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Microgrids: Building Blocks of the Smart Grid

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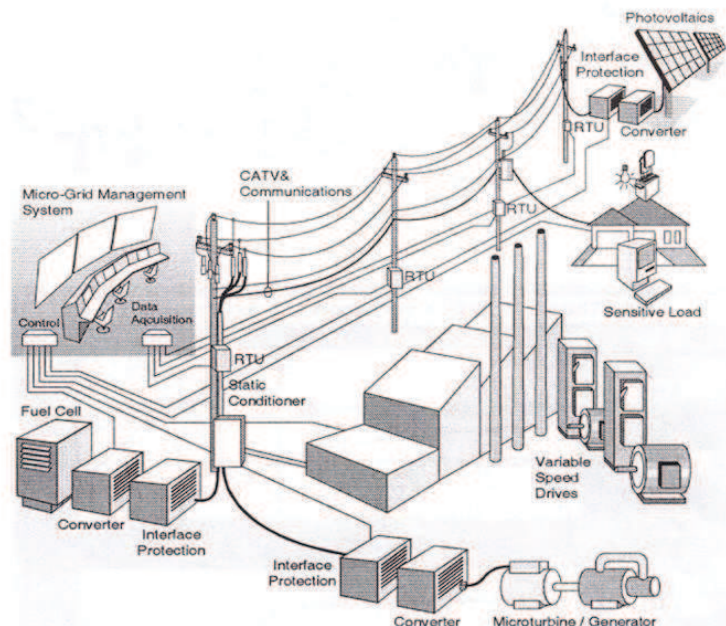
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Microgrids

Interconnection of small, modular generation to low and medium voltage distribution systems can be organized in Microgrids.

Microgrids can be connected to the main power network or operated islanded, in a **coordinated, controlled** way.





Technical Challenges for Microgrids

- ▶ Small size (challenging management)
- ▶ Use of different generation technologies (prime movers)
- ▶ Presence of power electronic interfaces
- ▶ Relatively large imbalances between load and generation to be managed (significant load participation required, need for new technologies, review of the boundaries of microgrids)
- ▶ Specific network characteristics (strong interaction between active and reactive power, control and market implications)
- ▶ Protection and Safety / static switch
- ▶ Communication requirements

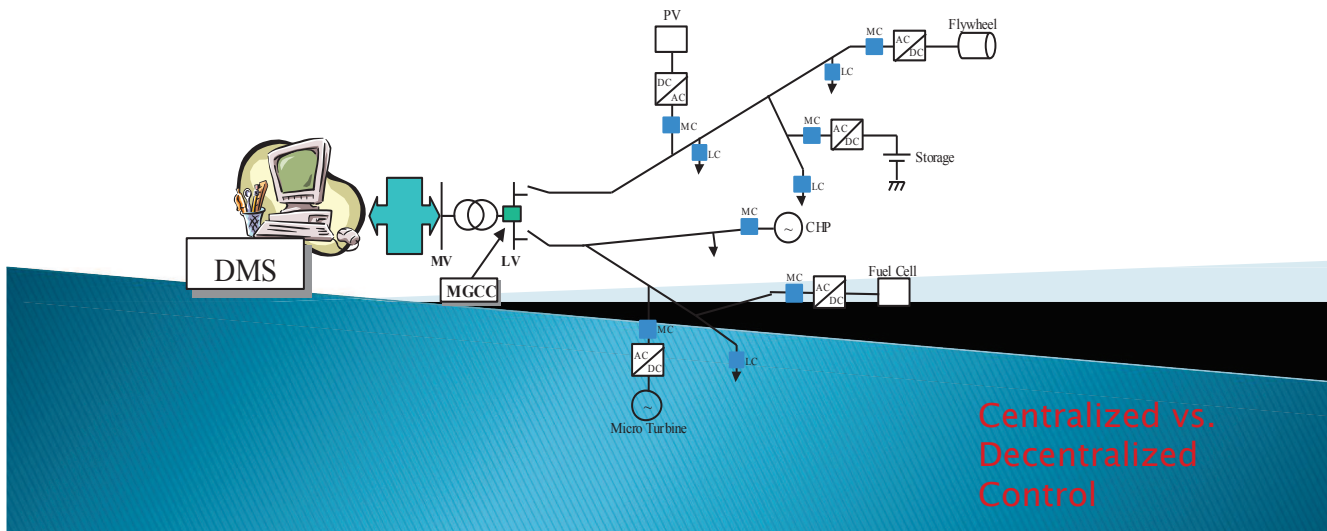


Market and Regulatory Challenges

- ▶ coordinated but decentralised energy trading and management
- ▶ market mechanisms to ensure efficient, fair and secure supply and demand balancing
- ▶ development of islanded and interconnected price-based energy and ancillary services arrangements for congestion management
- ▶ secure and open access to the network and efficient allocation of network costs
- ▶ alternative ownership structures, energy service providers
- ▶ new roles and responsibilities of supply company, distribution company, and consumer/customer

Microgrids – Hierarchical Control

MicroGrid Central Controller (MGCC) promotes technical and economical operation, interface with loads and micro sources and DMS; provides set points or supervises LC and MC; MC and LC Controllers: interfaces to control interruptible loads and micro sources



Panelists

- ❑ “The Fort Collins Renewable and Distributed Systems Integration Project in Colorado”, **Siddharth Suryanarayanan**, Colorado State University, USA
- ❑ “Microgrid: The Technology Issues and Environmental-Economic Benefits”, **Saifur Rahman**, Virginia Tech Advanced Res. Institute, USA
- ❑ “Coordination of Multi-Microgrids”, **Joao A. Peças Lopes**, INESC Porto, Portugal
- ❑ “Adaptive Protection Schemes for Microgrids”, **Enrico Ragaini**, ABB, Italy
- ❑ “Stabilizing the Graciosa Island Grid With Many Renewables but Without Diesel Engines”, **Carsten Reincke-Collon**, Younicos, Germany