



ALMA MATER STUDIORUM  
UNIVERSITÀ DI BOLOGNA

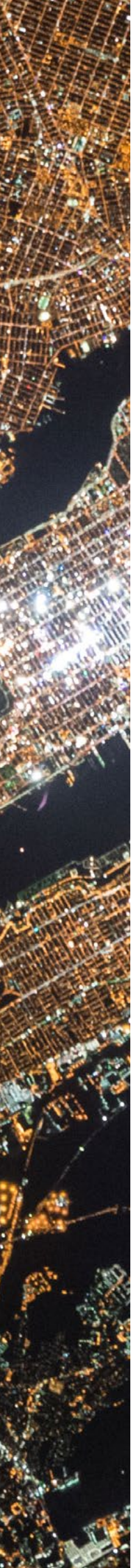
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## SMART ENERGY SYSTEMS

*A significant percentage of electricity is nowadays produced from renewable energy.*

*This increased production from intermittent, non-dispatchable sources, such as wind and photovoltaic, poses technical challenges for grid management and highlights the need for flexibility.*

*Smart energy systems capable of balancing power generation and demand in real time, are badly needed.*



Some research groups at the University of Bologna have been pioneers in the research on smart energy systems. Innovative solutions for distribution networks operation in presence of small scale generating plants, fully automatic scheduling systems of experimental microgrids, which include generators and storage systems and relevant components, have been developed and tested.

Main research themes:

- Analysis and Control of **distribution systems** with embedded generation from **renewable sources**
- **Power quality** improvements in distribution networks
- Automatic **fault location** in medium voltage distribution networks
- Distribution networks operation in presence of **small scale generating plants** and **micro-grids**
- Design of **mechanism and policies** to assemble, monitor and control **smart grids**
- **Decision support tools** for power producers in a competitive **electricity market**

## HIGHLIGHTS

### **LISEP – Power Systems Engineering Laboratory**

Research in the areas of production, transmission, distribution and utilization of electricity with particular reference to smart grids.

The scientific activity is carried out in connection with the Institute of Electrical and Electronics Engineers Power and Energy Society - IEEE PES.

### **LIT - Laboratory of Innovation Technology**

Research activities regard materials and components for Electrical Engineering and smart grids. In particular:

- Electro-thermic characterization of semi-conductor and insulating materials, also nanostructured, cellular piezoelectric materials and magnetic materials
- Diagnostic of solid, liquid and gas insulating systems
- Development of diagnostic techniques for smart-grid and super-grid

## **European Projects**

[EdgeFLEX](#) - *Providing flexibility to the grid by enabling VPPs to offer both fast and slow dynamics control services H2020*

[PlaMES](#) - *Integrated Planning of Multi-Energy Systems H2020*

[SOGNO](#) - *Service Oriented Grid for the Network of the Future H2020*

[FLEXMETER](#) - *Flexible smart metering for multiple energy vectors with active prosumers H2020*

[ADMS](#) - *SmartGrid Active Distribution Management System to accommodate Renewable Energy Sources and Low Carbon Emissions H2020*

[INCITE](#) - *Innovative controls for renewable sources Integration into smart energy systems H2020*

[CONNECT](#) - *Innovative Smart components, modules and appliances for a truly connected, efficient and secure smart grid H2020*

[R3-PowerUP](#) - *300mm Pilot Line for Smart Power and Power Discretes H2020*