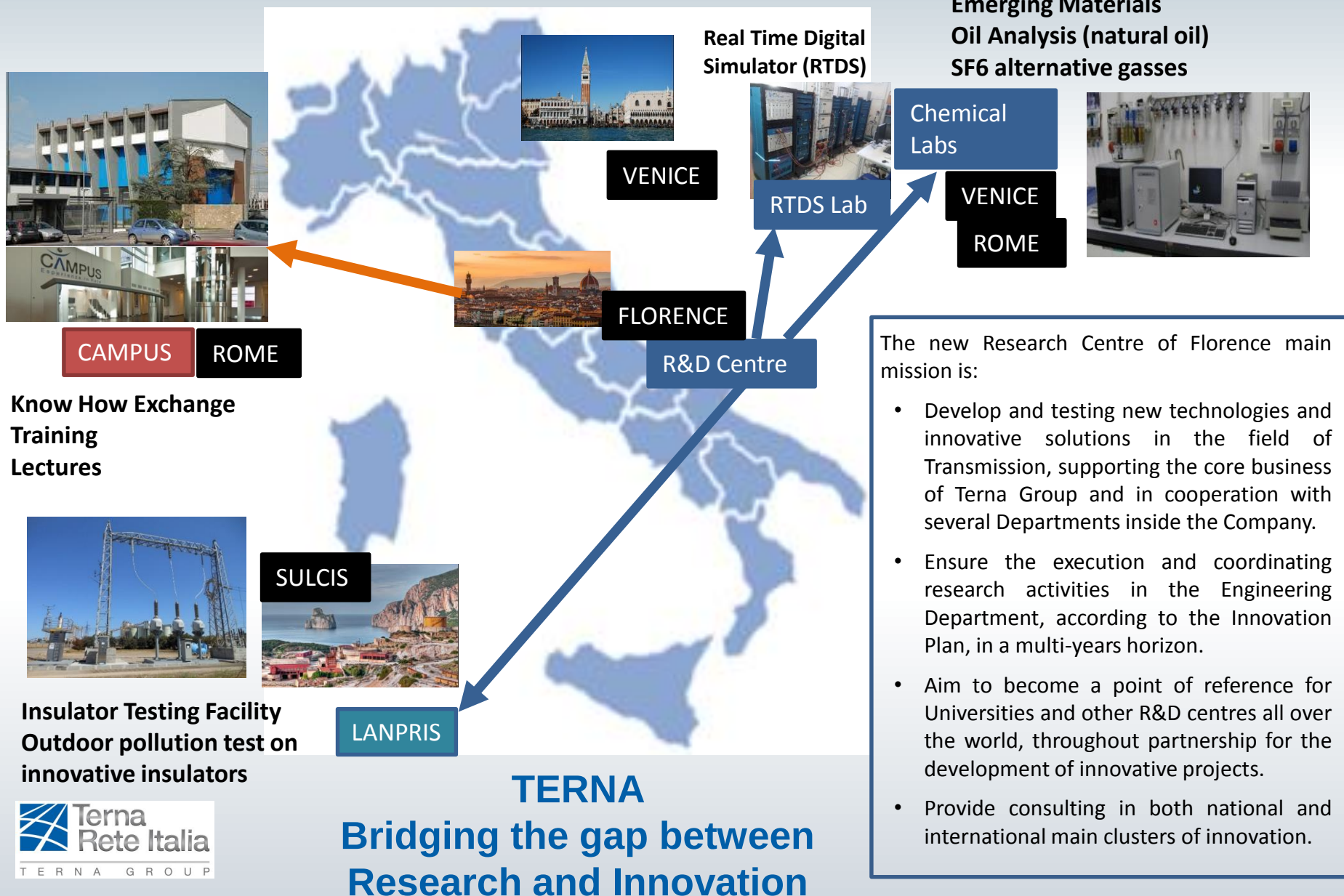




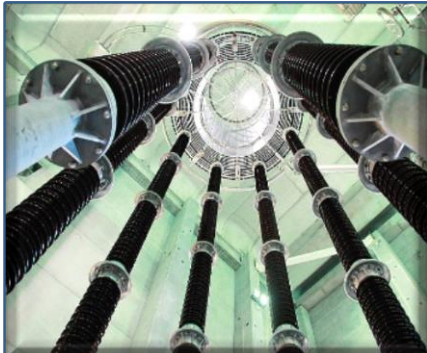
RESEARCH CENTRE FLORENCE

Research Centre of Florence



Research Centre of Florence – Clusters

The main R&D clusters include the establishment of MoU, testing and analysis, with the following fields of interest:



Power Electronics e HVDC

- Converters
- HVDC



Sustainability

- EMF
- Noising
- New materials
- Life Cycle Assessment
- Natural Esters



Asset Management e Smart Grids

- Innovative Conductors
- On-line monitoring
- Diagnostic
- Insulation
- Protection and control systems



Resiliency

- Climate changes
- Earthquakes
- Flooding
- Icing
- Severe wind



5
Research
Laboratories



More than 60
Research Projects in
the Engineering field,
included in the 2017-
2021 Innovation Plan

Research Centre of Florence – Chemical Laboratories



Chemical Laboratories – Venice/Rome

The laboratory has passed Round Robin Test comparing with about 20 renowned laboratories worldwide. And has at its disposal a wide range of instrumentation periodically checked in compliance with ISO9001 and 17025 Standards significant activities include:

- a) Measurements in SF6 HV equipment: GIS, TA, switches
- b) solid insulating Analysis and diagnosis used in marine cables
- c) Methods of maintenance activities of insulating oils (removing PCB and corrosive sulfur, regeneration, degassing)
- d) Testing of new on-line monitoring systems transformers
- e) Studies for adoption at Health Index for the fleet of installed transformers for the purpose of predictive maintenance.



Gas Cromatografo con rivelatore di massa (GC/MS). Strumento da ricerca per antinomia.



Gas Cromatografo con rivelatore ad emissione atomica (GC/AED). Con esso abbiamo scoperto per primi al mondo l'esistenza del DBDS.



Spettrofotometro infrarosso a trasformata di Fourier (FTIR). Fornisce una specie di impronta digitale di quasi tutte le sostanze chimiche.



Cella per misure delle proprietà dielettriche dei solidi ($\tan \delta$, etc.).



Cromatografo liquido ad alte prestazioni (HPLC), usato per quantificazione additivi nell'olio e prodotti degradati isolante solido.

Research Centre of Florence – LANPRIS



LANPRIS - Sulcis

LANPRIS or "Laboratory Natural for Testing of Insulators" is the new site laboratory that Terna built within the power station of the Sulcis, Sardinia. The goal of the laboratory is to carry out aging tests of the insulators of various types installed on the Italian Network, in order to evaluate the degradation over time.

The laboratory entered in service in November 2016, in partnership with Ricerca Sistema Energetico (RSE), which will analyze the data from the control units of the acquisition system, following the monitoring of main electrical parameters of insulation, by means measurement of leakage currents on the insulators.

Apparecchiature e strumentazione

Inductive Transformer
(step-up)



Gonio-anemometro

Termoigrometro

Pluviometro



Solarimetro

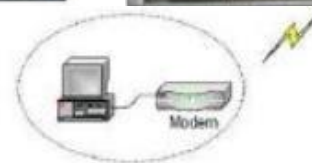
Data centre



Insulators



Monitoring case



Research Centre of Florence - RTDS Laboratory, Venezia



The RTDS, Real Time Digital Simulator, is a fully digital electromagnetic transient power system simulator used to conduct closed-loop testing of physical devices, such as protection and control equipment including IEC 61850 devices, to perform analytical system studies, and to educate operators, engineers and students. The RTDS Simulator allows the user to investigate the effects of disturbances on power system equipment and networks to prevent outages or complete failure.

- The RTDS Simulator is currently applied to many areas of development, testing, and studying of the following:
 - protective relaying schemes and integrated protection and control systems;
 - control system for HVDC, SVC, synchronous machines, and FACTS devices;
 - general AC and DC system operations and behaviour;
 - interaction of various electrical installations (e.g. between two HVDC systems)

Research Centre of Florence - RTDS Laboratory, Venezia

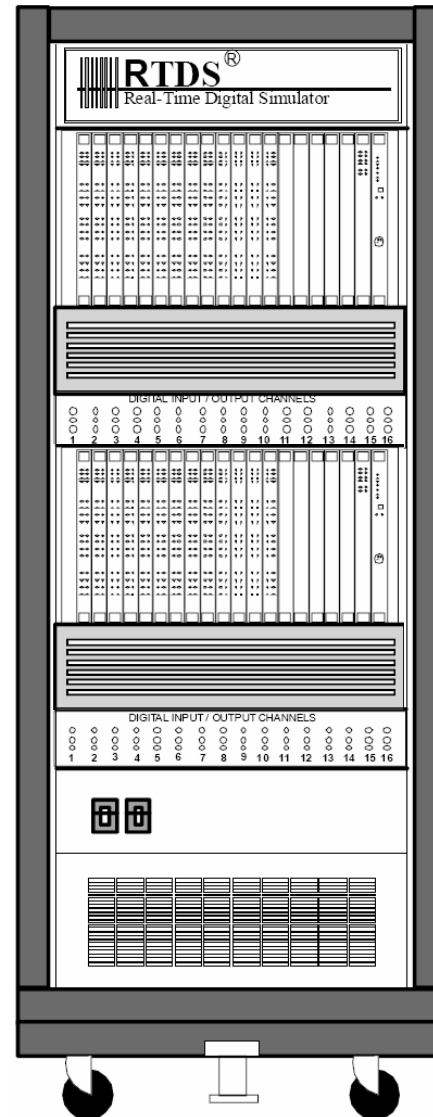
The RTDS system installed at Terna is composed of two racks:

- Rack 1 contains n.6 PB5 processor card: can simulate up to 2 subsystems of 90 nodes (single phase) each one.
- Rack 2 contains n.1 GPC and n.3 PB5 processor cards: can simulate up to 2 subsystems of 72 nodes each one.

Communication protocols:

- IEEE C37.118 data output streams
- IEC 61850 GSE binary messaging
- IEC 61850-9-2 sampled values

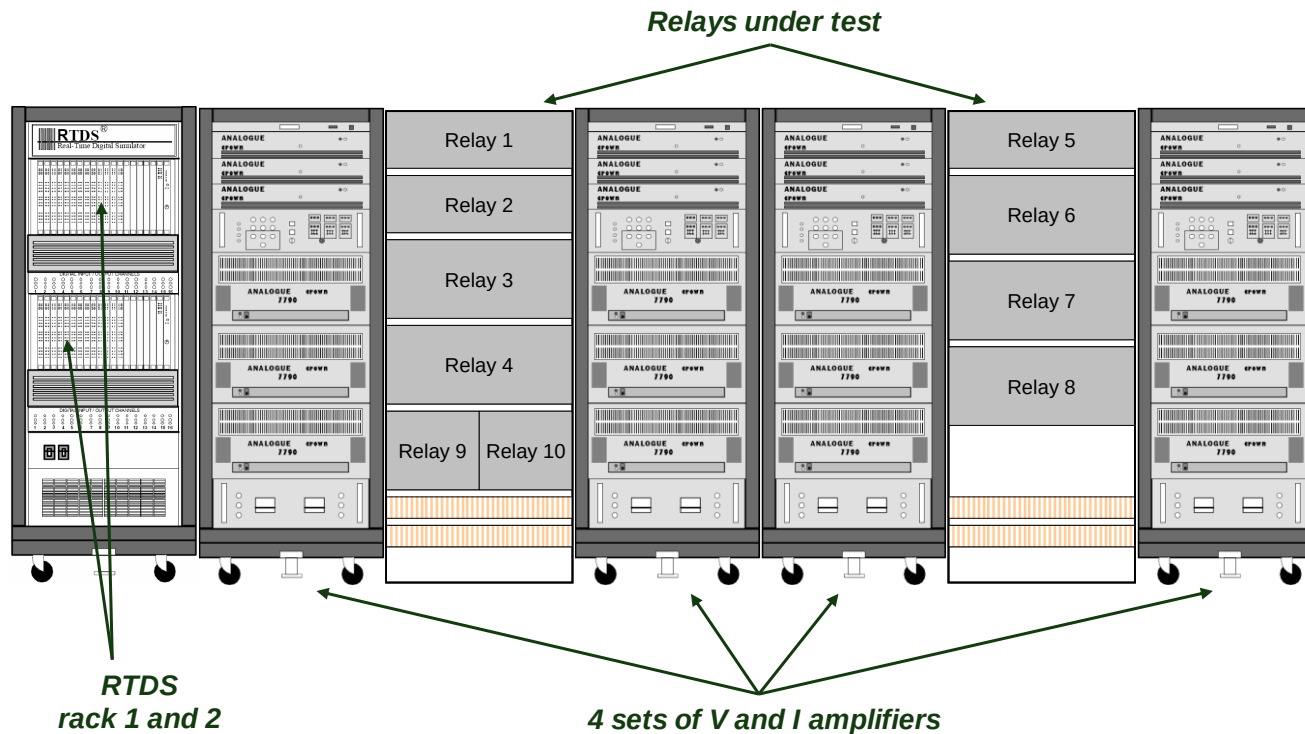
The I/O interface have 32 digital low voltage inputs and outputs and 16 up to 250 Vdc inputs and outputs. These interfaces allow for sufficient flexibility for the interaction with the devices under test



Research Centre of Florence - RTDS Laboratory, Venezia

4 sets of amplifiers are installed, each one consisting of 3 current amplifiers and 3 voltage amplifier. This equipments configuration allows to export simulated voltages and currents to the devices under test from up to 4 different locations in the simulated network.

The current amplifiers are designed to comply with the standard levels of secondary currents of Terna substations. So, they can easily supply more then the nominal CTs secondary current of 5 amps, up to 32 amps (rms) continuously. They especially can reach during fault simulations an output peak current of 200 amps, that is 14 to 28 times the nominal current.



Research Centre – Collaboration with the University of Florence



A new partnership has been established with the University of Florence, in order to investigate new field of interest in Transmission R&D.



Research Centre of Florence - Partnerships



Research Centre - Florence



Altre partnership

