia
  Director: Dr. Jose Martín Echeverria Ormaechea and Dr. Javier Vadillo Landajuela
  University: University of Navarra, TECNUN, Spain
  Defense: May. 2017
  Activity: Ph.D. committee member

Other Merits and Skills

- Co-recipient of the Best Poster Prize Award by the EWTEC 2009 Organizing Committee.
- Co-author of the paper awarded with the Best Paper Award by the PEDS 20015 Organizing Committee.
- Co-supervisor of the degree final project "Comparative tool of Multi-MW wind turbine's electrical systems" (in Spanish) by Carlos Javier Martínez de Ilarduya awarded with the 2011 Outstanding Final Project Award from the Basque Country University.
- Regular reviewer of international journals and conferences.