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The *mission* of **RSE** – a publicly owned company with the Italian national grid operator (GSE) as its sole shareholder – is to carry out publicly funded national and international programs in the fields of electrical power, energy and the environment. RSE studies cover the following:

- technical, economic, organizational and institutional aspects associated with the sustainable development of the Italian electrical power network and related infrastructures
- safe and effective use of primary sources of energy and of hydrogen as energy vector
- power generation, transport and distribution, and end-use energy efficiency

RSE is also engaged in disseminating research findings and it leads projects for the transfer and application of research outcomes to operators in the energy field. Furthermore, **RSE** is committed to promoting the development of the above mentioned areas including with technical and scientific cooperation at the national and international levels.

Currently, the company has about 350 employees.

ACTIVITIES

RSE is mainly active in the framework of the Three Year Plan 2009-2011 targeting research into electrical systems to the benefit of national electrical system users. It also participates in national and European call for tenders such as the Sixth and Seventh Framework Program and the Italian Program for Industry 2015, and it carries out research, provides expert advice and consultancy services to institutions and third parties at the national and international levels. **RSE** working modalities include cooperation with a number of Italian and foreign organizations and universities.

Research activities are grouped into three main areas as identified by the 2009-2011 Three Year Plan, approved by Decree dated 19 March 2009 by the Italian Ministry for Economic Development, and by the subsequent Program Agreement signed with the Ministry's Directorate General for Nuclear Power, Renewables and Energy Efficiency on 29 July 2009. In this framework, **RSE** work is based on deeply integrated, strongly interconnected projects.

Governance, Management and Development of the National Power System

- Studies on the development of the electrical energy system and the national power grid
- Research into smart grids, distributed generation and energy storage systems
- National and International cooperation projects for the rebuilding of skills in the nuclear sector

Power Generation and Environmental Protection

- Research into hydro and wind power potential
- Research into concentrating solar photovoltaic power
- Studies on local power generation from biomass and waste
- Studies on the use of clean fossil fuels and CO₂ capture and sequestration

Rationalization and Saving in the Use of Electricity

- Studies and assessment of rational energy utilization and measures to increase end-use energy efficiency
- Impact of widespread electric vehicle adoption on the Electrical System

The results achieved through the "Ricerca di Sistema" (research into electrical system) are shared with the scientific community, institutions, public administration bodies, energy operators, large energy consumers, citizens, and consumers' and manufacturers' associations. Results are disseminated through technical reports, publications on scientific and specialized magazines, general press releases, published guidelines, manuals, fact sheets and monographs, the company newsletter, initiatives targeting education and participation in scientific meetings. Other key activities target feasibility studies of energy districts powered by renewables, in cooperation with Public Administration bodies.

RSE scientific production is available at www.rse-web.it

T&D

- Techniques to optimize the use of existing infrastructures while meeting safety and reliability requirements
- New technologies for smart grids
- Study and assessment of innovative materials and components for the development of the power grid
- Power quality
- HV and LV dielectric tests and metrology

Power Generation Systems

- Performance improvement in coal and natural gas-fired plants
- Abatement of polluting emissions and CO₂
- Experimental research on fuel cell technology and on generation, transport, storage and use of hydrogen
- Testing of small size plants (renewables, cogeneration), dynamic interaction between plants and power grid
- Prototypes to lower the generation costs of sun energy, inorganic LEDs for lighting and road signals
- Safety of nuclear plants

Environment and Sustainable Development

- Applied meteorology, climatology and atmospheric sciences supporting the planning, development and management of the electricity and energy systems
- Sustainable development and management of the hydro sector, to ensure the safety of infrastructures, plants, and the territory
- Studies, methods and techniques to assess and monitor the impact of the electricity and energy systems
- Integration of the electricity system into the territory

SKILLS

Skills and knowledges are distributed among 4 areas working in full synergy, tackling the various issues of the electricity/energy sector with a system-oriented logic.

Power System Development

- Analysis of demand/supply integrated scenarios, to meet the needs for security of supply, environmental sustainability, competitiveness
- Assessment of end-use energy efficiency actions
- Study and application of planning methods and tools for the national power transmission grid and interconnections with foreign countries
- Development and application of methods and tools for assessing power grid operational safety under static and dynamic conditions
- Development of methodology and techniques for demand side management and distributed generation aimed at the development of the smart grids

LABORATORIES

- LV Test facility (smart grid) including distributed generation, cogeneration, energy storage systems and programmable loads
- Metal Organic Chemical Vapour Deposition – MOCVD – reactor and testing equipment for concentrating solar power
- Hydrogen and fuel cells lab
- Lab on CO₂ capture membranes
- Lab on pollutants abatement processes
- Lab on power storage
- Lab for High Voltage dielectric tests (rated voltage up to 1.600 kV with alternating current and 700 kV with direct current)
- Lab on electric and mechanical testing of conductors for overhead power lines
- Lab on superconductivity
- Lab for dielectric testing of medium-voltage equipment; tests in a contaminated atmosphere; telecommunication and protective devices; Faraday cage (250 kV AC)
- Electro-optics lab
- Calibration lab for measurement transformers and HV measurement equipment (Centre with SIT Accreditation nr. 57)
- Environmental analysis lab: environmental metrology; chemistry and microbiology; Plateau Rosa CO₂ monitoring station; meteorology