

Laboratory Fact Sheet

1 Institution

CESI RICERCA

Name:

CESI RICERCA S.p.A.
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CESI RICERCA SpA has been established at the end of 2005 as a separate company owned entirely by CESI "Centro Elettrotecnico Sperimentale Italiano Giacinto Motta" SpA, with the mission to take over funded research activities of national and international interest and it started operating on January 1st 2006. CESI RICERCA S.p.A. is currently owned by ENEA "Italian National Agency for New Technologies, Energy and the Environment" (51%) and CESI S.p.A. (49%).

Four hundred researchers and technicians - and their main laboratory facilities - were moved from CESI to CESI RICERCA SpA.

The new company will carry out research in the electricity and energy sector, with strong emphasis on experimental applications, thus ensuring the consistent continuation of all current research activities and the development of new strategic projects in the future. Focus of the mission is to ensure the technology transfer in order to improve the operation of the Italian electrical system from the environmental, safety, security and economic point of view.

The company will also ensure the proper diffusion of scientific results to provide a good indication of the potential of emerging technologies in the electrical energy field.

2 Classification

- independent
- accreditation according to IEC 17025
- long-time DG experience (more than 3 years)
- active in standardisation committees

3 Brief historical background

CESI is founded in 1956 with the support of the Italian electrical utilities and electromechanical manufacturers with the aim of concentrating large investments in testing facilities to qualify Italian electromechanical industry and skills in power system analysis for the development of the national grid.

In 1962 ENEL, Italy's largest electricity supplier, acquires the majority of CESI share capital and CESI acts as technical support to ENEL in transmission and distribution fields and supplies testing, certification and consulting services on the international market.

CESI incorporates ENEL Research Division in 2000, with the aim of:

- concentrating all research knowledge and expertise in a unique company
- widening the range of services offered to the national and international market in the electro-energetic and environmental sectors
- developing "full range" approaches and solutions for the market.

In 2002 CESI acquires

- Piacenza Laboratory from ENEL Power Generation, which integrates and strengthens the packages of services dedicated to O&M in thermo-electrical power plants
- Polo Idraulico e Strutturale specialised in structural and hydraulic engineering for hydroelectric and thermoelectric systems and relevant infrastructures.

CESI RICERCA SpA is established in 2005, concentrating all resources, 400 researchers and technicians and laboratory facilities, devoted to conducting funded research activities of national and international interest in the electricity and energy field.

In 2006, ENEA "Italian National Agency for New Technologies, Energy and the Environment" acquires 51% of the shares of CESI RICERCA S.p.A. that becomes a public research Company in the electro-energetic sector.

In the field of the operation and development of transmission and distribution networks CESI RICERCA is performing research projects and carrying out studies dealing with:

- the expansion of power electric systems in the new liberalised scenario
- the study, testing and experimentation of new technologies like power electronics and superconductivity
- the exploitation of renewables and the application of DG concepts
- the study of the interconnection of electric power system in any area of the world (mostly in the east and west Europe as well as in the Mediterranean region)

CESI and CESI RICERCA have been involved in several European and National projects:

- DISPOWER: Technical Potential for the integration of decentralised power generators (especially Renewable Energy Systems) into existing utility grids under the long term energy scenario of the European Community - ENK5-CT-2001-00522
- ENIRDGnet: European Network for Integration of Renewable Sources and Distributed Generation - ENK5-CT-2001-20528
- RETE 21: Developing and Managing the Italian Network in the 21st Century
- GEN 21: Sustainable Electricity Generation in the 21st Century

- GENDIS 21: Improving Electrical Service Quality and Environment Through Distributed Generation
- GENDIS: Distributed Generation
- EVINGEN Innovation and Evolution in Generation
- ENERIN: Renewable Energies
- More Micro Grids
- ELEP

4 Mission statement

The mission of CESI RICERCA is to develop research projects of general interest to the national electricity system, focusing on applied research and with a system-oriented approach. The activity is aimed at innovating and improving the performance of the system from the point of view of economics, safety and environmental compatibility. Other major purposes are a wide activity of dissemination of the results, and the in-depth discussion of electro-energetic and environmental issues.

5 Institution in brief

- Associations

- AIEE Associazione Italiana Economisti dell'Energia
- AIGE Associazione Italiana Gestione Energia
- ANIPLA Associazione Nazionale Italiana Per L'Automazione
- CEI Comitato Elettrotecnico Italiano
- FIRE Federazione Italiana per l'uso Razionale dell'Energia
- UNICHIM Associazione per l'Unificazione del Settore dell'Industria Chimica

- Accreditations

- CESI RICERCA is the accredited Centro di Taratura (Calibration Centre) SIT No. 57.
- CESI RICERCA fulfills the requirements of standard ISO 9001:2000 (IQNET/SQS, registration number CH-32919).
- Number of staff: about 400 employees.
- Main source of funding: Electrical System Research National fund.
- Any potential conflicts of interest with respect to the cooperation under the NetDERlab e.g. due to source of funding: No conflict of interest.

6 Brief summary of competences

Where appropriate you can also provide a narrative of scientific background and competences in addition to the summary of main competences in the table shown below.

Template for matrix of competences

Institution: CESI RICERCA SpA	
Description of competence	Yes/no / list
Involvement in standardisation groups/committees	<p>Yes.</p> <p>Several technicians of CESI RICERCA are engaged in scientific and regulatory organisations like CIGRE, CEI (the National Electro-Technical Committee), IEC, UNI (the National Standardisation Body) by participating to the activities of Committees, Working Groups, Task Forces. In particular: the General Manager of CESI RICERCA is vice-president of IEEE - Italian Chapter; persons of CESI RICERCA are Chairman of 10 Committees and Sub Committees of CEI, of 3 Committees/WG IEC, of 1 Study Committee of CIGRE. Persons of CESI RICERCA are also national representatives in 4 CIGRE SC.</p> <p>Nominally, we are involved in the following Technical Committees:</p> <p>CT082 – Solar photovoltaic energy systems;</p> <p>CT088/IEC88 – Wind turbine systems;</p> <p>CT105 – Fuel cell technologies;</p> <p>CT 8/CENELEC 8 – System aspects for electrical energy supply;</p> <p>SC 8/D – Dispersed generation plants</p>
Certification expertise	Yes. Certification is part of our mission
Area of Scientific expertise	<ul style="list-style-type: none"> - HV research and testing - Power system analysis and economics - DER/RES integration - Development of Distribution Networks with DER (active distribution network) - ICT application for DER management - DSM
Involvement in consultancy (e.g. for industry and government)	Yes. Consultancy is part of our mission
DG reference project list	<ul style="list-style-type: none"> - DISPOWER: Technical Potential for the integration of decentralised power generators (especially Renewable

Institution: CESI RICERCA SpA	
Description of competence	Yes/no / list
	<p>Energy Systems) into existing utility grids under the long term energy scenario of the European Community - ENK5-CT-2001-00522</p> <ul style="list-style-type: none"> - ENIRDGnet: European Network for Integration of Renewable Sources and Distributed Generation - ENK5-CT-2001-20528 - RETE 21: Developing and Managing the Italian Network in the 21st Century - GEN 21: Sustainable Electricity Generation in the 21st Century - GENDIS 21: Improving Electrical Service Quality and Environment through Distributed Generation - GENDIS: Distributed Generation - EVINGEN Innovation and Evolution in Generation - ENERIN: Renewable Energies - More Micro Grids: Advanced Architectures and Control Concept for More Microgrids - ELEP: European Local Electricity Production
List of recent publications (2003-2004)	<p>Power Systems Conference and Exposition PSCE'04, 10-13 October 2004, New York, "A microturbine generation system for grid connected and islanding operation", A.Bertani, C.Bossi, F. Fornari, S. Massucco, S. Spelta, F. Tivegna</p> <p>Energia Elettrica (national journal), 2004 "Distributed Generation: a model of evolution for the energetic system", C.Bossi "Estimate the spread of co-generation in Italy", C.Bossi, O.Perego, F.Sanson, E.Tassi,</p> <p>Electrical Distribution and Distributed Generation: automation and control, 31 October 2004, Milan, "Test Facility to experiment with DGs integrated in low voltage grid and related control systems, A. Bertani, C. Bossi e V. Prandoni</p> <p>47° National Congress ANIPLA 21-22 November 2003, Brescia</p>

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Description of competence	Yes/no / list
	"Distributed Generation integration in low voltage grids by mean appropriate control systems", A.Bertani, S.Spelta "Control and Simulation of a storage system to feed a distribution grid in emergency conditions", V. Prandoni, S. Spelta, De Marco, C. 17th International Conference on Electricity Distribution - CIRED 12-15 May 2003, Barcelona, "Electrical energy distribution networks: actual situation and perspectives for distributed generation", A.Bertani, C.Bossi, B. Delfino, N. Lewald, S. Massucco, E. Matten, T. Meyer, F. Silvestro, I. Wasiak

7 Laboratory facilities

A DG test facility has been installed at CESI RICERCA, Milan. It is used for characterizing, testing and evaluating the performance of interconnected distributed resources. Also control systems have been investigated to make sure they operate properly and meet interconnection and communication standards. Tests have been planned for grid-connected or stand-alone use, micro-grids and hybrid systems.

The test facility is also able to reproduce disturbances such as sags, swells, and harmonic problems. A load simulator with resistive, inductive, and capacitive elements is able to generate different power factor values.

A high-speed Data Acquisition System (DAS) has been set up to collect and analyse the experimental data derived from the field test with the aim to monitor power quality, harmonic distortion, and electrical transients.

A Power Line Carrier (PLC) technology is implemented as an outdoor communication infrastructure in the test facility.

Template for facilities and capabilities

Facilities	Capabilities
Battery test laboratory	Under Test Zebra Battery (64kW, 36kWh), Redox Battery (42kW, 84kWh), Lead Acid Batteries (100kWh)
PV pannels testing	Outdoor test facility with 24 kWp PV arrays (Si-poli, CIS, Si-amorfo)
Hybrid system testing	Diesel engine (6,4 kW), Wind Turbine Simulator (8 kW) and PV arrays
Solar Dish Stirling testing	Eurodish (10kWp)
Microturbine testing	Testing in co-generation and tri-generation modes (105 kWe and 160 kWt)

Facilities	Capabilities
Fly-wheel testing	Urenco 100 kW for power quality
MCFC fuel cell plant set-up	Stack MCFC 125kW + microturbine
ORC biomass plant set-up	10 kW
Power Line Laboratory	Testing of various communication technologies on power line
Fuel Cells Laboratory	3kW
Simulation	Matlab, Simulink, SymPowerSystem, Power Factory DigSilent, ATP.

8 Standardisation activities

See Table at par. 5.

9 Testing activities

The test facility is used in order to understand how the distributed resources interact among them and with the utility grid. It is possible to perform several different experiments:

- during transient state: behaviour during short-duration voltage variation for single/three phase AC faults, or dynamic response to sudden load changes and to conditions of phase imbalance or loss of phase, islanding condition following interruption of the supply etc.;
- at steady state: intentional islanding condition (a portion of the LV system is normally not connected to MV grid);
- power quality impact in terms of: harmonics, flicker, voltage fluctuations, unbalances;
- specific test for generator characterisation.