

Scientific Workshop

Micro and Smart Grid

**October 6th
2017**

Cité Descartes

Bâtiment Bienvenue
14-20 Bd Isaac Newton
77420 Champs-sur-Marne

Conference
Workshop
Poster Session

**Invited
Speakers**

- **Joseph M. GUERRERO**
- **Nikolaos HATZIARGYRIOU**
- **Romeo ORTEGA**
- **Carlos BORDONS**

Mandatory free registration before September 22th, to website
<https://www.eventbrite.fr/e/billets-jsn-micro-reseaux-2017-33620781663>



To the purpose to adress the technical constraints of interfacing renewable sources with the public electricity network, AC or DC micro-smart grid composed of a multi-source system an related controller/supervisor represent an integrated solution. Whether they are integrated into the distribution system or the transmission network, which can be AC or DC, HV or LV, high power or small power, the micro-smart grid or the componing clusters require a hierarchical approach. It will be composed by a systemic approach studying the interactions among the subsystems, with to each operation mode adapted control laws, and a specific approach related to the intermittent aspects of the system.

The Scientific Workshop on micro-smart grid is organized by the GT Microgrids (GDR SEEDS) and the GT RSEI (GDR MACS) in collaboration with the ITE Efficacity. The event will take place in Marne-la-Vallée on October 6th and will allow researchers, PhD students and industrial partners to present their work and to exchange on the micro-smart grid' theme. This will aim to introduce both theoretical and pratical micro-smart grid developments, offering information on their control and the possible industrial applications. Possible interesting subjects and related applications are :

- Modeling, control and management of micro-smart grid;
- Control for AC and DC micro-smart grid;
- Energy and power quality for micro-smart grid;
- Renewable energy integration and multi-energy systems;
- Static converters for micro-smart grid (topologies, efficiency, performance, etc.);
- Energy storage systems for micro-smart grid;
- Energy management for micro-smart grid (optimal planning, load shedding, real-time optimization, uncertainties evaluation, etc.);
- Test-beds, case-studies and pilot projects.

Invited Speakers

Josep M. Guerrero, Professor

• Aalborg University,
Faculty of Engineering
and Science,
Department of Energy
Technology
• Director of Microgrids
Laboratory
(<http://www.et.aau.dk/research-programmes/microgrids/>)

Nikolaos Hatziaargyriou, Professor

• National Technical
University of Athens,
School of Electrical and
Computer Engineering
• Director of SmartRUE
Laboratory
(<http://www.smartrue.gr/>)

Romeo Ortega, Professor

• Laboratoire des
Signaux et Systèmes,
Centrale Supélec,
Paris-Saclay University
• Research Director,
L2S Laboratory
(<http://www.l2s.centralesupelec.fr/en>)

Carlos Bordons, Professor

• Professor, University
of Sevilla, Spain
• Member of the
European Union
Control Association
Council

Important dates

- Mandatory free registration before **September 22th, 2017** to website <https://www.eventbrite.fr/e/billets-jsn-micro-reseaux-2017-33620781663>
- Scientific Workshop on Micro and Smart Grid : **October 6th, 2017 (8h – 18h)**

Confirmed Speakers

Romeo Ortega

Directeur de Recherches CNRS au Laboratoire des Signaux et Systèmes - L2S

Romeo Ortega was born in Mexico. He obtained his BSc in Electrical and Mechanical Engineering from the National University of Mexico, Master of Engineering from Polytechnical Institute of Leningrad, USSR, and the Docteur D'Etat from the Politechnical Institute of Grenoble, France in 1974, 1978 and 1984, respectively. .

He then joined the National University of Mexico, where he worked until 1989. He was a Visiting Professor at the University of Illinois in 1987-88 and at the McGill University in 1991-1992, and a Fellow of the Japan Society for Promotion of Science in 1990-1991. He has been a member of the French National Researcher Council (CNRS) since June 1992. Currently he is in the Laboratoire de Signaux et Systèmes (SUPELEC) in Paris. His research interests are in the fields of nonlinear and adaptive control, with special emphasis on applications.

Dr Ortega has published three books and more than 290 scientific papers in international journals, with an h-index of 74. He has supervised more than 30 PhD thesis. He is a Fellow Member of the IEEE since 1999 and of IFAC since 2016. He has served as chairman in several IFAC and IEEE committees and participated in various editorial boards of international journals.

Talk : Research activities on power systems and power electronics

In this brief talk we describe the activities of our group on these areas for the period 2013-2017. The reported results include:

- modular modeling of power systems
- analysis and control of transient stability phenomena
- modeling and PI control of HVDC systems
- modeling and droop control of microgrids
- identification and control of alternative energy generation systems (wind and photovoltaic arrays)
- analysis and control of power converters: PI control and constant power loads

Carlos Bordons

Carlos Bordons received the Ph.D. degree in Electrical Engineering in 1994. He joined the Escuela Superior de Ingenieros of Seville (Spain) as an Assistant Professor and he is currently Full Professor of Systems Engineering and Automatic Control there. He has worked in different projects in collaboration with industry in fields such as control of power management in hybrid vehicles, control of microgrids including renewable sources, simulation and optimization of oil pipeline networks, automation of copper furnaces or modelling and control of fuel cells systems. His current research interests include advanced process control, especially model predictive control and its application to hybrid vehicles. His recent work is focused on power management in hybrid systems including fuel cells as power sources, as is the case of hybrid vehicles and microgrids. He is co-author of the books *Model Predictive Control in the Process Industry* and *Model Predictive Control* (1st and 2nd edition) published by Springer-Verlag, London. He holds three related patents and is a senior member of the Institute of Electrical and Electronic Engineers. He is currently Associate Editor of the journals *IEEE Trans on Industrial Electronics*, *Control Engineering Practice* and *Revista Iberoamericana de Automatica e Informatica Industrial*. He was EUCA (European Union Control Association) Council Member since 2007 to 2015. Since 2008 to 2012 he was the Managing Director of AICIA, which is the main Research and Technology Organization in Andalusia (Southern Spain). He is founder of the start-up IDENER, a spin-off company oriented to applications of Advanced Control and Optimization techniques. He is currently the Head of the Systems Engineering and Automation Department at the University of Seville.

Talk : Control of microgrids integrating renewable energy and hybrid storage

This talk will present an overview of the challenges related to the control of microgrids which include renewable sources (mainly solar and wind) and hybrid storage (both electricity and hydrogen). It will be focused on the control methodologies in the framework of Model Predictive Control (MPC). Energy management systems will be designed trying to fulfil different control objectives, related to economic profit, power balance, durability of the microgrid components and environmental issues. The intrinsic uncertainty associated to renewable generation and demand can be considered using Stochastic MPC. The optimal operation of networks of microgrids is also addressed, using a solution based on Distributed MPC. Real experiments on a laboratory-scale DC microgrid as well as simulated results will be used to illustrate the concepts.

Samson LASAULCE

RTE Chair on the Digital Transformation of Electricity Networks

Talk : "Jeux de recharge de véhicules électriques"

Le but de cette présentation est de montrer en quoi le problème de recharge de véhicule électrique constitue un jeu. Pour cela, une petite introduction tutorielle sera faite. Plusieurs algorithmes de recharge seront présentés et testés, notamment pour mesurer l'impact sur le réseau de distribution. Trois manières pour construire un algorithme de recharge seront discutées : en partant d'une formulation sous forme de jeu statique ; en partant d'une formulation de type contrôle optimal ; en utilisant les outils numériques pour résoudre les processus de décision markoviens.

Philippe EGROT

Power Grid Senior Engineer

EDF – R&D Electrical Equipment Laboratory

Le titre : le MVDC pour les smart-cities : Mythe ou réalité ?

Direct current for High Voltage transmission systems is a real opportunity to reduce losses and offer many new ancillary services. But does that also concern large cities with overloaded electrical income feeders ?

Alessiolovine

Chercheur ITE EFFICACITY

Title : Distributed Nonlinear Control for a MicroGrid embedding Renewables, Train's Energy Recovery System and Storages

Abstract : A low-level distributed nonlinear controller for a DC MicroGrid integrated in a Train Station is introduced. A number of elements are connected to the MicroGrid: two different transient time scale renewables (braking recovery and photovoltaic), two kinds of storage acting at different time-scale (a battery and a supercapacitor), and a load. The model is developed and a complete stability analysis is investigated: power balance and voltage grid stability requirements are both met. A System of Systems approach is utilized to develop the control laws for the DC/DC converters in order to fulfil the dedicated objective each controller has. Simulation results showing the desired grid behaviour are presented.

Bruno FRANCOIS

Professeur Ecole Centrale de Lille

Laboratoire d'Electrotechnique et d'Electronique de Puissance de Lille L2EP

Bruno Francois received the PhD degree in electrical engineering in 1996 from the University of Science and Technology of Lille (USTL), France. He is Professor at the Department of Electrical Engineering of Ecole Centrale de Lille and researcher at the Laboratory of Electrical Engineering (L2EP) in the Power System group. He is currently working on the design of advanced energy management systems, uncertainty analysis in power system applications and future electrical network architectures.

Titre :Analyse et quantification des incertitudes - Applications au dimensionnement et à la gestion des réseaux électriques à fort taux d'énergie renouvelable