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http://www.uco.es/icei/index-ing.htm

Bilateral Meetings

- Thursday (10:00am - 12:00pm)
- Thursday (12:00pm - 2:00pm)

Description

The Industrial Electronics and Instrumentation (IEI) group located at the School of Engineering Science, University of Cordoba, is one of the leading R&D groups in Spain in the field of Smart Grids.

The Smart Grid refers to the application of ICT to the electric power sector to improve reliability, reduce cost, increase efficiency, and enable new components and applications. The emergence of Smart Grids together with smart meters, sensors, devices and appliances promises new financial and environmental advantages in the energy market and the overall economy.

In particular, the IEI group includes significant research capabilities and activities related to Advanced electrical distribution protection and automation, Power Quality troubleshooting, Micro Grids, Advanced Instrumentation, sensors and signal conditioning, Large scale grid integration of renewable energy sources, Communication infrastructures and wireless technologies, Smart Metering, Smart Lighting, Stochastic modelling of energy consumption, Demand Response (DR). And facing the challenges of Smart Homes, Smart Cities and Communities or the Internet of Energy.

Our researchers are actively involved in several standardization committees: IEC, CENELEC, AENOR, CIGRE, CIRED; and in different IEEE technical Societies, like the IEEE Industrial Electronics Society or IEEE Consumer Electronics Society, e.g. organising both the IEEE International Conference on Consumer Electronics - Berlin (IEEE ICCE-Berlin 2015) and the IEEE International Conference on Consumer Electronics- Las Vegas 2016 (ICCE-Las Vegas 2016)

The IEI group carries out research in close collaboration with industry and research partners nationally and internationally, supported by a wide range of research grants, strategic partnerships and industrial R&D projects. With some 19 research staff and postgraduate research students, and a substantial portfolio of aligned research activities it is one of the most dynamic research group in the region of Andalusia.

This research leverages a number of relevant technology solutions developed, including:

- A new system for sensing, monitoring and treatment of the information in real time for a pioneer MW grid-connected PV park pilot with storage capability

- Smart wireless street lighting system
- Stochastic modelling for electricity consumption in the residential sector

Organization Type
University
Organization Size
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Areas of Activities

ENERGY

1. renewables
2. efficiency
3. management
4. ICT
5. electricity
6. metering

MOBILITY

1. electric vehicle

Offer

Electric Demand Response

Demand response (DR) is defined as: Changes in electric usage by end-use customers from their normal consumption patterns in response to changes in the price of electricity over time, or to incentive payments designed to induce lower electricity use at times of high wholesale market prices or when system reliability is jeopardized.

DR includes all intentional modifications to consumption patterns of electricity of induce customers that are intended to alter the timing, level of instantaneous demand, or the total electricity consumption. Although the concept of DR in Europe has been rapidly developed in the last decade, it cannot be considered ready for use to required functionality standards in Europe. The situation is different in the United States, where demand response management systems (DRMS) are used in growing numbers and grid operators are more flexible giving customers day-ahead or hour-ahead notices to turn down power usage or fire up backup generators. It is expected that demand response programs will be designed to decrease electricity consumption or shift it from on-peak to off-peak periods depending on consumers' preferences and lifestyles.Demand response activities are defined as "actions voluntarily taken by a consumer to adjust the amount or timing of his energy consumption". Actions are generally in response to an economic signal (e.g. energy price, or government and/or utility incentive). We have developed stochastic models of energy consumption (electrical and thermal) profile of end users and determined key factors for modelling of the end user energy

consumption; they are ready to use into demand response controllers, both in residential and industrial environment.

Keywords: smart grid demand response
Cooperation Offered

1. Technical co-operation

Cooperation Requested

1. Technical co-operation
2. Investment/Financing

Offer

High-performance monitoring solution for utility-scale Photovoltaic power plants

Scheduling power output from generating plants used to be relatively easy, and there was little or no need for Real-Time information. A central dispatcher simply estimated overall customer demand for a period stretching out for a few days, and then supplied this information to its wholly owned generating plants, sometimes via a phone call. A major change to the power generation landscape was the emergence of renewable energy sources, particularly wind and solar. Unlike conventional generation, the power produced by solar and especially by wind can vary over a wide range in an unpredictable fashion, upsetting the entire balance of power supplied to the grid. Initially, the problem of variable generation from solar and wind was easily accommodated as these sources made up a very small percentage of power supplied to the grid. But as more and more distributed solar and wind plants have been built and integrated in the grid, variable generation is becoming a huge issue. To cope with the rising penetration of renewable energy sources and expected widespread adoption of electric vehicles, the future smart grid needs to implement efficient monitoring and control technologies to improve its operational efficiency. Hence, the owner tends to centralize monitoring, control and operation of the plants.

Real-time information concerning power flowing into and out of the grid is measured by utilities through monitoring of their transmission and distribution systems. These power measurements are made by various Ethernet-enabled devices such as protective relays and power monitors. These devices are connected in a substation wide Ethernet network to substation controllers, either general purpose Programmable Logic Controllers (PLCs) or more specialized substation controllers. Synchronization is critical to operate the grid optimally and reliably. This equipment can use IEEE 1588-2008 Standard to insure that instruments take snapshots of grid parameters at exactly the same time and that the phase relationships between current and voltage are preserved. Ideally, all of these Ethernet-enabled devices will comply with the IEC 61850 Standard for Substation Automation.

Real-time Supervision and Management System of PV power stations are absolutely necessary. Our solution can perform Real-Time monitoring and control on the PV solar array, DC current convergent cubicle, DC distribution cabinet, grid-connected inverter, step-up substation, and environmental monitoring system. It is equipped with a high-precision protocol for synchronizing all data acquisition equipment, something that is necessary for correctly establishing relationships among events in the plant. Our solution is also equipped with rich user interfaces, strong analysis and

processing functions as well as complete monitoring alarm mechanisms. The system provides a detailed, comprehensive Real-time Supervision of the performance of all of the components, quantifying different loss mechanisms and detecting the presence of any failures or deviations by comparing the production with prediction models. If included, the solution is able to control the Storage System (SS) operating mode. It also enables both the Power Quality (PQ) of the signal injected and the installation's influence on the distribution grid to be controlled. With our solution it is possible to centralize the monitoring and control of equipment in solar power plant and process the data for Operation and Maintenance (O&M) personnel.

Keywords: Photovoltaic power plants
Cooperation Offered

1. Technical co-operation
2. Sales / Distribution