



Power Engineering Group

Summary of research activities September 2020

- Grupo de investigación en Sistemas Eléctricos de Potencia
- Responsable: Antonio Gómez-Expósito (IEEE PES Fellow)
- Actualmente 30 miembros, 23 Doctores y 5 Catedráticos



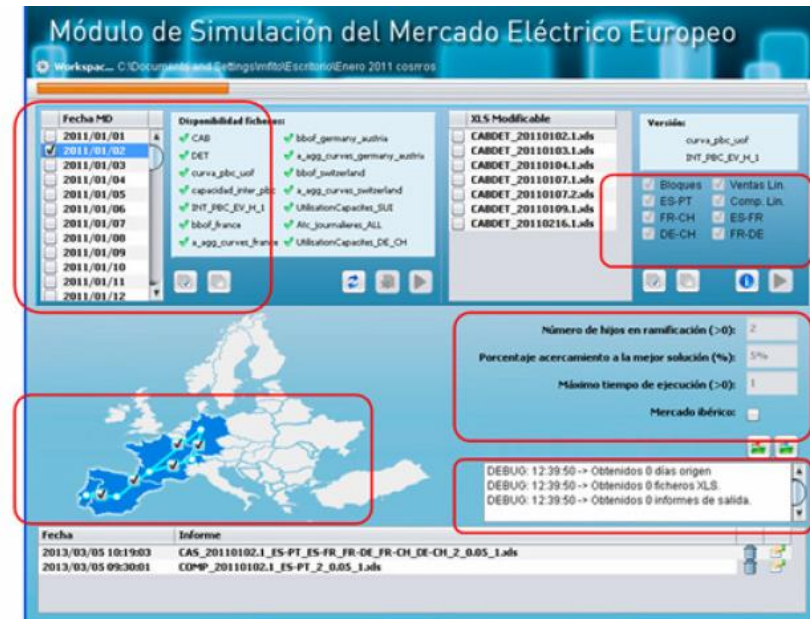
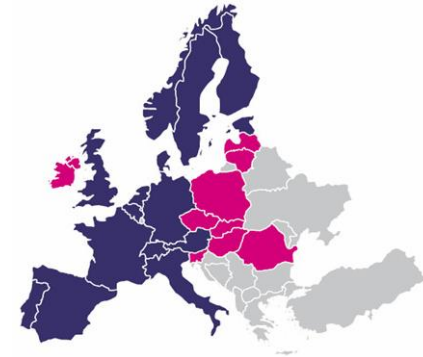
Plan Andaluz de Investigación (PAIDI)
TEP-196 Sistemas de Energía Eléctrica
Dpto. Ingeniería Eléctrica

- Responsables en REDYD 2050:
 - ✓ José Luis Martínez Ramos (jl.martinez.ramos@gmail.com)
 - ✓ Jesús Riquelme Santos (jsantos@us.es)

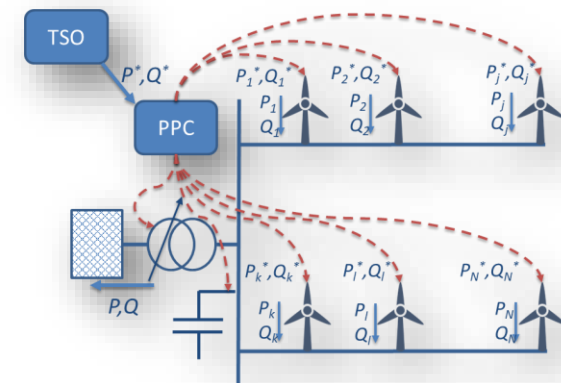


- Electricity markets and ancillary services
- Operation and control of T&D smart grids
- Integration of renewable energy sources
- Optimal planning of renewable power plants
- Power electronic applications on T&D grids
- Modeling, computational and simulation tools
- Monitoring and protection of smart grids

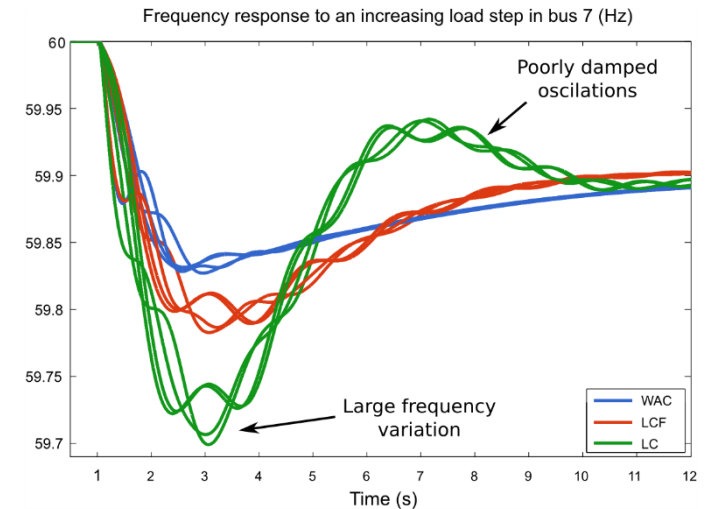
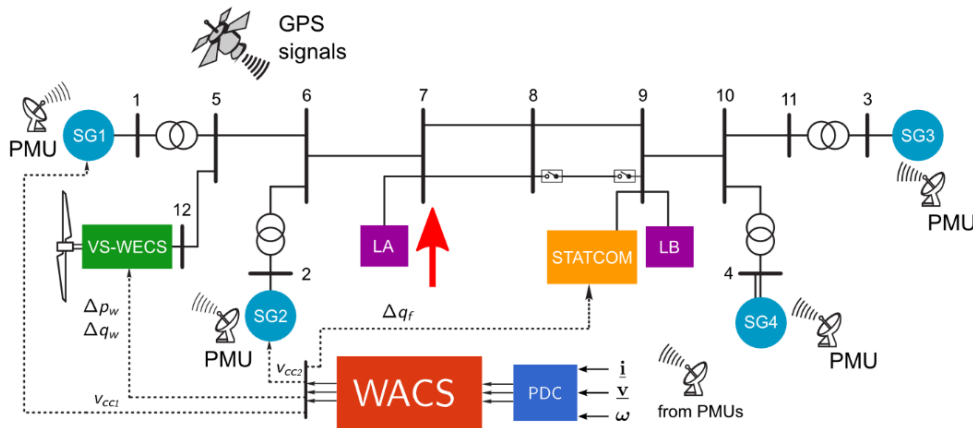
- Electricity markets and ancillary services:
 - New European energy market different from MIBEL
 - European market simulator
 - Implementation of Euphemia algorithm:
 - Fully configurable (markets and interconnections)
 - Historical data
 - Countries: 8
 - Variables: 150.000 - 300.000
 - Computation time:
 - Single matching: 3-5 seconds
 - Complex matching: 5 minutes
 - Local markets
 - Forecasting tools



- Operation and control of T&D smart grids
 - State estimation:
 - Solution breakthroughs
 - Transmission: multi-area applications (PMUs)
 - Distribution: substations and distribution feeders
 - Balanced and unbalanced-planned systems (European versus American designs)
 - OPF tools in restructured and decarbonized systems:
 - Large scale system (SC-OPF)
 - Optimal operation of renewable power plants
 - Security analysis of transmission systems
 - Optimal system restoration



- Integration of renewable energy sources (RES):
 - Power systems with massive penetration of renewables
 - Provision of ancillary services by RES:
 - Frequency stability
 - Voltage control
 - Damping oscillations



- Main current projects:
 - Proyecto EASY-RES (H2020 2019-2021). Provisión de servicios complementarios por parte de la generación distribuida
 - Pastora: Análisis Preventivo de Redes Inteligentes en Tiempo Real e Integración de Recursos Renovables (Innterconecta, 2018-2021)
 - Solar to Vehicle S2V (Junta de Andalucía 2020-2022): Maximización de sinergias entre generación fotovoltaica distribuida y vehículo eléctrico
 - Development of a prototype for the power supply of the Seville Spherical Tokamak (Junta de Andalucía 2020-2022)
 - Diseño, desarrollo y demostración de una microrred inteligente y activa (Plan Estatal Retos - Programación Conjunta Internacional 2017-2019)
FP7 ERANET-MED

- Software:
 - PSS-E
 - DigSilent PowerFactory
 - CYMDIST
 - PowerWorld
 - PSCAD
 - ATP-EMTDC
 - PLECS
 - Matlab
 - GAMS

SIEMENS
PSS/E

CYME
INTERNATIONAL T & D

 **PowerWorld**
Corporation

PSCAD
MANITOBA-HVDC
RESEARCH CENTRE


MATLAB

SILENT
DIG

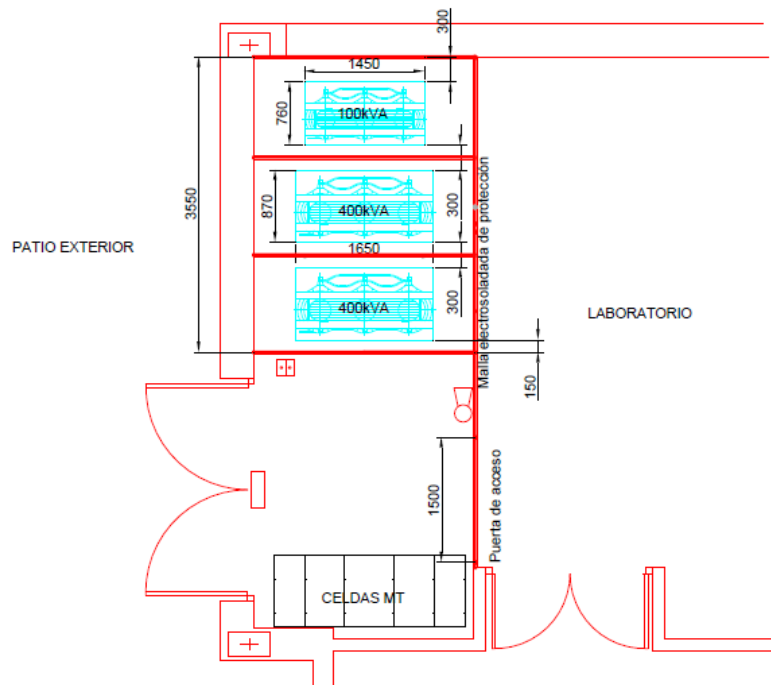
ATP Draw

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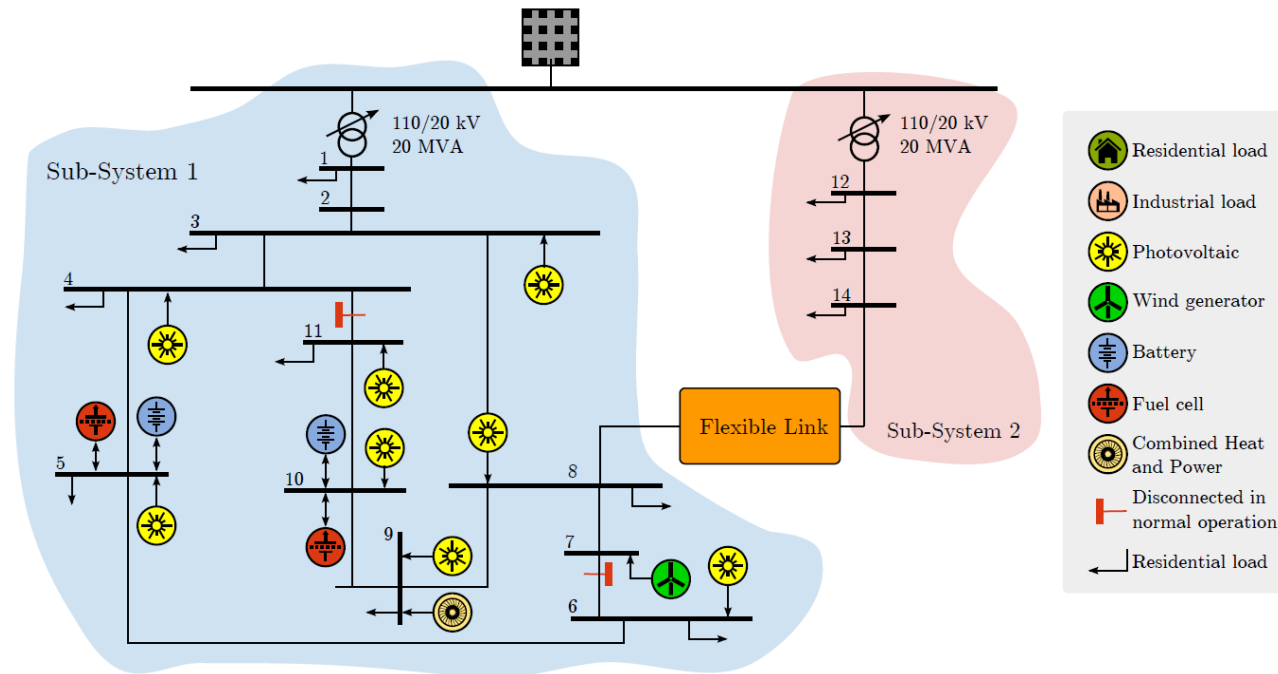
GAMS

GAMS Development Corp

- Labs:
 - MV laboratory: full-scale MV/LV substation (20 kV, 500 kVA)



- Labs: Scaled-down active distribution networks
 - MV & LV scaled-down distribution system (CIGRE)

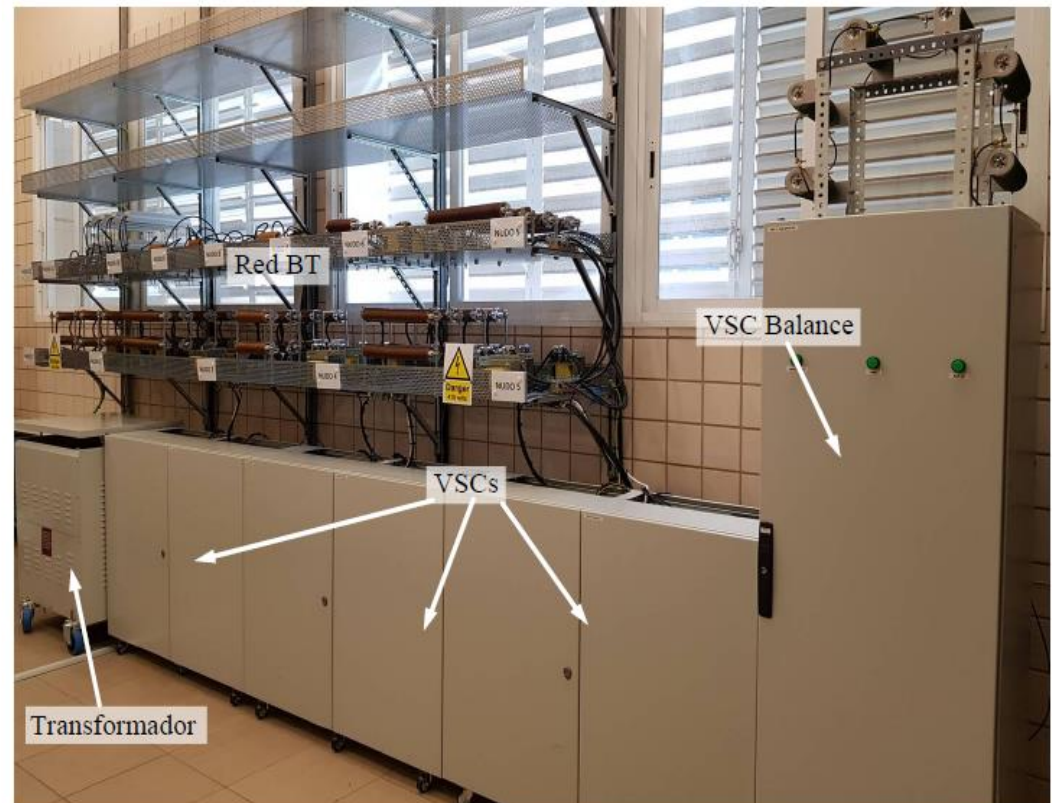
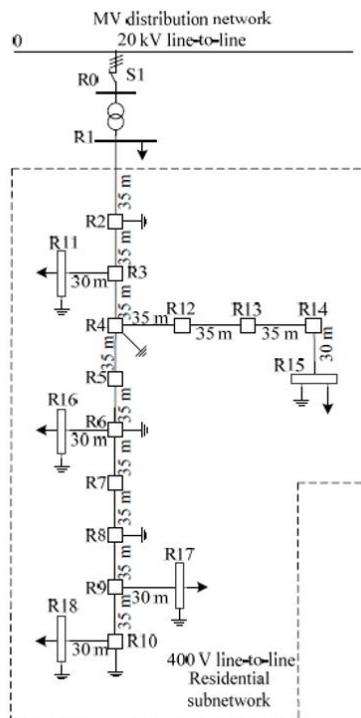


- DG Integration in distribution systems
- New tools for DMS

- Hardware:
 - MV scaled-down distribution system



- Hardware:
 - LV scaled-down distribution system (CIGRE Task Force C06.04.02): unbalance microgrid



AICIA, Centro Tecnológico vinculado a la Escuela Técnica Superior de Ingeniería de la Universidad de Sevilla



Red de Excelencia Cervera HySGrid+ (2020-2023): Desarrollo de comunidades locales energéticamente positivas con sistemas híbridos de generación renovable y almacenamiento.

En colaboración con ITE, ITG, CARTIF e IKERLAN

**INGELECTUS, Empresa Basada en el Conocimiento (EBC)
creada por el grupo de investigación en 2012**



www.ingelectus.com



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Gracias por su atención

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