



## The Energy Technologies Department

The “Energy Technologies” Department fosters innovation in the sectors of renewable energy sources: thermal and thermodynamic solar with accumulation systems, photovoltaic, bioenergies, biorefining for production of energy and biofuels; energy efficiency technologies, and end uses of energy, smart cities and rational energy use, smart grids, sustainable mobility, transport, sustainable use of fossil fuels and advanced thermal cycles, hydrogen and fuel cells, accumulation of energy for mobile and stationary applications, robotics and ICT.

### STRATEGIC OBJECTIVES

- Contributing to medium-to-long term diversification of energy sources; contributing to curbing emissions and fossil-sourced energy dependency; fostering development of a low-carbon economy, also by optimizing energy use.
- Enhancing the competitiveness of Italian industry by reducing energy costs; boosting productivity and returns for energy producers by developing innovative energy technologies and services.

The Department ensures its presence as a highly qualified player in dealings on key national, EU and international levels. The priorities as regards the Department’s activities take into account the Strategia Energetica Nazionale (national energy strategy), the programme agreement with the Ministry of Economic Development, for power system research, and the vision embodied by the SET (Strategic Energy Technology) Plan, EERA (European Energy Research Alliance), BIC (Bio-based Industries Consortium), SERIT (Security Energy in Italy) and the Horizon 2020 programme. The Department coordinates the national energy technology cluster.

### ACTIVITIES UNDERTAKEN TO SUPPORT COMPANIES

The Department develops, implements and disseminates technologies, methodologies, materials, processes and products. It also engages in advanced design activities, construction of prototype installations, provision of advanced technical services, and technology and knowledge transfer to Italian companies, in order to develop a more sustainable energy system.



#### Organizational structure

**Energy Technologies Department**  
*Ing. Gian Piero Celata*

**500 researchers and technicians organised in six Divisions, a Strategic Technical Support Unit, two Technical Units and two Operation Services and Management Units**

**Strategic Technical Support**  
*Ing. Giambattista Guidi*

**Deputy-Director in charge of Operations Management for Service**  
*Dr. Piero Massari*

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## our mission

“ENEA is a public body with the aim of pursuing research and technological innovation, as well as providing enterprises, public administration and citizens with advanced services in the sectors of energy, the environment and sustainable economic development.”

*Law no. 22 of 28th December 2015*

ENEA’s mission is to contribute to Italy’s competitiveness and sustainable development by conducting research and technology development activities in support of Public Administration, companies -particularly SMEs- and citizens.

ENEA comprises four Departments developing research, technology innovation and advanced services, with some 2,500 personnel composed of researchers, technicians and administrative staff distributed in 13 research centers throughout Italy.

ENEA has a long-standing experience in innovation and research in the fields of energy, new technologies and the environment.



ITALIAN NATIONAL AGENCY FOR NEW TECHNOLOGIES,  
ENERGY AND SUSTAINABLE ECONOMIC DEVELOPMENT



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## we research innovation

# energy technologies



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## Renewable sources and smart grids

The Department conducts research, development, and design and production activities. It produces materials, processes and products for prototype installations in the sectors of renewable energy sources (thermal and thermodynamic solar, with accumulation systems, photovoltaic, bioenergies and biofuels) and Smart Grids. These activities concern development in various spheres: low and medium temperature solar technologies; components and systems for high-temperature concentration solar installations; thermal storage systems with various types of materials (blends of fused salts, phase-change materials, low-cost solid materials etc.); innovative components for photovoltaic generation; technologies and components for construction of integrated, smart energy networks; techniques and strategies for management, advanced control and optimization of complex networks and systems; and biological processes for conversion of biomasses into energy and liquid and gaseous fuels.

The Department is committed to developing projects aiming to curb energy consumption, enhance performance ratings for end users, and provide advanced network and customer services networks.

## ICT and smart cities

The Department develops technologies and methodologies for the production system, institutions and the citizenry in the energy sector and the sector of end uses of energy. It does so by implementing ICT solutions. It engages in a variety of activities such as: designing and managing smart buildings and smart districts; modelling and managing distributed generation systems; construction of smart cities, including urban networks (municipal lighting, and power, water and gas networks); mobility systems; information systems (ICT City Platform); risk forecasting and risk management systems (safety & security, risk analysis for infrastructures presenting criticalities with respect to natural events); smart homes; assisted living systems; fostering energy awareness; and interactions with energy networks.

The Department also manages the Agency's high-performance computing and data transmission infrastructure, and contributes to development of modelling solutions, cloud computing, and web-based applications based on Big Data and Internet of Things paradigms, for tackling a variety of energy and industrial innovation issues.

## Sustainable use of fossil fuels, energy accumulation systems, sustainable mobility

The Department designs, manufactures and manages equipment and installations for experimentation of advanced technologies in the field of energy. To this end, it also develops and applies models of computation/computational codes for dynamic and non-dynamic simulation of components and processes. Methodologies, processes and optical components for application in a variety of ambits (energy, thermal fluid dynamics, chemical) are developed.

The Department studies technologies for decarbonising fossil fuels for energy production, as well as materials and processes within the ambit of chemistry and electrochemistry, for energy conversion and accumulation, and higher-efficiency vehicles with reduced environmental impacts. It also develops innovative instruments to back the processes of planning, managing and running transport systems.

## Thermal and thermodynamic solar systems and smart networks

The Division engages in research, development and classification of technologies, materials, processes and products for the solar power sector, for production of heat and use of heat during conversion to electricity, for industrial processes and environmental conditioning. It develops systems for integrating solar energy into thermochemical processes for production of fuels, hydrogen and thermal storage systems. It also develops methodologies and technologies for modelling and implementing integrated energy networks and micro-networks in the presence of distributed polygeneration and energy accumulation systems in accordance with a Smart Grids approach.

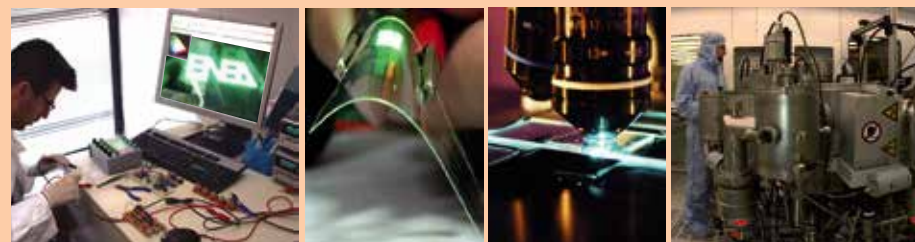
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## Photovoltaic and smart devices

The Division undertakes various activities; R&D, design and production of materials, devices, processes, products and demonstrators. It also analyses and implements advanced technologies for providing advanced technical services to business concerns and public administration bodies within the sectors of photovoltaic solar installations and devices and sensors applied to multi-utility systems. The strategic aim is to contribute toward developing innovative devices, components and systems for photovoltaic generation as a means of boosting growth, enhancing the competitiveness of domestic national companies in the sector, and enabling a grid-parity photovoltaic generation market.

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## Bioenergy, biorefining and green chemistry

The Division operates within the sectors of bioenergies, biorefining and green chemistry for the production of heat energy, electricity, biofuels, biomaterials and chemical intermediates. It conducts research into increasing productivity and returns for farming activities linked to biorefining (curbing environmental impacts while safeguarding biodiversity). This research also focusses on the biomasses production sector, with application of advanced biochemical and molecular biology methods in order to pinpoint the molecular factors involved in biosynthesis of high added-value molecules.

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## Production, conversion and efficient use of energy

The Division engages in the following activities: research, innovation and technology transfer for sustainable use of fossil fuels and integration of such fuels with renewable resources; developing advanced energy cycles; power to gas; thermal fluid dynamics applied to energy and industrial systems; production of hydrogen; fuel cells; systems of electrochemical accumulation for mobile and stationary application; and sustainable mobility. It produces and runs experimental infrastructures, for research into aspects of energy production, conversion and use.

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## Smart energy

The Division operates in the sector of energy end uses, and in metropolitan areas. It deals with integration among distributed energy production systems, as well as transmission and use, and interconnection among local systems and national energy networks. It roots its methodological approach in its holistic capacity to model systems, and provide new services thanks to innovative organisation of the systems themselves, while adopting ICT as a technology that enables inter-relations between networks and components, and meets the needs of individuals.

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## Development of systems for IT and ICT

The Division furthers the objectives of research and technological innovation, and of providing advanced services from ENEA (Italian National Agency for New Technologies, Energy and Sustainable Economic Development), in the sectors of energy and sustainable economic development, via implementation of ICT solutions, with particular regard to: scientific computing, high-performance networks, cloud computing, web-based applications, web services for communication and training, and, lastly, the Agency's management computer system. The Division also handles data security, confidentiality and communication tasks, while ensuring savings in running costs.

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