FRANCE

The country report for France was prepared by the Institut Technique Europeen du bois-Energie. Complementary data used comes from the web sites: http://www.ademe.fr/guadeloupe/Bagcharb.htm, http://www.groupecharbonnages.fr/version_francaise/le_groupe_CdF/Operateur/dom.html, and IEA Reports.

Current situation on CHP and biomass CHP in the national energy sector.

France has few energy resources of its own. All types of fossil resources can be found on French territory, but the quantities are very small. The only significant resource in France is uranium. France has about one-third of European uranium resources and some 7% of world resources.

Energy balances in France (Source: Energy Policies of IEA Countries, 2001)

	1999	%
Population (millions)	**60.27**	
Energy consumption/capita	**2.82**	
Total energy production (Mtoe)	**127.6**	
Coal	3.5	2.7
Oil	1.9	1.5
Gas	1.7	1.3
Biomass & Wastes	11.4	8.9
Nuclear	102.7	80.5
Hydro	6.2	4.9
Geothermal	0.1	0.1
Solar/Wind/Other	0.1	0.1
Net energy imports (Mtoe)	**128.4**	
Coal	11.9	
Oil	87.1	
Gas	34.8	
Electricity	-5.4	
Total supply - TPES (Mtoe)	**255.0**	
Coal	15.3	6.0
Oil	90.2	35.4
Gas	34.5	13.5
Biomass & Wastes	11.4	4.5
Nuclear	102.7	40.3
Hydro	6.2	2.4
Geothermal	0.1	0.0
Solar/Wind/Other	0.1	0.0
Electricity Trade	-5.4	-2.1
Electricity generation	**44.7**	
Electricity generation (TWh)	519.8	

	1999	%
Total final consumption	**169.7**	
Coal	4.8	2.8
Oil	89.6	52.8
Gas	32.5	19.2
Biomass & Wastes	9.7	5.7
Geothermal	-	-
Solar/Wind/Other	0.0	0.0
Electricity	32.2	19.0
Heat	0.7	0.4
Total industry consumption	**51.5**	
Coal	4.1	8.0
Oil	19.9	38.6
Gas	14.2	27.6
Biomass & Wastes	1.8	3.5
Geothermal	-	-
Solar/Wind/Other	-	-
Electricity	11.4	22.1
Heat	-	-
Transport consumption	**51.8**	
Total other sectors consumption	**66.5**	
Coal	0.7	1.1
Oil	19.2	28.9
Gas	18.3	27.5
Biomass & Wastes	7.7	11.6
Geothermal	-	-
Solar/Wind/Other	0.0	0.0
Electricity	19.9	29.9
Heat	0.7	1.1

France produces about 2.1% of its annual oil consumption, 5.6% of its gas consumption and 22% of its coal use. Indigenous production of all three resources has been in decline for at least 10 years, due to depletion and/or unfavourable economics of the resources. It is the second largest producer of nuclear power in the world following the United States.
Power production in France is a special case in Europe with a dominant operator: the state electricity company, Electricité de France (EDF). Power production is centralised and nuclear plants produce the main part of electricity (75-80%). This is the highest share in the world. Correspondingly, France reduced its energy import dependence from 81% in 1973 to 50% in 1998. In contrast, natural gas imports quadrupled between 1973 and 1998.
While industrial energy consumption fell rather dramatically after the two oil crises and has not changed much since, the transport sector has grown rapidly and today accounts for 30%.
Indigenous production and supply of renewables was 16.8 Mtoe in 1998, some 13% of production and 7% of supply, i.e. relatively significant amounts. The largest part came from combustible renewables, especially non-commercial wood combustion.

CHP utilisation is a decentralised way of power production and its development was limited in the centralised scheme of electricity production in France. No specific policy existed for the CHP development but since 1995 a permanent buy-back obligation for the electricity produced by CHP has been implemented (cf part legislation and support mechanisms). Since 1995 cogeneration plants are more cost-effective and the development of CHP has been accelerated.

CHP represents actually 3% of the energy production in France with about 670 installations and 5000 MWel. CHP is mainly implemented in industries with large-scale installations. The main fuels used in CHP plants are natural gas and heavy fuel oil.

Biomass CHP is not well developed. The power installed in France and in its overseas territories is about 300 MWel. Some projects will probably be implemented when the biomass buy-back rate is published.

RTD and Demonstration projects on biomass CHP
ADEME the energy and environment agency in France (national body), subsidise studies on wood energy: In 2001 a study on the different technologies available for wood fuel CHP was performed by Biomasse Normandie (an association for the promotion of renewable energy). ADEME will probably implement a biomass CHP program on the model of the wood energy program 2000-2006.
CEA, the state research centre on energy, works on a project on gasification processes with national funding.
SOLAGRO, association, works on methanisation of farm residues.

Legislation and support mechanisms

Cogeneration
Since 1994 a permanent buy-back obligation from the state electricity operator: Electricité de France (EDF) is instigated and a 1995 decree clarifies the conditions for the buy-back obligation.

This is available for CHP plants on the following conditions:

- Global energetic efficiency higher than 65%
- Heat/electricity ratio higher than 50%
- Effective utilisation of the produced heat

An incentive is accorded to the plants that have a very good efficiency.
In 1997 a standard contract is adopted and the buy-back obligation is modified: the purchase of electricity is applicable for 12 years to the cogeneration plants up to 12 MWel.

A law adopted in February 2000 (n°2000-108) transposes the European electricity liberalisation directive one year after the EU deadline and defines rules for the opening of the electricity market.
The latest modification of the decree was published in august 2001 with the buy-back rate for CHP, which depends on the capacity and on the annual operating time of the plant. The purchase prices of the electricity produced by CHP are ***favourable for gas CHP but not for biomass CHP plants***.

Biomass cogeneration

National electric utility is obliged to purchase electricity from renewable suppliers at an enhanced buy-back rate.

Biogas: A decree published on October the 3rd, 2001 fixes the purchase prices of electricity produced from biogas. The buy-back rate depends on the capacity of the CHP plant.

Wood and other biomass: The buy-back rate for electricity produced in biomass plants is not fixed yet. A project sets a purchase tariff between 0.067 and 0.076 €/MWh. The buy-back rate will be fixed according to the power range of the installation. Some actors of the wood market fear that high purchase prices would destabilized the market of wood and wood residues so the decision has been delayed. The results of the negotiation was to be published in 2002.

Fiscal measures :
TGAP (general tax on pollutant activities: atmospheric pollution, MSW landfill, oil collection, noise reduction and industrial wastes) was to be extended to CO2 emissions in 2001 but is not yet implemented.
ADEME (national body in the frame of the wood energy programme 2000-2006) provides a financial support for investments dedicated to the development of wood energy. The subsidy level is about 30-40 % of the investments in the collective sector and 10 to 15 % for industries.
ADEME provides help tools for RES projects in order to encourage RES investments: advice (diagnosis) and feasibility study are subsidized at the level of 70% and 50%.

Existing CHP plants
Biomass CHP plants are mainly implemented in France in the industrial sector.
Pulp and paper industries (fuel: wood residues, barks and black liquor): those CHP plants are large scale units more than 10 MWe. Steam is used for the paper and pulp process. The installed capacity is around 200 MWe in 10 plants.
Sawmills and wood second transformation industries: (fuel: wood residues) In this sector, wood residues are used in heating plants and CHP plants.
District heating plants (fuel: wood residues, bark, wood chips): Only one cofiring plant is working burning wood, animal flours and coal and having an electrical capacity of 11MWe. Another plant is under construction and will use wood residues and barks having a 2 MWe capacity.
Small wood CHP units: two or three small units are working in France (about 50 to 130 kWe)
Sugar refineries: Bagasse, the fibrous material left over after the sugar is extracted from sugar cane, is used as primary fuel in CHP or power plants. Those CHP plants are implemented in sugar refineries in overseas territories of France. The plants work one part of the year with bagasse as fuel (during the milling season) and during the other part of the year they run on bituminous coal. During the sugar-harvesting period the boilers generate steam for sugar processing requirements and to drive turbine generators to produce electricity. The electricity that is not used by the sugar mill is distributed on the national grid. During the other part of the year, the plants work as a classic power plants only producing electricity. 3 plants exist with a total capacity of 180 MWe.

A short description of the plants is given below:

- **La Centrale de Bois-Rouge, Reunion island**

Constructed in 1992 by SIDECand having an electrical capacity of 60MW, the CHP plant disposes 640.000t bagasse, equivalent of 120000t of heavy oil, and covering 30% of the island's electricity needs.

- **La Centrale de Goule, Reunion island**

La Centrale de Goule is identical with the Centrale du Bois-Rouge and was constructed in 1995.

- **La Centrale Bagasse – Charbon du Moule, Guadeloupe**

La Centrale Bagasse-Charbon du Moule was constructed in 1998 by Compagnie Thermique du Moule. It has two identical lines of a 32MW capacity and consumes 180 to 200 kton/y of bagasse. Each boiler produces 140t/h of steam (520oC, 80bar) that is used to produce electricity. After that a part of that steam (3 bar) is used as process steam by the sugar refinery nearby. In 1999 the plant produced 371GWhe. Bagasse was the fuel for the production of 71 GWh that represent 7% of the energy consumption of Guadeloupe.

Authorised landfill sites: biogas is used either in power plant or in thermal plants but CHP plants are not developed for this biogas in France.
Wastewater treatment plants: Biogas CHP plants are implented in order to produce heat and electricity for the need of the water treatment plant (On farm consumption). The capacity of those plants is low: about 1 MWe.

In Guadeloupe, there are plans for the exploitation of **waste** (60% combustibles) through the construction of 3 CHP incineration plants (Basse-Terre region, Pointe-a-Pitre region, Saint Martin).