



AGENCE D'ETUDES ET DE PROMOTION DE L'ISÈRE

# Grenoble isère-france

DECEMBER 2005  
AEPI

## New energy technology Hydrogen and fuel cells

Grenoble-Isère boasts assets of national and European standing in new energy technology. It has **500 jobs in research**, distributed between CEA, CNRS and local universities. Some **900 students** are enrolled on higher education courses at INPG, UJF and UPMF. Jobs in industry total about **10,000 jobs**, in firms such as Air Liquide and Axane, Alstom, Atos Origin, Photowatt, Schneider Electric, MGE UPS SYSTEM, Sogreah and Gaz Electricité de Grenoble. There are also a large number of subcontractors involved in metal-working, information technology and software, instrumentation and mechanical engineering. All in all the area is ideally placed for new energy technology to become one of the most promising growth sectors in the years to come.

Grenoble-Isère has opted to focus in particular on hydrogen and fuel-cell technologies targeting applications in transport and static uses.

This sector has all the necessary components to achieve quality development: CEA with its Laboratory for new energy technology (Liten), the universities, CNRS and firms such as Air Liquide and Axane. Together they form a well established talent pool.

In all there are 200 people working in public research in hydrogen and fuel-cell technologies. Grenoble-Isère is one of France's top research centres in this sector.





# Grenoble-Isère and Europe

G R E N O B L E - I S È R E - F R A N C E



**Grenoble-Isère offers direct access to the major centres of industry. Grenoble-Isère has invested in communications infrastructures that secure connections of exceptional quality.**

- 200 km: 9 million inhabitants
- 400 km: 43 million inhabitants
- 600 km: 88 million inhabitants
- 1,000 km: 180 million inhabitants
- 1,400 km: 450 million inhabitants



# Introduction

G R E N O B L E - I S È R E - F R A N C E

A wide range of technologies are being deployed to cope with the problems associated with greenhouse gas emissions, dwindling reserves of fossil fuels and energy dependence. Grenoble-Isère, with its exceptional scientific and industrial heritage, has several key assets – from hydroelectric to nuclear power, and power management and transmission – for developing new technologies for applications in housing and business, industry and transport.

Rooted in a highly diversified scientific and industrial fabric of international standing, new energy technology in Grenoble-Isère can draw on long established know-how and skills in electrical engineering, physics, materials science, electrochemistry, hydroelectric power, chemistry, microelectronics and computer science.

Since the end of the 19th century the economic and technological development of Grenoble-Isère has been based on the growing importance of energy technology, initially based on hydroelectric and then nuclear power.

In 1869 Aristide Bergès, the first Frenchman to harness hydroelectric power, started using the energy produced by mountain streams. His discoveries led to the development of a wide range of activities related to electricity production: turbines, penstocks, cables, electrical equipments, etc., marking a major turning point in the region's industry. After the second world war France's Atomic Energy Commission (CEA) took over a former army artillery range on the outskirts of Grenoble. It built first one then two nuclear reactors, providing the basis for experimental work carried out by the physicist Louis Néel, who specialized in magnetic bodies.

The two activities – hydroelectric and nuclear power – led to the acquisition of a wide range of specialist know-how in Grenoble-Isère's universities, research centres and firms.



## EnRRDIS

The Rhône-Alpes Drôme, Isère, Savoie Renewable Energies (EnRRDIS) centre of excellence focuses on all aspects of the development of new energy technologies. Certified in 2005, it has a nationwide reach, covering five specialist fields related to energy: solar power, hydraulic power, biomass, hydrogen and fuel cells, and electricity networks. It addresses the transformation of renewable energy sources into power vectors and their use in construction and transportation. Rhône-Alpes has all the necessary skills – in industry, research and training – to specialize in renewable energy. Several companies from Grenoble-Isère are part of the cluster EnRRDIS, among which there are Air Liquide, Alstom, Atos Origin, Gaz Electricité de Grenoble, Invensil, MGE UPS SYSTEMS, Photowatt, Schneider Electric, Sogreah and Thales. The Grenoble universities and their research laboratories along with CEA and CNRS are deeply involved.



## Public research

G R E N O B L E - I S È R E - F R A N C E

### CEA/Liten

The CEA Laboratory for New Energy technology and Nanomaterials (Liten) accounts for almost 300 people, mainly located in Grenoble. It has two departments:



- The New Energy Technology Department (DTEN) studies materials, from high-temperature materials to components (bipolar plates in fuel cells, innovative membranes, etc.). It is also developing several miniature energy sources (micro fuel cells and batteries, thermoelectricity).
- The New Energy Systems Department (DSEN) studies components and their assembly to form complete systems (hydrogen, fuel cells, photovoltaic devices and energy in building).

CEA Grenoble is exploring three main lines of research into new energy technology: transport, housing and business premises, energy sources for mobile devices.

Le CEA Liten employs 100 people in the field of hydrogen and fuel cells in Grenoble.

### Hydrogen

#### 1. Mass production of hydrogen

CEA is studying several new techniques for mass production of hydrogen:

- Using nuclear power involves a high-temperature electrolysis process based on next-generation high-temperature reactors; or alternatively thermo-chemical processes for cracking water molecules.
- Using organic matter, from which gas can be extracted, purified and then turned into hydrogen or other forms of liquid fuel.

#### 2. Transport

CEA is taking part in a study of the potential for distributing hydrogen via the natural gas network, as part of national and European projects. Hydrogen could be distributed:

- Via the existing network (mixed with natural gas, then separated).
- In special pressurized gas mains.

#### 3. Storage

CEA is working on several techniques for storing hydrogen:

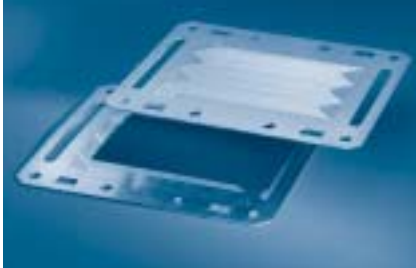
- In containers made using carbonated materials or alloys (hydrides) capable of absorbing then releasing it. This solution, with a low mass absorption capacity, would be suitable for stationary devices.
- Storage under high pressure (700 bar) as a gas in tanks made of composite polymer materials. The aim of ongoing development work, among others, is to reduce the large amount of energy required to compress the gas.



### Conversion: fuel cells

By an electrochemical reaction a fuel cell bonds hydrogen and oxygen atoms creating an electrical current in the process. It operates in the opposite way to electrolysis of water. A fuel cell is simply a system for converting electrochemical energy into electricity. A stack of fuel cells consists of elementary cells comprising an anode, a cathode, a polymer or ceramic membrane (depending on whether it is a PEMFC or a SOFC) and a catalyst. In other words it contains no moving parts. CEA is carrying out basic research in partnership with other research centres and technology research to reduce the size and cost of fuel cells and improve their

reliability. CEA currently has some 20 fuel cell-related patents in its portfolio. A building covering 5,000 sq m is being refurbished to house fuel cell technology platforms.



CEA/Liten is developing two technologies:

- Proton exchange membrane fuel cells (PEMFC) account for 70% of work being done at CEA on fuel cells. PEMFCs operate at low temperatures (50°C) and have many potential applications, ranging from micro fuel cells for mobile devices to supplying electricity for an entire building or a vehicle. France's largest centre of expertise is located at CEA-Grenoble. CEA/Liten is currently developing a micro fuel cell, based on PEMFC technology, for use in cellphones.
- Solid oxide fuel cells (SOFC) operate at high temperatures (700°C to 1,000°C) and are suitable for stationary applications. Another CEA research centre is working on this type of fuel cell.

**PACLAB** is a PEMFC development project carried out in partnership with laboratories in Belfort and Montbéliard, Nancy and Besançon. The project is jointly sponsored by CNRS, France's National Institute for Transport and Safety Research (Inrets), CEA, Université de Belfort-Montbéliard and Université de Franche-Comté. It centres on two main sites: the fuel cell technology platform at CEA-Grenoble and the fuel cell test platform for transport applications in Belfort. The project also includes a training partnership between various universities, INPG and the National Nuclear Science and Technology Institute (INSTN).

## Lepmi



The Electrochemistry and Physical Chemistry of Materials and Interfaces Laboratory (Lepmi) is a mixed basic research unit affiliated to CNRS, UJF and INPG. It comprises 130 people including 50 researchers and faculty members, working on the storage and electrochemical conversion of energy, materials and nano-materials of electrochemical interest, and how best to characterize and model them.

Lepmi has been working on fuel cells for many years, and more particularly its constituent materials, the main stumbling block in fuel cell technology. It focuses on ceramics for SOFCs and polymers for PEMFCs, electrolytic materials and catalysts permitting electrolytic exchanges.

It is also working on alkaline, cadmium and lithium batteries, for which the key challenge is reduce their size and weight and extend their life.

Lepmi is studying materials used in fuel cell systems, operating mechanisms and cores.

### SOFCs

Ceramics are used in SOFCs as the only material capable of carrying oxygen ions, but only at very high temperatures. Lepmi is looking for ways of bringing the operating temperature down, and improving the material's service life and architecture. It is also researching alternative fuels.

Lepmi is the only university research unit working in this field in France. The European Union has allocated it funds to support three research programmes. In terms of basic research Lepmi has reached a level comparable to German laboratories which have been receiving government funds for longer. SOFCs can be used for cogeneration and stationary applications.

### PEMFCs

Lepmi is mainly working on polymer electrolytes. As part of the EcoPac programme it is studying production of low-cost polymer membranes. EcoPac brings together several French players in this sector (Lepmi, CEA, Eras, Batscap, etc.).

## Batteries

Lithium batteries have long been the focus of research at Lepmi. Particularly promising results have been obtained with lithium-ion technology. Solid polymer electrolyte batteries yield performance twice as good as nickel-cadmium systems. Mobile applications are of course the main sector targeted by this technology.



### Lepmi research topics

- Electrochemical generators and storage units (fuel cells, batteries, etc.),
- Electrochemical materials for energy (ceramics, catalysts, polymers),
- Functional materials for biotechnology (boron-doped diamonds, biocompatibility, biocorrosion),
- Analysis and modelling of electrochemical systems, impedance spectroscopy,
- Engineering for electrochemical processes and the environment,
- Photo and opto-electrochemistry, characterization, electrochemical microscopy,
- Electrochemistry of metallic and electrocatalytic systems, functional surfaces and corrosion,
- Raman spectroscopy.

## Materials for energy platform

Lepmi is in the process of setting up a Materials for Energy platform in partnership with CEA (Paclab project), the Grenoble Electrotechnology Laboratory (LEG) and INPG (Predis project) and CNRS. Drawing on the range of research skills on offer in the Grenoble area and combining basic (Lepmi) and technology (CEA) research this platform confirms Grenoble-Isère's front-line role in materials research.

## LTPCM

LTPCM, Lepmi, the Materials and Physical Engineering Laboratory (LMGP), the Physical Engineering and Mechanics of Materials Laboratory (GPM2), the Soils, Solids and Structures Laboratory (L3S), the Laboratory of Rheology, the Magnetic Processes Laboratory (EPM), and the Therma service unit have joined forces to form the **Materials Science and Technology federative research unit**. The new unit, which brings together a wide range of complementary skills in the study of materials, has almost 200 researchers and faculty members.

The Thermodynamics and Physical Chemistry for Metallurgy Laboratory (LTPCM) is one of two laboratories affiliated to Grenoble's National Graduate School of Electrochemistry and Electrometallurgy (Enseeg), itself part of the INPG group. The other laboratory is Lepmi. LTPCM is a mixed basic research unit affiliated to CNRS, UJF and INPG, comprising 120 people.

It is the only laboratory in France to specialize in the study of materials – metals and/or functional ceramics – at very high temperatures (700 to 2,400°C). Its teams are working on alloys, their production (powder metallurgy, etc.), thin films, the mechanical properties of these materials, their electrical properties and their behaviour.

In the field of hydrogen and fuel cells LTPCM is the lead partner in a European project "H-Sorption in NanoMgH<sub>2</sub>" to research ways of lowering the sorption temperature of hydrogen in magnesium hydride tanks. Alongside Arcelor, the steel manufacturer, it is also working on SOFC interconnects, and more particularly on their corrosion and degradation, and on gas-solid interaction observed using high-temperature mass spectrometry.

Air Liquide and Axane are the main industrial players in conception and production of fuel cells. Thanks to the strong involvement of public research and university in this field, the two companies can find the resources they need to develop here.

## Air Liquide



Air Liquide, a specialist in industrial gases, supplies advanced technology firms (notably in microelectronics). Thanks to its subsidiary Axane it is the only company working in fuel cells.

The Advanced Technology Division, based in Sassenage just outside Grenoble, has a workforce of 350 people. It is developing several activities: cryogeneration, gas processing for various applications, purification of gas for electronic applications, temperature control reactors, nitrogen and oxygen production systems, on-board aerospace storage systems, and hydrogen for energy applications.

The Sassenage facility has a test zone, occupying a 10 hectare site, for carrying out mechanical, thermal and dynamic tests on liquid and gaseous hydrogen, components and devices, and tests of pressure, flow rate and quantity. It also houses France's first and only 350 bar hydrogen filling station for fuel cell-powered vehicles, originally set up in 2003.

Air Liquide's Advanced Technology Division is involved in several European projects:

- Hychain involves four European regions, including Rhône-Alpes, and aims to develop a network for hydrogen, from its production to use in public transport.
- The Clean Urban Transport for Europe (Cute) project, to which Air Liquide supplies hydrogen, without being a partner, is building nine different models of filling station in Europe.
- HyApproval brings together various players involved in filling stations to harmonize the process of approval and regulations for hydrogen stations serving fuel cell vehicles.
- The Hyvolution and BioH<sub>2</sub> projects concern the production of hydrogen (H<sub>2</sub>) from bacteria. Air Liquide is working on the hydrogen purification process.

## Axane



Axane is a wholly owned Air Liquide subsidiary. It was incorporated in May 2001 to develop energy production equipment based on hydrogen-powered fuel cells. It employs 35 people on the Air Liquide site. In all Air Liquide employs some 60 people working on hydrogen for fuel cells and on cells themselves.

Axane is developing Proton exchange membrane fuel cells (PEMFC) for use as a stationary power source at isolated locations, as a portable generator for emergency systems and outdoor events, as a cogeneration solution for residential applications, and as a system that can be integrated in small hybrid vehicles.

### Research and development

Axane's key objectives are to reduce the weight, footprint and price of fuel cell technology. Air Liquide is taking care of issues related to hydrogen production, storage and distribution.

Axane has its own R&D team, which is working with the Grenoble Electrotechnology Laboratory (LEG) and Grenoble's Graduate School of Electrical Engineering (Ensieg) on Fuel cell Energy systems standardised for large transport, BUSes and Stationary applications (FEBUSS), a five-year European programme



launched in 2002. The project involves end users, suppliers of fuel cell components, and experts in safety and legislation. Axane Fuel Cell Systems France is the lead partner in the project. Other participants include Alstom Transport, Schneider Electric, CNRS, UJF, Air Liquide and CEA.

Furthermore Axane and Air Liquide, in partnership with the Greater Grenoble Urban Council (Métro), the Isère Departmental Council and Rhône-Alpes Regional Council, have launched Hychain, a European project to develop an electrically-powered utility vehicle under the sixth research framework programme. At the Assises de l'Energie in early 2005 Grenoble presented a prototype utility vehicle, with a hybrid drive system. Axane is leading this project too. Grenoble and the surrounding urban area has all the necessary research and industrial resources to mount and carry through the project, with solid backing from local authorities keen to develop alternative power sources.

### Paxitech



Paxitech is a CEA spin-off, incorporated in September 2003. It specializes in deposition on membranes (active components) for mobile fuel cells used in laptop computers and CD drives. Its trade focuses on fuel cell cores and side-by-side architectures, as opposed to stacks. Paxitech is also developing suction fuel cells. These low-cost consumer devices are small, flat and light. They consist of layers of electrical conductors and plastic diffusers. They can be integrated in embedded devices used at sea or in the mountains and fitted with a hydrogen reservoir.

The recently created National Research Agency (ANR) has selected the topic of hydrogen and set guidelines for development work in the National Action Plan for hydrogen and fuel cells (PAN-H). The plan provides a framework for partnership between car manufacturers and research centres, in particular CEA and the French Oil Institute (IFP).

Projects submitted for PAN-H certification will be managed by CEA and the Environment and Energy Management Agency (Ademe). The programme will be allocated €600m in credits between now and 2010, thanks to a public-private partnership involving CEA, PSA, Renault and Air Liquide.



# Training in new energy technology

G R E N O B L E - I S È R E - F R A N C E

Grenoble-Isère universities are well known for the excellence of their science courses, which attract many foreign students. A total of 60,000 students are enrolled at Université Joseph Fourier (UJF), specializing in science, technology and medicine, the National Polytechnical Institute of Grenoble (INPG), Université Pierre Mendès-France (UPMF) specializing in human and social science, Université Stendhal, languages and literature, the Grenoble School of Management and many other public and private schools of higher education.

These universities are key players in Grenoble's economic development, rooted in the region's scientific and industrial life since the discovery of hydroelectric power. The first public course in industrial electricity was taught in Grenoble in 1892, laying the academic foundations for the first INPG school, the Institute of Electrotechnology.



■ INPG, with a total of some 5,000 students, has four schools working in fields related to energy technology – Ensieg for electricity, Enseeg for electrochemistry, ENSHMG for hydraulics and mechanics, and ENSPG for physics. It aims to build on the synergy existing between these schools to develop an energy competency centre, drawing on the other schools in the group and partnerships with higher education establishments elsewhere in the Grenoble area.



- Grenoble's Graduate School of Electrical Engineering (Ensieg) trains future engineers in the control of energy, signals and systems, for jobs in energy and information technology, and production systems. It has a total intake of 525 students.
- Grenoble's National Graduate School of Electrochemistry and Electrometallurgy (Enseeg) trains specialists in materials science and engineering, surfaces and interfaces, electrochemistry and process engineering for jobs involving applied physics and chemistry. It has a total intake of 330 students.
- Grenoble's National Graduate School of Hydraulics and Mechanics (ENSHMG) has a total intake of 450 students, divided into two departments: fluids and mechanical engineering; and hydraulics and the environment.
- Grenoble's National Graduate School of Physics (ENSPG) trains engineers in fields related to materials, biotechnology, energy management and nuclear power, optics and microelectronics, instrumentation and sensors. It has a total intake of 400 students.

■ Université Joseph Fourier (UJF), with 18,000 students, covers all the main scientific fields: mathematics, computer science and information technology, physical and engineering science, chemistry, life science and medicine, science of the Earth and the universe, human and social science. For courses focussing on energy UJF generally joins forces with INPG.

■ Université Pierre Mendès-France (UPMF), which specializes in human and social science, teaches a total of 19,000 students. Its Economics, Strategy and Enterprise research unit offers two specific courses on energy and energy policies, addressing the key issues facing the world today.



The following table details all the energy-related courses taught by vocational secondary schools, INPG, UJF and UPMF. Here it includes:

- All forms of energy: fossil fuels, nuclear, hydraulic and photovoltaic power, fuel cells, etc.,
- Materials for energy production,
- Energy transmission and distribution, and the associated information systems,
- Energy policy.

## 1. Training courses

School/ Component	Option/course	Degree	Number of students	Training target occupation
<b>Lycée Technique R. Deschaux Grenoble</b>	Fluids, energy, environment specializing in climatic engineering	BTS	24 students	Training target occupation.
<b>Lycée Galilée Vienne</b>	Electrical engineering specializing in intelligent housing	BTS	25 students	Intelligent housing technicians.
<b>UJF/IUT1</b>	Thermal engineering and energy	DUT	130 students	Thermal engineering technicians
<b>UJF/IUT1</b>	Thermal engineering and energy management	Professional Bachelor's	36 students	Sales engineers for climate control, heating, renewable energy, etc.
<b>UJF/IUT1</b>	Electricity and electronics specializing in electrical distribution and automation systems	Professional Bachelor's	28 students	Electrical distribution and system automation specialists
<b>UJF/IUP</b>	Electrical engineering and industrial computing specializing in power electronics and high-frequency circuits	Technology engineer	80 students	Electrical engineering and electronics specialists
<b>UJF/INPG/ INSTN/ UCB Lyon1</b>	Engineering, traceability, sustainable development specializing in drainage and dismantling nuclear facilities	Professional Master's	13 students	Nuclear power industry engineers
<b>Lycée Technique R. Deschaux UJF/ENSPG/ INSTN/UCB Lyon1</b>	Engineering, traceability, sustainable development specializing in scientific and technological management of radioactive waste	Professional Master's	15 students	Nuclear power industry engineers
<b>UJF/INPG</b>	Engineering, traceability, sustainable development specializing in acoustics and industrial heat engineering	Professional Master's	Opening in 2005	Heating, acoustics, structural engineering specialists
<b>ENSIEG/UJF</b>	Electrical engineering, electronics, automation and signal processing specializing in design of electrical energy systems	Professional Master's	15 students	Electrical network study and design

School/ Component	Option/course	Degree	Number of students	Training target occupation
<b>INPG/UJF</b>	Physics and engineering specializing in modelling and simulating industrial physical systems	Professional Master's	13 students	R&D engineers, specialists in digital modelling techniques and methods
<b>UPMF</b>	International economics and strategy specializing in: corporate governance for international development (incl. energy policy and the political economics of energy)	Professional Master's	15 students 15 degrees per year	Experts in decision aids and appraisal for national and international, public and private organizations
<b>ENSIEG</b>	Electrical energy <ul style="list-style-type: none"> <li>•Production, transmission, distribution of electrical energy</li> <li>•Power electronics</li> <li>•Decentralized production and energy storage</li> <li>•Designing, producing and managing electrical engineering</li> <li>•Control and diagnosis of electrical systems</li> </ul>	Engineer*	270 students 90 degrees per year Opening in 2005	Engineers in design, control and management of electrical systems, from components to complete networks and including conversion
<b>ENSIEG ENSHMG ENSEEG ENSPG</b>	New energy technology <ul style="list-style-type: none"> <li>•Organization of energy systems and procurement</li> <li>•Dependability and management of energy computer systems</li> <li>•Energy marketing management</li> </ul>	Engineer*	180 students 60 degrees per year	Engineers in design, control and management of hybrid energy systems in the energy international market
<b>ENSHMG</b>	Energy engineering and processes	Engineer*	60 students 30 degrees per year	Engineers working in design of complex mechanical systems involving fluids and their industrial application.
<b>ENSPG</b>	Electrical engineering and nuclear power	Engineer*	66 students 33 degrees per year	Current needs of nuclear power industry
<b>INPG/UJF</b>	Mechanical and energy engineering specializing in physical energy management	Research Master's	17 students 17 degrees per year	Specialists in materials for energy and heat transfer

\* Engineering degrees may be obtained as part of initial training or via continuous training.

School/ Component	Option/course	Degree	Number of students	Training target occupation
<b>INPG/UJF</b>	Mechanical and energy engineering specializing in fluid mechanics and transfer	Research Master's	15 students 15 degrees per year	Specialists in energy transfer at interfaces
<b>INPG/UJF</b>	Electrical technology, electronics, automation and signal processing specializing in electrical engineering	Research Master's	20 students 20 degrees per year	Specialists in electrical engineering and energy management
<b>INPG/UJF</b>	Materials and process engineering specializing in materials science and engineering, process engineering, electrochemistry	Research Master's	50 students 50 degrees per year	Specialists in: materials for energy saving, energy saving, electrochemical reactions
<b>UPMF</b>	International economics and strategy specializing in economics and international policy (option: sustainable development)	Research Master's	15 students 15 degrees per year	Project and development managers in international public and private organizations

### TOTAL Training courses in new energy technology:

**4 engineering courses**, including one started in 2005

**5 research master's degree courses**, covering seven specializations

**6 professional master's degree courses**, including one started in 2005

**1 technology engineering course**

**2 professional bachelor's degree courses**

**1 DUT technician's course**

**2 BTS technician's courses**

**900**  
students

**700**  
degrees per year

**20**  
theses presented per year

## 2. INPG continuous training department

MIDEP Electrical engineering option	Continuous training degree, grade 2	Project managers for electrical energy production and distribution systems
FORMATECH Electrical engineering option	Continuous training degree, grade 2	Technical managers in energy, from components to electrical networks
Specialist course Specialization in hydraulic machines		
Specialist course Choosing electrical equipment in an industrial context		
Specialist course Introduction to nuclear power		





## A dynamic area

G R E N O B L E - I S È R E - F R A N C E



Lyon - St Exupéry airport



### Grenoble-Isère: a quality environment

■ A region of manageable size, with 1.1 million inhabitants and 467,900 salaried jobs, located at the heart of Rhône-Alpes.

■ Population of 9 million consumers living within a 200 km radius.

■ Fully-developed transportation network: highways, TGV, international airports.

■ Fabric of industrial companies with organizations of all sizes working together, numerous foreign firms, a wide range of activities.

■ Renowned higher education, especially in sciences. 4 universities, 60,000 students.

■ Exceptional concentration of public and private research centres. First research area after Paris region. 19,000 researchers.

■ 4 international research centres: EMBL, ESRF, ILL, Iram.

■ 9 national research organizations: CEA, CEN, Cemagref, CNRS, CRSSA, Inra, Inria, Inserm.

■ International stature:  
- 400 companies with foreign capital creating 41,000 jobs,  
- accommodations for foreign newcomers: international schools, clubs and companies specialized in helping foreign managers and their families adjust to their new lives here.

■ Exceptional environment: at the heart of the Alps (34 ski resorts, at less than 1 hour's drive away), near Switzerland and Italy, 250 km from the French Riviera. A lifestyle that combines the pleasures of the urban and cultural life of Grenoble, Lyon and Geneva with sports and outdoor recreational activities.

■ Facilities for setting-up new companies, adapted to all types of projects. Grenoble-Isère can offer a wide range of solutions, with more than 1,500 hectares of fully-equipped sites, and industrial and office space of all sizes, available for rent or for sale.

**All these advantages contribute to the reputation of Grenoble-Isère, and have led numerous national and international companies and research centres, to locate here.**



■ Industry leaders:

**Agri-food industry:** Aoste, Danone, Sodiall (Candia/Yoplait)

**Medical and pharmaceutical activities:** BD, bioMérieux, Patheon, Roche Diagnostics, SkyePharma

**Chemicals:** Arkema, Rhodia

**Electrical construction:** Arnould FAE, MGE UPS SYSTEMS, Schneider Electric

**Energy:** Alstom, EDF, Gaz Electricité de Grenoble, Sogreah

**Sports and leisure equipment:** Petzl, Rossignol/Quiksilver

**Mechanical engineering:** A.Raymond, Caterpillar, Poma, Valeo

**Paper manufacturing:** Ahlsrom, ArjoWiggins, Matussièrre et Forest

**Information and communication technologies:** Atmel, Atos Origin, Bull, CapGemini, Freescale, HP, Philips, Photowatt, Radiall, Silicomp, Soitec, STMicroelectronics, Thales

**Textile:** Hexcel, Mermet, Porcher

**Metalwork:** Alcan, Ascométal, Federal Mogul

# Grenoble-Isère: well connected to European countries



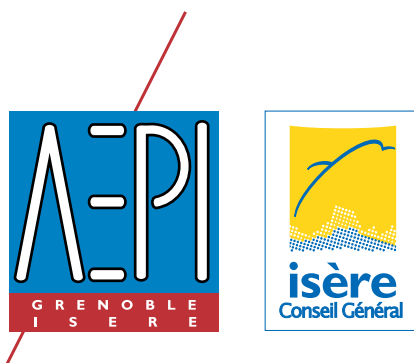
# The Isère economic development agency, AEPI

- An instrument serving the department and its various components,
- An interface between local, regional, national and international economic players,
- A resource centre for industrial, scientific and institutional players in the Grenoble-Isère economy.

**AEPI is funded entirely  
by the Isère Departmental Council.**

Missions serving the interests of the community:

- Development of key technologies,
- Economic promotion of Grenoble-Isère,
- Prospection of companies in France and abroad,
- Reception and location of firms in Grenoble-Isère,
- Economic studies and information.



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