



## TITLE

### Microgrids:

### Connecting renewable energy sources into the Smartgrid

## NAME AND AFFILIATION OF THE AUTHORS

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## SCOPE AND BENEFITS

A Microgrid can be defined as a part of the grid with elements like distributed energy sources, power electronics converters, energy storage devices and controllable local loads that can operate autonomously islanded but also interacting with the main power network, in a controlled, coordinated way. In this tutorial, the distributed control of these elements will be presented. Cooperative control and hierarchical control schemes will be introduced to coordinate the power electronics converters of the Microgrid in order to control the power flow and to enhance the power quality. The tutorial will be focused on analysis, modelling, and control design of power electronics based Microgrids. Power electronics control and communications will be emphasized. Further, the interconnection of Microgrid clusters will be shown as an approach towards the Smartgrid.

## CONTENTS

Schedule is as follows:

### Monday, August 29th - Tutorial day (Location: the ICC)

|               |  |
|---------------|--|
| 08:00 - 09:30 | Registration for <b>Tutorials</b>  |
| 14:00 - 15:30 | <b><i>Microgrids – Basic concepts</i></b><br>1 Microgrids systems<br>2 Control of voltage source inverters for microgrids<br>3 Droop control and virtual impedance concept |
| 15:30 - 16:00 | Coffee break   |
| 16:00 - 17:30 | <b><i>Microgrids – Advanced concepts</i></b><br>4 Stability of microgrids<br>5 Hierarchical control of microgrids<br>6 Power quality in microgrids                         |
| 17:00 - 19:00 | Possibility for registration for the EPE2011 in the lobby  |

## WHO SHOULD ATTEND

Here state the type of participants you would like to encourage to register to your tutorial: professional category, background, etc..

### Technical Level:

The expected audience is mainly PhD students, professors, or Industry engineers from Power Systems, Power Electronics, or Control area.



## **ABOUT THE INSTRUCTORS**



Josep M. Guerrero (S'01–M'04–SM'08) received the B.S. degree in telecommunications engineering, the M.S. degree in electronics engineering, and the Ph.D. degree in power electronics from the Technical University of Catalonia, Barcelona, Spain, in 1997, 2000 and 2003, respectively.

He is an Associate Professor with the Department of Automatic Control Systems and Computer Engineering, Technical University of Catalonia, Barcelona, where he currently teaches courses on digital signal processing, FPGAs, microprocessors, and renewable energy. Since 2004, he has been responsible for the Renewable Energy Laboratory, Escola Industrial de Barcelona. He has been a visiting Professor at Zhejiang University and Aalborg University. His research interests include power electronics converters for distributed generation and distributed energy storage systems, control and management of microgrids and islanded minigrids, and photovoltaic and wind power plants control.

Dr. Guerrero is an Associate Editor for the IEEE TRANSACTIONS ON POWER ELECTRONICS and IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS. He has been Guest Editor of the IEEE Transactions on Power Electronics Special Issues Power Electronics for Wind Energy Conversion and Power Electronics for Microgrids. Also he has been Guest Editor of the IEEE Transactions on Industrial Electronics Special Sections: Uninterruptible Power Supplies (UPS) systems, Renewable Energy Systems, Distributed Generation and Microgrids, and Industrial Applications and Implementation Issues of the Kalman Filter. He Chairs of Renewable Energy Systems Technical Committee of IEEE IES. He is an elected IEEE IES Adcom member.