DER–IREC
22@ Microgrid

http://der-microgrid.gtd.es

Going to smart is **our motivation**

The increasing presence of Distributed Energy Resources combined with the introduction of the Electric Vehicle is changing the way the electrical grid will need to operate.

Benefits that low-scale photovoltaic and wind power plants provide to the environment are proven, but now, the challenge is to guarantee their correct operation in an scenario of high penetration of renewable energy and electric vehicles.

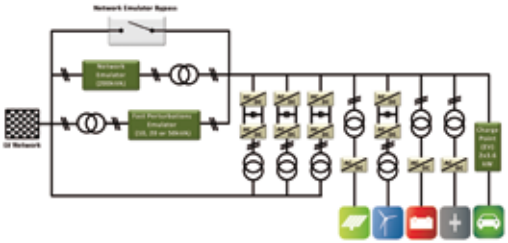
Understanding the consequences that all these new components will have on the existing electric distribution grid is the first step prior to applying research results. Proposals on new management schemes, control devices and measurement equipment are the basis for turning current electric grids into Smart grids.

In the context of offering the optimum environment for integrating DER successfully, three main points have to be considered:

- Design electric management schemes that minimize the effects of variable power sources and boost integration of electric mobility.
- Propose changes in the electric regulatory framework.
- Develop new business opportunities in the electricity market.

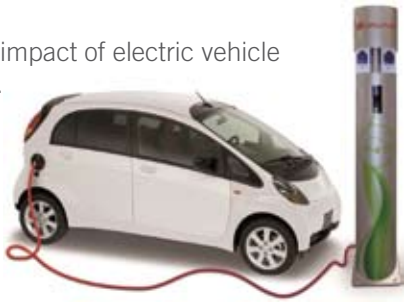
Focusing on these opportunities, in 2009 four companies together with tree research centres initiated an industrial research project called DER-IREC 22@ Microgrid. The goal was to introduce new added value products and services in the market that suit the requirements of a new paradigm in the electricity supply chain.

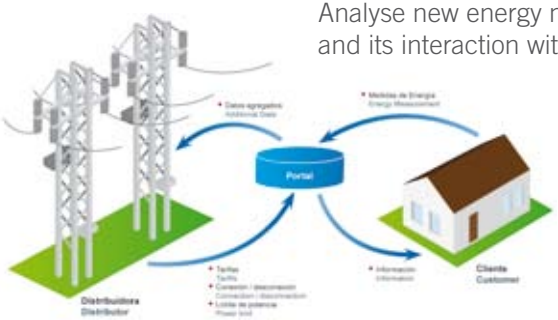
Objectives



Identify and overcome technical barriers of the new paradigm of Distributed Energy Resources (DER).

Consider and foresee the impact of electric vehicle on the new energy model.





Analyse new energy management models of microgrids and its interaction with distribution networks.

Check the viability of the research results on a real electric microgrid environment.
[IREC's Microgrid Smart Lab]

Milestones

Measurement

- Accurate measurement and monitoring of the whole microgrid.
- Use of the new generation measurement equipment prepared for microgrids and bidirectional power flow.

Communications

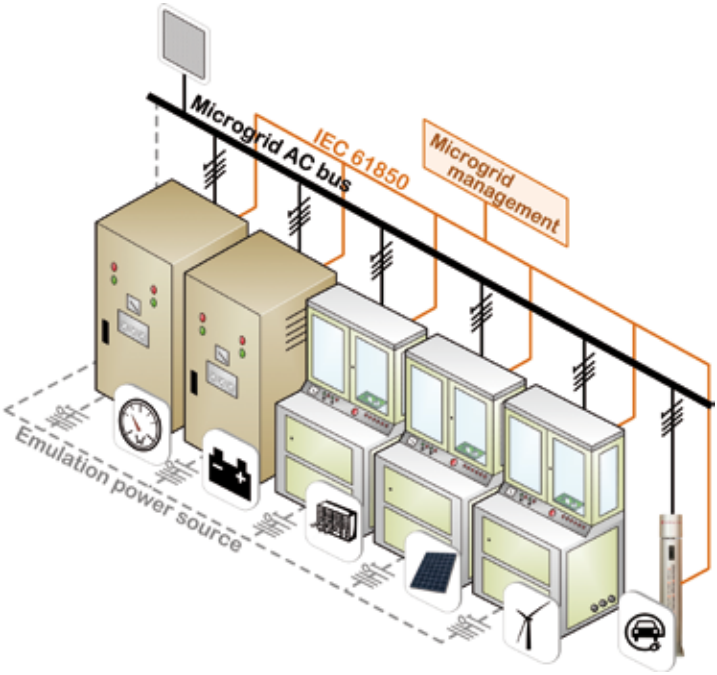
- Real-time exchange of information for regulating the power flow among all the elements of a microgrid thanks to distributed control intelligence.
- Communications according to the IEC 61850 standard, which allows and guarantees the integration and interoperability of multi-platform and multimanufacturer devices.

Management

- Development of control and optimization techniques for microgrids based on:
  - Technical criteria to provide safety and efficient operation.
  - Economic criteria to maximize the microgrid saving.
- Introduction of storage systems for gaining a degree of freedom in the economical and technical restrictions.
- Management of electric fleet charging points.

Environment

- Technical, economical and environmental impact of microgrids to distribution network and analysis of a multi-microgrid scenario.
- Identification of the existing legal barriers and formulation of regulatory proposals for the integration of microgrids.
- Development of new market and business models with microgrids as the key players.



Microgrids, the Smart solution

A microgrid can be defined as a small Smart Grid with the ability to manage power flow among its internal equipment (generation, loads and storage) and the distribution grid. To do so, interaction of smart measurement devices, communication systems and control methods becomes crucial.

The demonstration part of DER-IREC 22@ Microgrid project needed to put into practice issues that would appear in a real microgrid:

- Real-time power management algorithms based on economical and technical criteria
- Adaptation to variations of renewable power sources
- Give support to the electric distribution network in case of a contingency

Lessons learnt during DER-IREC 22@ Microgrid are implemented in the Microgrid environment at IREC's Smart Lab. The test setup consists of five emulated elements: two renewable power sources, one storage system, one variable load and a Smart meter.

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