

## Country Reports

IEA Bioenergy: 10 2021



This report was prepared from the 2021 IEA World Energy Balances and Renewables Information, combined with data and information provided by the IEA Bioenergy Executive Committee and Task members<sup>1</sup>. Reference is also made to FAOstat and Eurostat data as well as data from national statistics. All individual country reports were reviewed by the national delegates to the IEA Bioenergy Executive Committee, who have approved the content. General background on the approach and definitions can be found in the central introductory report for all country reports.

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### HIGHLIGHTS

- Renewables make up 11% of total energy supply in France in 2019. The renewable energy share in *final energy consumption* is 16.5%<sup>2</sup>. Around 60% of renewable energy is from biomass.
- Around half of the land area in France is agricultural land, one third is forest land. France has quite favourable geographic and climatic growth conditions, so there is important potential for agricultural and forestry biomass.
- Solid biofuels are still the main type of biomass used to produce bioenergy, with fairly stable consumption in residential applications and industry. The use of solid biofuels for (combined) heat and power production has doubled in the past 7 years.
- The role of liquid biofuels is more pronounced than in other countries and has been steadily growing in the past 15 years up to an average level of 7% by energy of overall transport energy consumption. The main biofuel is on biodiesel, which is consistent with the dominant role of diesel fuels in the French fleet.
- Nuclear energy is dominant in electricity production in France and the role of bio-electricity is quite low (most connected to bio-CHP). The role of wind and solar power is still modest, but growing.

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<sup>1</sup> While data for 2020 are starting to become available at national level, it was decided to consider trends up to 2019 for good comparability and benchmarking between the different IEA Bioenergy member countries. Care should also be taken when using 2020 data for analysing trends as these data are distorted by the COVID19 Pandemic.

<sup>2</sup> The difference between the share of renewables in supply and consumption relates to unused heat from (nuclear) power plants (which is counted in energy supply, but not in final consumption).

## COUNTRY PROFILE

### Population and land use

France is one of the bigger countries in West Europe. It has a total land area of 548 thousand km<sup>2</sup> and a population of 65.1 million people, representing a population density of 119 persons per km<sup>2</sup>.

France has quite favourable geographic and climatic growth conditions. Around half of the land area is agricultural land, about two thirds arable land and one third permanent meadows/pastures. 31% is forest land (of which 23% protected).

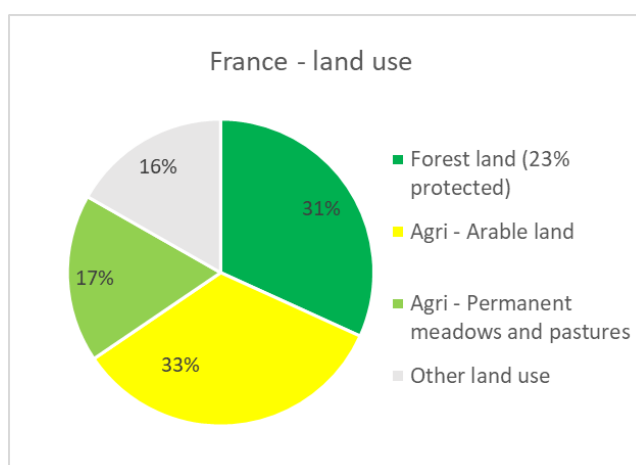


Figure 1: Land use in France (2018 figures - Source: FAOstat)

### Final energy consumption

Overall final energy consumption in France (also including non-energy use of oil, natural gas and coal in industry) equates 2.3 tonnes of oil equivalent (toe) per capita, which is around the average of IEA Bioenergy member countries. The role of industry (per capita) is fairly modest compared to other countries.

Table 1: Distribution of the final consumption of energy carriers by sector in France (2019 figures - Source: IEA (2021) World Energy Balances and Renewables Information)

Final consumption energy carriers	Toe/capita (2019)	% of total	Median* (toe/capita)
Industry (energy use)	0.42	18%	0.67
Industry (non-energy use)	0.21	9%	0.21
Transport	0.69	30%	0.69
Residential	0.57	25%	0.57
Commercial & public services	0.33	14%	0.34
other	0.08	3%	
<b>Total</b>	<b>2.30</b>		<b>2.34</b>

\*Median of the 25 member countries of IEA Bioenergy<sup>3</sup>

<sup>3</sup> Comparative figures of the different IEA Bioenergy member countries are discussed in the central Countries' Report.

# NATIONAL POLICY FRAMEWORK IN FRANCE

## TARGETS AND STRATEGIES

The Energy Transition for Green Growth Act of 2015 and the Energy and Climate Law of 2019 have set objectives for the different energy sectors by 2030. The energy sector overall must contribute to the objective of reducing GHG emissions by 40% and to the development of renewable energies to reach 33% in the French energy mix in 2030.

The share of renewable energies in 2030 should represent at least 38% of final heat consumption and at least 15% of final fuel consumption in transport. The share of renewable energy in electricity production, which amounts to 22.5% in 2020, should reach at least 40% in 2030.

*Table 2: renewable energy and climate targets in France\**

Sector	Share of renewables in gross final consumption per sector	GHG reduction target
<b>Overall target</b>	33% by 2030	-40% by 2030 compared to 1990 Climate neutral by 2050
<b>Heating and cooling</b>	38% by 2030	
<b>Electricity</b>	40% by 2030	
<b>Transport</b>	15% by 2030 (biofuel final consumption)	

\* 2030 targets mentioned in the 2019 Energy and Climate Plan are likely to be reviewed in the frame of the European Fit for 55 package of 2021.

### The Multiannual Energy Plan

In order to meet the ambitious targets set out in the Energy Transition for Green Growth Act, the French Government established the **multiannual energy plan (MEP/PPE)**<sup>4</sup>, which sets out the government's strategic priorities in terms of energy policy for the next ten years divided into two five-year periods. The current programming, which covers the period 2018-2028, sets objectives for the development of production sectors renewable and recovered energies in France, by 2023 and 2028. This programming is updated every five years. The MEP sets out two fundamental priorities: reducing energy consumption, particularly fossil fuel consumption, and developing renewable energy sources. These will be the central tenets of the French energy system as it evolves to meet the demands of the low-carbon economy. The transition also needs to safeguard the security of the energy supply and the competitiveness of French businesses. With a strategic commitment to developing clean mobility, the MEP devotes considerable attention to the transport sector.

<sup>4</sup> <https://www.ecologie.gouv.fr/programmations-pluriannuelles-lenergie-ppe>

Table 3: Objectives in the field of renewable electricity and heat, under the MEP (2018-2028)<sup>5</sup>

	Unit	Realised			Objectives	
		2018	2019	2020	2023	2028
<b>Renewable heat &amp; cold and energy recovery</b>						
Biomass	TWh	112	113	106	145	157 - 169
Heat pumps including geothermal heat pumps	TWh	28	32	33	39.6	44 - 52
Deep geothermal energy	TWh	2	2	2	2.9	4 - 5.2
Solar thermal	TWh	1.19	1.2	1.21	1.75	1.85 - 2.5
Quantity of renewable and recovered heat delivered by district heating networks	TWh	13.9	14.6	n.a.	24	31 - 36
<b>Renewable gas</b>						
Biogas injected into the gas grid	TWh	0.7	1.2	2.2	6	14 - 22
<b>Renewable electricity</b>						
Hydropower (including pumped storage and tidal energy)	GW	25.5	25.6	n.a.	25.7	26.4 - 26.7
Onshore wind	GW	15.2	16.6	17.5	24.1	33.2 - 34.7
Solar PV	GW	8.4	9.3	10.2	20.1	35.1 - 44.0
Electricity from biogas	MW	178	214	235	270	340 - 410
Offshore wind	GW	0	0	0	2.4	5.2 - 6.2

Source: Service de la donnée et des études statistiques (SDES)

## The French bioeconomy strategy

The bioeconomy encompasses the whole range of activities linked to bioresource production, use and processing. The purpose of those activities is to provide a sustainable response to the need for food and to part of society's requirements for materials and energy, while at the same time preserving natural resources and guaranteeing the provision of high-quality environmental services.

In order to support the development of the bioeconomy, France has put in place a strategy tabled in the French Council of Ministers on 18 January 2017.

The French bioeconomy strategy lays down a framework for sustainable development of the bioeconomy consistent with the French territory's resources and needs while avoiding excessive exploitation. The present action plan translates this strategy into distinct actions in order to ensure an operational roll-out of the bioeconomy across France in 2018, 2019 and 2020. The action plan translates the overall bioeconomy strategy into operational actions under five broad headings:

- Extending knowledge
- Promoting the bioeconomy and its products to the general public
- Creating the conditions for matching supply with demand

<sup>5</sup> <https://www.statistiques.developpement-durable.gouv.fr/edition-numerique/chiffres-cles-energies-renouvelables-2021/4-objectifs-dans-le-cadre-de>

- Sustainable bioresource production, mobilisation and processing
- Removing obstacles and providing funding

A description of renewable energy and climate policies and measures in France is available at the IEA's Policies and Measures Database: <https://www.iea.org/policies?country=France>

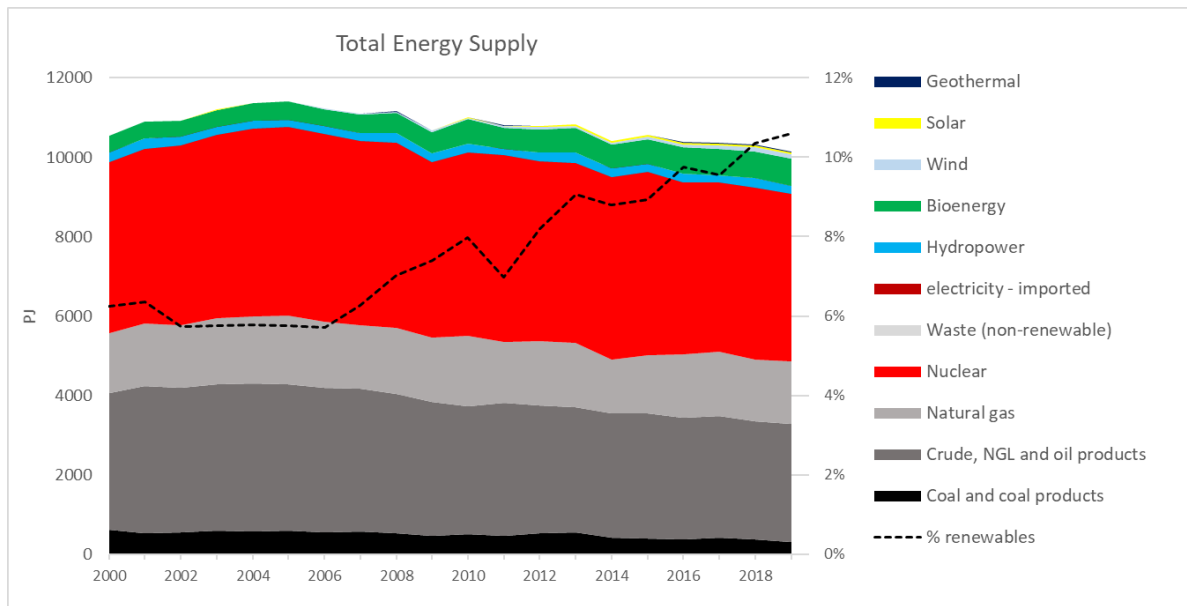
Specific policies related to renewable electricity, renewable heat and transport biofuels will be highlighted in the chapters about the role of bioenergy in different sectors.

## THE CONTRIBUTION OF BIOENERGY IN NATIONAL ENERGY SUPPLY

### TOTAL ENERGY SUPPLY

The total energy supply (TES) of France in 2019 amounted to 10,150 petajoule (PJ) with an export surplus of electricity of 208 PJ (2% of total energy supply). The main share (43%) holds nuclear energy with 4,353 PJ, producing 70% of all electricity in France. Mind that its role in final energy consumption is lower (~22%) as total energy supply also includes unused waste heat, which distorts the picture somewhat. Oil products account for 29% of total energy supply (2,978 PJ). Natural gas accounts for 15.5% (1,572 PJ) and coal products for 3% (306 PJ). Non-renewable waste accounts for 0.7% (73 PJ). Renewable energy sources have a share of 10.6% or 1,076 PJ. Around 63% of renewable energy supply in 2019 came from biomass (675 PJ), followed by hydropower (205 PJ), wind energy (125 PJ), solar energy (52 PJ) and geothermal energy (19 PJ).

In the past 10 to 15 years total energy supply slightly decreased at an average pace of 0.9% per year. The share of fossil fuels and nuclear energy in TES was relatively stable, with nuclear energy between 42 and 45%, oil products around 30%, gas around 15%. The share of coal decreased from 5% to 3% since 2013. The share of renewable energy in TES increased from 8% in 2010 to almost 11% in 2019. Bioenergy has been and still is the dominant type of renewable energy. In the past decade wind power and solar energy saw strong increases, together rising from 31 PJ in 2009 to 177 PJ in 2019. Hydropower was relatively stable around 200 PJ (2% of TES).



**Figure 2:** Total energy supply<sup>6</sup> and the contribution of different energy sources in France, with distribution in 2019 (Source: IEA (2021) World Energy Balances and Renewables Information)

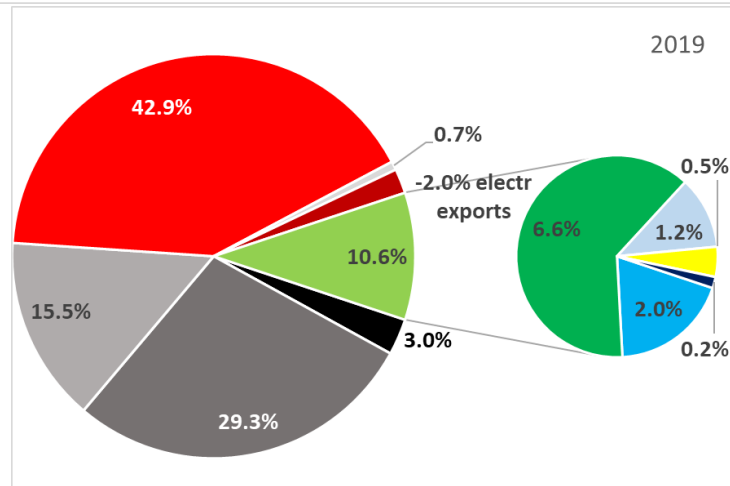
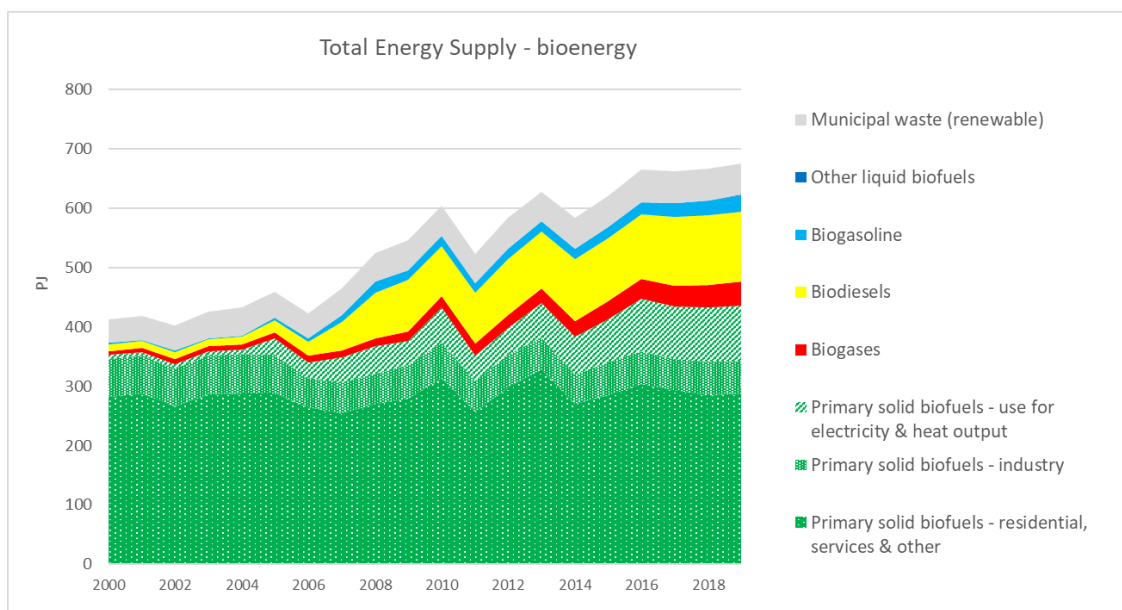


Figure 3 shows the evolution of the different types of bioenergy. Overall bioenergy supply increased from 400 PJ in the early 2000s to 675 PJ in 2019. Solid biofuels were the dominant type of bioenergy in France, but the main growth has been in transport biofuels.

Evolution of the bioenergy carriers:

- The use of solid biomass in residential applications and industry has been fairly stable around 350 PJ together. On the other hand, the use of solid biofuels for electricity and heat production has doubled in the past 7 years, from 45 PJ in 2012 to 95 PJ recently.
- France was one of the first European countries to adopt biodiesel, which was at around 10 PJ per year in the early 2000s. Levels of biodiesel have consistently grown since 2006 up to 120 PJ in recent years. In the same period, bioethanol use also increased from 2 PJ to 27 PJ, still at much lower levels than biodiesel (also related to the dominant role of diesel fuel in the French fleet).
- Biogas is also consistently growing, from 10 PJ in 2005 to 40 PJ in 2019.
- Renewable energy from MSW was rather stable around 50 PJ since 2009.

<sup>6</sup> Total energy supply refers to the use of resources. In terms of the role in the energy system this distribution overestimates the role of resources producing electricity with a high share of unused waste heat (like nuclear plants).



**Figure 3:** Development of total energy supply from bioenergy in France 2000 - 2019 (Source: IEA (2021) World Energy Balances and Renewables Information)

Table 4 displays the 2019 total bioenergy supply values on a per capita basis. Compared to the other 24 member countries of IEA Bioenergy (expressed per capita), France ranks at the higher end for liquid biofuels, and in the middle for solid biomass, biogas and renewable MSW.

**Table 4:** Total energy supply per capita in 2019 for different bioenergy carriers

	Supply per capita	Median IEA Bioenergy members
<b>Bioenergy</b>	10.4 GJ/cap	10.6
<b>Solid biofuels</b>	6.7 GJ/cap	7.0
<b>Renewable MSW</b>	0.8 GJ/cap	0.8
<b>Biogas</b>	0.6 GJ/cap	0.7
<b>Liquid biofuels</b>	2.2 GJ/cap	1.5

Source: IEA (2021) World Energy Balances and Renewables Information

Table 5 indicates the amounts of the different bioenergy carriers compared to some relevant reference points, namely the amount of forest in the country (for solid biomass), the amount of generated MSW (for renewable MSW used for energy), the amount of natural gas consumed in the country (for biogas) and the amount of fossil oil products consumed (for liquid biofuels).

**Table 5: Comparison of the supply of different bioenergy carriers in 2019 to specific reference points**

Compared to reference points			Median*
<b>Bioenergy</b>	6.6% %	of total energy supply	7.2 %
<b>Solid biofuels</b>	33.0 GJ/ha_forest	compared to the domestic hectares of forest land (excl. protected)	21.3 GJ/ha_forest
<b>Renewable MSW</b>	1.57 GJ/ton_MSW	compared to the total generated MSW in the country	1.4 GJ/ton_MSW
<b>Biogas</b>	0.026 GJ/GJ_NG	compared to natural gas supply	0.023 GJ/GJ_NG
<b>Liquid biofuels</b>	0.049 GJ/GJ_oil	compared to oil products supply	0.028 GJ/GJ_oil

Source: energy data from IEA (2021) *World Energy Balances and Renewables Information*; forest figures from FAOStat; waste figures from World Bank

\* Median of the 25 member countries of IEA Bioenergy <sup>7</sup>

Specific comments in relation to the reference points:

- The use of solid biomass for energy is fairly modest compared to the domestic forest area (~1.7 tons<sub>dry mass</sub> of wood per hectare<sup>8</sup>), certainly considering the good growth conditions and the relatively high forest increment in France. The modest use of forest biomass can also be explained by the specificity of the French forest, of which 75% is privately owned and 25% public forest and mainly made up of deciduous trees.
- The use of renewable MSW for energy production is also modest compared to other European countries with well-developed waste management systems.
- Liquid biofuels are at relatively high level compared to other countries. The support of biofuels in France has traditionally been linked to the agricultural sector, which is of high importance in the French economy.
- Biogas is also at modest levels and still has a good growth potential.

<sup>7</sup> Comparative figures of the different IEA Bioenergy member countries are discussed in the central Countries' Report.

<sup>8</sup> Counted with a typical calorific value of wood (dry mass) of 19 GJ/ton<sub>dry mass</sub>



## ROLE OF BIOENERGY IN DIFFERENT SECTORS

### OVERVIEW

The overall 2019 share of renewables in **final energy consumption** among electricity, transportation and heat sectors is a little over 16%, with bioenergy making up 10% of the energy share (Table 6). Mind that these figures are higher than the shares in total energy supply (where unused waste heat, e.g. in nuclear and fossil power production, is also included).

*Table 6: Role of bioenergy and renewable energy in electricity, transport energy and fuel/heat consumption in 2019*

Sector	Share of bioenergy	Share of renewable energy	Overall consumption
Electricity <sup>9</sup>	1.7%	22.2% (11% hydro)	507 TWh (1826 PJ)
Transport energy (final consumption)	7.1%	7.4%	1893 PJ
Overall fuel and heat consumption <sup>10</sup>	Direct biomass: 15.7% Biobased heat: 3.3%	19.5%	2328 PJ
<b>TOTAL FINAL ENERGY CONSUMPTION*</b>	<b>10.1%</b>	<b>16.5%</b>	<b>6011 PJ</b>

Source: IEA (2021) World Energy Balances and Renewables Information

The following paragraphs will consider the evolutions in the different sectors.

### ELECTRICITY

The French power production is dominated by nuclear power. It represented around 78% of power generation in the 2000s, dropping slightly in recent years to 70%, still the highest level in the world. Fossil fuels only have a modest role of less than 10%. Mind that the decrease of coal based power (from 25 TWh in 2013 to 6 TWh in 2019) was compensated by an increase of natural gas (from 20 TWh in 2013 to 40 TWh recently). Renewable electricity was mostly hydropower, representing a stable share of around 10% of power generation. The role of biomass-based electricity is fairly low at 1.5%; there is a slight increasing trend, probably connected with an increase in biomass-based CHPs.

<sup>9</sup> Renewable electricity production compared to final consumption. Potential renewable shares of imported electricity are not included.

<sup>10</sup> This includes final consumption of fuels and heat in industry, the residential sector, commercial and public services and agriculture/forestry. Transport fuels are excluded. Energy used for transformation and for own use of energy producing industries is also excluded. Electric heating (direct or through heat pumps) is not included in these figures as this is not separately reported.

Solar and particularly wind power increased steadily from a combined 2% power production in 2010 up to 8% recently. France typically exports around 10% of its power production to neighbour countries.

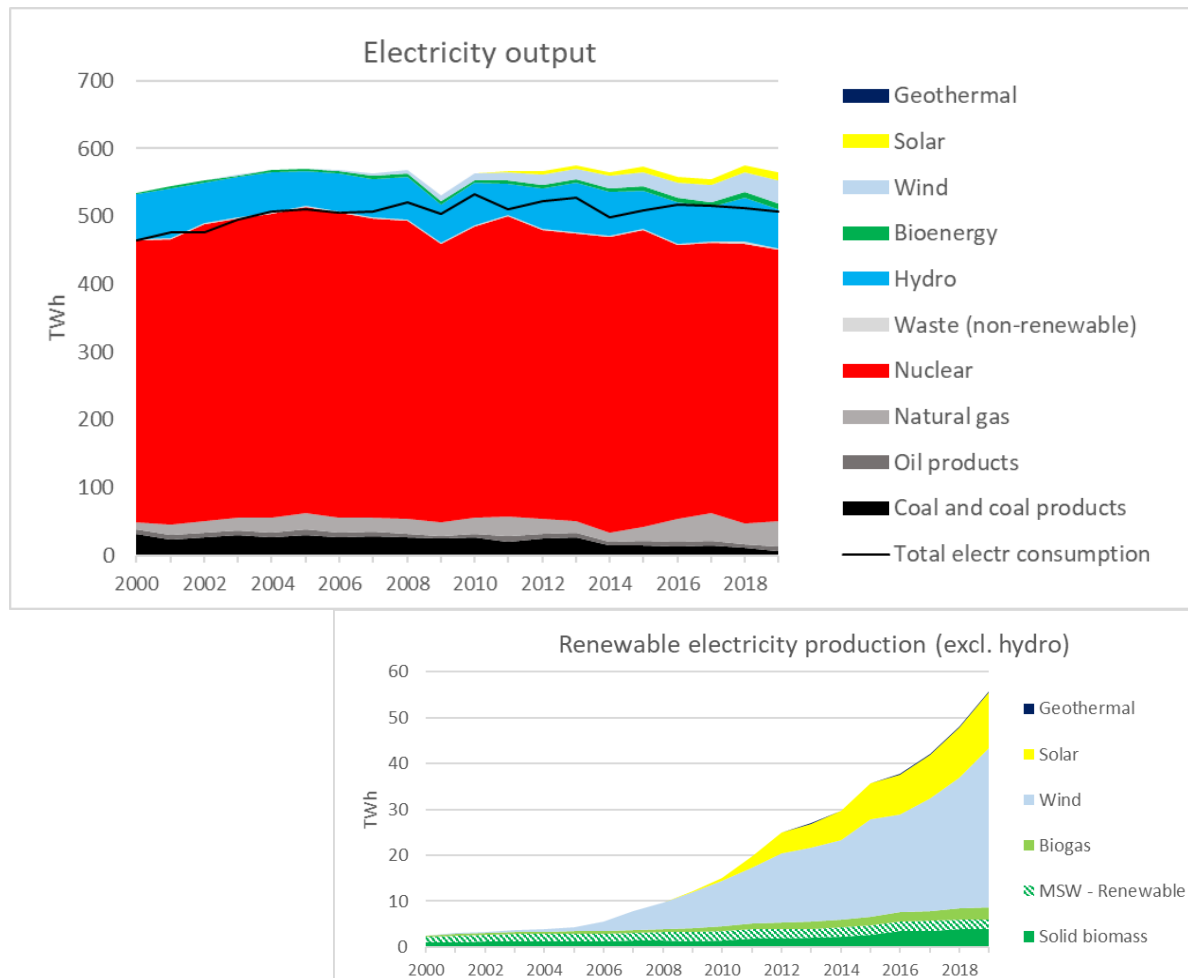


Figure 4: Evolution of the electricity mix in France 2000 - 2019 (Source: IEA (2021) World Energy Balances and Renewables Information)

## Policy framework

### Solid biomass:

- The Multi-Annual Energy Plan (MEP/PPE) of 2016 set a target of 540 MWe for solid biomass at the end of 2018. With a capacity of over 590 MWe this target has been met. The new MEP sets targets of 800 MWe for 2023, which remains unchanged for 2028.
- Calls for projects have been launched by the Energy Regulation Commission (CRE). Projects of the third phase of the latest call "CRE-5" will benefit of a guaranteed 20 year average electricity tariff of € 113/MWh, against € 122,50/MWh for projects of the second phase.

With the new MEP, priority has been given to the use of solid biomass for heat generation. The MEP plans to shut down the last coal fired power plants by 2022 and, in accordance with the guidelines on the priority valuation of biomass in the form of heat, the French state will not provide financial support for projects to produce electricity from solid biomass.

### Biogas:

- While the 2020 MEP addresses biomethane electricity production, it gives priority to projects that feed biomethane in the gas grid;
- On September 20, 2020, 517 MW of power capacity was operational (851 installations).
- A 20 year feed in tariff is being offered for installations < 500 kW on mainland France. For installations with higher capacities an additional remuneration is being offered.
- Call for projects by the CRE for biogas co-generation installations have led to few projects (2016: 2 installations; 2017: 2 installations, and only 1 for the 2019 call). The reason is that it turns out to be difficult to valorise the heat produced by the installations.

### **HEAT/FUEL**

Figure 5 shows the role of different fuels/energy carriers for providing heat in different sectors (industry, residential sector, commercial and public services and other). It also includes heat sold to customers, e.g. through district heating. Fuel use by energy producing industries for transformation and for own use is excluded. Mind that electric heating (direct or through heat pumps) is not included in these figures as this is not separately reported in the IEA database.

The provision of heat is still for more than three quarters based on fossil fuels, mainly natural gas and heating oil. The share of oil products is steadily decreasing, while natural gas is fairly stable. Direct use of biomass represents around 15%.

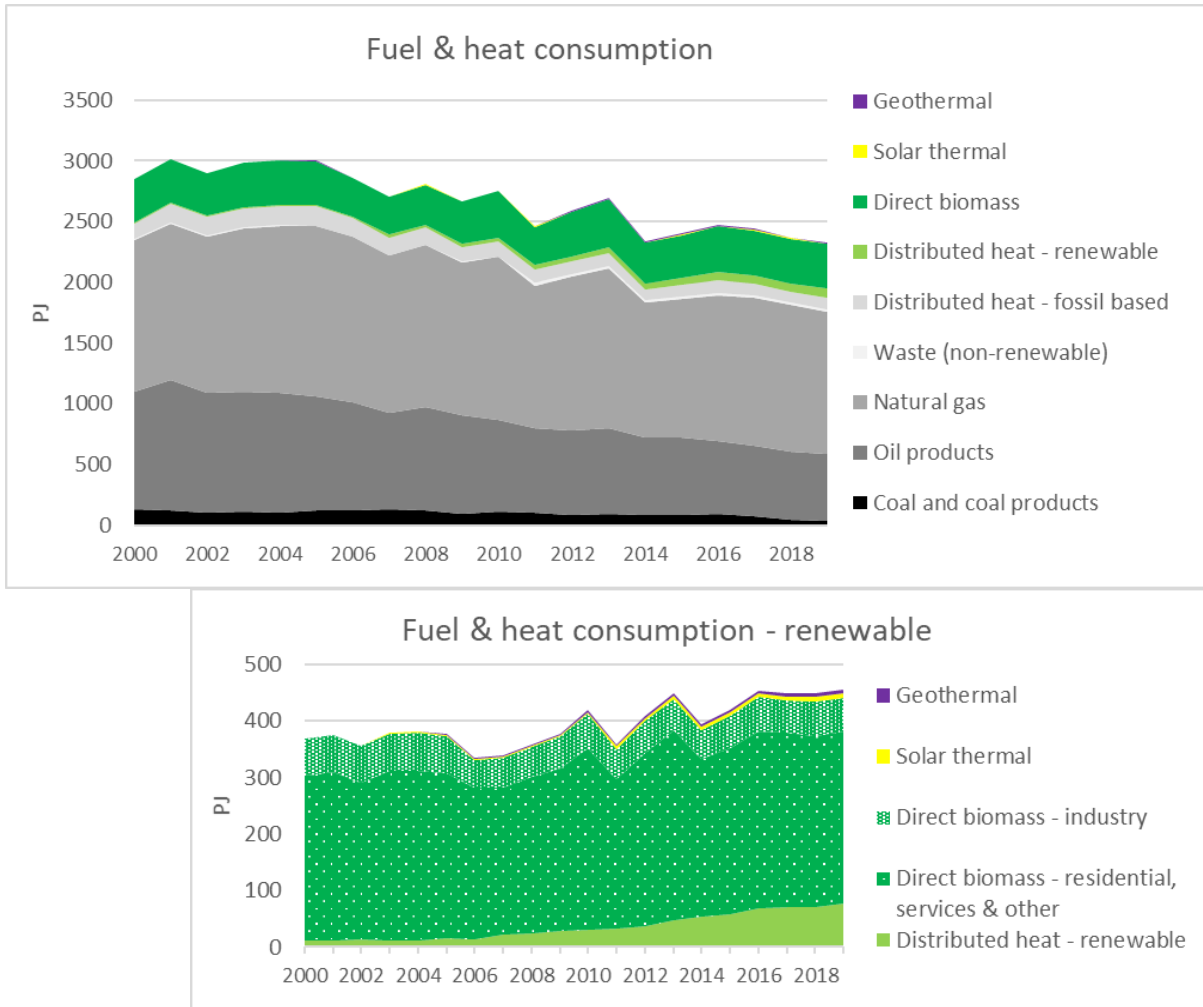
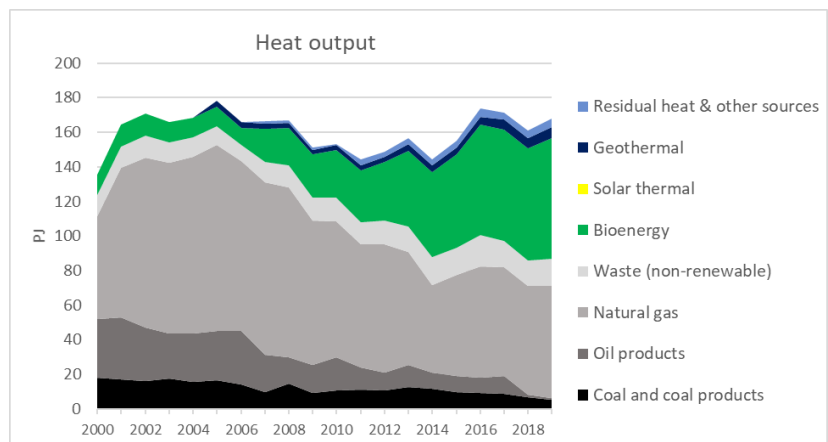


Figure 5: Evolution of fuel and heat consumption in France 2000 - 2019 (Source: IEA (2021) World Energy Balances and Renewables Information)

Heat output generated and sold by CHP plants and heat plants represents around 7% of fuel/heat provided. Figure 6 shows that the role of bioenergy for heat distribution increased from 6% in 2006 to 40% in 2019.

Figure 6: Evolution of fuels for heat output in France 2000 - 2019 (Source: IEA (2021) World Energy Balances and Renewables Information)



## Policy framework

The main relevant policy instruments behind these evolutions are:

- French law n° 2015-992 of August 17, 2015 relating to the energy transition for green growth which sets ambitious objectives for the development of renewable heat.
- The multiannual energy plan (MEP) sets priorities for action by the public authorities in the field of energy in order to achieve the energy policy objectives defined by law, in particular on the development of renewable heat.
- The Heat Fund, set up in 2009 by the French Government and managed by ADEME, which aims to accelerate the development of renewable heat for communities and businesses; notably through investment aid.
- Reduced VAT for heating networks - since the 2007 finance law
- Industry decarbonisation fund, with specific support for heat in industry through investment and operating aid to compensate the difference of operation costs between biomass combustion plant and the fossil reference - set up in 2020.
- Energy saving certificates (EEC)

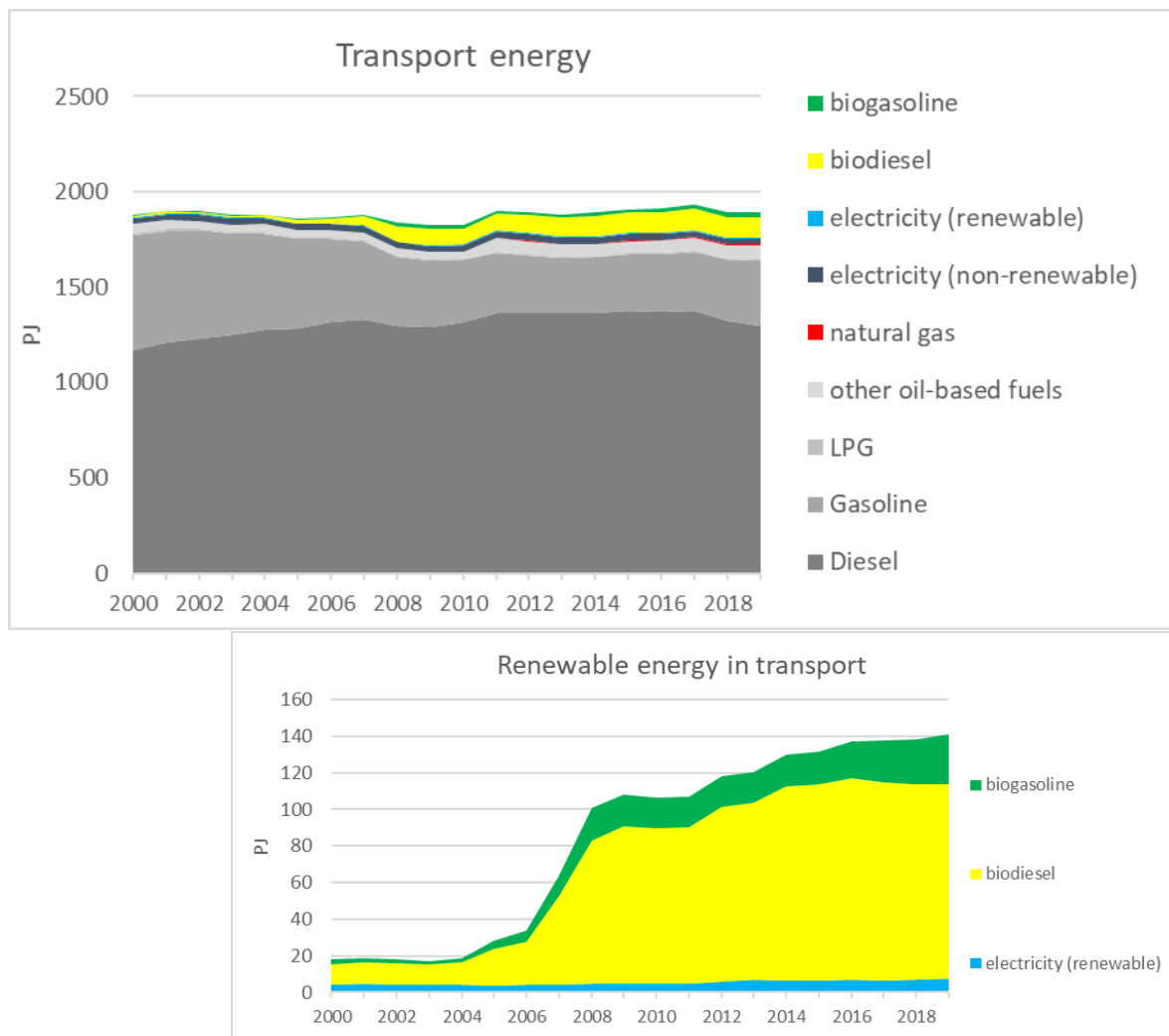
For domestic sector :

- MaPrimeRénov': Aid for financing the purchase of heating equipment using renewable energies for owner-occupiers, owner-lessors (from July2021) and condominium associations. The amount (max 10,000 euros) is determined on the basis of resources of the household tax and the type of work planned
- Reduced VAT rate to 5.5% for work aiming at installation of materials and renewable heating equipment
- Energy saving certificates (EEC) for domestic sector

## TRANSPORT

Figure 7 shows an overview of the energy used in transport in France, split up by different fuels/energy carriers.

Diesel is the dominant transport fuel in France; its role (fossil & biobased diesel) increased in the past decades up to more than three quarters of transport fuel, while gasoline decreased to less than 20%.



**Figure 7: Evolution of transport fuels in France 2000 - 2019 (Source: IEA (2021) World Energy Balances and Renewables Information)**

In the early 2000s France already blended around 1% biodiesel in diesel fuel and 0.4% bio-ethanol in gasoline fuel. Between 2006 and 2008, the consumption of biofuels (predominantly biodiesel) increased sharply up to a combined level of 5% (by energy), and in the following years this has grown consistently, dominated by biodiesel. It has continued to progress since 2008, but in a more moderate way, up to a level of 7%. The incentive mechanisms, in particular the incentive tax relating to incorporation biofuels (Tirib, formerly TGAP Biofuel), and the rising level of diesel until the summer of 2015 accompanied the development of biofuels for ten years. On average biodiesel (FAME and HVO) represented 7.6% by energy of diesel consumption in 2019. Bioethanol on average represented 7.4% (by energy) of gasoline consumption. Biofuels represent 8.4% of primary energy

supply of renewables in France, making it the fifth largest source of energy renewable. In 2020 (not on the figure), the consumption of biofuels dropped by 16%, mainly due to the sharp drop in fuel consumption of the transport sector related to the COVID pandemic.

Electricity represents a share of 2% of total transport energy use. This is mostly in rail - the use of electricity in road vehicles is still marginal in 2019 (0.06% of total transport energy use), but can be expected to grow in the coming years.

## Policy framework

The main relevant policy instruments behind these evolutions are:

- The Incentive tax relating to the Incorporation of Biofuels (TIRIB), previously named TGAP Biofuel, has been introduced in 2019 within the finance law in order to encourage actors putting fuels for consumption to incorporate biofuels. The Multiannual Energy Plan has reflected at the national level the objectives of incorporating *advanced* biofuels into fuels. For the gasoline sector, they are 1.2% in 2023, rising to 3.8% in 2028. For the diesel sector, they are respectively 0.4% and 2.8%.
- While the transport sector has to deal with deep changes linked to its decarbonisation, aviation requires particularly significant efforts in terms of R&D and productive investment. The French Government has established an ambitious roadmap for the incorporation of Sustainable Aviation Fuels (SAF), accompanied by a call for expressions of interest launched on January 27, 2020. It sets for objectives a threshold for the incorporation of 2% of SAF by 2025, of 5% in 2030, and to move towards 50% in 2050 in air transport. In addition, the TIRUERT tax system was extended to air transport in the initial finance law for entry into force in 2022 with a target of 1% incorporation of advanced biofuels.
- A call for projects "Development of a French production chain for sustainable aviation fuels", with an envelope of up to € 200 million has been launched in 2021. It is part of the 4th Future Investment Program (PIA4) and the national strategy "Biobased products and industrial biotechnologies - Sustainable fuels "

## COMPARISON WITH RENEWABLE ENERGY TARGETS

According to Eurostat<sup>11</sup>, the following renewable energy shares in *gross final energy consumption* were reached.

*Table 7: Share of renewables in different sectors in France, according to Eurostat, and compared to the 2020 target*

	2005	2010	2015	2019	2020 target
<b>Overall share</b>	9.6%	12.7%	15.1%	17.2%	23%
<b>In heating &amp; cooling</b>	12.3%	16.2%	19.7%	22.5%	33%
<b>In electricity</b>	13.7%	14.8%	18.7%	22.4%	27%
<b>In transport</b>	2.1%	6.5%	8.5%	9.2%	10%

The transport sector is close to its 2020 target, while other sectors are quite distant from their target (*mind that electricity is already largely defossilized through nuclear energy*). France will likely rely on statistical transfers from other countries to reach their overall renewable energy target.

Mind that some of these figures can differ from the IEA derived data because of different accounting rules. Particularly in transport the Eurostat shares are higher, which is due to the multiple counting of advanced biofuels and renewable electricity towards the transport target. The heating & cooling figure in Eurostat also includes heat pumps.

## RESEARCH FOCUS RELATED TO BIOENERGY

ADEME published two guides in 2021 promoting the work of research programs. These guides were elaborated in collaboration with representatives of research, public authorities, forest management organizations and timber sectors as well as environmental associations.

The first one<sup>12</sup> presents the carbon cycle in forests (including its capture and storage) and the effects induced by the different uses of wood such as storage in long-lived products and the avoidance of carbon emissions of fossil origin. It describes how these mechanisms interact based on the latest results from research programs. It then sets out the levers for action and the tools available to integrate the challenges of the fight against climate change within the framework of sustainable and multifunctional forest management.

The second guide<sup>13</sup> addresses the various issues and recommendations for a sustainable harvest of wood intended for the production of forest chips. It presents operational decision support tools. A

<sup>11</sup> [http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nrg\\_ind\\_335a&lang=en](http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nrg_ind_335a&lang=en)

<sup>12</sup> <https://librairie.ademe.fr/changement-climatique-et-energie/4647-forets-et-usages-du-bois-dans-l-attenuation-du-changement-climatique-9791029714498.html>

<sup>13</sup> <https://librairie.ademe.fr/produire-autrement/4196-recolte-durable-de-bois-pour-la-production-de-plaquettes-forestieres-9791029714474.html>



focus is made on good practices which aim to maintain the chemical fertility and physical integrity of soils, to conserve habitats for biodiversity, to preserve wetlands and rivers.

## RECENT MAJOR BIOENERGY DEVELOPMENTS

Heat Key Figures:

- Collective, industrial and tertiary wood-energy heating systems with a power greater than or equal to 50 kW have produced 23 960 GWh of renewable heat in 2020 in France. This production covers 3.6% of the final heat consumption.
- Since 2009, the Heat Fund managed by ADEME funded more than 6,000 renewable energy and recovery (EnR & R) plants thanks to 2.6 billion euros of subsidies, generating 9.4 billion euros in investments. This represents nearly 36 TWh per year of cumulative additional RE & R production. Over 1,100 biomass combustion plants have been funded, representing more than 15.5 TWh annual production of heat and almost 780 million euros of subsidies.
- 6,725,500 domestic wood-burning appliances produced 75,700 GWh of renewable heat in 2020, in Metropolitan France. The continuous replacement of old devices by high-performance devices allows a better thermal production and less atmospheric pollution. This renewable thermal production covers 11.3% of final heat consumption.

## LINKS TO SOURCES OF INFORMATION

Key figures for renewable energies - 2021 edition: <https://www.statistiques.developpement-durable.gouv.fr/edition-numerique/chiffres-cles-energies-renouvelables-2021/livre>

Panorama of the Renewable Heat and Recovery – Edition 2021: <https://www.syndicat-energies-renouvelables.fr/wp-content/uploads/basedoc/panorama-chaleur-2021-web.pdf>

Fonds chaleur (heat fund): <https://fondschaleur.ademe.fr/>

ADEME publications: <https://librairie.ademe.fr/>

Observ'ER, Le baromètre 2020 des énergies renouvelables électriques en France: [http://www.energies-renouvelables.org/observ-er/html/energie\\_renouvelable\\_france/ObservER-Barometre-EnR-Electrique-France-2020.pdf](http://www.energies-renouvelables.org/observ-er/html/energie_renouvelable_france/ObservER-Barometre-EnR-Electrique-France-2020.pdf)

French Strategy for Energy and Climate, Multiannual Energy Programming (MEP) - Stratégie Française pour l'Énergie et le Climat, Programmation pluriannuelle de l'énergie (PPE) 2019-2023, 2024-2028: <https://www.ecologie.gouv.fr/programmations-pluriannuelles-lenergie-ppe>