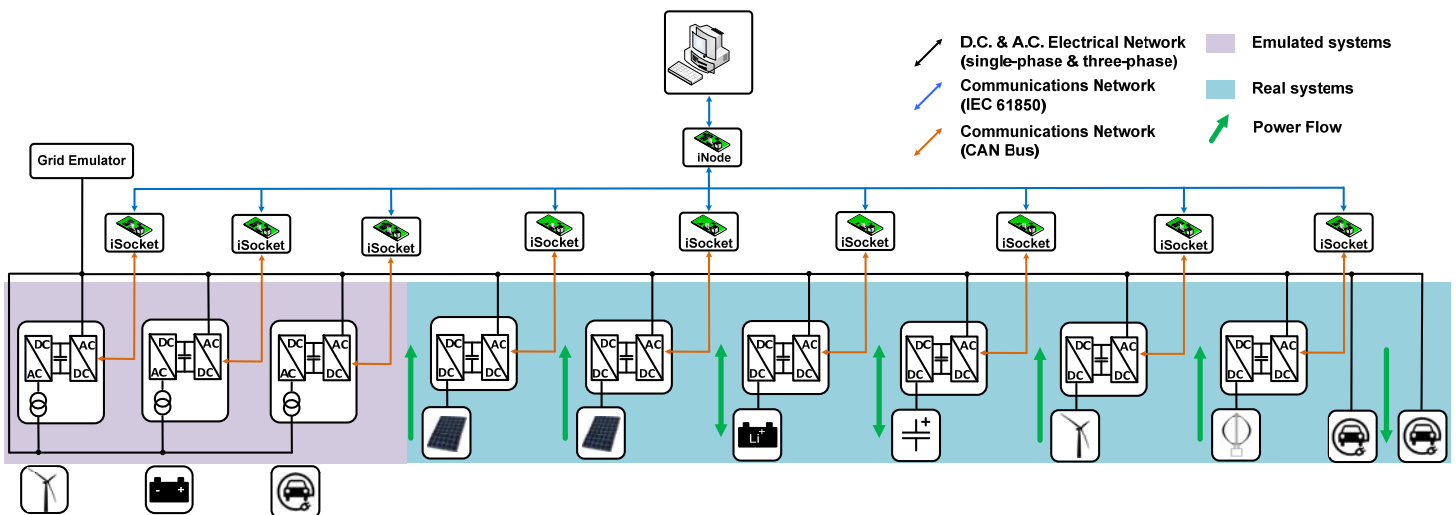


MICROGRID PROJECT

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Economic optimization of microgrids

Due to the **2020 Strategy in the European Electrical Sector**, there are different initiatives to lead the **CO2 reduction**, the **renewable increment** in the generation mix and the **efficient energy management**. A new component of this scenario will be **microgrids**, which can be defined as a power system composed of **Distributed Energy Resources (DER)** that can operate coordinately as an electrical or thermal generator, as a storage system or as a load, to provide **maximum electrical efficiency with a minimum incidence to loads profile in the local power grid**.



Objective

Design a **control strategy** to meet the management needs of the microgrid. This control strategy will be based on optimization tools in order to **maximize the economic profit** of the microgrid operation subject to **security and environmental restrictions**.

Methodology

From a general point of view, the optimization problem can be defined as follows:

Objective Function:

Minimize energy cost: $MIN \sum P_{it} \cdot C_{it}$

Indices:

i = Microgrid units
 t = Time period

Decision Variables:

P_{it} = Power consigned to each microgrid unit [kW]

Constraints:

Production capacity of unit i [kW]: $P_{it} \leq P_{max_{it}}$

Satisfy energy demand and deal with energy balance: $\sum P_{it} = D_t$

Lower boundaries: $P_{it} \geq P_{min_i}$

Storage capacity: $0 \leq E_s \leq E_{max}$

Given Data:

D_{ft} = energy demand forecast within the microgrid in period t [kWh]

D_t = energy demand within the microgrid in period t [kWh]

C_i = cost per generation unit [€/kWh]

Expected results

- Theoretical development of a microgrid control strategy using advanced optimization tools .
- Implementation of the control strategy in IREC's microgrid test facilities.

Requirements

- Capacity to work in a team, flexible, with initiative and ability to innovate. High level of analysis and synthesis skills.
- Knowledge on operations research, mathematical modeling and optimization techniques are required.

Contact

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