

A decorative graphic on the right side of the page consists of three overlapping circles in shades of blue, arranged vertically. Two thin blue lines intersect at the top left and extend diagonally across the page, framing the circles and text.

**French Position
Paper Rome, 10th
May 2008**

**Ilaria Agozzino
Bernardo Bonaventura
Valeria Contu
Francesca Donfrancesco**

Table of contents

The natural gas	3
Introduction.....	3
Organization of the gas market in France	3
Gas prices.....	6
The natural gas french policy.....	6
The French oil situation	7
The actions of the Ministry of the Economy, Finance and Industry.....	8
The coal market in France.....	9
Nuclear Power.....	9
The Renewable Energy mix.....	11
The renewable France policy	13
Electricity	15
The electricity market	16
Electricity prices	16
Degree of energy-dependence.....	17
Source of crude oil imports.....	17
Source of natural gas imports	17
Energy Efficiency	18

The natural gas

Introduction

Natural gas accounts for 14.6% of the national energy consumption. The sectors that mainly use natural gas are the residential sector (39%), industry (38%), services sector (16%), the energy sector (8%) and the farming sector (1%) .

Natural gas is imported mainly by long-term contracts (33% Norway, Russia 21%, 15% Algeria, 20% Netherlands), Procurement episodic (Nigeria, Qatar, ...) or directly by eligible customers. The remainder (less than 3%) derives from domestic production and mainly by the reservoir Lacq now almost used up.

Its share in the French energy consumption is likely to increase in the future, particularly because of the development of new uses, such as the use of natural gas for vehicles in the heavy commercial vehicles (buses, garbage skips) and for the combined heat and power (CHP)¹.

Organization of the gas market in France

The natural gas market in France is organized around six main hubs: the production, transport, LNG terminals, storage, distribution and marketing.

1. **The Gas production:** Gas production in France represents only 2% (13,4 TWh) of national consumption. The largest operator of gas production in France, **Total**, operates the *reservoir Lacq*. In addition, Total and Gaz de France are pursuing a business exploration and production outside France.
2. **The natural gas transmission:** The imported natural gas arrives on the French territory either by **pipeline** from Dunkirk, Taisnieres, Obergailbac, Oltingue, Lacal, either by **LNG terminals**, tankers that deliver the gas in the re-gasification terminals of Fos-sur-Mer and Montoir de Bretagne. This gas is then transported under high pressure into a transportation system that is functionally divided into two parts:

¹ www.industrie.gouv.fr

The main network, also said "great transportation network" which joins the borders with foreign operators, but also allows the transit to other countries.

The regional network, which delivers natural gas to public distribution and largest industrial consumers. The network is divided into 5 areas: north, south, east, west and TIGF network, called balancing while gas shipper must effectively balance the volumes of gas at the entrance and exit of each zone.

In 2002, companies Total and Gaz de France became owners of the various networks ceded by the State, and then on 1st January 2005, these groups have created two integrated subsidiaries of transportation known as TIGF for South West and Gaz de France Network Transport, which became GRT gas.

The French network is operated today by two operators: TSO Gas (100% subsidiary of Gaz de France) and TIGF (Total Infrastructures Gaz France, a 100% subsidiary of Total). GRT gas and TIGF own, in addition to their network, compressor stations and also adjacent to TIGF, compression facilities and storage facilities that are connected to its network.

A multi-year plan over 10 years of infrastructure development and the evolution of the demand for natural gas was produced in April 2007. It includes many investments and enhancements of interconnections with the mains European partners (Spain, Germany, and so on.).

3. **LNG Terminals:** To make possible the delivery of natural gas extracted from areas beyond the reach of international pipelines, transportation of liquefied natural gas (LNG) by ship has been progressively developed. LNG is natural gas rendered liquid by cooling to -160°C . For France, supply chains LNG now accounts for about 30% of its supply. The French terminals in operation are Fos-Tonkin and Montoir de Bretagne. Other projects are under development in Le Havre, Dunkirk and Bordeaux, given the growing needs of capacity of LNG.
4. **Storage of natural gas:** The storage facilities have been developed to cope with the seasonal demand for natural gas, ensure security of supply and allow better

management of the transport network by promoting the balance of the transport system.

The activity of underground gas storage is subject to the permission of the Minister for Energy. France is now equipped with two types of storage: storage in the aquifer and the storage cavern in saline.

The storage facilities are operated by:

- Gaz de France, which manages 12 storages, including 9 in aquifer (focusing on the Paris Basin) and 3 Cavity saline (in the Southeast), which makes a total of 106 TWh (79% of capacity French);
- TIGF, which operates in the Southwest two sites in aquifer: Izaute and Lussagnet which represent a total volume of 27 TWh (21% of capacity French).

TPA (Third Part Access) underground storage facilities is arranged in order to preserve the seasonal use of this infrastructure (filling in the summer, racking in winter) and implemented in a transparent and non-discriminatory manner. In practice, each seller has a right of access to the storage capacity directly deducted from the modulation needs of customers being operated.

5. **The natural gas distribution:** The services to the downstream of natural gas in the transport network to domestic consumers, small or tertiary industry, is served by the distribution system which delivers natural gas at low pressure to consumers.

The Act of April 8, 1946 on the nationalization of the electricity and gas, has entrusted Gaz de France responsibility for national distribution of gas, while recognizing and maintaining the existence of a public distribution by existing local distributors not nationalized. In this context, 17 non-nationalized distributors (DNN) formed the historic landscape distribution along with Gaz de France. Moreover, the distribution of gas in un-served areas has been opened to competition.

Nowadays, 9100 French communes are served by natural gas, which represents a relatively small proportion of the number of communes, but allows 76% of the French population have access to gas. Nearly all towns with more than 10000 inhabitants is

served by natural gas. Distribution networks represent a total length of 181500 km, making them the second highest in Europe, after the German networks.

- 6. The marketing of natural gas** The selling of gas to final consumers, which lies at the interface between distributors and final consumers is open to competition. It involves retailing of gas purchased in bulk or in the context of supply contract for long-term, lasting 15 to 20 years, either as part of transaction for the short term.

The sale of gas can be supplemented with the provision of services related to energy (i.e. maintenance, consulting controlling consumption). The French market for the supply of natural gas is the 5th volume market open to competition.

Gas prices

French gas prices closely follow the European averages, while household prices are generally higher than the EU-15 and EU-25. In 2006, household gas prices were about 8 % higher than the European averages, while industrial gas prices were 2 % lower than the respective EU-15 and EU-25 averages. Prices for industrial users are lower in absolute terms than for households².

The French natural gas policy

In the natural gas sector, Directorate-General for Energy and raw materials (DGEMP) performs several actions:

* *Security of supply throughout the gas chain.* To this end, the DGEMP ensure the diversification of supplies. In addition, it provides, as part of the European Directive 2004/67/EC on measures to ensure security of supply, gas supply obligations to be met by suppliers and gas carriers. It also participates in the preparation of crisis' plans to ensure the minimum functioning in the event of disruption of supplies.

* *The control and monitoring of the exploitation of hydrocarbon gas national;*

* *The development of the general rules concerning the activities gas.* Within this framework, DGEMP actively participated in the negotiation of the European Directive on the internal gas market of 26 June 2003 and proceed to the elaboration of the texts applicable in the context

² Ibid.

of the implementation of the single market for gas (Law January 3, 2003 amended by the Act of December 7, 2006 and Act of August 9, 2004). It develops and implements the regulations concerning storage facilities. The regulations and technical requirements including on security and for the transmission, distribution and use of natural gas are provided by the Enterprise Directorate-General (DGE);

* *The guardianship over Gaz de France*, a public limited company whose 80% stake is currently owned by the state. It defines public service missions and tariff changes of Gaz de France over determinate periods;

* *Encouraging new gas applications, especially natural gas for vehicles*³.

The French oil situation

Oil accounts for 33.8% of primary energy consumption in France. The transport sector alone represents more than half of the demand for oil. If one adds the consumption of oil as raw material, oil "captive" uses for these two sectors amount to over 72% of total oil consumption.

Nearly all (90.4%) of oil consumed in France is imported from the North Sea (30.6%), the Middle East (24.2%) and Africa (21.7%). Domestic production of oil (1.4 million tons) is concentrated in the Paris basin (54%) and Aquitaine (45%).

There are 13 refineries in the metropolis whose production was sufficient to cover 91% of the needs of petroleum products in 2003.

Despite its small hydrocarbon production, France is endowed with very dynamic petroleum industries, *parapétrolières* and *paragazières* that carry the bulk of their sales abroad.

³ Ibid.

The actions of the Ministry of the Economy, Finance and Industry

* *Security of supply on the whole* chain as oil is a cornerstone of French energy policy. The actions carried out by the Secretariat of State for Industry come in several areas ranging from upstream to downstream oil:

- The effort to research and development is strongly encouraged. The French Petroleum Institute (IFP), under the Ministry of the Economy, Finance and Industry, plays a central role in the petroleum industry.
- The France participation at the International Agency for Energy (IEA) and the supply areas diversification are involved in the stabilization of markets.
- The main objective is to satisfy domestic consumption of petroleum products. For this reason, the Secretariat of State for Industry ensure that the technical, economical and fiscal regulations, do not impede the refining and the oil distribution in France.
- The existence of reserve stocks representing about three months of consumption, according to the Act of 31 December 1992 on the reform of the oil, strengthens the security of supply.
- Finally, the Ministry of the Economy, Finance and Industry is preparing crisis plans for the maintenance of minimal priority services in the event of disruption of supplies such as the development of French oil and *parapétrolières* on the world energy scene⁴.

⁴ Ibid.

The coal market in France

With a primary consumption of nearly 22 million tons of coal in 2003, France has only produced 1.8 million tons but imported 18.4 million tons. The main suppliers of France are Australia (4.4 million tons), the United States (3.4 million tons) and South Africa (3.2).

Coal is mainly consumed by thermal power plants for electricity generation (45%) and steel (32%) and the rest (23%) is used in industry, residential and tertiary sector.

- **The end of coal mining in France:** National production of coal has suffered a steady decline since 1947, rising from 47 million tons by that date less than 2 million tons in 2003. The heavy operating losses suffered for several years by the group Charbonnages de France (CdF) because of his activities as coal mining and the absence of any prospect of improving the situation, have led the authorities to implementing a programme of gradual closure of the mines. The end of coal mining in France is officially occurred on April 23, 2004, at the closure of wells in Lorraine La Houve⁵.

Nuclear Power

France is the most nuclear-dependent countries in Europe, and the second one in the world after the US. France has 19 nuclear plans with 58 functioning nuclear reactors. Indeed, it derives over 75% of its electricity from nuclear energy.

France has 59 nuclear reactors operated by Electricité de France (EdF)⁶ with total capacity of over 63 GWh, supplying over 430 billion kWh per year of electricity, 78% of the total generated there. In 2005 French electricity generation was 549 billion kWh net and consumption 482 billion kWh - 7700 kWh per person. Over the last decade France has exported 60-70 billion kWh net each year and EdF expects exports to continue at 65-70 TWh/yr.

⁵ Ibid.

⁶ The EDF was created in 1946 to alleviate the energy shortage that occurred just after World War II. In the 1950s the EDF provided France with the energy to modernize itself into an industrial power.

This large amount of energy generation allows France to be more energy self-sufficient than most European countries. In fact, France is over 50% able to meet its own energy needs, an incredibly large percentage for a modernized, western country. In comparison, Italy is only 18% energy self-sufficient.

The present situation is due to the French government deciding in 1974, just after the first oil shock, to expand rapidly the country's nuclear power capacity. This decision was taken in the context of France having substantial heavy engineering expertise but few indigenous energy resources. Nuclear energy, with the fuel cost being a relatively small part of the overall cost, made good sense in minimizing imports and achieving greater energy security.

As a result of the 1974 decision, France now claims a substantial level of energy independence and almost the lowest cost electricity in Europe. It also has an extremely low level of CO₂ emissions per capita from electricity generation, since over 90% of its electricity is nuclear or hydro.

In order to foster a high degree of energy efficiency, on August 2006 the French Government decided to build a third-generation reactor on Flamanville, in the department of Manche in the Basse-Normandie region, close to other two reactors of 1300 MW each.

The investment is about 3,3 billions of Euro⁷ and the works started in 2006 and will end in 2012. The new EPR reactor will have a power of 1650 MW and with respect to the ordinary reactors will last the double and will produce 15 per cent less nuclear wastes. Through this new reactor France started a third phase in the nuclear process.

⁷ Also the ENI, an Italian company, participates into the project with a 450 millions of Euro of investment.

The Renewable Energy mix

France has several advantages in terms of renewable energy: is rich in water resources, has one of the largest forests of Europe, a good exposure to wind and large areas, especially beyond the sea, where solar energy is well developed. In fact, France is the first European producer of renewable energy followed by Sweden and Germany⁸.

Renewable energy generation in France is as follows:

Hydroelectric Power: is the second source of electricity in France after the bio energy generation. It represents 12% of total electricity production, with a production capacity of 70TWh per year on average. The production varies according contingencies of hydropower; in 2006, it was 60.9 TWh. Its contribution in terms of installed power is a little more significant: it is 25.4 GW, that is 22% of all plants contributing to the public electricity. The production of electricity in hydropower is estimated at 53210 GWh representing 91.44% of electricity production of renewable energy in France. The hydropower results from a transformation in energy electric hydraulic power, or the energy provided by a mass of water in motion.

There are two main types of power:

- The plants along the water, which do not have any storage capacity and produce electricity in the light of continuous inputs of water. The production is therefore directly affected from precipitation. These plants are usually located in the plains on the watercourses with a strong and not too variable flow throughout the year, as the Rhine or the Rhone.
- The lake plans, that are characterized by their large water storage capacity by one million m³ to more than billion m³. These plants produce an average of 30 TWh per year.

One of the great advantages of central hydraulic is its great flexibility of use. Indeed, while for a nuclear power are needed 24h running and 12 h for the thermal power plant, for hydraulic are needed only a few minutes.

⁸ AIE: Renewable Energy production in European Union (without biofuels).

The **Bio energy** is the energy produced from biomass and biogas, in the form of heat, electricity and fuels (bio ethanol and biogas olio).

Biomass is the part of biodegradable products, waste and residues from agriculture, forestry and related industries. In France, the potential still available for biomass energy and raw materials, without the optimisation of this potential with additional crops, is approximately 20 million tonnes of which about 80% are the part of wooden cellulose biomass.

With a generation of 11,2 Mtep in 2006 that represent the 2/3 of the total French renewable energy production, the biomass production is divided as follows:

- 9,3 Mtep for the wood energy;
- 0,9 Mtep for the exploitation of waste;
- 0,7 Mtep for bio-fuels;
- 0,2 Mtep for bio gas.

France is the first European producer of wood power. With regard of bio-fuels, it occupies the second highest place with a land area of about 400.000 hectares.

The production of wood fuels is nearly four times the national generation of coal, oil and gas combined (7.3 Mtoe). The development of the biomass can enable France to help achieve the objectives laid down by EU directives for example to increase its production of electricity from renewable up to 21% of the total consumption of electricity, increase of 50% the share of heat from renewable sources rising from 11 to 16 Mtoe, to increase the share of bio-fuels up to 7% in 2010.

Wind power requires complex machines, as the great variation in the speed of wind resistance requires exceptional components. There are two types of wind plants: horizontal axis which represents the majority of wind power (their axis of transmission is parallel to the ground) and vertical axis, rather rare. France, with a 2005 production estimated at 985 GWh, that is 1.69% of its production of renewable energy, is an installed power of 918 MW.

Since 2004, the Directorate-General Energy and raw materials questions each year prefects to know the situation of wind in their department. The investigation 2007 confirms the pace of development of wind power in France.

Indeed, between February 2006 and the 1st February 2007, 292 building permits, representing a force of 1,480 MW, were issued. These projects join the 2,787 MW agreed between the 1st February 2004 and 1st February 2006, putting France among European leaders of wind power in terms of annual market.

The Solar energy. The solar thermal arose from the use of sensors that convert solar energy into heat conveyed by water. This principle is used to provide either hot water, or to contribute to heat a house. The solar thermal sector is one of the most dynamic and bright way of heat production.

Tendencies for the 2007 show an intensification of solar photovoltaic after a continuous growth of three years. The power of the installed sensors linked to the metropolitan network in 2006 is doubled (6100kWc versus 3075 in 2005). In addition, incentive programmes like Hélios 2006, will carry out the installation of a surface of about 175000 m² of photovoltaic cells!

The renewable France policy

The law program on July 13, 2005 laying down guidelines of energy policy , has set targets for renewable energy production.

It provides for the production of 10% of French energy needs from renewable sources by 2010 with the objectives encrypted for each of energy carriers in 2010:

- The production of 10% of French energy needs from renewable energy sources by 2010- domestic production of electricity from renewable up to 21% of consumption in 2010 against 14 % today, or + 50%;
- The development of renewable energy from thermal by 2010, such as an increase of 50% of heat production from renewable sources;
- The incorporation of bio fuels and other renewable fuels up to 5,75% by December 2010

Among the measures carried out to meet these objectives, it includes:

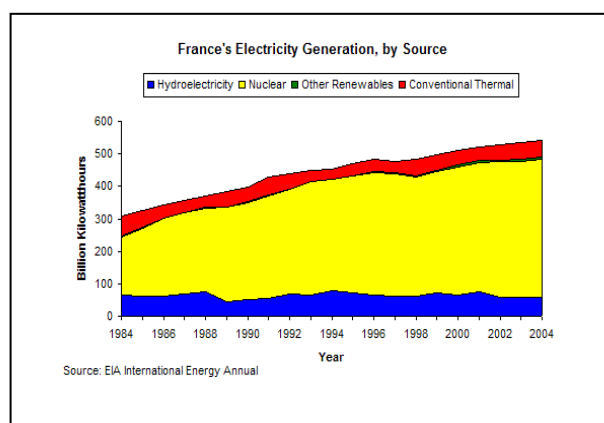
- The establishment of a tax credit that can stick to 50% of the cost of acquisition for an equipment that use a renewable energy source;
- The definition of the objectives quantified within the framework of multi-annual programming investments (PPI) for electrical and thermal sectors, between 2010 and 2015;
- The put into place of economic instruments for the production of electricity from renewable sources such as the obligation to purchase electricity produced with rates specific to each branch (wind, photovoltaic, etc..), And the launch of requests purchasing, for wind power on land and sea, biomass, biogas or bio fuels.

Electricity

Total production

In 2006, total net output of electricity reached **548.8 TWh**, which are divided into 78.1% nuclear, 10.4% of conventional thermal, 11.1% hydroelectric and 0.4% of wind power and photovoltaic. By compared to 2005, total net output declined by 1.4 TWh -0.2%.

Total production of electricity	
Nuclear	428,7 TWh
Conventional thermal	57,1 TWh
Hydroelectric	60,9 TWh
Wind and solar	2,2 TWh



Thanks to the nuclear energy and the hydroelectric, France is completely independent and she has the opportunity to export the overproduction.

Total domestic consumption

Final consumption of electricity by sector in 2006	
Household and service sectors	279 TWh
Agriculture	3 TWh
Industry	125 TWh
Iron and steel industry	11 TWh
Public transports and railwais	12 TWh

The total energy consumption is calculated in 478,0 TWh. The sectors that consume the major share of electricity are the residential one end the service sector⁹.

⁹ www.iea.org (International Energy Agency).

The electricity market

The electricity market is organized around four main pillars: the generation, transmission, distribution, marketing.

1. The sector of electricity generation in France today comprises three main actors: Electricité de France (EDF), Electralabel-Suez and Endesa (formerly SNET). They provide more than 95% of electricity production in France, 90% being provided by the Production Park of EDF essentially nuclear (85% of the production of EDF is generated by nuclear power). This segment of the electric chain is opened to competition.
2. The transport consist in delivering electricity on the major routes of the electricity network, the "highways" of electricity, to the place of delivery and in controlling the overall balance of the electrical system. Some large companies are fed directly from the transmission grid. The RTE (Transmission System Operator in France) is the network manager in charge of public transport infrastructure (management, construction, maintenance,...) in France.
3. With the distribution, electricity is distributed to final customer. This activity is organized by geographic monopoly. The distribution system is also in charge of rotating electricity meters. EDF and the local distribution companies are the players in the distribution charges, under the control of local organizers of the public distribution of electricity.
4. The two sectors of transport and distribution are regulated by the Energy Regulatory Commission (CRE) responsible for ensuring the conduct transparent and non-discriminatory managers of these networks. It has thus broad powers for example on tariffs for the use of networks and investments.
5. Finally, the marketing phase is the sale of electricity to final consumers, which lies at the interface between distributors and final customers. This activity open to competition is to sell retail electricity purchased or produced in bulk (if supplier has itself the means of generation, in the case of Endesa France, CNR, EDF), possibly providing additional services related to energy¹⁰.

Electricity prices

Electricity prices for households have followed a downward trend in the last 10 years. Currently, the average electricity household price is about 16% below the EU-15 and EU-25 averages. Prices for industrial users are lower in absolute terms than for households. Over the last 10 years, prices for industrial users have also followed a downward trend. Currently, they are the fifth lowest among Member States and more than 29% below the EU-15 and EU-25 averages¹¹.

¹⁰ www.industrie.gouv.fr

¹¹ www.iea.org

Degree of energy-dependence

France is a country with a degree of energy-dependence that is almost equal to the average index for the EU-25 countries. According to the Eurostat data, France has an index equal to 51 per cent, while the EU-25 index is equal to 53 per cent. This means that half of the French economy relies upon imports in order to meet its energy needs. Other major economies in Europe, like for instance Germany, Italy and Ireland, are relatively more import-dependent having higher indexes respectively equal to 61, 85 and 90 per cent. The vital relations for the country are with Russia, Norway, Saudi Arabia and Algeria.

Source of crude oil imports

Despite the oil's share of France's total energy consumption has declined by almost half since 1973 due to the nuclear strategy, moving from 71 per cent in 1973 to 36 per cent in 2004, nowadays France is the second largest European oil consumer, preceded by Germany, with an average of 2.0 million barrels per day (bbl/d)¹². However, according to "*Oil and Gas Journal*" (OGJ), the country produces just 78,900 barrels per day and the remaining amount is covered by imports. According to Eurostat, France imports 1.57 million bbl/d of crude oil in 2006. The largest source of these imports is Norway (256,000 bbl/d), followed by Russia (186,000 bbl/d) and Saudi Arabia (166,000 bbl/d).

Source of natural gas imports

France imports almost all of its natural gas demand. According to the OGJ, France consumes around 1.6 trillion cubic feet (Tcf) of natural gas with less than 5 per cent of demand covered by domestic sources. However, it must be stressed that in the European scenario France is not the main gas consumer but rather a marginal user. The most important sources of France's natural gas imports are Norway, Russia, the Netherlands, and Algeria.

Because of its dependence on natural gas imports, France has numerous pipeline connections with its neighbors. The Franpipe, completed in 1998, links Norway's Draupner platform in the North Sea to the French port of Dunkerque. The 521-mile-long, 1.4-Bcf/d Franpipe was the first pipeline to directly link France with a natural gas field in a foreign country. Analysts predict that Franpipe will eventually supply one-third of France's total natural gas consumption. France also imports natural gas from Russia through the Cerville-Velaine distribution center in northeast France and from the Netherlands through the Taisnieres entry point. In October 2005, Total inaugurated the 48-Mmcf/d Euskadour natural gas pipeline between the liquefied natural gas (LNG) receiving terminal in Bilbao, Spain and southern France. This pipeline allows France to be linked with Algeria.

¹² Source EIA short-term outlook, 2006.

Energy Efficiency

The implementation of the national policy for the rational use of energy has been strongly boosted by the public authorities, in particular to help France to reduce its emissions of greenhouse gases in order to combat climate change.

* The challenges of energy efficiency and the development of renewable energies. The draft law on energy proposes to reduce by 2% per year by 2015 and 2.5% by 2030 the French energy intensity (or the relationship between consumption energy and economic growth).

This involves the revival of the national policy on energy efficiency. Since the first oil shock, it has already enabled France to save about 15 million TOE (tons oil equivalent). This revival is essential to address three major issues:

1. The fight against climate change;
2. The security of supply;
3. The preservation of human health and of the environment.

The action in this field works in two directions.....

The first one is to promote energy savings, especially in the sectors covered daily uses (housing, offices, shops, and transport) where consumption is important;

The second is to promote renewable energy (biomass, solar, wind, geothermal, hydro, heat pumps).

.....And in four levels:

1. Supports research programs on solutions to clean and efficient transportation (electric vehicles, bio-fuels,... particulate filters), the energy efficiency of buildings (solutions for heating, hot water, cooling system, ventilation, lighting...) and new energy technologies;
2. It provides financial and technical assistance for the feasibility studies that enable clients to guide their choices of operations to energy efficient;
3. It promotes the development of exemplary and inspiring efficient use of energy and their dissemination;
4. Relying in part on the space-Info Energy, it broadcasts to the general public targeted information on existing technologies (appliances labeled "low consumption, efficient boilers, solar water heater individual heat pump, isolation techniques, ambient temperature, tire and fuel "green.") and best practices that allow a more economical use of energy¹³.

¹³ www.industrie.gouv.fr