Theme-based objectives and endpoints

Optimisation of the Electricity (production - transmission - distribution - usage) chain

Network architectures and integration of producer, storage and consumers;
Control of local and global energy flows - ancillary services;
Security and availability;
Economic, environmental and societal impacts.

Research issues:
Multi-scale and multiphysics models adapted to understand problem-solving phenomena;
Multi-criteria optimisation methods: applied to architecture and sizing choices;
New suitable supervision control, protection laws and architectures;
Demonstration and validation of proposed solutions.

Support objects:
Transmission, distribution and private networks and embedded networks;
Distributed generation systems;
Non-conventional loads.

G2Elab
Grenoble Génie Electrique
Grenoble Electrical Engineering

SYREL Team
SYSTEMS AND ELECTRICAL NETWORKS

Scientific activities

The central theme

Intelligent power systems in their broadest sense, « smart grids «, microgrid, supergrid: a global problem that can be handled from component to macro system.
Electrical networks are indeed complex systems, in which many elements are in strong interaction. The researches have a highly multidisciplinary content (economics, control, electromagnetic, mechanic, hydraulic, among others) and are linked to many stochastic phenomena.

Three structuring areas

1/ Unconventional connected systems
(controllable energy sources, loads, storage and microgrids)

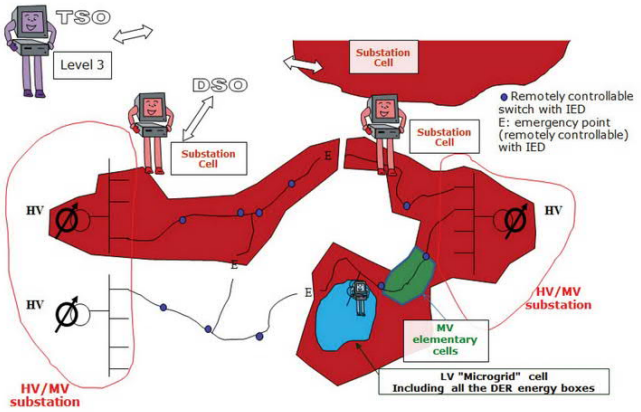
- Design/model of modular architectures
- Find decentralized management rules which need only a few data
- Integrate behavioral models (human, V2G, among others)
- Integrate technico-economic models of production and storage systems

2/ Analysis and optimization of advanced power systems - Towards a fusion smartgrids/supergrids ?

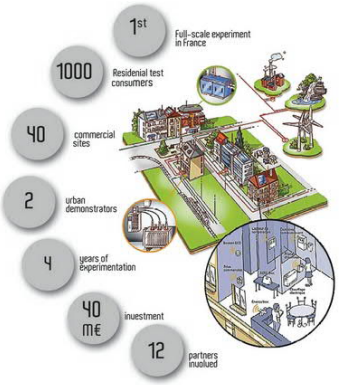
- Model and plan very large systems with strong interdependency
- Develop innovative control and observation laws
- Integrate the societal factor in the methodologies

3/ Advanced methods in understanding and securing complex infrastructures

- Use of new concepts (invariance of scale, fractals among others)
- Develop robust architectures of power systems
- Capitalize and hybridize methods coming from the study of complex systems (interdependencies and coupled infrastructures)



DREAM FP7 european project :
heterarchical management of complex electrical power grids

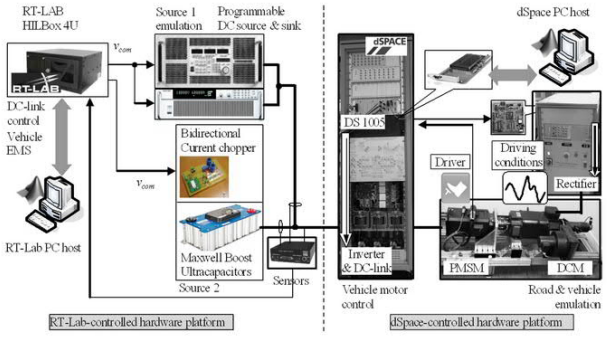


GreenLys french project :
smart grid full-scale demonstrator

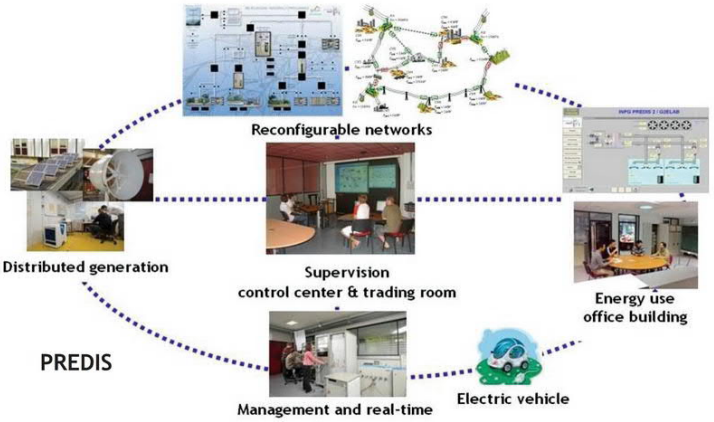
Superconducting Faut Current Limiter
for meshed HVDC grids

Facilities

PREDIS platforms :
Analysis, demonstration and benchmarking tools common to the research program
e.g.: the real-time hybrid simulator of electrical systems and distribution microgrids



Real-time Power-Harware-In-The-Loop
simulation of electric vehicle



Collaborative projects / Paternships

University
CEA-LITEN, GIPSA, GSCOP, LEGI, LEPMI, L2EP...

Industry
Airbus, Alstom, APC by SE, Areva, ATOS WorldGrid, EDF, ERDF, GDF Suez, GEG, Nexans, RTE, Schneider Electric, Thalès, TSV, SNCF, ...

International
Algeria, Belgium, Bulgaria, China (Beijing and Hong Kong), Colombia, Spain, Iran, Morocco, Romania, Sweden, USA, Venezuela, Vietnam, Ecuador, ...

European projects
ALP ENERGY, CRISP, DREAM, ECCOFLOW, EvolvDSO, FEBUSS, FENIX, FINSENY, FINESCE, FLEXMETER, GRID, INTEGRAL, KIC INNOENERGY, MOET, POA, SEESGEN ICT

National projects
ANR, OSEO, FUI, ADEME
DLDPV, ENERGETIC, ESPRIT, GREENLYS, MODECO, MULTISOL, REACTIVHOME, SINARI, SOGREEN, SOLUTION PV, SUPERBAT, SOGRID

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