

Renewable Energies

Renewable energies, already a major research focus in France, include bioenergy, geothermal energy, thermodynamic heating, solar energy (thermal, photovoltaic, concentration), wind energy, hydroelectric and marine energy, and hydrogen-based generation.

Beneficial to the environment, renewable energies come from a variety of sources: the sun, wind, water, and geothermics, as well as firewood, crop residues, biogas, biofuels, urban or industrial waste, and heat pumps. In order to protect the environment and to mitigate climate change, carbon-free energies and sustainable development are now priority research areas.

The goal is to ensure greater energy efficiency by developing clean technologies and alternatives to technologies that depend on fossil fuels. Renewable energy development seeks to ensure high output and low emissions.

Students may begin studying some aspects of renewable energies in their first years of higher education, including HVAC systems and marketing. However, at the master level, students decide to specialize in engineering (systems, energy efficiency, etc.), physics (electricity, materials, etc.), or chemistry. Sustainable development is a component of programs in management and the environment.

Renewable energies by the numbers

- € 24 million spent on renewable energies in 2012
- Renewable energy sector produced 24.8 Mtep of primary energy in 2013
- 23% of energy originating from renewable sources by 2020
- Renewable energy accounts for 14.2% of total energy consumption (2013)
- 11% increase in renewable energy production between 2012 and 2013.

Source: French Ministry of Ecology, Sustainable Development, and Energy
www.developpement-durable.gouv.fr

INTERNATIONAL

France is rich in renewable energy sources. It has Europe's fourth largest forest area after Sweden, Finland, and Spain (source: Food and Agricultural Organization of the United Nations). With its strong output of hydraulic, wind, and geothermal energy, France is Europe's second largest producer of renewable energy after Germany. Thanks to France's abundant wood resources, biomass accounts for 43% of its renewable energy output whereas hydraulic accounts for 25%, biofuels 10%, and heat pumps 7%.

When France signed the European Union's "2020 Energy & Climate Package," it set the goal of having renewable energy account for 23% of its final energy consumption. By the end of 2013, renewables, primarily wood and hydraulic energy, accounted for 14.2% of the total energy consumption. Photovoltaic energy has reached and surpassed the goal of 5,300 MW in continental France and 5,700 MW in French overseas territories. Other forms of marine energy are emerging. In fact, in 2016-2017, two pilot farms will be operating 11 marine turbines.

The French law on energy transition aims for 32% of French energy to be renewable by 2030 whereas the European Union has set a target of 27%.

Related fields

Ecology – Energy – Physics – Public health – Environmental science – Marine science – Earth and space sciences – Life sciences and health – Transportation – Urban planning

Subfields

Bioenergy - Biomass - Wind energy - Energy efficiency - Geothermal energy - Hydraulics - Carbon-free energy - Marine energy - Photovoltaic energy

Useful links

- Agence de l'Environnement et de la Maîtrise de l'Énergie (ADEME): www.ademe.fr
- Alliance Nationale de Coordination de la Recherche pour l'Énergie (ANCRE): www.allianceenergie.fr
- Association Savoyarde pour le Développement des Énergies Renouvelables (ASDER): www.asder.asso.fr
- Commissariat à l'Énergie Atomique et aux Énergies Alternatives (CEA): www.cea.fr
- Comité de Liaison des Énergies Renouvelables (CLER): www.cler.org
- Écosources.info, portal with data on renewable energies: www.ecosources.info/
- EDF Énergies Nouvelles: www.edf-energies-nouvelles.com
- Enercoop, a cooperative devoted to green electricity: www.enercoop.fr
- Grenelle Environnement: www.legrenelle-environnement.fr
- Groupe Énergies Renouvelables, Environnement et Solidarités (GERES): www.geres.eu
- French Ministry of Foreign Affairs and International Development (MAEDI): www.diplomatie.gouv.fr > Politique étrangère de la France > Environnement et développement durable
- French Ministry of Ecology, Sustainable Development, and Energy (MEDDE): www.developpement-durable.gouv.fr > Énergie, air et climat
- Observatoire des Énergies Renouvelables (Observ'ER): www.energies-renouvelables.org
- Planète énergies, online encyclopedia: www.planete-energies.com
- Pôle d'Excellence Rurale Énergies Nouvelles (PEREN): www.peren.org
- Syndicat des Énergies Renouvelables (SER): www.enr.fr
- Université Virtuelle Environnement & Développement Durable (UVED): www.uved.fr

CHOOSE YOUR PROGRAM

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Licence level

Brevet de Technicien Supérieur Agricole (agricultural technician certificate) (Secondary diploma +2 years of higher education) – L2

Students can earn a **BTS** in **fluidics, energies, and domotics** in one of three areas:

- HVAC systems and fluidics;
- cooling systems and air conditioning;
- domotics and connected infrastructures.

• www.campusfrance.org>Espace documentaire>Offre de formation>Fiches Diplômes>BTS

Diplôme d'Études Universitaires Scientifiques et Techniques (Secondary diploma +2 years of higher education) – L2

The DUT is offered by the technology institutes of certain universities:

- the DUT in **civil engineering and sustainable construction** covers energy efficiency and new energies. It emphasizes renewable energy development.
- The DUT in **thermal engineering and energy** trains students in specialized techniques applicable to the production, management, storage, and transmission of thermal energy in industry. It also emphasizes renewable energy development.

• www.campusfrance.org>Espace documentaire>Offre de formation>Fiches Diplômes>DUT

Professional licences (bachelor's degree) (Secondary diploma +3 years of higher education) - (L2 +1 year)

Students pursuing the bachelor's degree in **sciences, technologies, and health** can select from among 20 majors related to renewable energies, such as:

- HVAC systems,
- management of renewable energies, development and management,
- energy efficiency
- renewable energy in construction,
- renewable and alternative energy systems,
- renewable energy development, energy technologies, etc.

• www.campusfrance.org>Trouvez votre formation>Licence

Master level

Master (Secondary diploma +5 years of higher education) – M2

Students pursuing master's degrees in **sciences, technologies, and health** can specialize in renewable energies:

- Three specializations are available in the **renewable energies and intelligent systems** program:
 - eco-technology,
 - mechatronics,
 - information processing.
- Chemistry specialization in **new and renewable energies**
- Electronics and energy management with a specialization in **new and renewable energies**
- Physics and engineering sciences with specializations in:
 - **strategies and management in energetics and renewable energies,**
 - **new and renewable energies**
 - **renewable energies and efficient management of electrical energy**
- Materials science with a specialization in **materials for renewable energies**
- Physical sciences for the environment with a specialization in **energy systems and renewable energies**
- **Science and technology for renewable energies.**

• www.campusfrance.org>Trouvez votre formation>Master

Program taught in English:

- *Master Energy: Renewable Energy, Science and Technology*
- <https://www.universite-paris-saclay.fr/en/education/masters>

Master of Science in Management (MSc) (Secondary diploma +5 years of higher education) – M2

- *European Joint Masters of Science in Management and Engineering of Environment and Energy.* www.mines-nantes.fr/en/Study/Masters-of-Science-English-taught/ME3
- *Project Management for Environmental and Energy Engineering.* <http://www.mines-nantes.fr/en/Study/Masters-of-Science-English-taught/PM3E>

Master of Business Administration (MBA) (Secondary diploma +5 years of higher education) – M2

An English-language **MBA** program is offered by IPAG, a French private institution of higher learning:

- *Energy and Sustainable Development Management.* www.ipag.fr/programmes/mba/

Diplôme d'ingénieur (engineering degree) / Master (Secondary diploma +5 years of higher education) – M2

French engineering schools offer engineering and master's degrees accredited by the CTI (*Commission des Titres d'Ingénieur*). Several specializations are available:

- alternatives for energy of the future,
- thermal energy,
- environment, construction, and energy,
- energy engineering and environment,
- HVAC engineering and energetics,
- energy systems and renewable energies, etc.

• List of accredited engineering programs:

www.cti-commission.fr/Liste-officielle-des-programmes-d-

Beyond the master

Mastère Spécialisé (MS, specialized master's degree) (M2 +1 year of higher education) – post-M

Labeled by the *Conférence des Grandes Écoles* (CGE), the specialized master enables students to earn an institutional credential attesting to dual competence. Numerous specializations related to the environment are available:

- energy efficiency,
- renewable marine energy,
- renewable energies,
- renewable energies and their production system,
- energy performance and renewable energies.

Programs taught in English:

- *International Environmental Management*
- *Water Utility Management*

• Information on MS degrees:

www.campusfrance.org/fr/ressource/les-masteres-specialises-ms

• List of MS programs: www.cge.asso.fr/nos-labels/ms