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NATIONAL ENERGY CLIMATE - PLAN

FRANCE

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UPDATE

June 2024

This update of France's integrated national energy and climate plan is based on three national planning and governance documents on energy and climate, currently under revision.

The construction of these strategies is a planning exercise aimed at setting, among the various possible pathways and despite uncertainties, an energy and climate target scenario based on a set of measures and assumptions, intended to guide collective action. This process is iterative and continuously improving.

Since 2021, the Government has focused on the 2030 horizon of the National Low Carbon Strategy (SNBC), which is an important step in putting France on the right path towards achieving carbon neutrality in 2050. Work is ongoing until 2050. Draft national programming and governance documents on energy and climate will be subject to public consultation in the coming months.

This update reflects, by date, the targets that France sets itself up to 2030 for each sector, and up to 2035 for the energy sector. Trajectories beyond these time horizons will be updated once the national documents have been formally adopted, for example in the context of the biennial progress report.

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SECTION A: NATIONAL PLAN

1. Outline and procedure for drawing up the plan

1.1. Summary

1.1.1 Context and objective

This update of France’s integrated national energy and climate plan is based on three national planning and governance documents on energy and climate, currently under revision and whose drafts will be subject to public consultation in the coming months:

- **the multiannual energy programming (EPP)**, which sets out the priorities for public action in the field of energy for the next 10 years, shared in two 5-year periods. It deals with all energy sources and all the pillars of energy policy: managing energy demand, promoting renewable energies, ensuring security of supply, controlling energy costs, balanced development of networks, etc. It makes it possible to build a coherent and credible strategy for decarbonising the French energy mix and strengthening the country’s energy sovereignty by exiting fossil fuels;
- **the National Low-Carbon Strategy (SNBC)**, which is France’s roadmap for climate change mitigation policy. It provides guidance for implementing the transition to a low-carbon economy in all sectors of activity. It sets targets for reducing greenhouse gas emissions at France level in the short/medium term – carbon budgets – and aims to achieve carbon neutrality, i.e. net-zero emissions, by 2050;
- **the National Plan for Adaptation to Climate Change (PNACC) aims** to protect citizens and prepare territories, the economy and the environment for the impacts of climate change. It is based for the first time on a reference warming trajectory of 2 °C in 2030, 2.7 °C in 2050 and 4 °C in 2100 in hexagonal France compared to the pre-industrial era. This trajectory, which corresponds to the trend scenario according to the IPCC, is intended to serve as a reference for all climate change adaptation policies and actions in France.

The principle of drafting the SNBC and the EPP was introduced by the Energy Transition for Green Growth Act (LTECV) of 17 August 2015. The National Low-Carbon Strategy (SNBC 2) and the carbon budgets in force (2019-2023, 2024-2028, 2029-2033) were adopted by decree on 21 April 2020 (Decree No 2020-457). The multiannual energy programme for the period 2018-2028 was adopted by decree on 21 April 2020 (Decree No 2020-456).

EPP and SNBC are united by a compatibility link: the LTECV stipulates that the EPP must be compatible with the SNBC and the greenhouse gas emission reduction targets set out in the carbon budgets. The EPP energy scenario is the same as the SNBC energy scenario for the period it covers. Thus, from the point of view of energy consumption and the energy mix, the EPP focuses on the first ten years of SNBC. In the EPP, these ten years have an operational objective for state action on the decarbonisation of energy: for example, she mentioned the pace of calls for projects for the deployment of renewable energy in France. The continuation of the SNBC projection up to 2050 is a possible path towards achieving France’s greenhouse gas emission reduction targets. SNBC also addresses all other greenhouse gases that are not dealt with in the EPP framework. **In terms of geographical scope,** the EPP covers only mainland France, whereas SNBC also covers Corsica and overseas departments. As a result, the elements incorporated in the PNIEC may show slight variations in the perimeter.

The LTECV provides for the review of these two documents every five years. The EPP and SNBC are currently undergoing a full review cycle that started in 2021 and is continuing.

The preparation of future editions (third editions of SNBC and EPP) of these strategic documents is fully articulated. It is part of the 'ecological planning' project ¹launched in 2022. **The preparation process for the future SNBC 3 and EPP 3** takes place in a particular context **linked to the significant increase in European climate ambition**, which has been reflected in the adoption of the 'Fit for 55' package.

There are many challenges in developing them. In addition to translation for France of the increase in this ambition (significant increase in milestone 2030, distribution of the additional effort between the various sectors and definition of the additional sectoral measures needed), **work on the preparation of the future SNBC 3 and EPP 3** also focuses on **strengthening the link between national climate and energy objectives and territorial planning, putting in place tailored accompanying measures**, in particular for households and businesses, and taking better account of future climate change.

The construction of these strategies is a planning exercise aimed at setting, among the various possible pathways and despite uncertainties, an energy and climate target scenario based on a set of measures and assumptions, intended to guide collective action. This process is iterative and continuously improving: it consists of readjusting trajectories and levers of action along the way, in order to ensure that the objectives are met by identifying additional measures to compensate for the risk areas identified in the modelling. The iterative nature of this method means identifying levers, assessing its impact, comparing it with the overall climate target and restarting it if it is not achieved. It gradually incorporates the new data available and the effect of the envisaged measures.

Since 2021, the Government has focused on the 2030 SNBC 3 horizon, which is an important step in putting France on the right path towards achieving carbon neutrality in 2050. Work on the 2030-2050 horizon has been ongoing.

The construction of this strategy is therefore not finalised. For the 2030 horizon, the trajectories will continue, until the final adoption of the SNBC 3 in 2025, to **be reassessed in the light of new knowledge on each of the levers in order to put it on a long-term path in line with the achievement of our objectives.**

In order to place citizens and businesses in the necessary transformation effort, **the Government is paying particular attention to the many potential co-benefits of the green transition.** The levers to reduce emissions, which have a positive impact in terms of local jobs, improve French living comfort and health, or make it possible to resolve financial equations that are sometimes difficult for households or increase the competitiveness of businesses through the exit from fossil fuels, will be systematically favoured.

Prior to their adoption by decree, the SNBC and EPP projects will be subject to regulatory consultations with stakeholders and the public, in accordance with the principle of public participation enshrined at constitutional level in France and in European law: consultations under Directive 2001/42/EC, as well as consultations with energy competent authorities, the High Council for Climate Change, the Assembly of Corsica, the overseas communities, the National Council for the Assessment of Standards, the National Council for Ecological Transition, the regulatory impact of the General Secretariat of the Government and the public.

¹ <https://www.Gouvernement.fr/france-nation-verte>

This integrated national energy and climate plan for France is based on ecological planning work, in which several citizens' consultations were held, in particular, on French energy policy. It is thus based on the preliminary elements of the forthcoming public consultation documents presenting the first broad orientations of the SNBC 3 and EPP 3 mentioned above, while respecting the general framework set out in Annex I of the Regulation on the Governance of the Energy Union.

This French strategy aims to enable France to meet its European energy and climate objectives. The table below summarises these broad objectives and orientations and compares them, where they exist, with European objectives.

| | Objective | Horizon | Forecast (as currently modelled) |
|--|--|---------------|--------------------------------------|
| Final energy consumption ² | National Objective: move towards – 30 % in 2030 compared to 2012 (i.e. 1 243 TWh or 106,9 Mtoe) — EU target of 28.6 % compared to 2012 | 2030 | 1 381 TWh |
| Primary energy consumption ³ | EU target of – 36 % compared to 2012 (1 844 TWh or 158,6 Mtoe) | 2030 | 2 239 TWh |
| Primary energy consumption for energy use – Charbon | Reduce coal-based primary energy consumption by 70 % in 2030 and 75 % in 2035 compared to 2012 | 2030 and 2035 | 26 TWh in 2030 and 21 TWh in 2035 |
| Primary energy consumption for energy use – Natural gas | Reduce natural gas-based primary energy consumption by 40 % in 2030 and 60 % in 2035 compared to 2012 | 2030 and 2035 | 260 TWh in 2030 and 173 TWh and 2035 |
| Primary energy consumption for energy use – Petroleum products | Reduce primary energy consumption based on petroleum products by 50 % in 2030 and 70 % in 2035 compared to 2012 | 2030 and 2035 | 359 TWh in 2030 and 216 TWh and 2035 |
| Final renewable energy consumption | Renewable targets by sector: In 2030: MINUTES: 54 to 60 GW Terrestrial Eolien: 33 to 35 GW Eolien at sea: 3.6 GW | 2030 | ~ 570 TWh in 2030 |

²Final energy consumption: according to the scope of the EED (2023/1791/EU)

³Primary energy consumption: according to the scope of the EED (2023/1791/EU)

| | | | |
|---|--|-----------------------------------|--|
| | Hydropower (including STEP): 26.3 GW Renewable heating and renewable cooling: 297 TWh Biofuels: 48 TWh Biogas: 50 TWh | | |
| Share of renewable heating and cooling in heating and cooling consumption | National target of 45 % in 2030 and 55 % in 2035 | 2030 and 2035 | 297 TWh in 2030 and between 330 and 419 TWh in 2035 |
| Share of renewable energy in buildings | Indicative national target of 49 % in 2030 EU target of 49 % in 2030 | 2030 | Achievement of the 49 % target in 2030 |
| Nuclear production capacities | 9,9 GWe of new capacities committed by 2026 | 2026 | 9.9 GW of new capacities committed |
| Carbon intensity of energy used in the transport sector | Reduction of greenhouse gas emissions by 14.5 % in 2030 and 25 % in 2035 | 2030 and 2035 | 48 TWh in 2030 and 90 TWh in 2035 |
| Renewable gas production capacity | Gas injection of 15 % renewable gases into the gas network in 2030 | 2030 | 44 TWh/year |
| Flexibility installed capacity | Aim to develop flexibilities | 2028 2030/2035 2050 | 6.5 GW of demand response (PPE 2019-2028) in 2028, to be reassessed in the context of the future EPP and in relation to the new EMD provisions. Between 28 and 68 GW of additional flexibility requirements (including production, demand, storage) according to RTE's report 'Energy Beans 2050'. Work is under way to specify future objectives, on the basis of the dedicated chapter of RTE's forecast balance, which will soon be published. |
| GHG emissions other than LULUCF | Reduction of greenhouse gas emissions by -50 % in 2030 compared to 1990 | 2030 | 271 MT CO ₂ eq in 2030, i.e. -50 % compared to 1990 |
| GHG emissions | Reaching carbon neutrality in 2050 | 2050 | Objective not assessed at this stage |

| | | | |
|---|--|------|--|
| ESR Regulation – target France | Reduction of greenhouse gas emissions by -47.5 % in 2030 compared to 2005 | 2030 | 215 MT (compliance with the trajectory with a small surplus at the end of the period) |
| Land use, land use change and forestry (LULUCF) – target France | LULUCF sink gain (agriculture + forest) of 7 MtCO ₂ between the average of the years 2016 to 2018 (-25 MtCO ₂) and 2030 | 2030 | The well in 2030 is currently projected to – 18 MtCO ₂ , compared to -31 MtCO ₂ . As a result, 13 MtCO ₂ would be missing in relation to our targets, although there is considerable uncertainty about these projections. |

Table1: Summary of the main orientations of the French Energy and Climate Strategy

1.1.2 Political, economic, environmental and social context when drawing up the plan

During the energy crisis following Russia’s invasion of Ukraine, France used existing schemes or mobilised new ones to protect consumers. These mechanisms, which are consistent with European law, both Directive 2019/944/EC and the applicable State aid guidelines, have been regularly revised in order to adapt consumer protection to the situation of energy prices, in order to cushion the impact of the surge in energy prices for households, in particular the most vulnerable ones, and businesses in 2028.

Tariff shields have been put in place to protect households from unprecedented increases in energy prices:

- Gases: reference tariff set at its November 2021 level, then limiting the increase to 15 % in 2023, State aid to reduce the price of market offers to an equivalent price, aid to households in collective heating using natural gas;
- Electricity: limiting the increase in regulated electricity sales tariffs in February 2022, then limiting the increase to 15 % in February 2023 and to an additional 10 % in August 2023, reducing the excise duty on electricity to its minimum permitted level, aid for collective housing;
- Fuels: rebound on fuel in 2022, followed by targeted fuel compensation in 2023.

During the winter truce, between¹ November and 31 March, energy suppliers are obliged to maintain the supply of natural gas and electricity to their customers in arrears. On the other hand, electric power may be reduced, except for the most vulnerable households, defined as those eligible for the energy cheque. Apart from the winter truce, if a supply interruption is envisaged, its implementation is strictly regulated for all households (relaunch letters, deadlines, information to social services by the supplier when the food has not been restored within five days of the cut).

Furthermore, since 1 April²⁰²³, a minimum electricity supply period of 60 days has been put in place for the beneficiaries of the energy voucher and the Housing Solidarity Fund, prior to any outage in the event of unpaid payments, including outside the winter truce. During this period, the electricity supply is maintained at 1kVA, to give the consumer and supplier time to find a solution to the household situation.

In addition to these preventive measures, France also has corrective measures to help small households pay their energy bills. Generalised in 2018, the energy voucher is state aid to small households to help them pay their energy bills, regardless of the type of heating (electricity, gas, wood, fuel oil, LPG, etc.) or energy renovation works. State aid earmarked for household energy expenditure is the tool that mitigates the cost of the transition on small households and is an essential element in ensuring a just transition.

Based on income and household composition (all persons living under the same roof), it is granted on the basis of the reference tax income per consumption unit (RFR/UC). Households do not have to take any steps to obtain it, it is sent to them automatically on the basis of the data in the possession of the tax administration. In 2022, 5.8 million households benefited from the energy voucher, ranging from EUR 48 to EUR 277. 82.6 % used it.

An exceptional energy voucher of EUR 100-200 was allocated to the 40 % of the smallest households between the end of 2022 and early 2023 to help these households cope with bill increases.

The modalities for the evolution of the energy voucher after the abolition of the housing tax needed to target beneficiary households are being developed. Improvements to the scheme could also be explored as part of this reform. The integration of the energy voucher into the French Services package since 1 January²⁰²⁴ will make it possible to increase information and support for beneficiary households to facilitate the use of the energy voucher and associated rights.

1.1.3 Key strategies and measures on the five dimensions of the Energy Union

In general, presentation according to dimensions and sectors should not forget that several measures have cross-cutting effects and contribute to several objectives. For example, measures to reduce greenhouse gas emissions generally have positive effects on air pollutants and in many cases lead to very substantial improvements in energy efficiency. In other cases, it is important to be vigilant about potential adverse effects (e.g. impact of the development of energy wood on air quality). The work on the scenario underpinning the EPP and SNBC, which is still ongoing, is an opportunity to have a holistic and cross-cutting view on the different dimensions and sectors.

1.1.3.1 Climate policy

The National Low-Carbon Strategy

The National Low-Carbon Strategy (SNBC) was established by Law No 2015-992 of the 17 August 2015 on the energy transition for green growth. It is a strategic document that sets out France's roadmap to pursue its climate change mitigation policy and meet its short-, medium- and long-term greenhouse gas (GHG) emissions reduction targets. It constitutes one of the two strands of French climate policy, alongside the National Plan for adapting to Climate Change (Plan national d'adaptation au changement climatique, PNACC).

This roadmap shall include:

- **A long-term objective:** achieving carbon neutrality in 2050 (carbon neutrality is a balance between greenhouse gas emissions and removals, for example through our forests) and reduce the French carbon footprint;
- **A target path to achieve this:** the Government shall establish a credible path towards the long-term objective, based on a set of measures and assumptions;
- **carbon budgets:** these are ceilings for greenhouse gas emissions not to be exceeded, expressed as an annual average per 5 year period, in million tonnes of CO₂equivalent, broken down by sector of activity and per greenhouse gas;
- **public policy guidelines to achieve these objectives (sectoral, governance and cross-cutting guidelines) and monitoring indicators.**

The SNBC in force is SNBC 2, adopted by decree in April 2020. It aims to reduce France's gross greenhouse gas emissions (excluding the land and forests sector) by at least 40 % in 2030 compared to 1990, and to achieve

carbon neutrality in 2050. The law provides for the revision of the SNBC every five years, which makes it possible to take account of the uncertainties inherent in this planning by integrating the results and developments observed over time.

Work on the preparation of SNBC 3 has been ongoing since 2021. The new SNBC (SNBC 3) will set a path towards higher targets, in particular the -50 % reduction in our gross greenhouse gas emissions (excluding emissions and removals associated with land use and forestry) between 1990 and 2030, in line with the European Green Deal.

At that time, the government has focused on the 2030 horizon and work is continuing on the 2030-2050 horizon. This horizon is subject to greater uncertainty and deserves specific consideration in relation to the closing issues of each sectoral decision. The final version of the future SNBC will set a framework for action for 2030-2050 to guide collective action.

Carbon budgets: a key tool to steer the GHG emission reduction trajectory

The SNBC sets carbon budgets, i.e. greenhouse gas emission ceilings not to be exceeded at national level over five-year periods. They define in the short and medium term the target trajectory for reducing greenhouse gas emissions, in line with France's Community and international commitments. They shall be broken down:

- by major sectors: emitters covered by the EU emissions trading scheme, drivers covered by the ESR Regulation (transport, buildings, agriculture, waste, energy and industry not covered by the ETS) and, since 2019, negative emissions linked to land use, change of land allocation and forestry)
- by main areas of activity (transport, buildings (residential and tertiary), industry, agriculture, energy production and waste)
- and indicatively in annual tranches per greenhouse gas.

The first three national carbon budgets were adopted by decree in 2015 together with the first SNBC (covering the periods 2015-2018, 2019-2023 and 2024-2028 (Decree No 2015-1491 of 18 November 2015)). **Every 5 years, a new carbon budget is defined** when the SNBC is revised and the **'future' budgets are adapted** if necessary to reflect the updates in the French climate strategy, for example to raise our targets as is the case under Fit-for-55, or to take account of new data, for example, on the state of the French carbon chip.

The **SNBC 2 (in force), adopted in 2020, set the 2th, 3th and 4th carbon budgets covering the periods 2019-2023, 2024-2028 and 2029-2033**, in line with the French climate ambition at the time of reducing France's gross greenhouse gas emissions by at least 40 % in 2030 compared to 1990 and achieving carbon neutrality in 2050 (cf. Decree No 2020-457 of 21 April 2020 and table below).

SNBC 3 will reflect the new French objectives following the adoption of the European Fit-for-55 package⁴.

⁴ Within this framework, the **3th and 4th carbon budgets** (2024-2028 and 2029-2033) **will be updated**, in line with France's new climate ambition for 2030 and the **5th carbon budget will be established** (2034-2038 period). They will be laid down by decree when the SNBC 3 is adopted. A first provisional estimate of the 3th and 4th carbon budgets can be found in the remainder of the document. SNBC 3 will also set indicative carbon budgets for the carbon footprint and international bunkers.

Table 2: Carbon budgets established by Decree No 2020-457 of 21 April 2020 (technically adjusted in 2024⁵)

| Average annual emissions (in Mt CO ₂ eq) | Reference years (Inventory 2024) | | | 2th carbon budget | 3th carbon budget | 4th carbon budget |
|---|-------------------------------------|------|------|----------------------|----------------------|----------------------|
| | Period | 1990 | 2005 | 2015 | 2019 – 2023 | 2024 – 2028 |
| Total (excluding LULUCF) | 539 | 550 | 454 | 420 | 357 | 299 |
| Total (with LULUCF) | 521 | 497 | 417 | 377 | 315 | 253 |
| Of which ETS sector (excluding international and domestic aviation) | | | 100 | 99 | 81 | 67 |
| of which ESR sector | | | 350 | 316 | 271 | 227 |
| of which domestic aviation | | | 4 | 5 | 5 | 4 |
| of which LULUCF sector | – 18 | – 53 | – 36 | – 43 | – 42 | – 46 |

A key indicator for monitoring the implementation of the strategy is the comparison of France’s emissions (based on the most up-to-date inventories) with the carbon budget for the period under consideration, including in sectoral terms. This comparison shows in particular the recent impact of past measures.

The 2 SNBC carbon budget for the period 2019-2023 in gross terms (420 Mt CO₂eq/year on average⁶) should be respected (based on the pre-estimate for 2023 of Citepa⁷). For the time being, for the period 2019-2023, the annual average of gross emissions is estimated at 400 Mt CO₂eq (see details in section 1.2.2). The final balance of this carbon budget will be drawn up in 2025 on the basis of consolidated data from the CITEPA National GHG Emissions Inventory for the year 2023.

Current policies and measures for the decarbonisation dimension

⁵ The Environmental Code (Article D. 222-1-B) provides for a technical adjustment of the carbon budgets for each period if changes in the methodology of greenhouse gas emission inventories lead to changes of more than 1 % of the values of the reference years used for the SNBC scenarios (1990, 2005 and 2015). These ‘technical’ adjustments are intended to maintain the consistency of the trajectory initially chosen, maintaining the same sectoral and gas reductions in ‘relative value’ compared to 2005. The Code foresees that this technical adjustment will take place at the time of closure of the carbon budget (the final balance of the 2019-2023 carbon budget will be drawn up in 2025 on the basis of updated inventory data (Secten 2025)). Nevertheless, in order to maintain annual consistency with the trajectory initially chosen in the SNBC, carbon budgets may also be adjusted, indicatively and provisionally, over a period of time, in the light of methodological developments in the national greenhouse gas emissions inventory. The HCC carried out in its 2024 annual report the technical adjustment of the indicative annual carbon budgets for the second period, in the light of Citepa’s 2024 national greenhouse gas emissions inventory (Secten 2024) and published the adjustment methodology (see page 68).

⁶ Technically adjusted carbon budgets in 2024 in accordance with the Environmental Code (Article D. 222-1-B).

⁷ Citepa Inventory, Secten 2024

Asemissions from energy combustion account for around 70 % of France’s greenhouse gas emissions, the decarbonisation of energy is essential to achieve the emission reduction targets. This is done through four pillars: sobriété energy, energy efficiency, the acceleration of all renewables and the relaunch of nuclear power. The EPP defines the state’s action over the next ten years to reduce energy consumption in all sectors and decarbonise the energy mix.

For non-energy emissions, in the waste sector, the Circular Economy Roadmap published in 2018, as well as the Law on Combating Waste and the Circular Economy published in 2020, aim at better production (eco-design, incorporation of recycled materials), better consumption (development of reuse and repair, longer product lifespan), better waste management (optimisation of waste sorting, development of recycling and recovery) and mobilising all actors.

In the agriculture sector, several strategies and plans contribute to the climate and agro-ecological transition and will reduce direct and indirect greenhouse gas emissions, such as the National Strategic Plan 2023-2027, the National Strategy on Plant Proteins, the Bio Ambition Programme and the plan to teach how to produce otherwise. In addition, the French Government’s 2030 investment plan, worth EUR 54 billion, launched in 2021, includes an agricultural component, which aims to speed up the adaptation of tools and change in practices. The ongoing work on the Third National Climate Change Adaptation Plan (NCDP) to be consulted includes a component targeting sectors identified as particularly vulnerable to climate change, including the agricultural sector, and could include actions to engage the sector towards resilient and low-carbon models (diagnosis of resilience, preservation of cultivated biodiversity, reduction of water and input consumption). France also defends the strengthening of the environmental ambition of the Common Agricultural Policy (CAP). In addition to the development of agricultural practices, measures resulting from the General Food States organised by the Government in 2017 are intended to influence demand and consumption in the agri-food sectors, such as regulating the minimum share by 2022 of local agricultural products or under quality marks served in mass catering, and the introduction of diagnostics prior to the approach to combating food waste which are compulsory for all mass catering operators.

As regards the land use, land use change and forestry (LULUCF) sector, policies and measures to ensure compliance with Regulation (EU) 2018/841 are based in particular on agro-ecological practices (planting and sustainable management of hedges, agroforestry, carbon farming, etc.), on the one hand, and boosting forest management on the other, but also in the longer term of a strategy for adapting French forests. In particular, as regards the wood sector, four levers are identified as complementary: carbon sequestration in the forest ecosystem, carbon storage in wood and wood-waste products, the substitution of energy-intensive materials by bio-based products and the energy recovery of bio-based products or waste from such products that replace fossil fuels

Several national strategies and plans aim to activate these various levers, including the national bioeconomy strategy, the national forest and timber programme, the national biomass mobilisation strategy, and the forest-based sector strategic contract.

These strategies have been strengthened through public aid in the sectors concerned through various calls for projects during the Relance Plan or France 2030, in particular the renewal of forestry, the Constructive Bois System (SCB) and Biomasse Chauffage pour l’Industrie du bois (BCIB). They are also supported by certain elements of EU law, in particular the sustainability requirements for bioenergy defined by RED II.

The broad guidelines planned in the National Low-Carbon Strategy (SNBC)

The current SNBC (SNBC 2) formulates 45 guidelines for public policies, both cross-cutting and sectoral, to implement the transition to a low-carbon economy and to achieve carbon neutrality by 2050.

SNBC 3 aims to achieve carbon neutrality by 2050 and reduce France’s carbon footprint, taking into account imported emissions (beyond France’s international commitments on its territorial emissions). **To deliver on these targets, the 2030 horizon is an important milestone. In line with the new European climate ambition, France has set itself the target of a gross reduction in its GHG emissions of -50 % in 2030 compared to 1990 (i.e. reaching a target of around 270 MtCO₂ eq⁸) (up from -40 % until then).**

In order to meet these targets, France **will now have to reduce its greenhouse gas emissions by 5 % each year between 2023 and 2030**, compared with an average annual reduction of 2 % between 2017 and 2022. This acceleration requires all efforts and transformations in all GHG emitting sectors of our economy.

In this context, the ongoing work at national level is being carried out with a view to making SNBC 3 a robust and shared operational and programmatic planning tool capable of giving the various actors a **clear view of the actions to be taken and to secure the achievement of our climate objectives**.

The levers of measures identified and quantified to achieve the green transition affect all dimensions of the economy and life of French people: managing transport demand, modal shift, increasing occupancy rates for passenger transport, deployment of sustainable fuels in land, air and maritime transport, decarbonisation of heating vectors, reduction of energy consumption in buildings (sobriety), electrification of uses, decarbonisation of production processes, modification of inputs in industry, recycling of raw materials, redirecting waste to material and energy recovery, green re-industrialisation, etc.

The construction of a baseline scenario to achieve France’s climate and energy targets

The development of the future SNBC is based on **extensive foresight modelling work**. The aim of this work is to build the sectoral greenhouse gas emission trajectories underpinning the SNBC by identifying new measures, public policies and the needs to be put in place or supported in order to achieve our objectives (financing, jobs and skills, etc.) **(see details in section 5 of this INECP)**. The aim of this scenario is **to establish the carbon budgets (global and sectoral), to determine the roadmap to be followed by each sector**.

The modelling exercise is complemented by a **specific verification to ensure overall consistency (“loop”)**. It is **for each time horizon**, and for each of the energy sectors and carriers, to **verify the adequacy of resources** (quantity of energy, industrial capacity of sectors and availability of skills, financial resources, etc.) **to the needs** arising from the scenario, to **monitor its economic impact and acceptability**, and to **confirm the overall stability of the model and its robustness**, building on the work of the government and all stakeholders.

This **work is ongoing at national level** with the aim of establishing a robust and shared baseline scenario for the future SNBC. This work is **iterative**. It started in 2021 and **will continue until the adoption of the future SNBC**. The assumptions, trajectories and objectives presented in this document come from the **second iteration of the scenario exercise. They are not final**.

The place of this scenario will be strengthened in the future SNBC and the sub-sectoral trajectories and the evolution of the different categories of most influential levers (consumption level, energy efficiency, unit

⁸ The value of 270 Mt CO₂ eq is obtained by applying a 50 % decrease in gross greenhouse gas emissions in the year 1990 (539 Mt CO₂eq) [Secten 2024].

emissions, etc.) will be explained. The aim is to make it easier for those involved to find themselves in relation to the scenario and to facilitate the debate on the compatibility of public policy measures or sectoral plans with the SNBC.

Achieving decarbonisation objectives

The provisional version of the baseline scenario produced as part of the preparation of SNBC 3 sets out a more ambitious scenario than that of SNBC 2.

At this stage, this provisional version of the SNBC 3 baseline scenario makes it possible to achieve the national target of -50 % gross GHG emissions in 2030, at⁹ 2MtCO 2030 eq gross emissions in 271 compared to 1990.

Reaching this target means reducing by about 124 MtCO₂eq. No emissions between 2022 and 2030. This effort is considerable: between 1990 and 2022 our emissions were reduced by 144 Mt.

The battle plan devised by the Government contributes to all the sectors that emit our economy, beyond what the SNBC provides in force.

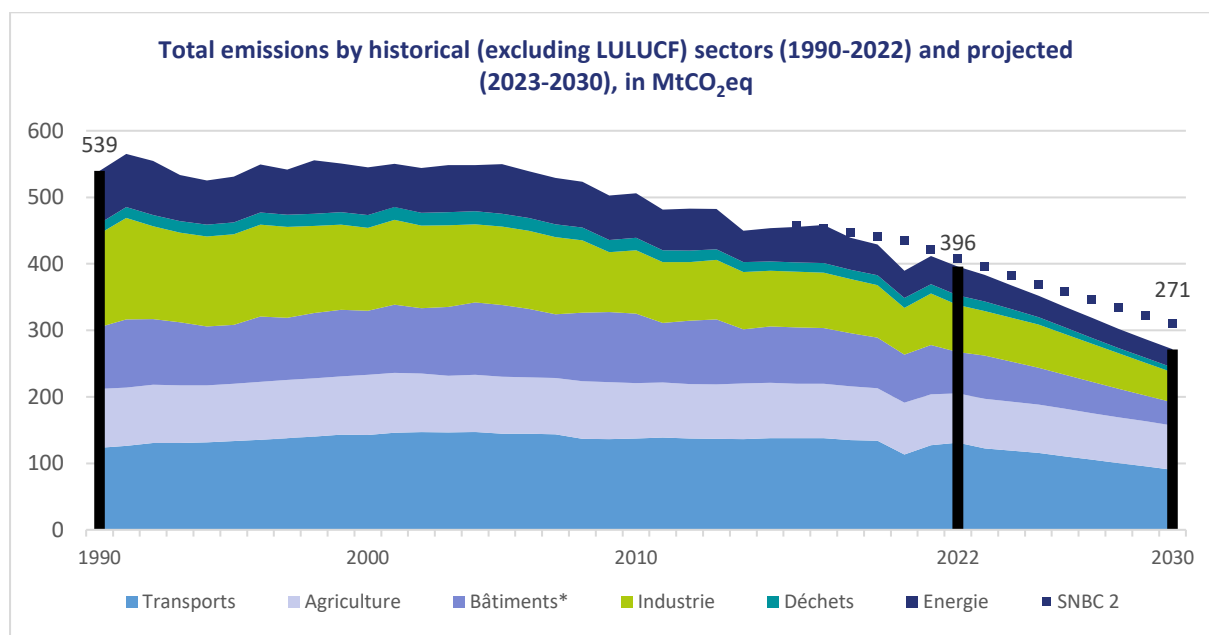


Figure1: Developments in territorial greenhouse gas emissions (Sources: national greenhouse gas emission inventory, DGEC modelling) (* Taking into account the target of 32 Mt CO₂ eq for the buildings sector, the overall target for 2030 would be around 268 MtCO₂eq)

⁹ Taking into account the 2030 target of 32 Mt CO₂ eq for the buildings sector as part of the planning work and for which additional measures remain to be secured in the coming months, the overall target for 2030 would be around 268 Mt CO₂eq.

The graph below shows the **sectoral effort distribution by sector by sector by 2030** resulting from the results of the provisional modelling.

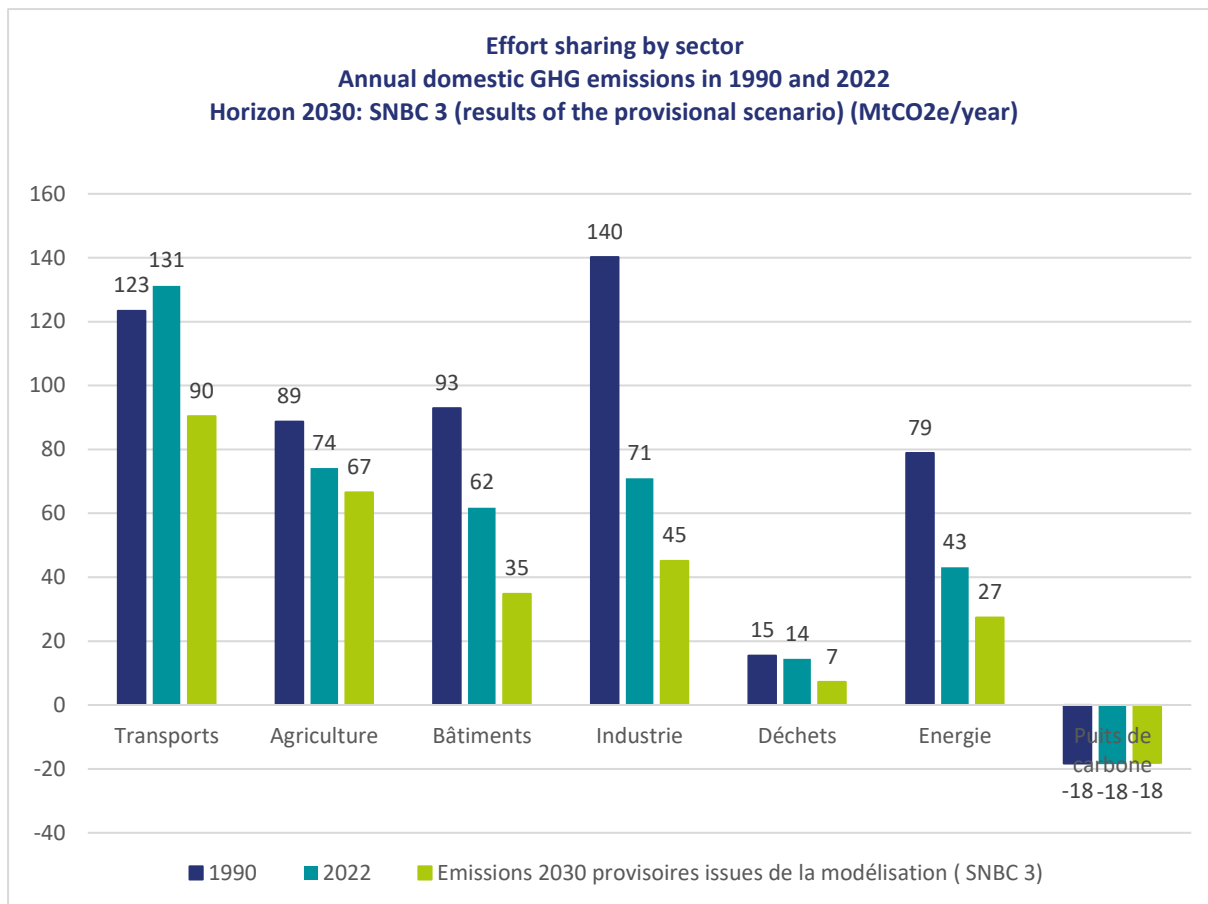


Figure2: Effort sharing by sector (sources: national greenhouse gas emissions inventory – CITEPA – SECTEN 2024; DGEC Models)

(* The modelling exercise at this stage allows the buildings sector to reach 35 Mt CO₂ eq by 2030. The sector’s residual emissions by 2 030 are above the government’s target for the sector. Additional measures remain to be secured in the coming months to reduce emissions from the sector to less than 32 Mt CO₂ eq in 2030).

1.1.3.2 Energy policy

Taking stock of the EPP 2

In 2022, final energy consumption excluding international bunkers reached 1 500 TWh¹⁰, representing a decrease of 7 % compared to 2018. The French strategy is based on an acceleration of the energy efficiency and sobriety effort.

¹⁰ This indicator is not equivalent to final energy consumption within the meaning of the revised EED (2023/1791/EU)

The target set by the PNIEC1 was to reduce primary consumption of petroleum products by 19 % in 2023 compared to 2012. In 2022, the reduction reached 17.2 %. This is why the government stresses the importance of accelerating the exit from fossil fuels.

The share of renewable energy in final energy consumption increased to 20.5 % in 2022, showing a net acceleration compared to 2021 (+ 1.1 %), and putting France at a level comparable to our main European partners (Germany, Spain and Italy). It amounts to 22.2 % in 2023, according to provisional data calculated in accordance with the rules of the EU Directive 2018/2001 on the promotion of the use of renewable energy, thus still increasing by 1,7 points in 2023 compared to 2022.

Finally, almost 570 000 dwellings were renovated thanks to MaPrimeRénov' aid in 2023.¹¹ The electric passenger vehicle fleet (including plug-in hybrids) now stands at 1.1 million with more than 100 000 publicly accessible recharging points mid-2023.

EPP Broad Orientations 3

The energy strategy proposed by the Government provides the keys to putting France on an energy path enabling it to achieve carbon neutrality by 2050.

Three levers of the French energy strategy:

1. **Reducing our energy consumption** through sobriety and energy efficiency
2. **Producing the electricity we need to** meet our consumption in France: relaunch of nuclear and acceleration of renewable energies
3. **Decarbonising our energy mix**: switching from gas and oil to low-carbon energy through biomass (wood energy, biofuel, biogas), solar thermal, geothermal, waste, etc. This is complementary to the electrification of uses.

Clear and concrete pathways are set for the **exit from fossil fuels**. The remaining coal-fired power plants will be closed or converted to decarbonised solutions by 2027, and a significant decline in coal, gas and oil consumption will be committed, aiming at fossil energy consumption divided by 2 in 2030 and 3 in 2035 compared to 2012.

Guidelines are set, sector by sector (construction, industry, transport and agriculture), in order to achieve the objectives of **reducing our energy consumption**, which have been strengthened at European level, namely the target of achieving a 30 % reduction in 2030 compared to 2012.

There is a **marked shift in the production of decarbonised energy**, through the electrification of uses, an increase in the development of photovoltaic electricity (2-fold increase in the annual rate of development of new photovoltaic capacities) and offshore wind (acceleration of the allocation of offshore wind capacity), the development of bioenergy and renewable heat (more than twice the amount of renewable heat and recovery by 2035; increase in the proportion of biogas injected into networks to 15 %, increase in hydrogen deployment targets to 6.5 GW of production capacity in 2030, support for the establishment of biofuel production capacities on national territory) and **revival of the nuclear sector** (including continued operation of all reactors as long as safety permits, construction of 6 EPR2 and study for 13 GW of new nuclear capacities, innovation programme in new reactors and reinforcement of the fuel cycle).

¹¹Key figures 2023, ANAH, January 2024, Link: https://www.anah.gouv.fr/sites/default/files/2024-01/202401_ChiffresCles2023_WEBEA.pdf

Particular emphasis is placed on **the adaptation of energy networks and security of supply** in order to meet, on the one hand, the increasing demand for electricity (due to electrification of uses but also through the use of air conditioning during heat peaks), the quantitative and qualitative changes in gas and oil consumption and, on the other hand, the expected impact of climate change on the networks. The French strategy will thus ensure better anticipation of the necessary changes in the electricity grid in order to adapt to the acceleration of the development of renewable electricity projects, provide for the connection of highly powerful units such as offshore wind farms and future EPR2 nuclear reactors, while ensuring the supply of new charging stations for electric vehicles, electrolyzers for hydrogen production and the electrification of new, highly energy-intensive uses. It will also organise the development of the gas and oil networks to enable the transport of developing energy carriers (biogas, hydrogen) and the adaptation of infrastructure to the reduction in consumption.

Preserving the purchasing power of households and the competitiveness of businesses will be at the heart of the next energy programming, completing the reform of the electricity market, supporting small households, supporting the structuring of industrial sectors and encouraging research for innovation.

This planning ensures that the **challenges of “loop”** are fully taken into account, i.e. it ensures sufficient availability of energy resources to meet needs (e.g. biomass or electricity), but also economic “loops” and the availability of the skills needed for the transition.

Finally, two key conditions are integrated into our energy strategy: to ensure its success, the **mobilisation of territories** to implement and translate them into practice on the ground; to ensure its credibility, account must be taken **of environmental protection and the efficient and sustainable management of resources and space**.

1.1.3.3 Consideration of macroeconomic and social impacts

The low-carbon transition is accompanied by major changes that can create vulnerabilities and opportunities. To ensure that these profound changes are not seen as a form of injustice (loss of employment, insecurity, rising energy prices, etc.), they will continue to be accompanied by: aid for the energy renovation of private and social housing, aid for the payment of energy bills, public transport, premium for converting the most polluting vehicles, etc. **with increased targeting.**

To feed into the reflections on these aspects, **the SNBC 3 will be the subject of a macroeconomic assessment.** This assessment, carried out by comparing the reference scenario supported by the government with the ‘existing measures’ scenario¹², **will provide valuable elements in terms of the social and economic impact of the assumptions and guidelines used in the SNBC.** It will contribute to the reflections on the operational planning of SNBC 3, thus complementing the challenges identified in the report “The economic impacts of climate action” by¹³ Jean Pisani-Ferry and Selma Mahfouz regarding the economic impact of the transition.

1.2. Overview of the current state of public policies

1.2.1 Context of the energy system and energy policy of the Member State and the Union taken into account in the national plan

¹²Scenario “AME” or “with existing measures”. This scenario aims to estimate the effect of already adopted measures on the greenhouse gas trajectory. It provides a point of comparison with the SNBC scenario.

¹³ <https://www.strategie.gouv.fr/publications/incidences-economiques-de-laction-climat>

The new European climate ambition commits us to move faster and further. At national level, it increases the target of reducing our gross greenhouse gas emissions from -40 % to -50 % between 1990 and 2030.

Moreover, **France is still aiming to achieve carbon neutrality in 2050.**

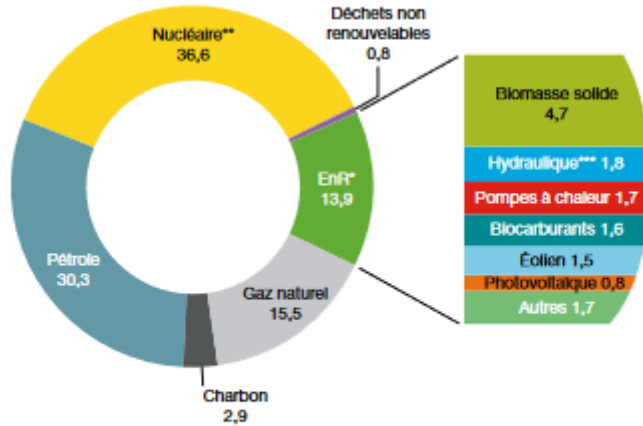
These objectives structure the work on the development of the future SNBC.

France's primary energy consumption stood at 2 482 TWh in 2022 (¹⁴actual data not adjusted for climatic variations). France's real primary energy mix consists of 37 % nuclear, 30 % oil, 16 % natural gas, 15 % renewable energy and waste (1 % non-renewable waste) and 3 % coal. Wood energy, which accounts for almost all solid biomass (5 %), remains the largest source of renewable energy consumed in France, far ahead of hydro electricity. It is almost exclusively dedicated to heating.

¹⁴ 2 372 TWh in the sense of primary energy consumption of the revised EED (2023/1791/EU), SDES, 29/05/2024

TOTAL : 2 482 TWh en 2022 (donnée non corrigée des variations climatiques)

En % (données non corrigées des variations climatiques)



* EnR – énergies renouvelables.

** Correspond pour l'essentiel à la production nucléaire, déduction faite du solde exportateur d'électricité. On inclut également la production hydraulique issue des pompages réalisés par l'intermédiaire de stations de transfert d'énergie, mais celle dernière demeure marginale comparée à la production nucléaire.

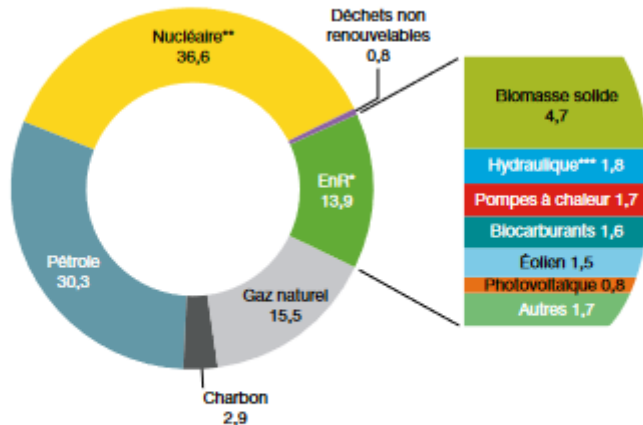
*** Hydraulique hors pompages.

Champ : France entière (y compris DROM).

Source : SDCS, Bilan énergétique de la France

TOTAL : 2 482 TWh en 2022 (donnée non corrigée des variations climatiques)

En % (données non corrigées des variations climatiques)



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*** Hydraulique hors pompages.

Champ : France entière (y compris DROM).

Source : SDCS, Bilan énergétique de la France

Figure3: Distribution of primary energy consumption in 2022 (%)

Final energy consumption, adjusted for climatic changes, amounted to 1 532 TWh¹⁵ in 2022. The year 2022, marked by the energy crisis, marked a decrease compared to 2021 (1.6 %). This decrease was mainly due to

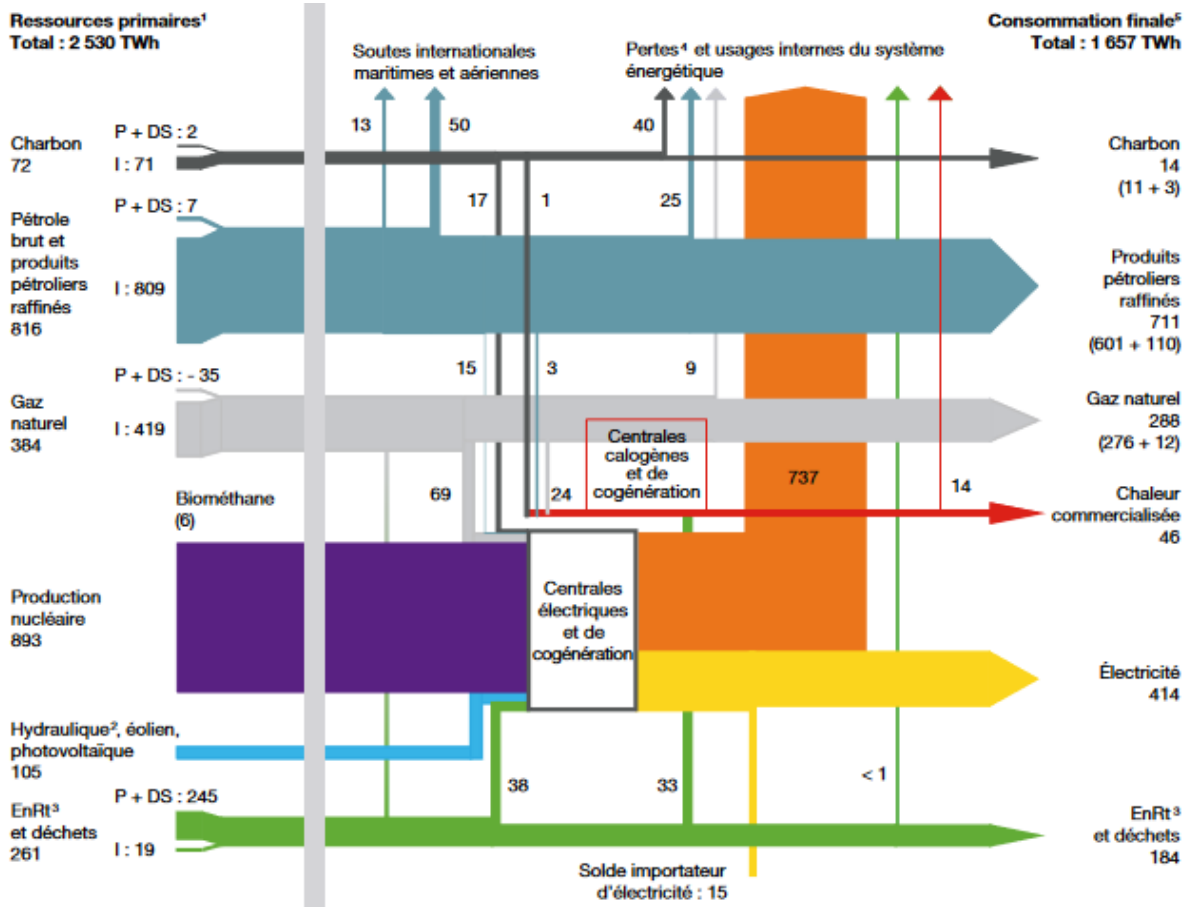
¹⁵ 1 556 TWh in the meaning of final energy consumption of the revised EED (2023/1791/EU), SDES, 29/05/2024

changes in consumption in industry (9.6 %) and, to a lesser extent, to that of residential consumption (2.6 %) and agriculture/fisheries (8.2 %). Conversely, consumption increases in transport (+ 4 %) and tertiary (+ 0.7 %). It was also driven by the energy sobriety plan, launched on 6 October 2022 by Prime Minister Elisabeth Borne, and the Minister for Energy Transition, Agnès Pannier-Runacher, which resulted in a reduction in gas and electricity consumption of 12 % between August 2022 and July 2023, and by -12,6 % between August 2023 and 23 June 2024, continuing beyond the energy crisis¹⁶.

After almost continuous growth between 1990 and 2001, final energy consumption then declined (0.6 % annual average between 2011 and 2022, with a corrected climate). From 1990 to 2021, the share of tertiary services in consumption increased from 13 % to 16 %, while that of industry decreased from 24 % to 19 %. The share of transport increased slightly (from 30 to 33 %) and that of residential (30 %) and agriculture (3 %) remained stable.

The Sankey diagram, depicted below and commonly used to represent energy balances, shows all flows (supply, transformation, consumption, including losses) in the form of arrows with a width proportional to the amount of energy. It represents the transition from primary to final energy. It also includes non-energy consumption (industrial processes), resulting in a total final consumption of 1 778 TWh.

¹⁶ climate-corrected data, compared to the reference year 2018-2019



P : production nationale d'énergie primaire ; DS : déstockage ;
I : solde importateur.

- ¹ Pour obtenir la consommation primaire, il faut déduire des ressources primaires le solde exportateur d'électricité ainsi que les sorties maritimes et aériennes internationales.
- ² Y compris énergies marines, hors accumulation par pompage.
- ³ Énergies renouvelables thermiques (bois, déchets de bois, solaire thermique, biocarburants, pompes à chaleur, etc.).
- ⁴ L'importance des pertes dans le domaine de l'électricité tient au fait que la production nucléaire est comptabilisée pour la chaleur produite par la réaction, chaleur dont les deux tiers sont perdus lors de la conversion en énergie électrique.
- ⁵ Usages non énergétiques inclus. Pour le charbon, les produits pétroliers raffinés et le gaz naturel, la décomposition de la consommation finale en usages énergétiques et non énergétiques est indiquée entre parenthèses.

Note : pour assurer la cohérence du bilan toutes énergies, les quantités sont toutes exprimées en TWh PCI (pouvoir calorifique inférieur), même pour le gaz, dont l'unité propre est usuellement le TWh PCS (pouvoir calorifique supérieur).
La chaleur commercialisée correspond à la chaleur vendue par les réseaux et la chaleur cogénérée vendue.

Champ : France entière (y compris DROM).
Source : SDCS, Bilan énergétique de la France

Figure4: Energy balance of metropolitan France in 2022 (TWh) – Source: SDES

Oil is the main energy in transport, while the building uses diversified energy sources: electricity, gas, oil, coal and renewable energy.

Energy sources in buildings are much more diverse than in transport. Electricity accounted for the largest share, followed by gas, followed by oil and wood for heating.

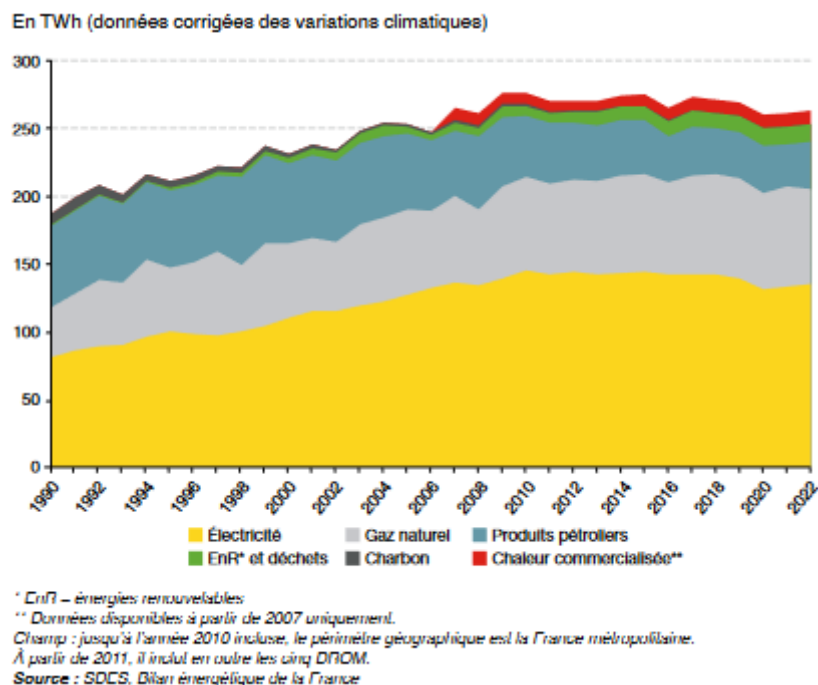
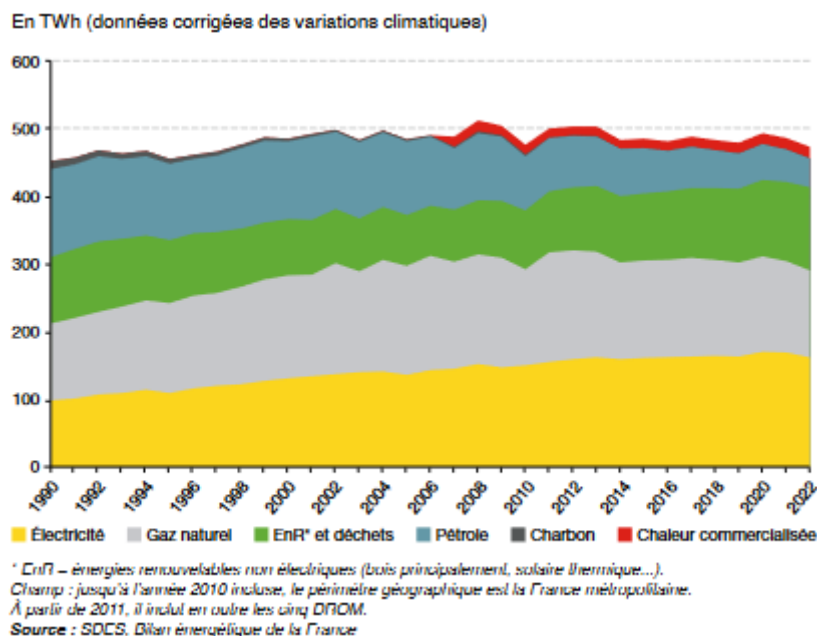


Figure5: Final energy consumption in residential and tertiary sectors in 2022 (TWh) – Source: SDES

Energy sources are changing over time: oil was the dominant energy in industry in the early 1970s. Following the oil shocks of the 70s, certain industrial uses and the heating of buildings gradually replaced oil with gas and electricity.

The share of coal in French industry consumption has decreased significantly over recent decades (4 % in 2022 compared to 11 % in 1990). The main energy sources are electricity and gas. Oil today has a small share and renewable energies too.

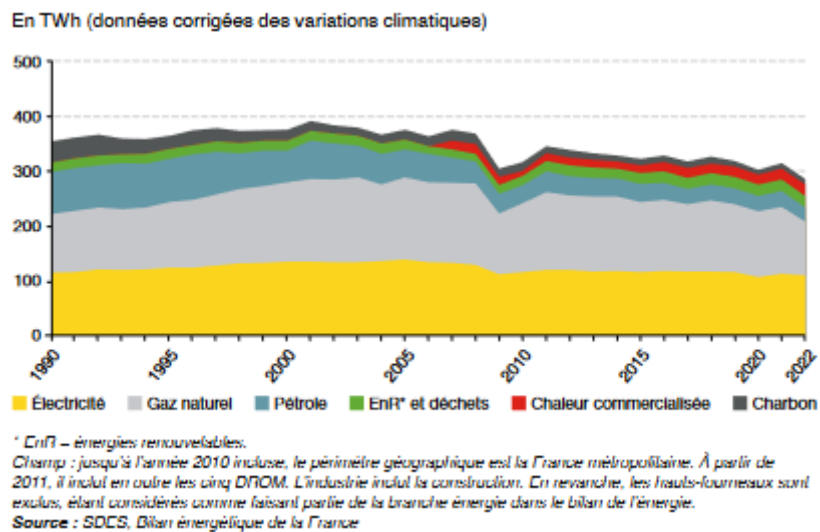


Figure6: Final energy consumption in industry in 2022 (TWh) – Source: SDES

Transport remains almost exclusively supplied by liquid hydrocarbons. Biofuels account for a small share and electricity remains extremely marginal.

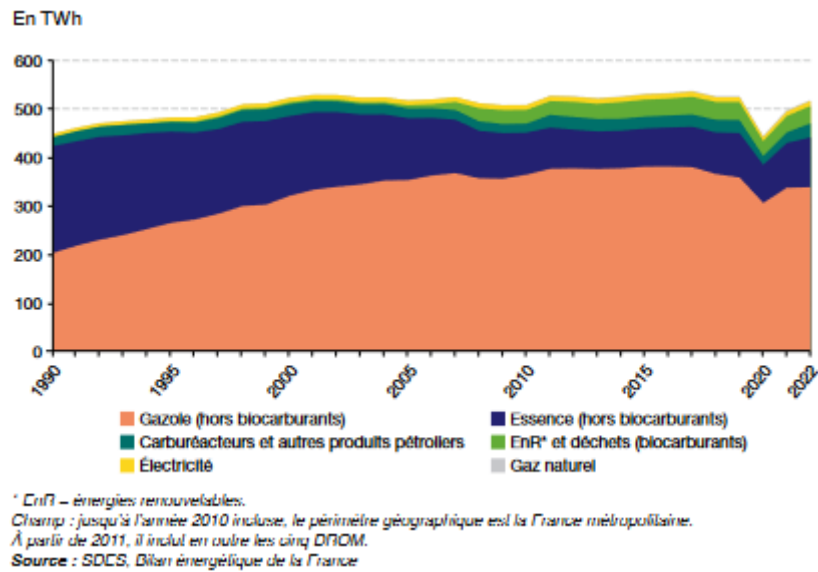


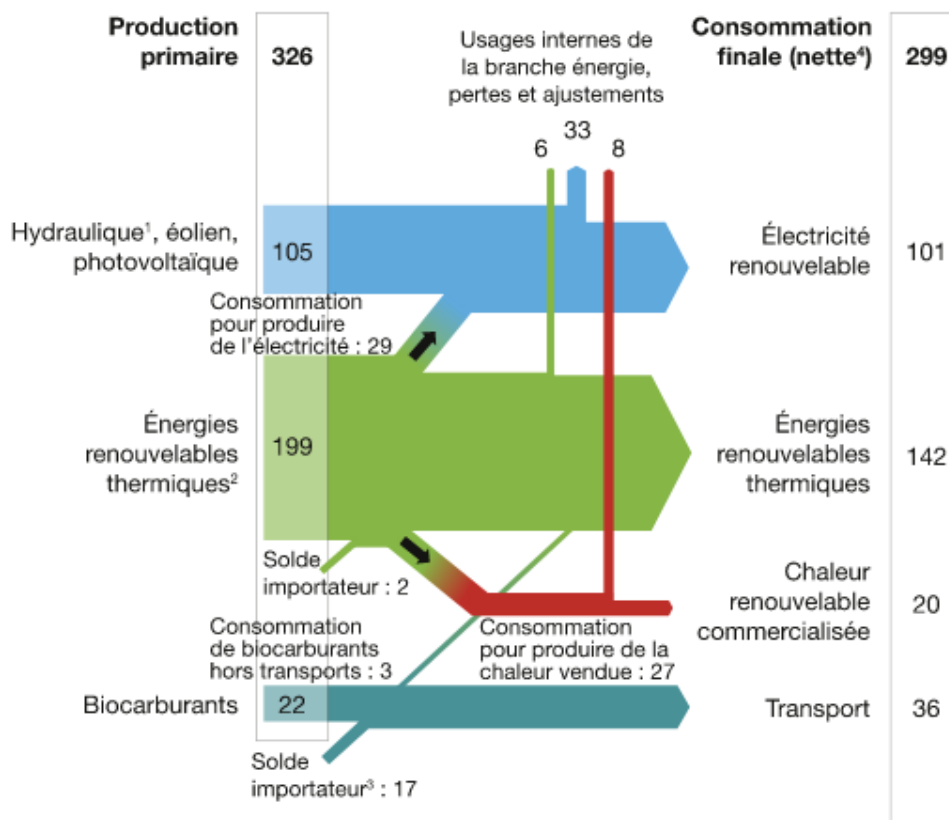
Figure7: Final energy consumption in transport in 2022 (TWh) – Source: SDES

The figure below shows that renewable energies are first used for heating (56 %), then for electricity generation (34 %) and finally for transport (10 %).

DIAGRAMME DE SANKEY

Le diagramme de Sankey, communément utilisé pour représenter des bilans énergétiques, retrace l'ensemble des flux sous forme de flèches de largeur proportionnelle à la quantité d'énergie.

En TWh



¹ Y compris énergies marines, hors accumulation par pompage.

² Hors biocarburants.

³ Importations - exportations.

⁴ Nette de l'énergie consommée par la branche énergie pour ses usages propres et des pertes de transformation, de transport et de distribution.

Source : calculs SDES

Figure8: Energy balance of renewable energy in France in 2022, SDES

1.2.1.1 The production of energy

Of the energy sources used, France imports almost all gas, oil and coal.

The production of national coal has been completely halted since 2004. National gas and oil production accounts for around 1 % of consumption and will decrease with the phasing out of hydrocarbon research and exploitation

in France recorded by Parliament on a proposal from the Government in 2017, making France one of the first countries to abandon permanently the exploitation of its own fossil energy resources.

As regards electricity, France participates fully in the European market while seeking to ensure that its needs are met by means located on French soil, in a spirit of responsibility and contributing to the common security of supply. The graph below shows the prominence of nuclear and renewables in this production.

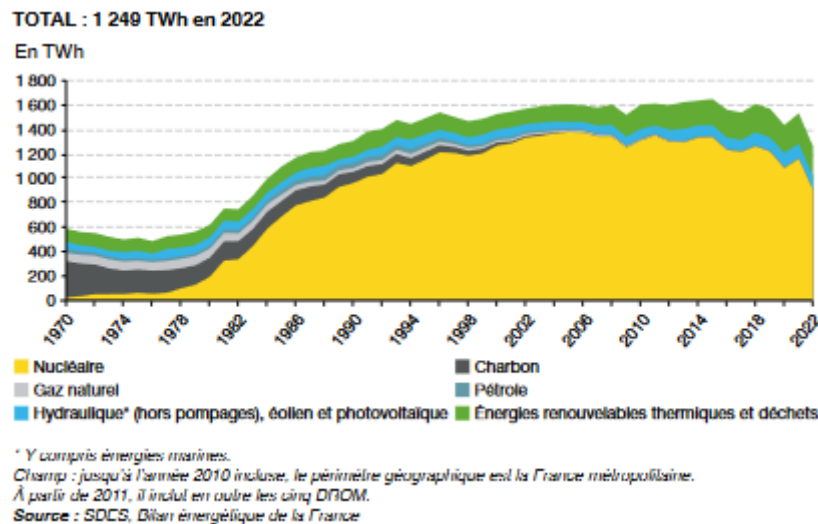


Figure9: Primary energy production in 2022 by origin (Mtoe) – Source: SDES *

1.2.1.2 The French electricity generation park

The total installed capacity of electricity generation facilities in metropolitan France amounts to almost 144 GW by 31 December 2022.

The vast majority of electricity generation is provided by nuclear power plants, as well as fossil fuels (coal, natural gas, fuel oil) and increasingly renewable energy (hydro, solar, wind, bioenergy). In 2022, electricity production was broken down as follows: 62.2 % nucl production, 11.1 % hydro, 9.9 % gas, 8.7 % wind, 4.2 % solar and 2.4 % bioenergy, 0.6 % coal and 0.5 % oil.

The French nuclear production park consists of 56 reactors in 18 power stations, with a total power of 61.4 GW. All reactors use pressurised water technology (PWR).

In France there are several 'steps' of nuclear reactors:

- **CP0: 4 reactors of 900 MW: these are the oldest reactors still in operation;**
- **CPY: 28 reactors of 900 MW;**
- **P4: 8 reactors of 1 300 MW;**
- **P' 4: 12 reactors of 1 300 MW;**
- **N4: 4 reactors of 1 450 MW**
- **EPR: 11 600 MW reactor to be commissioned in 2024**

The main renewable electricity production pathways are as follows (capacity as at 31 December 2022):

- **25.7 GW hydraulic: the hydraulic capacity has been stable since the late 1980s;**
- **20.6 GW onshore wind: the growth in installed capacity of onshore wind turbines has accelerated in recent years (+ 1.4 GW in 2022);**
- **0.5 GW of offshore wind;**
- **15.7 GW of solar: solar power is also steadily increasing (+ 2.6 GW in 2022), particularly as a result of significant cost reductions;**
- **2.2 GW of bioenergy: the installed capacity of the bioenergy sector (paper waste, household waste, biogas, wood/energy and other solid biofuels) increased by 20 MW in 2022, mainly thanks to the dynamism of plants using wood energy, solid fuels and biogas.**

The fossil fuel thermal park in 2022 consists of:

- **12.8 GW of gas-fired means of production;**
- **1.8 GW of coal production assets in sharp decline since 2012;**
- **3.1 GW of oil production facilities in the process of closure.**

1.2.1.3 Electricity generation

Total electricity production in France reached 445.2 TWh in 2022. It has been at its lowest level since 1992, due to the low nuclear and hydraulic production that year. It imported for the first time since 1980 (net balance of 16.5 TWh in import).

Nuclear generation accounted for 63 % of total electricity production in 2022. This production was at a historically low level, against the backdrop of delicate maintenance on some of the installations, and will increase substantially again in 2023, with a view to returning to availability consistent with international best practices while meeting safety requirements in the coming years.

By comparison, total electricity production in France amounted to 522 TWh in 2021, and nuclear production accounted for 69 %.

1.2.2 Lessons learned from PNIEC1

1.2.2.1 track record of historical GHG emissions trajectory and second carbon budget (2019-2023)

Between 1990 and 2023, gross greenhouse gas emissions in France (excluding emissions and removals associated with land use and forestry) **decreased by 31 % according to provisional data (Secten 2024)**, representing a **decrease of 167 Mt CO₂eq**, with an **acceleration of the pace of decline over the recent period** (average annual decrease of 13 Mt CO₂eq observed over the period 2019-2023, average annual decrease of 3 Mt CO₂eq observed over the period 2015-2018).

Over the last 5 years, the decreases amounted to -2.3 % in 2019, -9.2 % in 2020, + 5.7 % in 2021 (but reflecting a decrease of 4.1 % compared to 2019, a year before the health crisis), -3.9 % in 2022 and -5.8 % in 2023¹⁷.

¹⁷ Citepa Inventory, Secten 2024

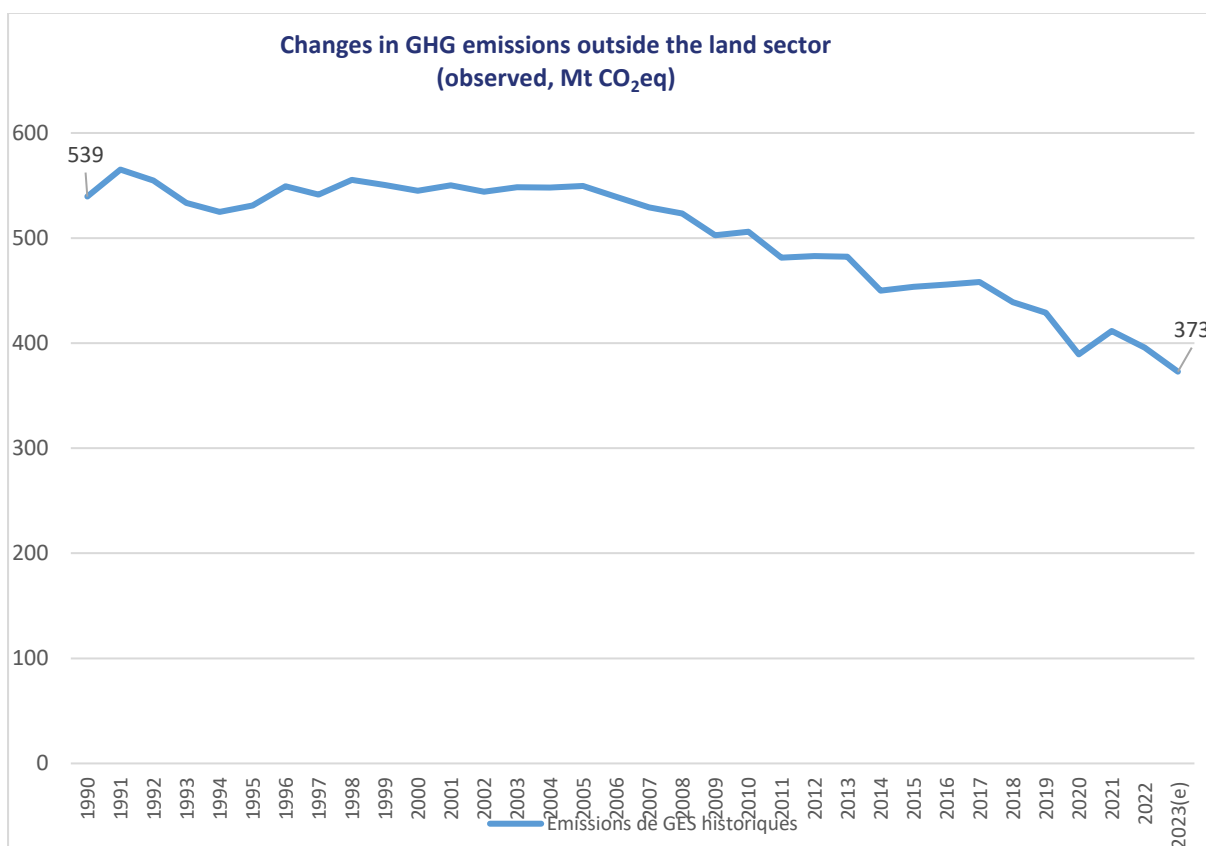


Figure10: Changes in GHG emissions (Mt CO₂ eq) outside the land sector. (Sources: evolution 1990-2023 (e): national greenhouse gas emissions inventory, Citepa, Secten 2024)

| <i>Emissions of CO_{2e}(MtCO_{2e}/year) Scope: Metropolitan and overseas areas included in the EU</i> | 1990 | 2015 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|-------|------|------|------|------|------|------|
| Energy industry | 78,9 | 50,0 | 46,0 | 40,9 | 42,1 | 43,1 | 35,4 |
| Manufacturing industries and construction | 140,2 | 83,7 | 79,0 | 70,3 | 77,2 | 71,0 | 64,8 |
| Centralised waste treatment | 15,5 | 14,0 | 14,9 | 14,8 | 14,3 | 14,4 | 14,4 |
| Use of buildings and residential/tertiary activities | 92,9 | 85,0 | 76,5 | 72,1 | 74,4 | 61,7 | 58,4 |
| Agriculture/Forestry | 88,7 | 83,2 | 78,6 | 78,2 | 76,4 | 74,2 | 73,0 |

| | | | | | | | |
|--|------------|------------|------------|------------|------------|------------|--------------|
| Transport | 123,3 | 137,7 | 134,1 | 113,2 | 127,2 | 131,2 | 126,8 |
| <i>Transport excluding total</i> | 17,5 | 23,4 | 24,8 | 11,4 | 12,6 | 17,9 | 19,7 |
| National total excluding LULUCF | 539 | 454 | 429 | 389 | 412 | 396 | 372,9 |
| LULUCF | - 18,3 | - 36,4 | - 18,6 | - 21,4 | - 19,0 | - 18,5 | - 20,7 |
| <i>Natural emissions excluding total</i> | 3,2 | 3,8 | 3,9 | 3,9 | 3,9 | 3,9 | 3,9 |
| National Total with LULUCF | 521 | 417 | 410 | 368 | 393 | 377 | 352 |
| <i>Out of total</i> | 20,8 | 27,2 | 28,7 | 15,3 | 16,5 | 21,8 | 23,6 |

Figure11: Historical GHG emissions, Citepa National GHG Emissions Inventory, Secten Edition 2024. Scope: Metropolitan and other sea included in the EU

The comparison of France's emissions (based on the most up-to-date inventories) with the carbon budget for the period under consideration is a key indicator for monitoring the implementation of the strategy. 2023 marks the end of France's second carbon budget (2019-2023). The final balance of this carbon budget will be drawn up in 2025 on the basis of updated inventory data, but a first provisional balance can be drawn up on the basis of the pre-estimates for 2023 of Citepa.

Taking stock of the first carbon budgets

The first carbon budget of SNBC 1 (SNBC 1 adopted in November 2015) covered the period 2015-2018. It averaged 442 MtCO₂eq per year, excluding emissions and removals associated with land use and forestry. This first carbon budget was exceeded by 61 Mt CO₂ eq cumulative over the period 2015-2018 (i.e. + 3.4 % over the whole period), but could be offset against the 2th carbon budget.

The 2 SNBC carbon budget for the period 2019-2023 in gross terms (420 Mt CO₂eq/year on average¹⁸) should be respected (based on the pre-estimate for 2023 of Citepa¹⁹): emissions reached 429 Mt CO₂eq in 2019, 389 Mt CO₂eq in 2020 (mainly due to the Covid-19 crisis), increased to 412 Mt CO₂eq in 2021, fell back to 396 Mt CO₂eq in 2022 and then to 373 Mt CO₂eq in 2023 on the basis of the latest Citepa estimates (Secten 2024). For the time being, for the period 2019-2023, the annual average of gross emissions is estimated at 400 Mt CO₂eq. The estimated lower emissions of -100 Mt CO₂eq cumulatively over the period of the 2nd carbon budget (2019-2023) make it possible to compensate for non-compliance with the first carbon budget.

Given the significant decrease in the forest sink level that had not been anticipated by SNBC 2, France is not expected to reach²² the UCTATF carbon budgets (+ 115 Mt CO₂eq cumulative over the period 2019-2023) and net emissions (+ 15 Mt CO₂eq cumulative over the period 2019-2023) that had been foreseen by SNBC 2 for the period 2019-2023. However, through a balanced approach to the various forest issues, the

¹⁸ The Environmental Code (Article D. 222-1-B) provides for a technical adjustment of the carbon budgets for each period if changes in the methodology of greenhouse gas emission inventories lead to changes of more than 1 % of the values of the reference years used for the SNBC scenarios (1990, 2005 and 2015). These 'technical' adjustments are intended to maintain the consistency of the trajectory initially chosen, maintaining the same sectoral and gas reductions in 'relative value' compared to 2005. The Code foresees that this technical adjustment will take place at the time of closure of the carbon budget (the final balance of the 2019-2023 carbon budget will be drawn up in 2025 on the basis of updated inventory data (Secten 2025)). Nevertheless, in order to maintain annual consistency with the trajectory initially chosen in the SNBC, carbon budgets may also be adjusted, indicatively and provisionally, over a period of time, in the light of methodological developments in the national greenhouse gas emissions inventory. The indicative annual carbon budgets for the second period have been adjusted in line with the 2024 National Inventory of Greenhouse Gas Emissions of Citepa (Secten 2024).

¹⁹ Citepa Inventory, Secten 2024

Government is mobilising to preserve the carbon sink. These measures include, in order to restore our forests, a massive adaptation of stands and species. The results of these public policies are, however, not quantifiable in short timeframes. **The carbonsink** of these resilient trees, which replace the declining trees, will only be significant when the plantations reach maturity, i.e. not before 2045 or 2050. **The Government will continue and expand its action to preserve this well.**

| Annual emissions (in MtCO ₂ eq) | Carbon budget 2 (2019-2023) (technically adjusted in 2024 ²⁰) Difference from the indicative annual carbon budget in Mt CO ₂ eq (deviation calculated on the basis of Secten 2024) | | | | | |
|--|---|-------------|-------------|-------------|-------------|--------------|
| | 2019 | 2020 | 2021 | 2022 | 2023 | 2019 – 2023 |
| Transport | + 1 | – 19 | – 2 | 5 | 4 | – 11 |
| Buildings | – 8 | – 10 | – 4 | – 13 | – 13 | – 48 |
| Agriculture | – 2 | – 1 | – 2 | – 3 | – 3 | – 9 |
| Industry | + 1 | – 6 | + 3 | – 2 | – 6 | – 11 |
| Production of energy | – 5 | – 11 | – 7 | – 2 | – 7 | – 32 |
| Waste | + 2 | + 2 | + 2 | + 2 | + 3 | + 10 |
| Use of Land, Change of Use of Land and Forestry (LULUCF) | + 25 | + 22 | + 24 | + 24 | + 21 | + 115 |
| Total (excluding LULUCF) | – 11 | – 45 | – 9 | – 12 | – 22 | – 100 |
| Total net (with LULUCF) | + 13 | – 23 | + 14 | + 12 | – 1 | + 15 |

Figure12: Provisional review²¹ of the carbon budget covering the period 2019-2023

1.2.2.2 review of the objectives of the second multiannual energy programming (2018-2023)

On reducing energy consumption

²⁰ In accordance with the Environmental Code (Article D. 222-1-B), a provisional technical adjustment of carbon budgets was made in the light of the Secten 2024 inventory of Citepa in the light of changes in greenhouse gas emission accounting for inventories.

²¹ The final review of the 2019-2023 carbon budget will be drawn up in 2025 on the basis of updated inventory data (Secten 2025)

The 2th multiannual energy programme (PPE2) aimed at a target for final energy consumption for energy use at continental level (excluding inter-national bunkers) of 1 528 TWh in 2023. In 2018 and 2022, energy consumption was 1 559 TWh and 1 614 TWh respectively.²² Although the indicators for the year 2023 are not yet available, and given the increased level of ambition for reducing energy consumption in the 3th Multiannual Energy Programming (MIP3), a strong acceleration of the energy efficiency and sobriety effort will be needed. The target set by PPE2 was to reduce primary consumption of petroleum products by 19 % in 2023 compared to 2012. In 2022, the reduction reached 17.2 %.

The decline in consumption has been driven by an active policy of energy efficiency, which affected the construction, transport and industrial sectors.

As regards the building, the creation of MaPrimeRenov' in January 2020 made it possible to structure the energy renovation and make it more accessible, in particular to the smaller ones. Since then, 2 million dwellings have been renovated, including more than 210 000 renovations, mobilising EUR 8.6 billion in aid.

The public service for the renovation of housing, France Rénov', was launched on¹ January 2022 to facilitate the energy renovation of housing by further informing and empowering households at all stages of their projects. More than 570 French Rénov' councils and 2550 councillors are now present throughout the territory, thanks to the mobilisation of the government and the local and regional authorities involved in the financing of this scheme.

In the field of transport, thanks to an active policy of aid for the purchase of clean vehicles through environmental bonuses and the conversion bonus and tax penalties for the most emitting vehicles, the fleet of electric passenger vehicles (including plug-in hybrids) has increased considerably. The number of electric light vehicles (electric and plug-in hybrids) in circulation exceeded 1 500 000 at the end of 2023. These vehicles now account for a quarter of the market, and 100 % electric vehicles accounted for more than 19 % of registrations in September 2023. Over this period, almost one million bonus for the purchase of electric vehicles and more than 450 000 conversion bonuses have been paid since 2020.

At the same time, the Government organised the development of a vehicle electron battery industry as part of the Important Project of Common European Interest (IPCEI) dedicated to batteries, which enabled 4 electric gigafactories projects to emerge in France. Greater attention was paid to the resilience of the supply of critical raw materials for their production at European level (Critical Raw Materials Act) and strict criteria on the life-cycle carbon impact of batteries were laid down in the Batteries Regulation negotiated under the French Presidency of the Union and adopted by the European Union on 10 July 2023.

In line with this electrification of the vehicle fleet, the number of recharging points has increased significantly since 2020. Thus, with the strong support of the State, more than 130 000 recharging points are currently accessible to the public, spread throughout the territory. In addition, nearly 2 million terminals are now deployed at home or in businesses. They make France one of the three best equipped countries in Europe, with the Netherlands and Germany, in terms of number of loading points and density.

A central public policy mechanism for energy efficiency, the energy saving certificates (EECs) system has been developed throughout the period. The fourth period of the EWC scheme (2018-2021) was based on enhanced

²² Update of EPP Monitoring Indicators (Indicators 2022) – March 2024, MTE, Access: https://www.economie.gouv.fr/files/files/2024/2024_01_22_Publication_Indicateurs_Definitifs_PPE.pdf

obligations (2133 TWhc, of which at least 533 TWhc would benefit households in energy poverty) compared to the third period, meaning that more energy saving actions would have to be financed by the obligated actors. The targets for the fifth period (2022-2025) have been strengthened compared to the fourth period (3100 TWhc over 4 years, including 1130 TWhc for energy poor households).

As a result of a sobriety and promotion of the least energy-intensive consumption patterns, France has also, over the period, strongly supported European policy on eco-design and energy labelling of energy-related products: it closely monitors the implementation of the successive work programmes, and currently the implementation of the 2022-2024 programme. The 2022-2024 work programme foresees 38 reviews of existing measures, which will save an additional 170 TWh per year at European level. Priorities include the revision of the provisions on heating and cooling appliances and the evolution of energy labels.

In the field of industry, the decarbonisation policy pursued by the State has been based on decarbonisation roadmaps for the most emitting sectors (metallurgy, heavy chemicals, cement) and was supported by the France Relance plan, which has made it possible to compensate for more than 200 industrial sites for a reduction of around 4 million tonnes of CO₂ per year. In addition, support for deep decarbonisation is under way in France Relance and the national strategy for the development of decarbonised hydrogen with EUR 9 billion of public support.

The graphs below illustrate the evolution of national final energy consumption over the period 2010-2022. They compare the trajectory projected by the PPE2 (Figure 6) and the observed track record (Figure 7) over the period 2010-2022. There is a sustained trend in reducing consumption.

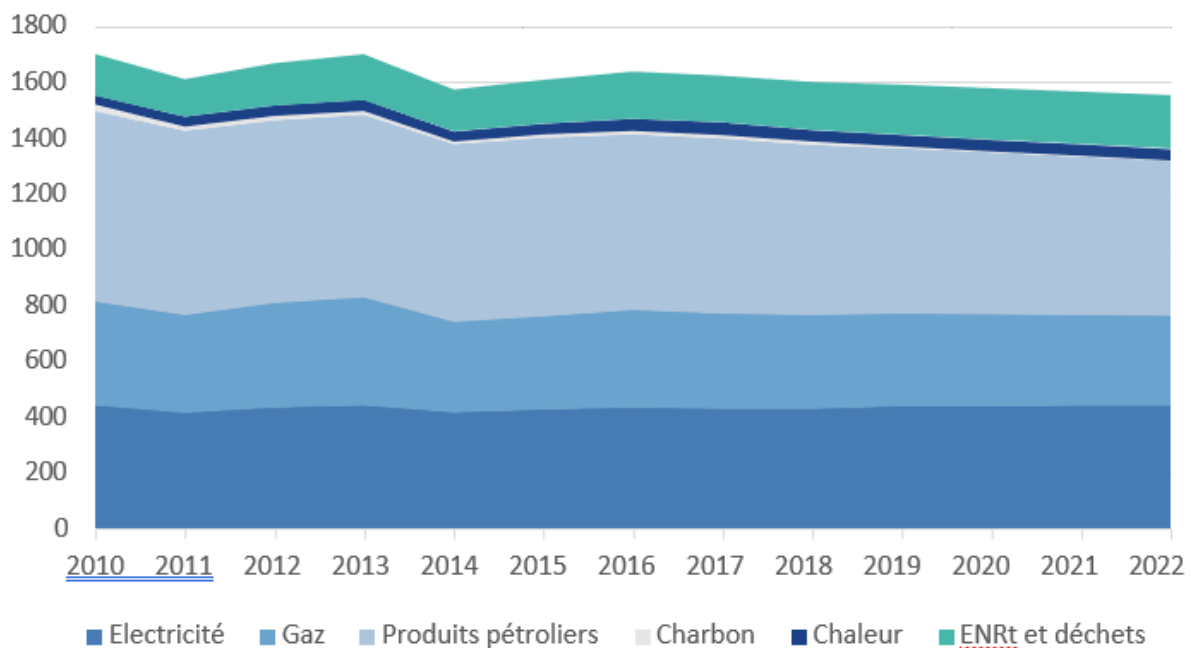


Figure13: Evolution of the real energy mix (2010-2018) and projected in EPP 2 (2019-2022) per energy carrier

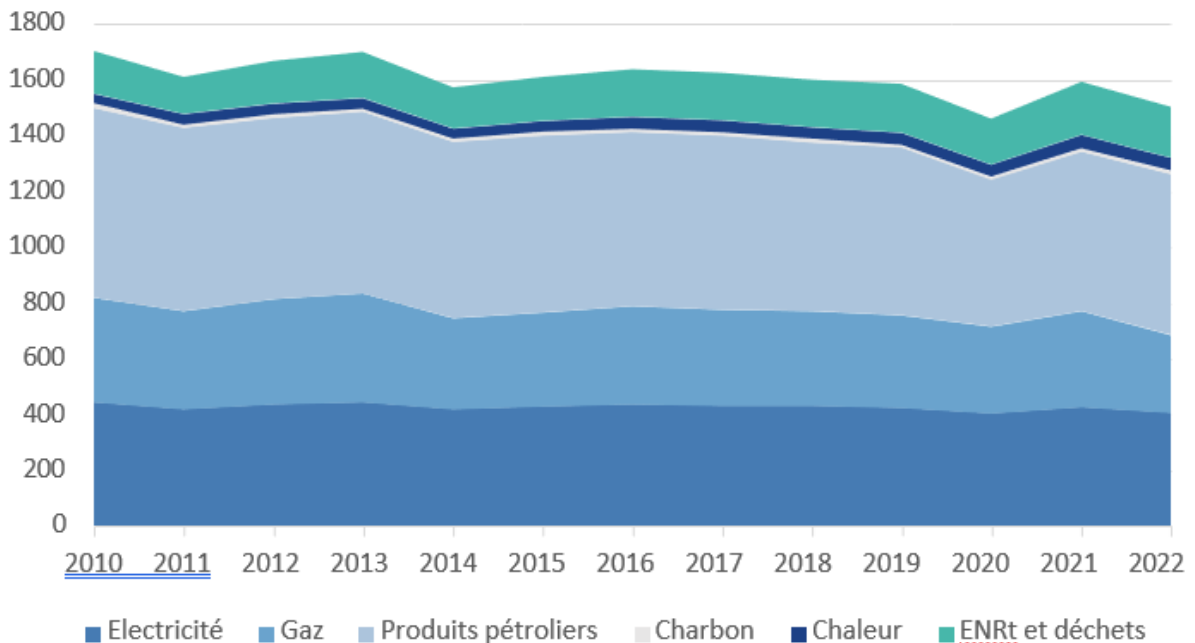


Figure14: Changes in the energy mix recorded (2010-2022) – Final (2010-2021) and provisional data (2022) – Source: SDES

More recently, on 6 October 2022 the Government presented a first energy sobriety plan resulting from work carried out in ten sectors of activity with more than 300 federations. The objective of the plan was to reduce consumption by 10 % compared to the end of 2019.

This mobilisation has yielded unprecedented results. Thus, over twelve months (1^{August} 2022 to 31 July 2023), France reduced its combined electricity and gas consumption by 12 % (and -12.6 % for 2023 to 23 June 2024) – adjusted for weather effects and for all types of consumers, including those less exposed to energy price volatility. This decline in consumption enabled France to reduce its greenhouse gas emissions by 8.5 % in the last quarter of 2022 and by 4.3 % in the first half of 2023.

On the development of renewable energies

The share of renewable energy in final energy consumption increased to 22.2 % in 2023, showing a net acceleration compared to 2022 (+ 1.7 %), putting us at a level comparable to our European partners of comparable size. This shows the success of the Government’s efforts to accelerate the deployment of renewable energy. This effort is first and foremost an effort to simplify the administrative procedures for setting up new installations for the production of renewable electricity: law No 2023-175 of 10 March 2023 on the acceleration of renewable energy production thus provides for various measures to speed up the development of renewable energy sources and its implementing legislation will be deployed at the turn of the year. This effort also takes place at local level, through the mobilisation of all the parties involved, both the decentralised government departments, which provide support for and appraisal of projects, and the local authorities involved in the local planning of the areas where ENR objectives are accelerated and regionalised.

The solar photovoltaic fleet has reached 20 GW by the end of 2023. In 2023, an additional 3.2 GW were connected, compared to 2.7 GW in the same period of 2022.

On 1^{June} 2024, the French wind farm had a power of 23.5 GW, of which 22.0 GW of onshore wind and 1.5 GW of offshore wind.

In 2025, the Courseulles-sur-Mer and Yeu-Noirmoutier projects will also be put into operation. Finally, the Dieppe-Le Tréport project will come into operation in 2026. With regard to renewable heat, despite an increased budget of the Heat Fund since 2018, the context of fiscal incentives did not allow for a sufficient differentiation between low-carbon and fossil fuels for heat production, making it difficult to stimulate sufficient momentum to achieve the EPP targets in this area. As a result, the heat development rate was at the beginning of the period almost twice as low as planned for the EPP. The budget of the Heat Fund for 2022 was increased to EUR 520 million in order to cope with the energy crisis and in particular to speed up the deployment of district heating networks, the main vector of renewable heat. It was further increased to EUR 595 million in 2023 to cope with the significant increase in new projects for district heating networks.

As part of the recovery plan, the Government has also put in place ambient and proactive support for the decarbonisation of the industry available since 2020, which was continued in 2021 and 2022 for a total of EUR 1.2 billion over the period 2020-2022. A very strong dynamic on renewable heat projects was thus observed in 2022.

The following table (mainland France – source SDES) summarises the EPP renewable energy targets for 2019-2028 and the current level of development of the different sectors.

| | UNITÉ | RÉALISÉ | | | | OBJECTIFS | |
|--|-------|---------|------|------|-------|-----------|------------|
| | | 2019 | 2020 | 2021 | 2022 | 2023 | 2028 |
| La chaleur et le froid renouvelable et de récupération | | | | | | | |
| Biomasse | TWh | 114 | 107 | 120 | 109 | 145 | 157 à 169 |
| Pompes à chaleur y compris PAC géothermiques | TWh | 32 | 33 | 43 | 43 | 39,6 | 44 à 52 |
| Géothermie profonde | TWh | 2 | 2 | 2 | 2 | 2,9 | 4 à 5,2 |
| Solaire thermique | TWh | 1,20 | 1,22 | 1,23 | 1,27 | 1,75 | 1,85 à 2,5 |
| Quantité de chaleur renouvelable et de récupération livrée par les réseaux de chaleur | TWh | 14,6 | 14,7 | 17,4 | n. d. | 24,4 | 31 à 36 |

| Le gaz renouvelable | | | | | | | |
|--|-----|------|------|------|------|------|-------------|
| Biomasse | TWh | 1,2 | 2,2 | 4,3 | 7,0 | 6 | 14 à 22 |
| L'électricité renouvelable | | | | | | | |
| Hydroélectricité (y.c. STEP et énergie marémotrice) | GW | 25,6 | 25,6 | 26,0 | | 25,7 | 26,4 à 26,7 |
| Éolien terrestre | GW | 16,8 | 18,0 | 19,3 | 20,9 | 24,1 | 33,2 à 34,7 |
| Photovoltaïque | GW | 9,5 | 10,7 | 13,4 | 15,9 | 20,1 | 35,1 à 44,0 |
| Électricité à partir de méthanisation | MW | 230 | 256 | 274 | 279 | 270 | 340 à 410 |
| Éolien en mer | GW | 0 | 0 | 0 | 0,5 | 2,4 | 5,2 à 6,2 |

Figure15: EPP renewable energy targets 2019-2028 and current level of development of the different sectors

In 2022 and 2023, after more than 15 years of public support for the emergence of renewable energies, most of them became competitive on our soil. They generated EUR 6.5 billion in additional net revenue, of which EUR 6.2 billion combined for onshore wind for 2022 and 2023.

In the field of nuclear development

While taking on the key role of nuclear energy in the French energy mix and its decarbonisation, PPE2 opened up several options for the place of nuclear energy in our country.

The “Energy 2050” works entrusted to RTE have confirmed the value of the electricity mix options based both on the massive development of renewable energy sources, the continued operation of the existing nuclear fleet as much as technically and as possible – without any further closures being envisaged – and on the launch of a new nuclear programme.

It is in this spirit that the President of the Republic presented in the Belfort speech political guidelines opening this choice for the country: following the public debate and then the work carried out by the working groups, this strategy is intended to endorse this choice.

On the exit from fossil fuels

EPP’s ambition was to move away from fossil fuels. In housing and transport, the effort to convert the fleet of road vehicles through the bonuses and conversion premiums, the effort to renovate energy and transform heat production methods, as confirmed in the revision of the energy regulation for new buildings (RE2020), paved the way for this strategy, making it possible to scale over the exit of fossil fuels in the main uses of French everyday life.

The shutdown of coal-only power plants and their possible conversion to less carbon solutions is confirmed by this EPP, with the ambition of exiting coal for energy use by 2027. These centres will require support from staff and territories: the Government has ensured that measures are already in place to provide vocational training for the employees concerned and to retrain sites to new activities in the context of territorial projects.

1.2.3 Consultations and involvement of national and Union entities and their results

1.2.3.1 Ecological planning

Ecological planning is putting society on the move to achieve our climate, biodiversity and pollution reduction goals, mobilising all actors: the State, businesses, local and regional authorities. This is to ensure that all decisions that are now taken for public policies are compatible with our public policy objectives.

This new comprehensive methodology for the green transition **aims to act in a coordinated way to:**

- Reducing greenhouse gas emissions and limiting the effects of climate change;
- Adapting to the inevitable consequences of climate change;
- Protecting and restoring biodiversity;
- Reduce the exploitation of our natural resources at a sustainable and sustainable pace;
- Reduce all pollution affecting health.

It **sets out a framework for reflection, action and engagement** so that everyone – citizens, local authorities, businesses and associations – has the right and ambitious objectives and is able to do so in line with their means, competences and impact. Because the topics are numerous, complex, and because not all the answers are yet known by 2050, this framework will evolve over the long term to operationalise French and European climate objectives. It **integrates all the themes of the green transition** that have a direct impact on the lives of the French people for the future: better place, protect and valorise our ecosystems, better feed, produce, house and consume better. It is built around these 6 themes, deployed in 22 ‘sectoral’ projects, supplemented by 7 transverse sites²³, to organise our action.

²³The 7 cross-cutting projects correspond to addressing challenges affecting all sectors and thematic sites: funding, planning and territorial differentiation, sectoral transition, environmental data, exemplary public services, just transition and sobriety of uses and resources.



Figure16: Environmental planning sites – France Nation Verte

1.2.3.2 The French Energy and Climate Strategy: a strategy based on consultation and dialogue

The French Energy and Climate Strategy (SFECE) aims to **address decarbonisation challenges in a coherent and integrated manner and to strengthen the necessary link between climate change mitigation and adaptation policies**. It consists of the third editions of the National Bas-Carbon Strategy (SNBC), the Multiannual Energy Programme (EPP), and the National Climate Change Adaptation Plan (PNACC). The PNIEC is made up of these three national documents.

The government has chosen to place the public debate at the heart of the process of preparing the future SNBC and EPP and the future PNACC (see paragraph 2.1.1.6.). **All public engagement initiatives that have been carried out since 2021 have therefore ensured inclusive public participation and broad participation of all relevant authorities, including local authorities, civil society and all stakeholders, including social partners, in the preparation of France's integrated national energy climate plan, which is exclusively based on the three national documents mentioned above.**

Ecological planning sets out general objectives, trajectories, policy levers and financial means to support stakeholders. **The Government's strategy emphasises in particular the practical implementation of these objectives on the ground**, through projects that are fair, realistic and desirable for all French people.

In order to respond effectively to these challenges, to identify the social impact of the proposed measures and to respond to them, **the development of SNBC and EPP 3 is based on extensive consultation and dialogue work with many stakeholders** (representatives of the business community, representatives of employees, associations, communities, NGOs, citizens), which has been engaged since October 2021.

In this context, **the State has:**

- **Involving all stakeholders (scientists,** economic actors, state, local authorities, associations, social partners, etc.) through a dedicated committee and sectoral experts via workshops and working groups (WGs) to discuss the initial assumptions and levers to be mobilised;
- **Involve citizens** through consultation phases to gather their guidance on the country's climate and energy policy;
- **Accompanied by the economic actors** of the most emitting sectors in the identification of decarbonisation levers available to them and their operational translation in decarbonisation roadmaps (Article 301 of the Climate and Resilience²⁴Law, roadmaps of the strategic sectoral committees of the National Council of²⁵Industry, roadmaps of the 50 most emitting industrial sites, etc.).

(a) participatory and inclusive process

Work on preparing the third edition of the SNBC involves 5 sectoral working groups (WGs) (transport, construction, agriculture, soil biomasse-forestry and industry/waste) and 5 cross-cutting WGs (lifestyles, overseas, carbon footprint, economy, communities). These WGs, made up of around a hundred stakeholders, were brought together in 2022 and 2023.

Two national concertations and nationwide work have been organised since the end of 2021.

First public consultation on 12 topics covering a broad scope of the low-carbon transition was conducted from 2 November 2021 to 15 February 2022. During this consultation, 14 325 contributions and more than 100 stakeholder books were submitted. The contributions received were the subject of several analyses available online²⁶. These analyses constitute an initial response from the Government to this consultation. A number of key lessons can be drawn from these contributions across all themes **and are already included in the reflections:**

- Contributors expressed **strong expectations of the state's programmatic intervention** via the French Energy and Climate Strategy to set a course, guide and frame the action of stakeholders (local authorities, businesses, citizens) in a spirit of pedagogy, transparency and co-construction with all stakeholders (businesses, citizens, environmental organisations, experts, etc.). Expectations have also been expressed in terms of governance to structure and clarify the policy framework, and on international cooperation, which is essential to address global climate challenges.
- The **use of sobriety** is widely **perceived as a sustainable and effective solution**. Sobriety is included in a broad acceptance. It can be applied at all levels and across all sectors of activity. The future French Energy and Climate Strategy must give its full place to sobriety as a lever to achieve our climate and energy objectives.
- In order to explain and accompany the behavioural changes needed for the transition, **efforts will need to be stepped up on awareness-raising, pedagogy and education among citizens** in all sectors of intervention.
- Participants also **highlighted the challenges of social justice** in decarbonising our economy. Supporting households, businesses, employees and territories in this transition must be a strong focus of the future French Energy and Climate Strategy.

²⁴ <https://www.ecologie.gouv.fr/feuilles-route-decarbonation-des-filieres-plus-emettrices>

²⁵ <https://www.conseil-national-industrie.gouv.fr/decouvrez-19-csf>

²⁶ <https://concertation-strategie-energie-climat.gouv.fr/>

The Government's responses to this consultation are fine-tuning as work on the future French Energy and Climate Strategy progresses.

A second phase of public consultation on the "energy mix of tomorrow" was launched on 20 October 2022 and ended on 22 January 2023 by a Youth Forum, attended by 200 young people aged between 18 and 35. This citizens' consultation took the form of a Tour de France in each region. The summary of these regional meetings, the table of 31 355 contributions from the online public consultation, as well as the guarantors' stocktaking report²⁷ submitted on 10 March 2023, are available online. Several lessons can be drawn from this citizens' consultation:

- **Energy sobriety has been described as a real subject of society**, to be put at the heart of the new model that we have to invent. There was consensus on the importance of energy sobriety not being confined to the accumulation of individual gestures, but that it was a collective matter for all stakeholders – state, local authorities, businesses, etc.
- Citizens demand '**clear, transparent and easily accessible information for everyone**', from information on their energy consumption to better control it, information on the various existing aids and the conditions for receiving them, and information on the right steps to be taken. This request for information is in addition to a request for training, from an early age, to the right steps and behaviour to be taken.
- The report makes it very clear that there is a consensus on the need **to define our energy needs a priori** and, consequently, to define precisely for each mode of energy production a clear direction for the coming years. Participants want local authorities to play a central role in this planning.

In addition to these two voluntary public consultations, Section III of Article L.100-1A of the Energy Code provides for prior **consultation by the SNBC, in line with the constitutional principle of public participation. This will take place in autumn 2024.**

As part of the ecological planning required by the President of the Republic and the Prime Minister and at the initiative of the Minister for Energy Transition, 7 working groups were set up in May 2023 to update our country's energy and climate strategy. These groups led by parliamentarians and local elected representatives and involving all relevant stakeholders (professional federations, social partners, experts, environmental and consumer associations, etc.) have been tasked with sharing the constraints that our country will face in the context of the various challenges facing it, to make the diagnosis and identify avenues for action. They submitted their conclusions in September 2023²⁸. These proposals have fed into the multiannual energy programming and the national low-carbon strategy.

(b) Mobilising economic actors through the development of decarbonisation roadmaps

Achieving the objectives of reducing greenhouse gas emissions **requires the mobilisation of economic actors.** In this context, the Government shall support **the eco-nominee emitters in identifying the decarbonisation levers available to them and their operational translation into decarbonisation roadmaps (Article 301** of the

²⁷ <https://www.ecologie.gouv.fr/concertation-sur-mix-energetique-publication-du-rapport-des-garants-commission-nationale-du-debat>

²⁸ <https://www.ecologie.gouv.fr/dossier-presse-travaux-preparation-strategie-francaise-energie-climat-restitution-des-groupes>

Climate and Resilience²⁹Law, roadmaps of the strategic sectoral committees of the National Council of³⁰Industry, roadmaps for the 50 most emitting industrial sites, etc.).

Article 301 of the Climate and Resilience Law **provides for the development of a strategy identifying measures to achieve France’s climate objectives for each sector with a high greenhouse gas (GHG) emissions.** This article seeks **to encourage economic actors in these sectors to characterise decarbonisation levers** (level of emission reduction, cost, technological readiness, etc.), **identify the obstacles to be removed** (be they regulatory, access to investment, etc.) **and the concrete actions to be taken to activate them.**

The first 7 roadmaps (**cars, air transport, heavy vehicles, maritime vehicles, building life cycle, fitting-out, digital**) are finalised and published³¹. The other 3 roadmaps (**waste, livestock and cereals**) will be produced in the course of 2024.

On the **industry side**, the exercise is carried out **at the level of each industrial sector**. It has been ongoing since 2021, when first roadmaps were published. The decarbonisation ambition and the level of detail of these roadmaps have been gradually increased. For example, the latest versions of the roadmaps for the **agri-food, cement, chemical, lime, glass and tiles and bricks** were published at the end of 2023. For the **mining and metallurgy and cardboard sectors** which had already been the subject of the first decarbonisation roadmaps in 2021 and 2022, the revision work is ongoing.

Furthermore, at the request of the President of the Republic, the **50 most emitting industrial sites** also worked in the course of 2023 to develop decarbonisation roadmaps. This work resulted in the signing, on 22 November 2023, of green transition contracts with the State, reflecting the willingness of public authorities and companies to take action to promote decarbonisation³².

These roadmaps have been the subject of in-depth exchanges between the sectors and the State **and feed into ecological planning projects, without being binding on the State.** They **show real ownership of the green transition challenges by economic sectors and major emitters.** It is essential **for the Government to involve all the stakeholders** involved in the implementation of the transition.

Before their final adoption, **SNBC and EPP will be submitted to several bodies** for consultation (Superior Council of Energy, National Council for Ecological Transition, High Council for Climate, etc.), they will be subject **to an environmental assessment** and a new **public consultation by electronic means.**

SNBC 3 and EPP 3 will finally be **adopted by decrees published in the Official Journal.**

1.2.4 Regional co-operation

France is involved in three regional cooperation organisations. Details of the actions carried out are set out below.

²⁹ <https://www.ecologie.gouv.fr/feuilles-route-decarbonation-des-filieres-plus-emettrices>

³⁰ <https://www.conseil-national-industrie.gouv.fr/decouvrez-19-csf>

³¹ <https://www.ecologie.gouv.fr/feuilles-route-decarbonation-des-filieres-plus-emettrices>

³² <https://www.entreprises.gouv.fr/fr/publication-contrats-transition-ecologique-50-sites-industriels>

These regional cooperation frameworks fully meet the requirement of Article 9 of Directive (EU) 2023/2413, which stipulates that “by 31 December 2025, each Member State shall agree to establish a cooperation framework for joint projects with one or more other Member States for the production of renewable energy”.

France will examine, within the framework of these existing cooperation arrangements, the desirability of setting up one or more joint projects with other Member States.

1.2.4.1 The Pentalateral Energy Forum

The Pentalateral Energy Forum (Penta) is a voluntary regional cooperation between Belgium, France, Germany, Luxembourg, the Netherlands and since 2011 Austria. These countries account for more than 40 % of the EU population and cover more than 50 % of electricity generation in the EU. Switzerland joined the Forum as a permanent observer in 2011 and actively contributes to technical work and decision-making. In close cooperation with the European Commission, the Pentalateral Energy Forum strengthens cooperation between all stakeholders to contribute to a reliable, decarbonised and efficient electricity system based on integrated and efficient markets. As the electricity sector plays a crucial role in decarbonising all our societies by 2050 at the latest, Penta countries aim to further increase the share of renewables and fully decarbonise their electricity systems as soon as possible and ideally by 2035.

Cooperation is led by the ministers responsible for energy policy, who meet regularly. The activities are monitored by the Penta coordinators under the guidance of the respective Directors-General of the Penta countries. The work programme is implemented by ministries, transmission system operators (TSOs), distribution system operators (DSOs), regulatory authorities and market participants that meet regularly in four thematic support groups. In order for each support group to achieve its objective, exchanges between and within support groups are strongly encouraged and supervised at the level of the Penta coordinators. Support groups also liaise with other international fora, such as North Sea Energy Cooperation.

As the transition to a decarbonised energy system is accelerating, countries are becoming increasingly interdependent and regional cooperation is becoming increasingly important to address the challenges. The Pentalateral Energy Forum is well placed to address many of these challenges, for example by working on security of supply, market integration, energy efficiency and decarbonisation. Over the past two decades, Penta countries have shifted from a purely national political perspective on energy markets to a regional approach. Penta countries are therefore ideally placed to contribute to the next phase of the energy transition.

Supply security

Security of supply has been at the heart of the Pentalateral Energy Forum since its inception. Since the beginning, countries have been cooperating closely to foster security of supply and to prevent, prepare and manage electricity crises in a spirit of solidarity and trust. Important milestones have been achieved through various regional adequacy assessments, common crisis exercises and a common framework under Regulation (EU) 2019/941 on risk-preparedness in the electricity sector.

Today, work on security of supply is organised in a dedicated support group, structured by two main work streams: resource adequacy assessment and risk preparedness. Future work is planned for these two work streams as well as for the interface between them.

Resource Adequacy Assessment

As regards resource adequacy assessments, the Penta countries will work together with the European studies carried out by ENTSO-E (European Resource Adequacy Assessment, seasonal outlook) to improve alignment and

usefulness for Penta countries. Based on the expertise and in-depth knowledge in this area, complementary sensitivity analyses could be carried out by Penta TSOs, focusing on the Penta region and taking into account regional specificities and cross-border interdependencies. The following topics deserve to be explored at regional level:

- The link between the planning of the national energy system, the implementation of the TEN-E Regulation and the rapid evolution of the European energy system;
- The role of demand side response and other flexibility resources for system adequacy;
- Improvement of resource adequacy assessment methods;
- The need to increase the capacity of the network and optimise the existing network;
- Analysis of critical situations and possible countermeasures.

Risk preparedness

As regards risk preparedness, the objective is to foster regional cooperation in the Penta region with a view to preventing, preparing and managing electricity crises in a spirit of solidarity and transparency and in full compliance with the requirements of a competitive internal electricity market and the operational security procedures of TSOs. The Penta countries will seek effective solutions between all the competent entities involved in crisis management and between the European, regional and national levels. As such, work will focus on the implementation of the Memorandum of Understanding on Risk Preparedness in the Electricity Sector, signed on 1 December²⁰²¹, and in particular on:

- Analysis and evaluation of regional measures, including the technical, legal and financial arrangements necessary for their implementation;
- Organisation of regional exercises;
- Revision of the regional electricity crisis scenarios for the Penta region in close cooperation with ENTSO-E and the Commission on applicable methodologies
- In the event of an electricity crisis within Penta, application of the agreed framework.

Interface between resource adequacy assessment and risk preparedness

In addition to the above, Penta countries will also work on the interface between resource adequacy assessments and risk preparedness. A first step was taken with the Penta study on methodological improvements of Resource Adequacy Assessment, which examined differences and overlaps. Penta countries will endeavour to close the gaps between long-term analysis and short-term operational planning, technical and political decision-making, as well as between countries. More specifically, Penta countries intend to support the development of analytical tools and procedures for information exchange and decision-making, closely involving ministries, TSOs, regulatory authorities as well as ACER, ENTSO-E, EU DSO and regional security centres located in the Penta region (i.e. Coreso and TSCNET).

Market integration

The Pentilateral Energy Forum has two decades of experience in market integration. During this period, Penta witnessed and driven major changes in the political landscape, the most important steps being the introduction of flow-based market coupling, first in the Penta region, and now in a larger part of continental Europe.

Promote future-proof market design

In recent years, work on market integration in Penta has expanded in terms of accents and topics. Ministers Penta firmly placed hydrogen on the national and European agenda as a key element for system and market integration. The newly created SG4 actively contributes to the development of an integrated European hydrogen market.

The Pentalateral Energy Forum also aims to contribute to the integration of renewables and the development of a future decarbonised electricity system, in which integrated markets play a crucial role. More recently, two studies have been carried out: “Vision 2050” and “Flexilité”. These studies were carried out in the framework of the Support Group 3 (SG3) on the future electricity system and will serve as a basis for the future work of the Penta Forum.

Vision 2050 compares national decarbonisation scenarios and proposes basic elements for a common political vision of the future electricity system. These building blocks describe the elements necessary for the efficient development of a future electricity system. The Penta countries will continue their work on the Vision 2050 project by drafting a political declaration that will contain a common vision for the future integrated energy system.

To develop this future electricity system, the Penta countries recognise the need for future-proof market design and will actively exchange on the improvement and implementation of electricity market regulation, while highlighting areas where further work is needed. Based on their past experience, the Penta countries will work together to highlight welfare gains from adopting an integrated and market-based approach to policy issues that may materialise. They will also continue to organise technical exchanges and projects that contribute to the effective implementation of energy policies in the Penta regions.

Flexibility

The Flexibility Report provided additional information on the current and future state of flexibility in the region. It describes the needs and sources of flexibility in 2030/40/50, driven by the integration of renewable energies, and shows that cooperation can lead to significant synergies between countries, thus reducing overall flexibility needs. The report also provides important recommendations on how to promote flexibility in the region and potential measures to improve the flexibility of market participants. Therefore, Penta countries:

- Discuss the harmonisation of non-standardised products such as network services (e.g. redispatching and topological remedial measures).
- Discuss how to facilitate the contribution of flexible market participants' behaviour to the balance of the energy system through wholesale markets and the operation of electricity grids in a secure and stable manner.
- Follow the development of technical requirements for additional electricity demand (e.g. heat pumps and other flexibility sources) to ensure interoperability so that additional electricity demand is truly flexible.
- Work together on the implementation of flexibility provisions in upcoming EU legislation, such as the electricity market reform and the network code on demand response. As far as possible, the Penta countries will endeavour to take into account the flexibility needs of the region when formulating national policy.

Energy efficiency

The Pentalateral Energy Forum recognises the importance of increasing energy efficiency as a means of reducing dependence on fossil fuels and mitigating the scale of the challenge of the energy transition. In this respect,

Penta considers it important to save energy and make energy demand more flexible. The Penta countries exchanged on the implementation of the electricity demand reduction obligation imposed by EU legislation for winter 2022/2023.

The Penta countries will continue to work together by exchanging on the implementation of the revised Energy Efficiency Directive (EED, (EU) 2023/1791) and on best practices in energy savings.

Decarbonisation

As described above, and building on previous work on Vision 2050, the Penta countries continue to work towards a common political vision on a decarbonised electricity system, which should be achieved as soon as possible and ideally by 2035. The Penta countries will work together to further develop renewable energy and raise awareness of the importance of flexibility to move towards a fully decarbonised electricity system without losing security of supply. The Penta countries fully recognise the importance of improved regional cooperation and seek to improve it in order to exploit synergies and achieve efficiency gains. The Penta countries will explore the added value of additional regional cooperation on renewable energy integration, grid planning, offshore and onshore connection (in cooperation with North Seas Energy Cooperation) and addressing other issues with a cross-border impact that may arise in the transition to a decarbonised electricity system.

Hydrogen

In 2020, a dedicated support group on hydrogen was set up with the aim of advancing Penta's work and close cooperation on hydrogen. SG4 focuses on regulatory and market developments for the deployment of hydrogen in the Penta countries, in relation to the national, European and international framework. On the basis of the political declaration on the role of hydrogen in decarbonising the energy system in Europe signed in 2020 and recent developments, including REPowerEU and the IEA report A 10-Point Plan to Reduce the European Union's Reliance on Russian Natural Gas, Penta countries exchange information and define common positions on the future market design for hydrogen deployment developments. In particular, SG4 will continue to work on the development of hydrogen certification, the emerging hydrogen infrastructure in the Penta region and the necessary measures to develop cross-border interconnections. It will also monitor progress in the implementation of Penta countries' hydrogen strategies by looking at regulatory development, support mechanisms, investments, changes in supply and demand, trade, among others.

1.2.4.2 North Seas Energy Cooperation

France is part of the North Sea region, which has significant renewable energy potential. The deployment of offshore wind energy will play an increasingly important role in achieving Europe's energy and climate objectives. The EU Offshore Energy Strategy has set the ambitious target of an installed capacity of 300 GW for offshore wind and 40 GW for marine energy by 2050. On 19 January 2023, the North Sea Energy Cooperation (NSEC) facilitated the development of a non-binding agreement on offshore renewable energy generation targets in 2050 with intermediate steps in 2040 and 2030 for the priority North Sea grid corridor under the TEN-E Regulation. The objectives for the priority offshore grid corridor NSOG are 60.3 GW in 2030, between 134,9 and 158 GW in 2040, and between 171,6 and 218 GW in 2050. This represents a significant change of scale for the offshore sector, the deployment of renewable energy and the integrated strategic development of offshore. High energy prices, for example in 2022, and geopolitical events threatening the European energy system have highlighted the need to accelerate the deployment of national renewable energy generation capacities and offshore transmission grids at regional level as soon as possible, thereby significantly improving energy security.

France is working with the other NSEC countries to identify, analyse and realise concrete cooperation projects. The NSEC is a voluntary, bottom-up, market-oriented regional cooperation initiative, established in 2016, aimed at:

- Creating synergies;
- Avoid incompatibilities between national policies;
- Share knowledge on international best practices;
- Promote common strategies where possible and beneficial.

Ministers responsible for energy meet regularly in the framework of the NSEC. In 2023, the NSEC consists of Belgium, Denmark, France, Germany, Ireland, Luxembourg, the Netherlands, Norway and Sweden, with the participation of the European Commission. On 18 December 2022, Nordic Energy Ministers and the European Commissioner for Energy signed a Memorandum of Understanding on cooperation with the United Kingdom in the field of offshore renewable energy. The establishment of this MoU was provided for in the EU-UK Trade and Cooperation Agreement of 30 December 2020, is based on the NSEC and is distinct from but complementary to the NSEC framework.

For the offshore wind sector, it is essential to provide a predictable and stable operating environment in the long term in order to facilitate long-term investment and further reduce costs. NSEC members are working together to make an important contribution to achieving these objectives through a regular exchange of expertise focused on several topics within the four NSEC Support Groups (SG):

- SG1: development of hybrid and joint projects;
- SG2: permits, maritime spatial planning and environmental considerations;
- SG3: financing and support frameworks;
- SG4: long-term network and infrastructure planning.

Development of hybrid and joint projects

The NSEC SG1 serves as a platform to collaborate on concepts of potential offshore wind projects and on coordinated electricity infrastructure, including transmission infrastructure. The activity of the group has intensified as the NSEC countries have launched more joint and hybrid projects in the North Sea, to facilitate technical and ministerial discussions and the sharing of best practices as projects progress.

In addition to joint offshore wind projects, which will be connected and supported by several countries, the Support Group is also working on possible 'hybrid' solutions that use cross-border options to connect offshore wind farms to more than one electricity market and create synergies between countries, as well as on the corresponding EU and national market provisions.

Consequently, SG1 members are developing opportunities for collaboration on hybrid projects as well as on possible legal, regulatory and commercial obstacles. SG1 will continue to work on obstacles and milestones of hybrid and joint projects, which can be addressed at national and regional level. In addition, collaboration will continue to function as a forum for reflection on how to work on issues related to legislative processes at EU and national level.

Permits, maritime spatial planning and environmental considerations

In order to achieve our energy and climate objectives in the EU, it is necessary to speed up planning and permitting procedures at European and national level, and at the same time to better understand the possible

ecological boundaries of large-scale wind development in the North Seas and the impacts on other users of the sea. SG2 has compiled an inventory of the spatial tensions of offshore wind farm developments up to 2030 at regional sea level. The next steps will be to better define ecological tensions and potential threats to development and define spatial strategies to avoid or mitigate these threats. In order to improve knowledge and support the deployment of wind energy in the North Sea, North Sea countries will continue to cooperate closely on maritime spatial planning, environmental research and the assessment of the cumulative impact of wind farms between the authorities responsible for energy, maritime spatial planning and the environment.

Financing and support frameworks

Offshore tenders are a central topic for funding and support frameworks. NSEC members coordinate offshore tenders by sharing information on timetables for national tenders in the framework of SG3. In the Working Group, countries also exchange best practices on tender design, grant free support, design elements for system and sector integration, as well as grid connection schemes. The implementation of joint projects is becoming increasingly important to achieve these ambitious goals.

This is why the Group is also looking into the possibilities for financing joint cross-border offshore projects, including through EU financial instruments such as the Connecting Europe Facility and the EU Renewable Energy Financing Facility. Finally, Power Purchase Agreements (PPAs) play an increasingly important role in financing offshore projects. Countries will address problems, obstacles and solutions for a wider adoption of PPAs. In addition, the group exchanges on decommissioning, lifetime extension and energy replenishment of wind farms.

The aim of these exchanges is also to jointly develop and discuss ideas for the medium-term future of the offshore energy system in terms of installed capacity, for example through coordinated tender schedules.

Delivery 2050: long-term network and infrastructure planning

NSEC SG4 works with ENTSO-E to provide and coordinate contributions to the Offshore Network Development Plan for the North Seas Offshore Grid under the EU TEN-E Regulation. In addition, SG4 aims to broaden the discussion on the long-term planning of the network to also include the early development and increase of production and transport of decarbonised hydrogen at sea, as well as its potential role in an increasingly interconnected North Sea energy system. Decarbonised hydrogen will play an important role in decarbonising our energy system. Power-to-X, and in particular hydrogen, will play a key role in providing flexibility where and when needed. Hydrogen demand is expected to increase significantly, especially after 2030, due to its potential as a storage energy carrier and as a fuel and feedstock for activities that are difficult to electrify. Several NSEC countries have announced targets for decarbonised hydrogen production on land and at sea. Under SG4, NSEC countries will exchange their first experiences with hydrogen linked to offshore wind, and exchange knowledge on transport infrastructure, renewable energy development and off-shore power-to-X production. They will work together to provide information on offshore hydrogen production, to discuss the deployment of electrolysis and to increase synergies between long-term offshore grid planning and hydrogen network planning. In all aspects of medium- and long-term infrastructure planning, SG4 underlines the importance of a broad engagement in this planning process with Member States and relevant stakeholders, including industry and NGOs, to anticipate and eliminate supply chain bottlenecks (e.g. port development and availability) in the deployment and acceleration of the roll-out of our North Sea energy system. This is closely linked to the importance of safeguarding the security of offshore and underwater critical infrastructure, as well as the supply of critical raw materials, through innovation and better circularity.

1.2.4.3 The High Level Group on Interconnectors in South-West Europe

The quadrilateral summit on interconnections, bringing together the Heads of State and Government of Spain, France, Portugal and the President of the European Commission, held in Madrid on 4 March 2015, decided to set up a **High Level Group on electricity and gas interconnections for South-West Europe**. The High Level Group, formally launched in Paris on 30 June 2015, brings together representatives of the three countries and the European Commission, as well as national regulators and transmission system operators. It provides a comprehensive view of the projects across the region and involves all stakeholders, including transmission system operators and regulators. It is supported by the Commission in recognising these projects as projects of common interest, and for mobilising European funding tools.

In December 2023, the European Commissioner for Energy and Energy Ministers of France, Portugal and Spain signed a Memorandum of Understanding on a new expanded scope of the High Level Group on Interconnectors for South-West Europe. In line with the new Memorandum of Understanding, the Member States of the High Level Group on Interconnectors for South-West Europe agreed on a plan for actions to be taken by 2030 and identified three priority areas for cooperation:

- Increase electricity interconnections between Portugal, Spain and France;
- Support the development of offshore infrastructure and accelerate the deployment of offshore RES;
- Harness the renewable hydrogen potential of the Iberian Peninsula (including storage and support for the deployment of electrolysers to produce hydrogen).

Regular meetings are held to monitor the implementation of this action plan.

1.2.5 Administration responsible for the implementation of the PNIEC

The Directorate-General for Energy and Climate (DGEC) is responsible for developing and implementing policy on energy, energy raw materials, combating global warming and air pollution. It was introduced in 2008 by Decree No 2008-680 of 9 July 2008 and the Order of 9 July 2008. It includes the Directorate for Energy and since¹ July 2023 the Directorate for Climate, Energy Efficiency and Air (formerly the Climate and Energy Efficiency Service):

— **the Directorate for Energy** prepares and implements the policy to ensure the security and competitiveness of France's energy supply. It ensures the proper functioning of energy markets (electricity, gas, oil) under economically competitive and environmentally friendly conditions. It is also responsible for French nuclear energy policy. In these policy areas, it integrates the challenges of climate change and ensures the development of clean technologies. The Directorate implements government decisions on renewable energy;

— **the Directorate for Climate, Energy Efficiency and Air** develops and implements policy on combating climate change, adapting to climate change and combating air pollution. It proposes measures to control demand and rational use of energy for all energy uses, as well as measures to increase the use of renewable heat. It designs technical regulations on safety and pollutant emissions from road vehicles. It proposes and implements incentives to accelerate the placing on the market of safer or more environmentally friendly vehicles.

Moreover, since 2022, in order to ensure greater efficiency, the coordination of ecological planning has been entrusted to the General Ecological Planning Sector (SGPE), under the authority of the Prime Minister. The SGPE's mission is to ensure the coherence and monitoring of green policies, to initiate and frame the mobilisation of ministries and stakeholders, to coordinate all negotiations and finally to measure the performance of the actions carried out.

The PNIEC is drawn up and steered by the DGEC, in close connection with the SGPE for the impacts on the various sectoral policies.

1.2.6 Territorialisation of the PNIEC

Through the policies they can deploy at local level, the relay they provide with many actors and the funding they can provide, communities and regions have many levers to implement energy and climate policies. Some of these levers are exclusive competences on which several national guidelines of the National Low-Carbon Strategy are based.

As regards the policy on combating climate change, **in 2023 the Government started work on territorialising planning** with the creation of the **conferences of the regional parties, known as 'regional COPs'**. These COPs are designed to enable regions to take ownership of the planning exercise, to take part in national objectives and to translate them into concrete projects at the level of each citizen's catchment area. They are intended to enable the co-construction of realistic policy levers adapted to the specific characteristics of each territory in order to implement these ambitions. **These COPs are called upon to mobilise all local and regional stakeholders**, in a format to be defined by the prefecture of the region and the regional council. They are co-moderated by the regional prefect and the president of the regional council, and **are intended to be monitored annually beyond the 2024 work. This shared approach to ecological planning must ensure that the objectives are actually met at national level.**

As regards energy policy, multiannual energy programming is a national planning document with national renewable energy development objectives in particular. EPP 3 will be the first EPP, which will then see its objectives broken down locally, territory by territory, in a bottom-up logic. The EPP 3 will make this place-based work a priority, co-constructing with local authorities the method for determining these local objectives in order to ensure consistency between the ambitions of the territories, the planning documents at local level and the national guidelines for the energy transition.

1.2.7 Transposition of Directive (EU) 2018/2001 as amended

Following the adoption of the new Renewable Energy Directive on 9 October 2023, France started the transposition process.

Certain provisions have already been incorporated into the French body of legislation with the adoption of the Law of 10 March 2023 on the acceleration of renewable energy production, which transposes, in Article 19, Article f of the Directive, which provides for recognition of the response to an imperative reason of overriding public interest for renewable energy projects above a certain power threshold. The APER Law also provides for the establishment of maps of acceleration areas for renewable energy, which can serve as a basis for identifying the areas needed to achieve renewable energy development objectives.

In addition, a draft transposing law is under preparation and is expected to be discussed in the second half of 2024. This will include the transposition of bioenergy and sustainability provisions as well as offshore wind and protected species derogations.

Finally, other measures will be transposed by regulation. These include more operational provisions on the permit-granting process and guarantees of origin.

Work on the establishment of acceleration areas within the meaning of the Directive will also be launched shortly.

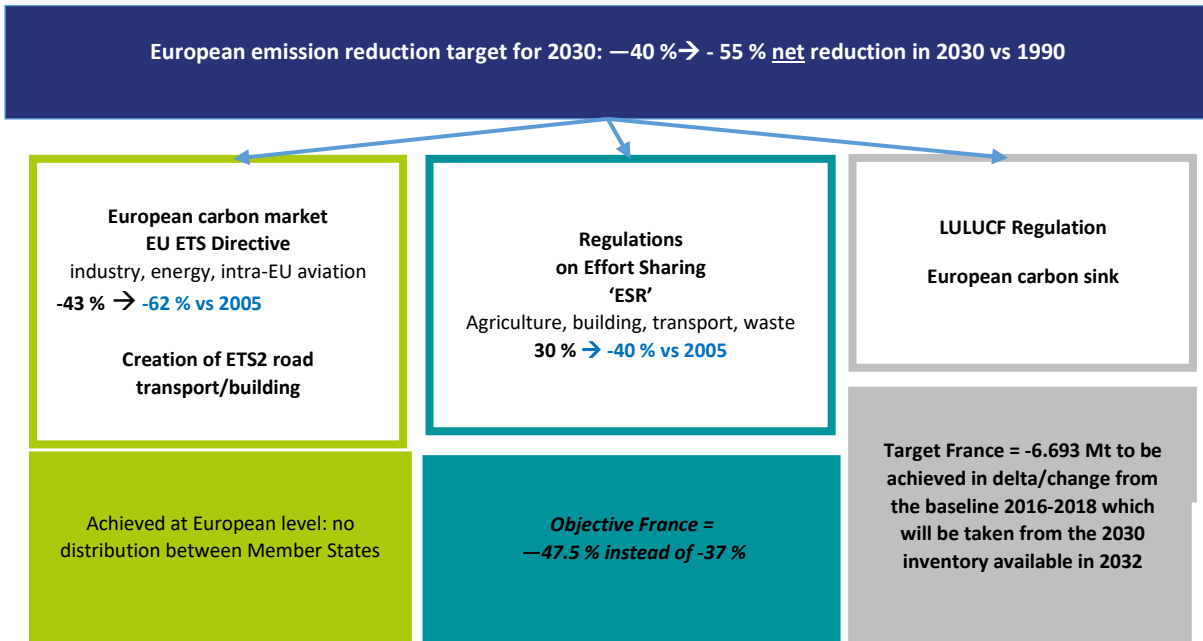
2. NATIONAL OBJECTIVES AND TARGETS

2.1. Decarbonisation dimension

2.1.1 *Greenhouse gas emissions and removals*

2.1.1.1 *European climate framework*

The diagram below sets out France's objectives in the architecture of the European climate framework.



2.1.1.2 *mitigation targets for France*

(a) *Enhancing France's 2030 climate ambition*

France sets the target of a gross reduction in GHG emissions of at least -50% in 2030 compared to 1990 (i.e. reaching a target of around 270 MtCO₂eq³³) (compared to -40% so far).

The provisional version of the baseline, produced as part of the preparation of SNBC 3, achieves the national target of -50% gross GHG emissions in 2030 compared to 1990 with 271 MtCO₂eq gross emissions in 2030 (see details in Part 5.1.1.1)

These results may change at the margin in line with future modelling iterations. In particular, the baseline scenario will be revised to take account, in particular, of stakeholders' feedback from the upcoming public consultation and ongoing or future work (post-2030 horizon, territorial COP, work with sectors).

(b) A short and medium term: carbon budgets

³³ The value of 270 Mt CO₂ eq is obtained by applying a 50% decrease in gross greenhouse gas emissions in the year 1990 (539 Mt CO₂eq) [Secten 2024].

In the short and medium term, France has carbon budgets, i.e. emission ceilings not to be exceeded in successive five-year periods. The carbon budgets are defined in the SNBC. Carbon budgets are set in relation to France's GHG emission reduction target trajectory³⁴. This trajectory is the result of extensive modelling work, updated every time the SNBC is revised. This exercise becomes more accurate in each revision cycle³⁵.

Every 5 years, a new carbon budget is defined when the SNBC is revised and **"future" budgets are adapted if necessary**. The SNBC 2 (in force³⁶) set the 2th, 3th and 4th carbon budgets covering the periods 2019-2023, 2024-2028 and 2029-2033, in line with the then French climate ambition³⁷.

The 2nd carbon budget (2019-2023) will come to an end when the final document of SNBC 3 is presented, so that it will not be amended a posteriori by this new strategy (apart from the technical adjustments linked to changes in the inventory provided for in the code for the surrounding area, see above). **A full review of this 2nd budget will be carried out in SNBC 3.**

On the other hand, **the 3th and 4th carbon budgets (2024-2028 and 2029-2033 periods) will be updated** in line with France's new climate ambition and the **5th carbon budget will be established** (2034-2038 period). They will be laid down by decree when the SNBC 3 is adopted.

A preliminary estimate of the 3th and 4th carbon budgets, as revised upon adoption of SNBC 3, could be calculated indicatively on the basis of the trajectory resulting from the modelling exercise³⁸. It is presented in the figure and tables below:

- the 3th carbon budget is estimated at 335 Mt CO₂eq excluding LULUCF and 327 Mt CO₂eq with LULUCF³⁹.
- the 4th carbon budget is estimated at 256 Mt CO₂eq excluding LULUCF and 239 Mt CO₂eq with LULUCF.

³⁴ They are then indicatively broken down by major sectors of activity: transport, residential and tertiary buildings, industry, agriculture, energy production and waste.

³⁵ Foresight modelling work is ongoing at national level. This is an **iterative** work, which gradually integrates the new data available and the effect of the measures envisaged. The first assumptions and trajectories presented in this document under the term 'provisional reference for SNBC 3' stem from the **second iteration of the scenario exercise**. They are not final. Future work will allow these hypotheses to be adjusted with a view to arriving at a definitive scenario which will form the basis for the final preparation of the SNBC 3.

³⁶ SNBC 2 was adopted in 2020

³⁷ Reduce France's gross greenhouse gas emissions by at least 40 % in 2030 compared to 1990 and achieve carbon neutrality in 2050 (cf. Decree No 2020-457 of 21 April 2020)

³⁸ Please note: this work was carried out on the basis of the latest CITEPA National Greenhouse Gas Emissions Inventory (Secten 2023), which leads to several methodological developments, the most impactful of which concern the agriculture and LULUCF sectors: From 15 March 2023, GHG emission inventories moved from GWP (Global Warming Potential) from AR4 (4th IPCC Assessment Report) to IPCC AR5 GWP (5th IPCC Assessment Report). In this update, the 100-year GWP of CH₄ and SF₆ increase, while those of N₂O and NF₃ decrease, leading to significant variations in agriculture and land (LULUCF). The spatial explicit LULUCF methodological improvement has also been implemented to comply with the EU 2023 reporting obligations. Finally, the use of the IPCC guidelines resulting from the 2019 revision also affected historical emissions from the agricultural sector.

³⁹ The figures are rounded to the nearest 1 Mt CO₂ eq.

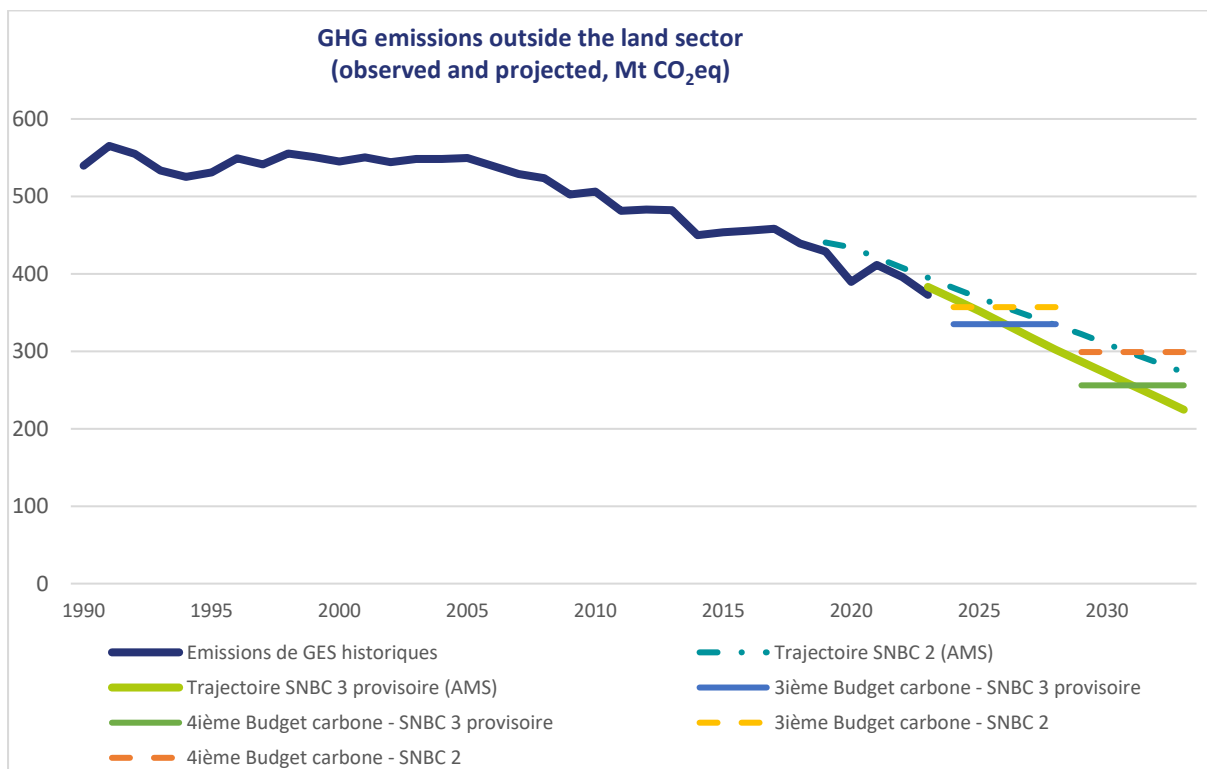


Figure 17: Trends in GHG emissions (Mt CO₂ eq) outside the land sector, comparison of trajectories and 3th and 4th carbon budgets of SNBC 3 and SNBC 3 (provisional).

(Sources: national greenhouse gas emissions inventory, Citepa, Secten 2024; DGEC Models)

The preliminary estimate of the **breakdown of carbon budgets by business area**, rounded to the nearest 1 Mt CO₂ eq, is as follows.

| Average annual emissions (in MtCO ₂ eq) | Reference years (Secten 2024) | | | 2 rd carbon budget (2019-2023) | 3 rd carbon budget (2024-2028) | | 4 rd carbon budget (2029-2033) | |
|--|-------------------------------|------|------|---|---|---------------------|---|---------------------|
| | 1990 | 2015 | 2019 | SNBC ⁴⁰ | SNBC2 | SNBC3 (provisional) | SNBC2 | SNBC3 (provisional) |
| Transport | 123 | 138 | 134 | 129 | 113 | 110 | 94 | 83 |
| Buildings | 93 | 85 | 76 | 78 | 61 | 51 | 44 | 33 |

⁴⁰ Technically adjusted carbon budgets in 2024 in accordance with the Environment Code (Article D. 222-1-B)

| | | | | | | | | |
|---|------------|------------|------------|------------|------------|------------|------------|------------|
| Agriculture | 89 | 83 | 79 | 78 | 73 | 71 | 68 | 65 |
| Of which N ₂ O* | 27 | 24 | 23 | 24 | 23 | 20 | 21 | 19 |
| Of which CH ₄ * | 50 | 46 | 44 | 43 | 41 | 40 | 38 | 37 |
| Industry | 140 | 84 | 79 | 75 | 65 | 60 | 53 | 42 |
| Production of energy | 79 | 50 | 46 | 48 | 36 | 32 | 30 | 26 |
| Waste | 15 | 14 | 15 | 12 | 11 | 10 | 10 | 7 |
| Use of land, change of use of land and forestry | − 18 | − 36 | − 19 | − 43 | − 42 | − 8 | − 46 | − 17 |
| Total (excluding LULUCF) | 539 | 454 | 429 | 420 | 357 | 335 | 299 | 256 |
| Total net (with LULUCF) | 521 | 417 | 410 | 377 | 315 | 327 | 253 | 239 |

Figure18: Preliminary estimate of the distribution of carbon budgets by areas of activity (source: DGEC).

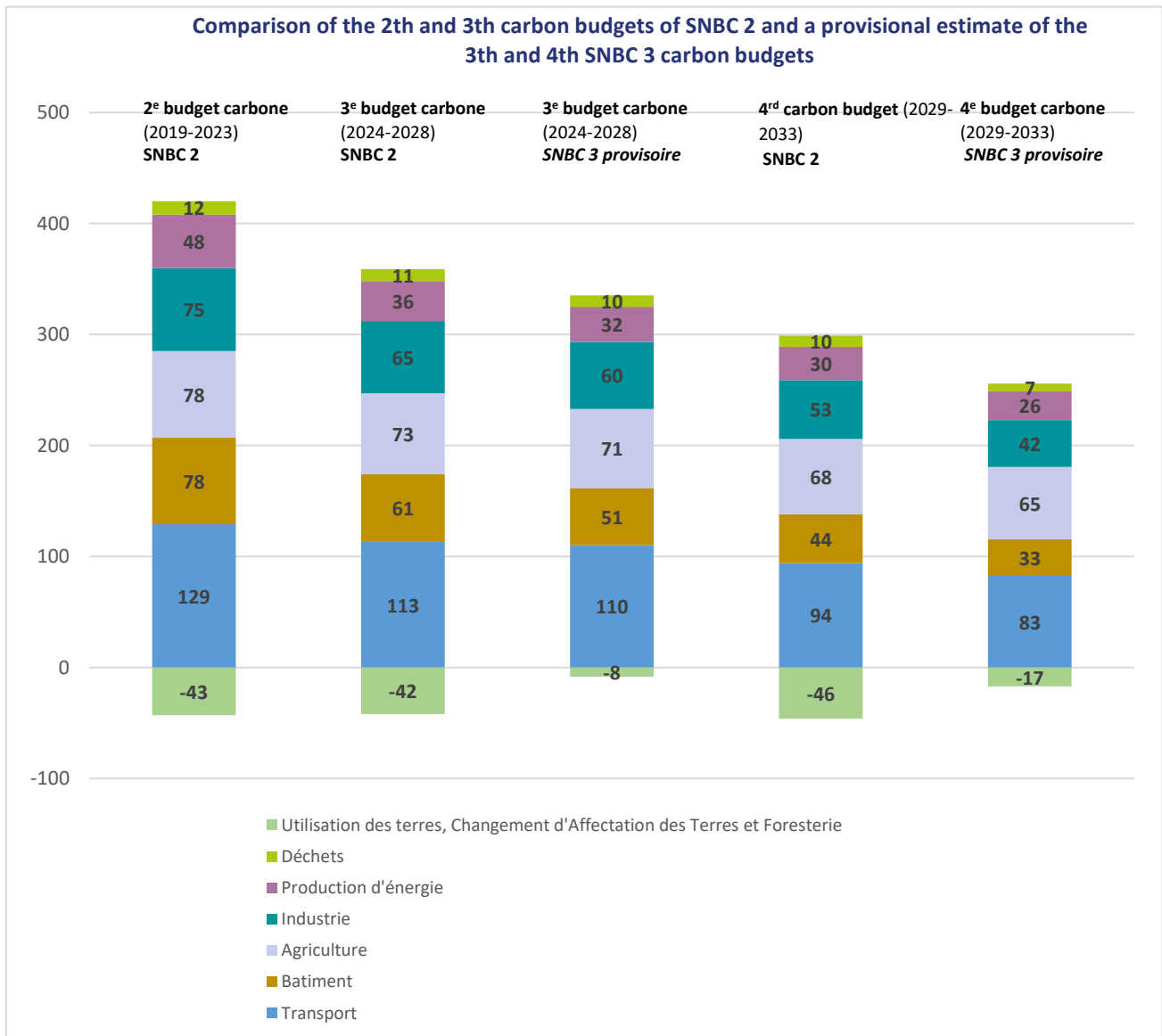


Figure19: Comparison of the 2th and 3th carbon budgets (technically indicatively and provisionally adjusted in 2024) of SNBC 2 and a provisional estimate of the 3th and 4th SNBC 3 carbon budgets calculated on the basis of the baseline (source: DGEC).

The preliminary estimate of the **distribution of carbon budgets by major sectors, in particular those for which France has entered into European or international commitments⁴¹**, rounded to the nearest 1 Mt CO₂ eq, is as follows.

| Average annual emissions (in MtCO ₂ eq) | Reference years (Secten 2024) | | 2 rd carbon budget (2019- 2023) | 3 th ^{carbon} budget (2024-2028) | | 4 th ^{carbon} budget (2029-2033) | |
|--|----------------------------------|------|--|---|------------------------|---|------------------------|
| | 1990 | 2015 | SNBC2 ⁴² | SNBC2 | SNBC3 (provisional) | SNBC2 | SNBC3 (provisional) |
| Sectors covered by the EU Emissions Trading Scheme (excluding civil aviation) | / | 100 | 99 | 81 | 68 | 67 | 50 |
| Sectors covered by the ESR Regulation (transport, buildings, agriculture, waste, energy and industry not covered by the ETS) | / | 350 | 316 | 271 | 263 | 227 | 202 |
| Domestic civil aviation | 4,2 | 4 | 5 | 5 | 4 | 4 | 4 |
| LULUCF (Use of Land, Change of Use of Land and Forestry) | — 18 | — 36 | — 43 | — 42 | — 8 | — 46 | — 17 |

Figure20: Preliminary estimate of the distribution of carbon budgets by major sectors (source: DGEC).

⁴¹ Application of Article L.222-1 B of the Environmental Code

⁴² Technically adjusted carbon budgets in 2 024 in accordance with the Environment Code (Article D. 222-1-B)

The preliminary estimate of the **breakdown of carbon budgets by greenhouse gas categories**, rounded to the nearest 1 Mt CO₂ eq, is as follows.

| Average annual emissions (in MtCO ₂ eq) | Reference years (Secten 2024) | | | 2 rd carbon budget (2019- 2023) | 3 rd carbon budget (2024- 2028) | | 4 rd carbon budget (2029- 2033) | |
|---|----------------------------------|------------|------------|--|---|------------------------|---|------------------------|
| | 1990 | 2015 | 2019 | SNBC2 ⁴³ | SNBC2 | SNBC3 (provisional) | SNBC2 | SNBC3 (provisional) |
| CO ₂ (excluding LULUCF) | 399 | 341 | 332 | 316 | 266 | 252 | 215 | 183 |
| N ₂ O (excluding LULUCF) | 52 | 29 | 29 | 29 | 27 | 24 | 25 | 21 |
| CH ₄ (excluding LULUCF) | 78 | 64 | 62 | 60 | 55 | 54 | 52 | 47 |
| F-gases (excluding LULUCF) | 11 | 19 | 18 | 15 | 9 | 6 | 7 | 4 |
| Total (excluding LULUCF) | 539 | 454 | 429 | 420 | 357 | 335 | 299 | 256 |
| CO ₂ (with LULUCF) | 378 | 303 | 286 | 272 | 223 | 241 | 168 | 164 |
| N ₂ O (with LULUCF) | 54 | 30 | 31 | 30 | 28 | 25 | 26 | 23 |
| CH ₄ (with LULUCF) | 79 | 65 | 63 | 61 | 56 | 55 | 52 | 48 |
| F-gases (with LULUCF) | 11 | 19 | 18 | 15 | 9 | 6 | 7 | 4 |
| Total (with LULUCF) | 521 | 417 | 410 | 377 | 315 | 327 | 253 | 239 |

Figure21: Preliminary estimate of the breakdown of carbon budgets by categories of greenhouse gases (source: DGEC).

⁴³ Technically adjusted carbon budgets in 2 024 in accordance with the Environment Code (Article D. 222-1-B)

In addition, under the Environmental Code, SNBC 3 will also incorporate **indicative carbon budgets for international bunkers** (accounted for outside total national emissions in accordance with international standards). A **preliminary estimate** of these carbon budgets could be calculated **indicatively** on the basis of the trajectory resulting from the modelling exercise carried out. It is presented in the table below.

| Average annual emissions (in MtCO ₂ eq) | Reference years (Secten 2024) | | | 2 rd carbon budget (2019- 2023) | 3 rd carbon budget (2024- 2028) | | 4 rd carbon budget (2029- 2033) | |
|---|----------------------------------|------|------|--|---|------------------------|---|------------------------|
| | 1990 | 2015 | 2019 | SNBC2 | SNBC2 | SNBC3 (provisional) | SNBC2 | SNBC3 (provisional) |
| International bunkers | 17,5 | 23,4 | 24,8 | / | / | 23,2 | / | 22,7 |
| of which international air bunkers | 9,4 | 17,8 | 19,2 | / | / | 18,5 | / | 18,3 |
| of which international maritime bunkers | 8,0 | 5,6 | 5,5 | / | / | 4,8 | / | 4,3 |

Figure22: Provisional estimate of the 3th and 4th indicative carbon budgets for international bunkers calculated on the basis of the baseline (source: DGEC).

(c) Horizon 2050

France **reaffirms its objective of achieving carbon neutrality in 2050**, i.e. net zero emissions on national territory, set by the Government’s Climate Plan published in July 2017 and now enshrined in the law.

Since 2021, the Government has focused on the 2030 SNBC 3 horizon, which is an important step towards putting France on the right path towards carbon neutrality. A detailed plan comprising objectives, trajectories, policy levers and financial means has thus been drawn up for this horizon. This was the government’s priority as the first step needed to put the country on the right path towards achieving carbon neutrality.

The 2050 horizon is subject to more uncertainty and deserves specific consideration in relation to the closing issues of each sectoral decision. However, the 2050 horizon is now preparing to put in place the long-term policies needed to further reduce emissions after 2030. This is the focus of the ecological planning carried out under the auspices of the Prime Minister. **Work on this 2030-2050 horizon of SNBC 3 is continuing at national level with a view to achieving a final SNBC 3 in the course of 2025 incorporating sectoral trajectories up to 2050.**

2.1.1.3 effort Sharing Regulation (ESR)

The revised European Effort Sharing Regulation (ESR) aligned the Member States’ targets for reducing GHG emissions from the transport, buildings, agriculture and waste sectors with the new European target for 2030. As such, France’s new reduction target for this area is -47.5 % by 2030 compared to 2005 (instead of -37 %).

Furthermore, the ESR obligation relates not only to the achievement of an emission reduction target in 2030 but also to compliance with a cumulative carbon budget for the whole period 2021-2030. Every year, countries must comply by surrendering as many emission allocations⁴⁴ as they have emitted for the sectors submitted. These targets largely shape the decarbonisation effort that France will have to make for the perimeter of these emitting sectors.

The provisional modelling prepared as part of the SNBC revision shows that the **trajectory of ESR targets would be respected in the Reference Target Scenario (AMS Scenario). Cumulatively, in the provisional scenario “AMS run 2”, the total surplus 2021-2030 is 85 MtCO₂e with 63 MtCO₂e less emissions compared to allocations over the period 2021-2025 and 22 MtCO₂e less than allocations over the period 2026-2030. Specifically in 2030, the scenario reaches 215 MtCO₂e on the ESR perimeter for an allocation of 211 Mt.** This difference is within the margin of error of the estimate and is well below the accumulated surplus over the period as a whole. The estimated total surplus over the period 2021-2030 is higher than the previously estimated surplus (draft update of the integrated national energy and climate plan) due to lower than anticipated emissions from 2022-2023 and lower ESR share in total projected emissions (recovery of historical trend).

Since the projections show that the trajectory for 2030 and the cumulative carbon budget over the period 2021-2030 will be respected under the Regulation (ESR), France does not plan, a priori, to use external flexibilities for its compliance, beyond those within the ESR’s year-to-year.

Due to the uncertainties on the level of LULUCF emissions, these projections do not include a possible shortfall in compliance with the LULUCF Regulation over the period 2021-2025 that could be addressed by the mobilisation of flexibilities under the LULUCF Regulation (see section 2.1.1.4).

⁴⁴ Annual Emissions Allocation – 1 AEA corresponds to 1 tCO₂e

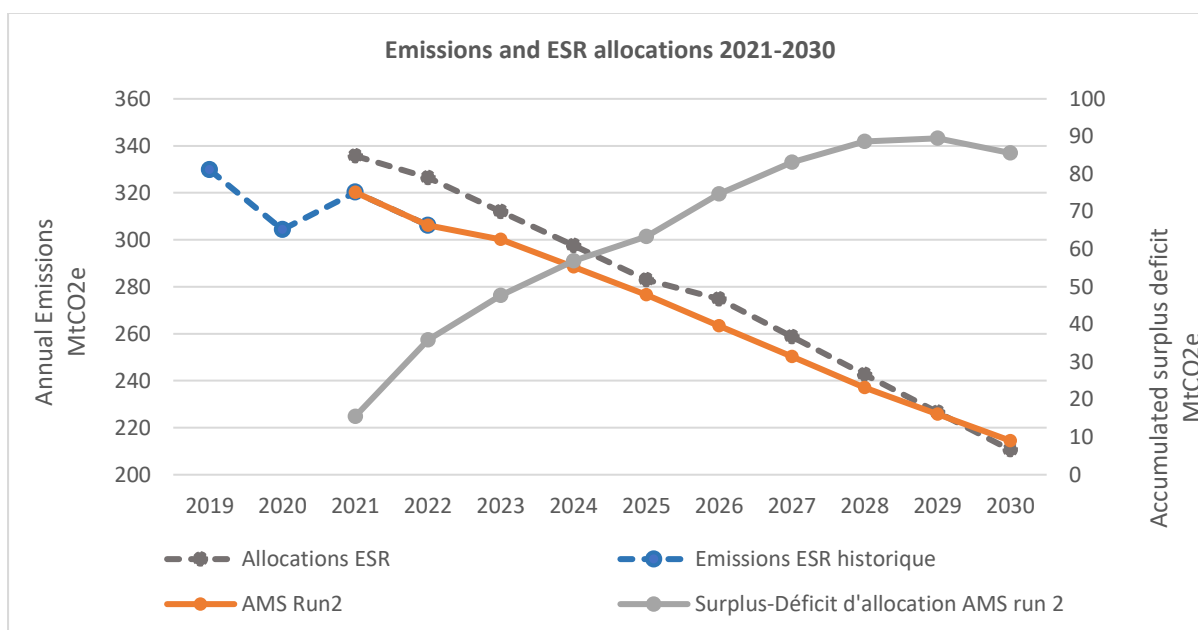


Figure23: Emissions and ESR allocations for the period 2021-2030. The ESR trajectory is calculated from the total emissions of the AMS run 2 scenario to which the average ESR share 2021-2022 is applied

2.1.1.4 application of Regulation No 841/2018 on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry. — LULUCF

As regards the forestry and land sector, Regulation No 2018/841 provides for the application of accounting for emissions and removals from these sectors and for a commitment on the part of the Member States to ensure that emissions do not exceed removals in the period 2021 to 2025 (the ‘no emit’ rule) in accordance with those accounts. This **Regulation takes into account the efforts that France will have to make in terms of forest management, the enhancement of long-lived uses for wood from French forests, and carbon storage in agricultural land** (e.g.: preservation of meadows, hedges, etc.) or reduction of land take.

As regards forest management, France sent its Forest Accounting Plan in January 2020, in accordance with Article 8 of Regulation No 841/2018, and including the calculation of the reference level for managed forests estimated at -55,40 MtCO₂e over the period 2021-2025.

Following the revision of Regulation No 2018/841 as part of the ‘Fit for 55’ package (by Regulation (EU) 2023/839 of 19 April 2023), the accounting rules have been simplified and the Member States are set a target for 2030 (for France: -6,693 MtCO₂e improvement to be achieved between the average of the 2016-2018 inventory and the year 2030). This target will be accompanied by a budget 2026-2029 which will be set in 2025 on the basis of the inventory values 2021 to 2023 (also set in “relative value”).

The **LULUCF** (Land Use, Land Use Change and Forest) sector is currently a **net carbon sink**. This means that it generates more removals of CO₂ than emissions. For the time being, this is the only way for France to generate significant removals of CO₂.

In 2022, the absorption of the sector was 18 Mt CO₂ eq (Citepa, Secten 2024). The carbon sink of this sector has fallen sharply over 10 years, largely due to the effects of climate change, resulting in increased mortality and lower growth in forests (drought, heatwave, fires, pests).

As a result of climate change, the French forest, which is highly dependent on climate change, is currently experiencing **a crisis of mortality and significant growth leading to a fall in its carbon sink**. Both researchers and experts have difficulties in deciding on its duration and a potential exit from the crisis. Thus, the choice has been made to focus on a central scenario (the one presented here) but also to establish a 'strong climate change' scenario, where the forest sink will be modelled in the light of a continuous crisis and which will prepare for possible less favourable situations. In order to emerge from this crisis, adaptation measures are and will be put in place to renew forests and plant species adapted to France's future climate. However, the impact of these renewal plans on the carbon sink can only be observed in the long term and sometimes after 2050, when stands planted in the next ten years reach maturity and sequester significant amounts of carbon each year.

The 2024 edition inventory for 2022 estimates an average of the years 2016-2018 at around -25 MtCO₂e. France's target for 2030 should therefore, for the time being, be set at -31 MtCO₂eq. To achieve this objective at national level, France's strategy is to stabilise the mortality and decline in forest growth and to adapt them to climate change through a massive forest renewal plan and to enhance harvesting in long-lived timber products to increase the sink. These objectives are reflected in the various calls for projects France Relance and France2030 on forestry upstream and downstream: Forest renewal, constructive wood system. These measures will have to be complemented in the short term by incentives for afforestation, as well as increased requirements for the preservation of forest soils.

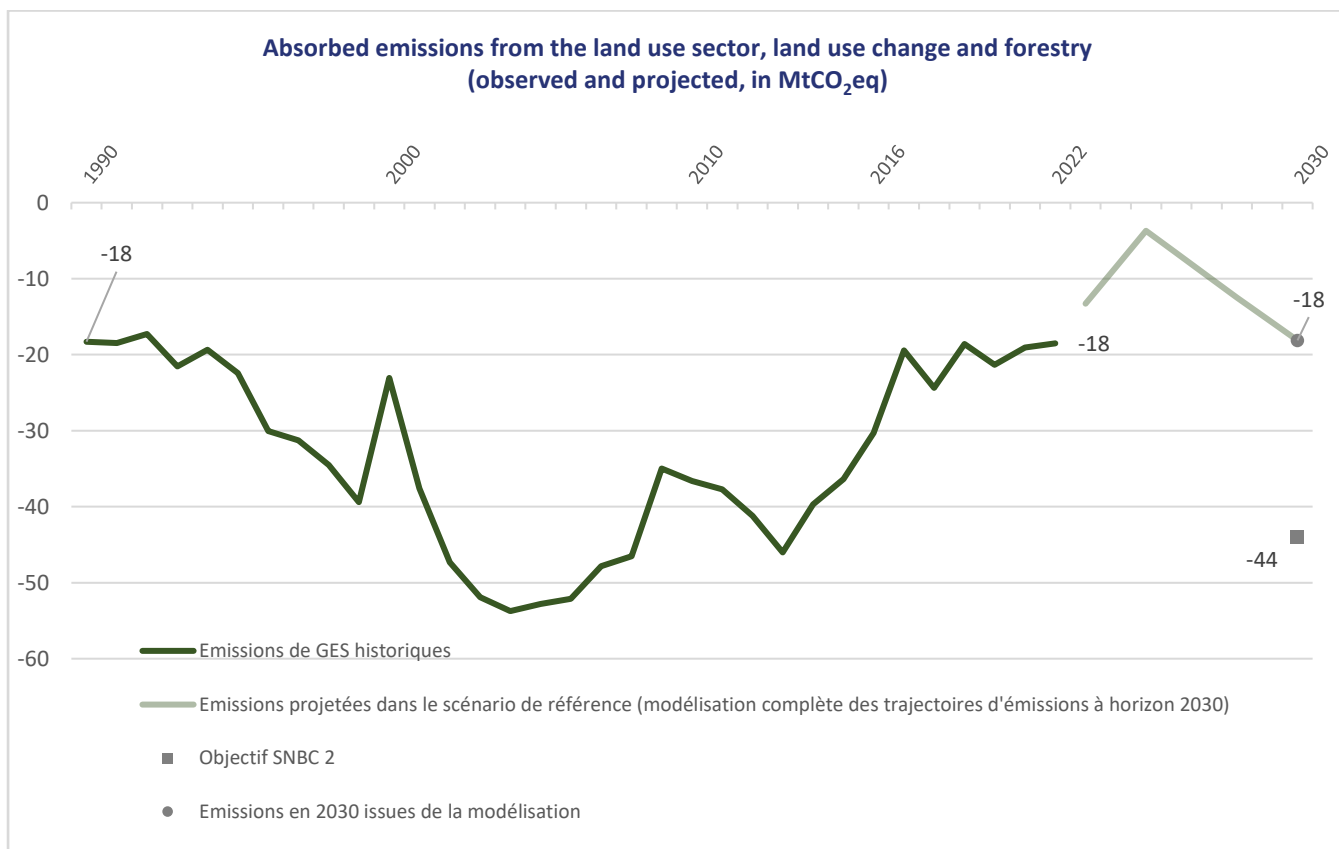


Figure 24: Trends in LULUCF emissions in Mt CO₂eq (source: national greenhouse gas emissions inventory, CITEPA, Secten 2024; DGEC Models)

In the current state of the French inventories (submitted in 2024, with data considered final for 2022), and taking into account the methodology currently applied, the unfavourable evolution of the essential parameters of French forest, namely mortality and gross biological growth, could lead to a significant projected LULUCF deficit over the period 2021-2025, mainly due to the result on the category of 'managed forest land' and the comparison with the FRL (Forest Reference Level).

There is considerable uncertainty at this stage on the possible mobilisation of the flexibilities of Article 13 ('flat-rate' flexibility linked to 'managed forest land', conditional on the achievement of objectives at Union level) and of Article 10 (taking into account natural disturbances). As regards Article 10, we consider that it should be possible to mobilise this Article to take account of the sharp increase in forest mortality since 2012, including diffuse mortality not directly linked to specific and localised disturbances.

However, even if the flexibility of Article 10 were to be mobilised, a deficit could still be observed.

2.1.1.5 methane emissions

The European Union (EU) and France individually committed to the Global Methane Pledge (GMP), an initiative launched at COP26. The Global Methane Pledge commitment is collective in nature, with PMG signatories committing to cooperate to reduce global methane emissions by 30 % between 2020 and 2030.

The statement covers all sectors of activity, but acknowledges that the main short-term fields concern the energy sector. Subsequently, the EU published its Methane Action Plan under GMP at the end of 2022, which indicates **that at EU level, the targeted methane emissions reductions by 2030 would reach 23 % compared to 2020, and just over 50 % compared to 1990.** This objective, which is not broken down by sector, should enable the EU to contribute to this global ambition in line with the methane emission reduction fields on its territory.

Preparations for SNBC 3 will focus on establishing a pathway for methane emissions consistent with this new target.

2.1.1.6 adaptation objectives

France is preparing its third national climate change adaptation plan (PNACC-3) and plans to finalise it in the course of 2024.

France is currently implementing its second National Plan for Adaptation to Climate Change (PNACC-2).

The general objective of the second National Plan for Adaptation to Climate Change (PNACC-2) is to implement the measures necessary to adapt the territories of France hexagonal and overseas France to the expected regional climate change by 2050. In line with the long-term objectives of the Paris Agreement and with the relevant objectives of other international conventions, France will have to adapt to the share of climate change that past emissions of greenhouse gases accumulated in the atmosphere are now inevitable. The assumption for PNACC-2 was an increase in the global average temperature of 2 °C in 2050 compared to the pre-industrial era, even though France is acting nationally and internationally to limit this increase to 1.5 °C.

Some adaptation policies and measures can contribute to achieving the objectives and targets of the Energy Union. The implementation of these policies and measures corresponds to the adaptation objectives under the PNIEC. In the work on EPP and SNBC, some interactions between climate change and the energy system have been taken into account (including changes in consumption in buildings). For example, the 2th **National Plan on Adaptation to Climate Change, adopted in December 2018**, provides for several actions to help adapt forests to climate change.

A first version of **the 3PNACC**, resulting from several months of work with representatives of all stakeholders, will be subject to public consultation in the course of 2024. The 3 NCDP will be organised along 5 main axes aimed at: (1) protect the French, (2) develop the territory and ensure the continuity of essential infrastructure and services, (3) improve the resilience of the economy, (4) protect natural and cultural heritage and (5) mobilise all the strong forces of the nation to successfully adapt to climate change.

The 3 PNACC aims to prepare France for the consequences of global warming of 3 °C by 2100, or + 4 °C for hexagonal France. This trajectory is the national reference trajectory for France's adaptation to climate change⁴⁵. It was subject to public consultation from 23 May to 15 September 2023. 1124 contributions were received, including 31 from public and private institutions (state services and operators, business federations, etc.). For the first time, the National Climate Change Adaptation Plan is therefore based on a concerted warming path that can be reflected in all public policies up to 2100.

⁴⁵<https://www.ecologie.gouv.fr/trajec-toire-rechauffement-reference-ladap-tation-au-changement-climatique-tracc>

The 3 PNACC was designed with an inclusive approach involving all stakeholders. Its measures were discussed in four working groups bringing together representatives of local and regional authorities, the State and its operators, trade unions, economic sectors and associations, meeting from July to December 2023. This co-construction will continue with the public consultation, which will make it possible to enrich the document with contributions from citizens and adaptation stakeholders.

Other policies and measures are mentioned in section 3.1.4.

2.1.1.7 CCS/CCU

Technologies for capture, storage and valorisation of CO₂ are necessary for the decarbonisation of activities for which there is no low-carbon alternative in the medium term. This is particularly the case for many industrial emissions directly linked to the process used (cement, lime, chemistry, metallurgy, etc.). As storage is available in limited quantities, the use of CCS is foreseen to address uncompressed residual emissions and must therefore complement energy efficiency actions and a comprehensive decarbonisation plan, starting with the prevention of emissions at source through the evolution of industrial processes.

In France, the use of CCS in the industrial sector is planned as of 2027. The volumes of captured CO₂ referred to in the state of play and prospects for CCUS deployment in France published in July 2024⁴⁶ could reach 4 to 8,5 MtCO₂ per year by 2030 and between 30 and 50 MtCO₂ per year in 2050 for all sectors (including biogenic CO₂). The SNBC 3 project (provisional scenario) aims at a volume of 6.6 Mt captured in 2030. This volume is 3.3 Mt captured in the primary metals sector (of which 0.5 Mt biogenic), 2.2 Mt in the chemical sector (of which 0.5 Mt biogenic) and 1.2 Mt (including 0.2 Mt biogenic) in the non-metallic minerals sector (in particular cement and lime). Letotal captured in 2030 of 1.2 Mt of biogenic CO₂ and 5.4 Mt of fossil CO₂. 10 % of this volume corresponds to CCU, used for the production of e-fuels. By 2050, beyond the capture of CO₂ in the industrial sector, CCS will contribute to carbon removals and to the objective of climate neutrality.

At national level, the development of CCUS technologies is supported under the 'France 2030' investment plan through the strategy for decarbonising industry with an overall budget of EUR 4.5 billion. Under the innovation component, the development of new technologies for capturing CO₂ is eligible for the calls for projects "DEMIBaC" and "IBAC PME" led by ADEME. A new support scheme to support large industrial decarbonisation projects, such as the installation of CO₂ capture units for geological storage, was announced in June 2023 and launched at the end of 2024. A public consultation on the draft tender specifications, accompanied by a call for expressions of interest, was published in June 2024⁴⁷, prior to the publication of the call for tenders.

France does not yet have a geological sequestration capacity of CO₂. Studies to assess these capacities were launched in early 2024. In addition, the 'France 2030' investment plan could devote EUR 25 to EUR 30 million to accompany the carrying out of studies or works to improve knowledge of the French basement capacities in terms of the storage of CO₂ (seismic campaigns or injection tests).

Finally, the deployment of the CCUS in France requires reflections on the transport of CO₂, for which different methods can be envisaged, such as pipelines, or alternatively the train, barge or lorry. The relevance of these various vectors is currently the subject of a consultation of the sector, which should feed into the reflection on

⁴⁶ https://www.ecologie.gouv.fr/sites/default/files/documents/Strategie_nationale_CCS.pdf

⁴⁷ https://agirpourlatransition.ademe.fr/entreprises/actualite-entreprises?ressource_id=1132

the CO2 transport framework models^{to be} provided in order to enable the sector to develop properly, and a task entrusted to the Energy Regulatory Commission.

2.1.2 Low carbon energy

France will meet its targets for the share of renewable energy in its gross final consumption for the year 2020. The 23 % renewable energy target is expected to be reached in 2024, and France will continue this renewable energy development path in order to contribute to the ambitious EU 2030 target.

Indeed, the share of renewable energy in gross final energy consumption in France already amounts to 22,2 % in 2023, according to provisional data calculated in accordance with the rules of Directive (EU) 2018/2001 on the promotion of the use of renewable energy. It thus increased by 1,7 points in 2023 compared to 2022. These provisional data, if they give a clear indication of the growth dynamics of renewable energy in France, will still have to be confirmed in the autumn.

Taking into account these data and the commissioning of new renewable energy generation capacity, **the target set for France for 2020 of a 23 % share of renewable energy in gross final energy consumption will be reached in 2024 and would even be exceeded by almost one point.**

The French energy and climate strategy makes it possible to estimate France's gross final consumption of renewable energy in 2030 at around 2 030 TWh. The sustained pace of development of the various renewable energy sectors used in the scenarios of the French energy and climate strategy (SFEC) and the efforts to achieve energy efficiency and sobriety will thus enable France to make a significant contribution to achieving the Union's 2030 energy targets.

It should be noted that the trajectories presented correspond to the latest models performed. The modelling exercise is an iterative task, consisting of identifying specific measures on a sector-by-sector basis, determining the impact on consumption, comparing it with the overall target and then restarting if the latter is not achieved. The final target set by France in its French energy and climate strategy will be specified at the end of the latest ongoing modelling.

France has one of the most decarbonised energy and electricity mix in the European Union, and one of the largest increases in the EU's share of renewable energy since 2012 (+ 40 %).

The trajectory set by the revision of the French energy and climate strategy and reflected in the PNIEC will allow France to reach 58 % of decarbonised energy in its final energy consumption and 71 % in 2035, which fully contributes to the European objectives. The French generation strategy also provides for covering all its electricity needs, while significantly increasing the decarbonisation of its energy mix, thus playing its full role throughout the transition in the security of electricity supply of the European continent. In the same spirit of responsibility, the scenarios for accelerating renewables in France provide for a conservative floor scenario in terms of renewable energy production, in order to have margins for our collective security of supply. The potential in France expressed by the sectors is higher and France will be authorised to support the development of renewable energy sources as far as possible and beyond this objective, so as to move away from fossil fuels more quickly, as the acceleration of the deployment of renewable energy already under way is confirmed. Moreover, the French electricity mix, made up mainly of nuclear and renewable energy, is already decarbonised by almost 90 %.

The priority is to maintain the objectives of phasing out fossil fuels, with a significant reduction in energy consumption and the development of all decarbonised energy carriers. The French strategy thus makes it possible to achieve levels of only 42 % of fossil energy in the energy mix in 2030 and 29 % in 2035 (including an exit from the residual share of coal in the electricity mix from 2027).

Summary of objectives:

| | Objective | Horizon |
|---|---|----------------|
| Final energy consumption ⁴⁸ | National Objective: move towards – 30 % in 2030 compared to 2012 (i.e. 1 243 TWh or 106,9 Mtoe) | 2030 |
| Primary energy consumption ⁴⁷ | EU target of – 36 % compared to 2012 (1 844 TWh or 158,6 Mtoe) | 2030 |
| Primary energy consumption – Charbon | Reduce coal-based primary energy consumption by 70 % in 2030 and 75 % in 2035 compared to 2012 | 2030 and 2035 |
| Primary energy consumption – Natural gas | Reduce natural gas-based primary energy consumption by 40 % in 2030 and 60 % in 2035 compared to 2012 | 2030 and 2035 |
| Primary energy consumption – Petroleum products | Reduce primary energy consumption based on petroleum products by 50 % in 2030 and 70 % in 2035 compared to 2012 | 2030 and 2035 |
| Share of renewable energy consumption in gross final energy consumption | Estimated at around 570 TWh of final renewable energy consumption | 2030 |
| Installed electric RES capacity | <p>In 2030: MINUTES: 54 to 60 GW Terrestrial Eolien: 33 to 35 GW Eolien at sea: 3.6 GW Hydropower (including STEP): 26.3 GW</p> <p>In 2035: MINUTES: 75 to 100 GW Terrestrial Eolien: 40 to 45 GW Eolien at sea: 18 GW Hydropower (including STEP): 28.5 GW</p> | 2030 and 2035 |
| Share of renewable heating and cooling in heating and cooling consumption | National target of 45 % in 2030 and 55 % in 2035 | 2030 and 2035 |
| Share of renewable energy in the buildings sector | Indicative national target of 49 % in 2030 | 2030 |
| Nuclear production capacities | 9,9 GWe of new capacities committed by 2026 further study of a possible reinforcement of the nuclear power programme in order to be able by 2026 to take a decision on a possible second step of at least 13GWe | 2026 |
| Carbon intensity of energy used in the transport sector | Reduction of greenhouse gas emissions of energy used by 14.5 % in 2030 and 25 % in 2035 | 2030 and 2035 |

⁴⁸ according to the scope of the EED (2023/1791/EU)

| | | |
|-----------------------------------|---|---------------|
| Renewable gas production capacity | Gas injection of 15 % renewable gases into the gas network in 2030 | 2030 |
| Flexibility installed capacity | 6.5 GW of demand response (PPE 2019-2028) in 2028, to be reassessed in the context of the future EPP and in relation to the new EMD provisions | 2028 |
| | Between 28 and 68 GW of additional flexibility requirements (including production, demand, storage) according to RTE's report 'Energy Beans 2050'. Work is under way to reassess these objectives for 2030 and 2035, on the basis of the "flexibilities" chapter of the TEN forecast report, which will be published shortly. | 2030 and 2035 |
| | | 2050 |
| | | |

Figure25: Summary of the EPP Objectives 3

2.1.2.1 electrical production

Electricity now accounts for just over a quarter of final energy consumption in France. It is largely decarbonised through nuclear production (around 65 % in 2022) and renewable (around 25 % in 2022).

Despite an overall decrease in energy consumption, electricity consumption will increase sharply as a result of the electrification of many uses (transport, heating, industry, etc.) to account for more than 50 % of our energy consumption by 2050. This leads to a **sharp shift in the need for the development of decarbonised electricity sources already in 2025 and to the need to recover nuclear production from its 2022 level.**

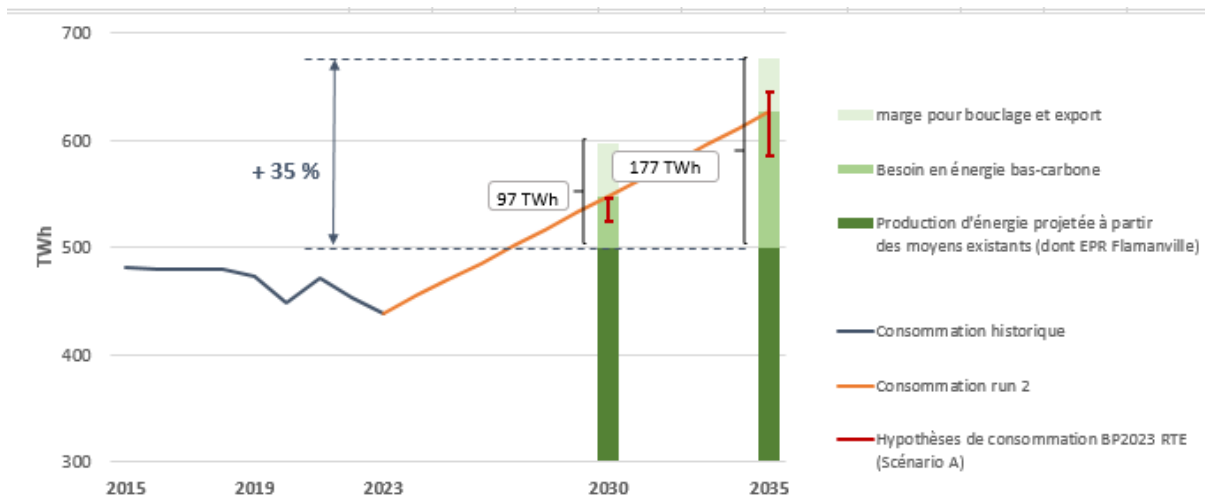


Figure26: Projected electricity consumption at 2030 and 2035 (Source: SGPE/DGEC modelling)

In order to cope with these increases in consumption, it is necessary to rely on an electricity mix based on the two low-carbon production pillars available – nuclear, with the reinforcement of the production of the existing fleet and the construction of new reactors, and renewable electric energy, which will have to be highly

developed, taking into account the development times specific to each sector. The analyses, including those of RTE initially presented in its report entitled 'Features 2050', published at the end of 2021 and confirmed by its 2023 forecast balance sheet, showed that the logic of adding low-carbon electricity production, through the development of renewable energy sources and the continued operation of existing nuclear reactors, increased the chances of achieving our climate targets and was economically efficient.

Beyond the projects already committed (Flamanville 3 reactor, onshore and offshore wind farms, photovoltaic projects) and the objective of restoring the availability of existing nuclear reactors:

- By 2030, the 7 offshore wind farms resulting from the 1-3 tenders will be put into operation. By that time, only additional onshore wind and photovoltaic projects can make a significant contribution to increasing decarbonised electricity generation capacity;
- Between 2030 and 2035, the commissioning of offshore wind farms currently under development, allocation, planned or resulting from the ongoing planning exercise will provide a complementary contribution;
- Post 2035, the gradual deployment of the new EPR 2 and small modular or innovative nuclear reactors, as well as the continued operation of the existing fleet of nuclear reactors, will make it possible to significantly strengthen the electricity generation fleet in addition to the further development of renewable energies.

While the central scenario used in this document is conservative that of nuclear production of 360 TWh over the whole period, the objective given to EDF, and endorsed by the company's management as a managerial ambition, is to achieve annual nuclear production in excess of 400 TWh. Like RTE in its forecast balance, it was decided to take into account in the modelling a conservative assumption of annual average production of 360 TWh by 2035 in the event of contingencies. Compared to the year 2022, when nuclear production was 280 TWh, this represents an increase in nuclear production of 80 TWh in the median scenario and 120 TWh in the target scenario. All investments to regain state-of-the-art management capacities will be prioritised. The development of hydropower capacity is possible – albeit to a limited extent in the absence of renewal of concessions – and is necessary: although the total energy produced will not necessarily increase due to the likely impact of climate change on water resources (lower throughput), the development of total installed capacity will be a valuable lever for the balance of the electricity system both for peak consumption and for the total volume of production.

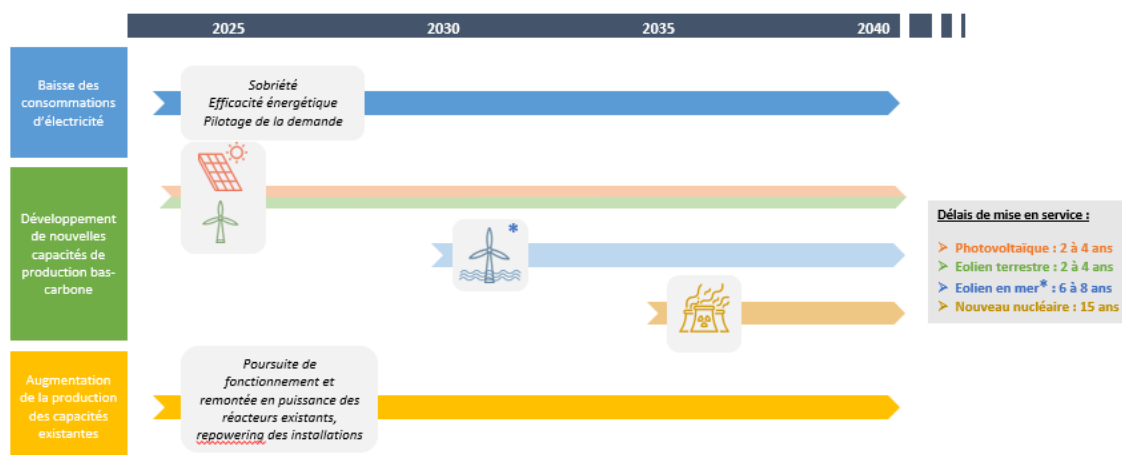


Figure 27: Timeliness of the levers available to ensure the energy loop in electricity

* Offshore wind projects launched since 2010 will gradually join the generation park to 3.6 GW in 2030, including 1.5 GW already in operation in summer 2024. It is therefore displayed here only when new projects are put into operation. This graph does not present the challenge of increasing the nuclear production of the existing fleet, since it is not new capacity.

The ongoing work on the Third National Climate Adaptation Plan envisages integrating the consequences of changes in consumption and production into energy programming exercises: stress-tests modelling extreme situations (heatwave or cold wave combined with wind-free periods) will make it possible to estimate the resilience of the electricity system. The models will be carried out by RTE as part of the preparation of the forecast balances and trajectories proposed by the future multiannual energy programming.

2.1.2.2 electric renewable energy

In 2035, at least an additional 177 TWh of electricity from renewable energy will have to be produced compared to 2022 to meet the growth in demand and ensure our security of supply. This will be achieved by the proactive deployment of all sectors (photovoltaic, wind and hydropower), reaching around 120 GW in 2030 and between 160 and 190 GW in 2035, which means in particular:

- For photovoltaic: double the annual rate of development of new capacity by working on a balanced distribution between ground plants, large roofs, and residential ones;
- For onshore wind: maintain the current pace of deployment by ensuring a more balanced distribution of installations across the territory and investing in the repowering of existing facilities.

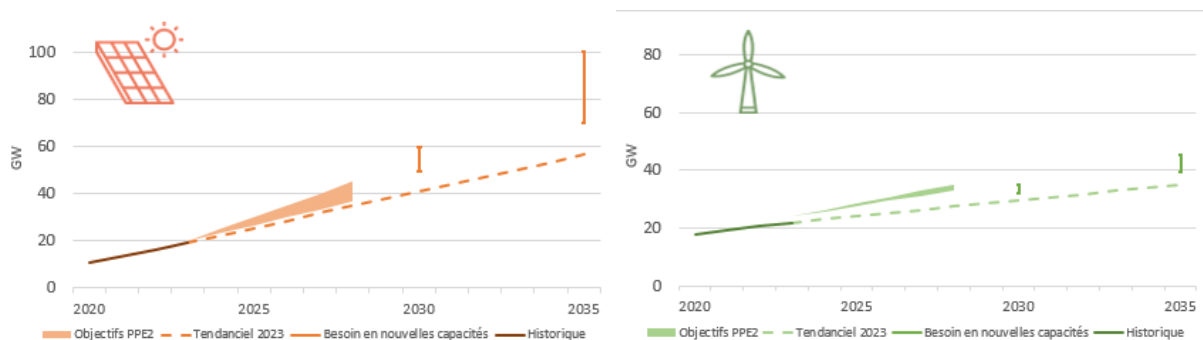


Figure28: Onshore renewable energy development trajectory in GW (Source: DGEC Models)

The installed offshore wind capacity in 2030 is expected to be 3.6 GW. The parks resulting from the 4-8 calls for tenders, ongoing or awarded, will allow a total capacity of around 8 GW to be reached in the following years. **The challenge will then be to achieve the objective of the 18 GW Offshore Wind Pact launched in 2035, while creating the conditions for further ambitious development in the following years (around 2 GW/year).**

While the development of offshore wind has significantly accelerated since 2019, with extensions already identified for some parks, long-term planning is needed to reach a target of more than 45 GW in 2050. **In order to secure this trajectory to 2035, the EPP 3 will include allocating an additional 8-10 GW by the end of 2026, following the planning exercise of the four maritime facades conducted between the end of 2023 and mid-2024. In line with the objectives of the Offshore Wind Pact and consistent with the objectives of the Offshore Wind Pact, a new call for tenders of an equivalent size may be launched by 2030.**

On the other marine renewable energies, the EPP 3 may provide for the launch of pre-commercial hydrolink tenders, subject to changes in the costs of the technology.

For hydropower, which is today the largest source of renewable electricity (42 % of renewable electricity generation and a total capacity of 25.7 GW in 2023), **the objective will be to increase installed capacity by 2.8 GW by 2035, largely on existing installations. This 2.8 GW will include around 1 700 MW of pumped power transfer stations – essential to increase our electricity storage capacity – 640 MW on installations above 4.5 MW and 485 MW on installations below 4.5 MW.**

The EPP3 will therefore strengthen the development of renewable electric energy and the following objectives could be set:

| Installed capacity in GW | 2022 | 2030 | 2035 |
|-----------------------------------|---------|-------------|--------------|
| Photovoltaics | 15.9 GW | 54 to 60 GW | 75 to 100 GW |
| Onshore wind | 20.6 GW | 33 to 35 GW | 40 to 45 GW |
| Eolien at sea | 0.5 GW | 3.6 GW | 18 GW |
| Hydro-electricity (of which STEP) | 25.7 GW | 26.3 GW | 28.5 GW |

Meeting the low trajectories presented above would imply an additional production of renewable electricity of just under 200 TWh in 2035 compared to 2022.

| Energy produced in TWh | 2022 | 2030 | 2035 |
|------------------------|------|------|------|
| Photovoltaics | 19 | 65 | 93 |

| | | | |
|--------------------------------------|-----|-----|-------------------|
| Onshore wind | 39 | 64 | 80 |
| Eolien at sea | 1 | 14 | 70 |
| Hydropower (<i>excluding STEP</i>) | 43 | 54 | 54 |
| Total | 101 | 197 | 298 |
| | | | Or + 197 TWh/2022 |

As part of the ongoing work on the Third National Climate Adaptation Plan, several actions to ensure the resilience of hydropower plants while maintaining a high level of production are envisaged:

- i. Continue ongoing studies to estimate the impact of climate change on hydrology (Explore2) and their integration by operators.
- ii. Continue to take account of the effects of climate change, as part of the safety of works, in particular through regular updates of hazard studies.
- iii. Integrate other water resource issues into hydroelectric reservoirs, with studies on the subject of multi-use STEP.

- **National targets for a renewables-based energy community**

The State is actively supporting the development of public projects (bonus in public procurement procedures, legislative provisions in the Law on Acceleration of Renewable Energy Production (APER), Decree on Energy Communities, etc.). At the time, it is not envisaged to impose targets on a local mesh.

- **National targets for the identification of acceleration areas**

Article 15 of the 2023 Law on the Acceleration of Renewable Energy Production (APER) introduced, in addition to measures for the simplified revision of planning documents for the reception of renewable energy sources, bottom-up territorial planning from the municipality level.

This approach enables local authorities to be closely involved early in the process, with the objective that the acceleration areas identified by the municipalities and consolidated at departmental and regional level will make it possible to achieve the objectives of multiannual energy programming. They are the equivalent of the areas to be identified pursuant to Article 15b of RED III.

In addition, the acceleration areas for renewable energies within the meaning of Article 15c of the Directive may subsequently be studied among the acceleration areas identified by the municipalities under the APER Law. They are de facto excellent candidates as they illustrate a strong political will on the part of local and regional authorities and should ensure good local acceptability. These areas for speeding up renewable energies proposed by the municipalities are the subject of a very early public consultation, broad consultation at departmental level and are subject to the opinion of the Regional Energy Committee. The areas proposed by the municipalities are not exclusive zones: projects may be located outside these areas, but a project committee will have to be set up.

The APER Law introduced provisions governing the time limits for the public inquiry and investigation within these areas in order to create a real effect of training and ownership of the energy transition by the territories, complementing measures to promote projects in these areas in the tendering procedures for the grant of State support.

Prefectural contact points for renewable energy have also been appointed to support local and regional authorities and project promoters in this process, as well as in the practical implementation of projects and their integration into the regions.

- **Integrating offshore renewable energy development objectives into national maritime spatial plans**

The 2020 Law on Acceleration and Simplification of Public Action (ASAP) now makes it possible to hold public debates on offshore wind projects at façade level (rather than on a project-by-project basis) in the interests of transparency and long-term visibility for the public and the sector. The 2023 Renewable Energy Acceleration Law (REPA) allows for the pooling of public debates on the updating of strategic façade documents (RSD) planning the use of maritime space, and public facade debates on offshore wind. The APER Law also provides for the planning of marine renewable energy with the formalisation of a mapping of priority areas for the development of future offshore wind farms. The State referred the public debate to the National Commission in March 2023 on the updating of the FMD and the development of offshore wind. Public debates were held on each façade between November 2023 and April 2024.

For offshore wind, the aim of the debates was, inter alia, to contribute to the identification of priority areas for offshore wind development for the next 10 years and up to 2050. Future calls for tenders for offshore wind projects will be launched on areas identified as priorities in the FMD, accompanied by a series of technical and environmental studies for de-risking. In particular, the State will launch one or more high-capacity tenders (in the order of 8 to 10 GW) at the end of this planning work to speed up the deployment of this energy and give visibility to the sector.

2.1.2.3 nuclear power production

The Law on Accelerating Procedures for the Construction of New Nuclear Facilities in the vicinity of existing nuclear sites and the operation of existing nuclear facilities repealed the target of achieving a 50 % share of nuclear power in the electricity mix by 2035. The Government takes note of this repeal, which is the result of the legislator's intention.

The Government calls on EDF to continue the operation of existing nuclear power reactors taking into account international best practices, including beyond the 50-year deadline as long as safety requirements are met. In accordance with the law, the 10-year safety reviews will allow periodic validation of the ability to continue operations for each reactor. The Government also calls on EDF to carry out studies, in conjunction with the Nuclear Safety Authority, to clarify the prospects for the operation of the existing fleet after 50 years and after 60 years, including the necessary reflections on the adaptation of reactors to climate change, in particular with regard to water resource issues.

The following actions are envisaged as part of the ongoing work on the Third National Climate Adaptation Plan:

- i. Continue the necessary studies and investments by integrating the latest knowledge on water management and the consideration of contingencies, particularly in the context of periodic reviews.
- ii. Include, in the studies for future RPE 2, the latest climatic models over the entire period of operation of the installations.

EDF shall carry out a work programme aimed, in the course of scheduled maintenance, at increasing the available power of existing reactors, in accordance with the safety framework. Nuclear generation expectations for the coming years will take into account the increase in the power of the nuclear power station that would result from the implementation of this programme. The Government sets EDF the objective of restoring the best

operational performance levels, with the target of returning to nuclear production of more than 400 TWh by 2030 (including Flamanville 3 EPR).

The strategy for the treatment and recycling of nuclear fuel will be preserved over the EPP period and beyond. With a view to renewing the installations downstream of the nuclear cycle, the nuclear sector will carry out by the end of 2026, under the supervision of the Government, work to define the most appropriate industrial scenarios for the future of the post-2040 fuel cycle, the financing arrangements and the timetable for associated decisions. The latter may subsequently be incorporated into successive revisions of the multiannual energy programming.

EDF is carrying out a construction programme of 6 EPR2, with two reactors on the Penly site, two on the Gravelines site, and two reactors in Bugey. The Government confirms its support for this programme and is in line with a view to a final investment decision by the EDF Board of Directors with a view to its launch by the end of 2025.

The Government will further study a possible strengthening of the nuclear power programme, by means of a work programme with EDF and the operators concerned to investigate issues relating to the dimensioning, the need and the adaptation of the design of EPR2, in order to be able by 2026 to take a decision on a possible second step of at least 13 GW, corresponding to the capacity of 8 EPR2 in their current design.

In conjunction with the CEA, the nuclear sector will undertake work to describe the desirability of deploying MRS in France, complementing high-power nuclear installations for their generating applications and, more generally, for their potential new non-generating applications, in particular heat production, hydrogen production or contributing to the closure of the fuel cycle. The Government will supervise this work and, at the same time, carry out discussions to prepare, if necessary, the identification of sites relevant for MRS in France. In parallel with its programme for the construction of new high-power reactors, EDF, via its subsidiary NUWARD SAS, brings the Nuward project for the development of a small modular reactor (Small Modular Reactor) with 170 MWe pressurised water (SMR). The government confirms its support for this project, which receives financial support from the France 2030 investment plan, with a view to building a prototype in France by 2030.

In addition, the Government will also continue to support disruptive innovation through the France 2030 plan, with a decision to launch at least one prototype of a small innovative nuclear reactor with different technologies by 2030. This target can be updated by this deadline.

In addition, the CEA will undertake, in conjunction with the nuclear sector, work to define the fuel requirements associated with the new concepts as innovative nuclear reactors, and to adapt the fuel cycle to be considered, with a view to identifying the relevant time horizons. The CEA and the nuclear sector will also continue work to close the fuel cycle, in line with the work carried out by the nuclear sector on the future of downstream industrial installations after 2040. The CEA will carry out, in conjunction with the French nuclear sector, a programme of investment in nuclear research infrastructures to maintain research capacity in the nuclear sector at the forefront of all the priorities of the nuclear policy pursued by the Government.

The Government calls on EDF, in conjunction with the stakeholders concerned, in particular Orano, to take measures to ensure that the existing infrastructure needs downstream of the cycle are met on a permanent basis by 2035 and beyond.

Radioactive materials and waste produced by the nuclear power station must also be managed in a sustainable manner, with due regard for the protection of human health, safety and the environment, in accordance with

the provisions of the Environmental Code. To this end, the definitive safety of radioactive waste must be sought and implemented in order to prevent or limit the burdens that will be borne by future generations.

Revised every five years, the National Plan for the Management of Radioactive Materials and Waste (PNGMDR) is a privileged tool for implementing these principles over time, in accordance with the framework laid down by the Programme Law of 28 June 2006 on the sustainable management of radioactive materials and waste. Its main objectives are to regularly review the policy for the management of these radioactive substances, to assess new needs and to identify future objectives, in particular in terms of studies and research.

2.1.2.4 renewable heat

Heat now accounts for just under half (43 %) of final energy consumption⁴⁹ in France, of which only about one quarter is currently renewable. France is pushing for a sharp increase in the production of renewable heat and the accelerated development of urban heating and cooling distribution networks to move away rapidly from fossil fuels.

Thus, the EPP 3 targets should increase the consumption of renewable heat and recovery from 183 TWh in 2021 to 419 TWh for the high target in 2035. The targets set for the EPP 3 lead to a more than two-fold increase in the amount of renewable heat and recovery by 2035.

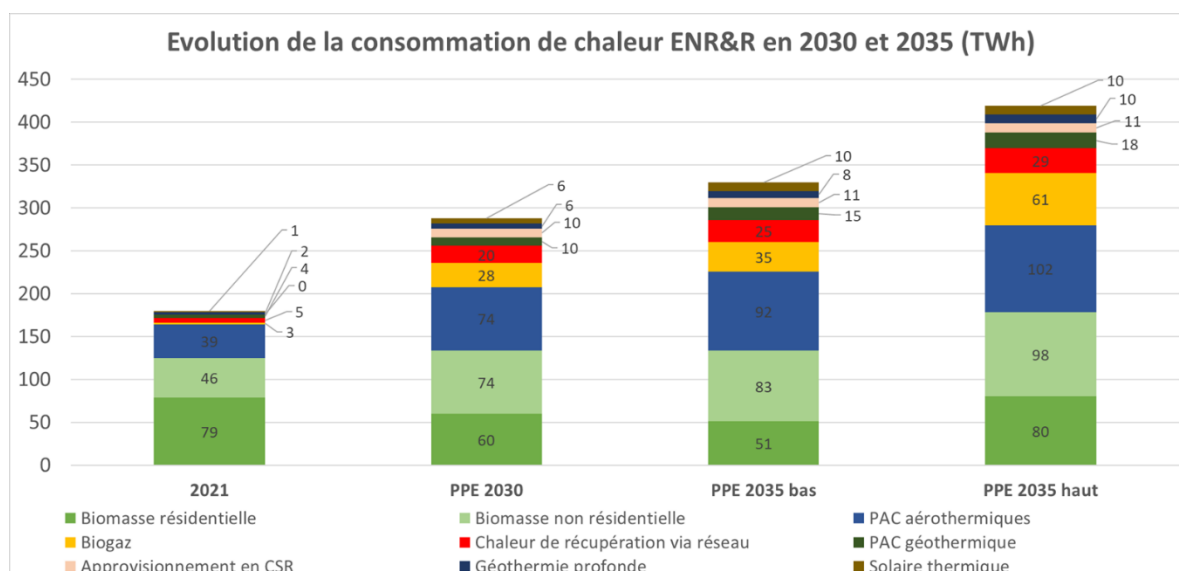


Figure29: Changes in heat consumption ENR & R in 2030 and 2035

Similarly, the share of renewable and recovered heat in total heat consumption is expected to increase significantly over this period.

⁴⁹The final or available energy is the energy delivered to the consumer for final consumption (petrol at pump, household electricity, etc.).

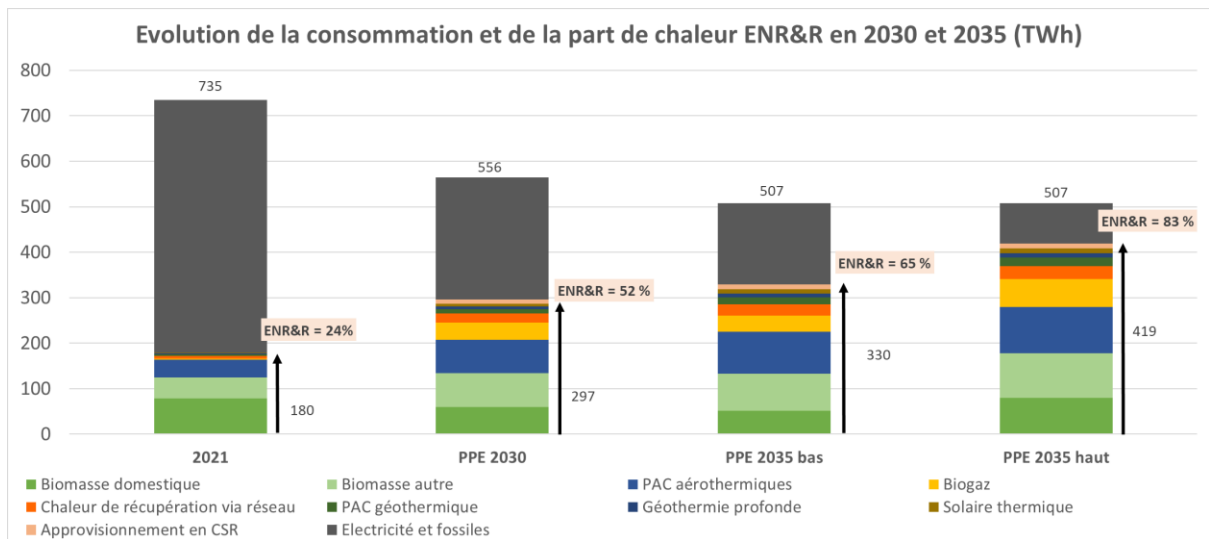


Figure30: Change in the share of heat ENR & R in 2030 and 2035

To accompany this increase in renewable heat consumption, all renewable heat production pathways are requested, as well as greater use of waste heat recovery. The EPP 3 sets targets for each of the renewable heat production pathways as well as for the recovery of waste heat used in district heating networks. The largest increase is due to the deployment of heat pumps. However, proportionally, the development of solar thermal, biogas and geothermal energy are the most important challenges.

The following table summarises the objectives by sector.

| Chaleur ENR par secteur en TWh | 2021 | 2030 | 2035 seuil bas | 2035 Seuil haut |
|--|--------------|------------|----------------|-----------------|
| Biomasse (conso nette) | 123 | 134 | 134 | 178 |
| Géothermie de surface | 3,9 | 10 | 15 | 18 |
| Géothermie profonde | 2,3 | 6 | 8 | 10 |
| PAC (hors PAC géothermiques) | 39,1 | 74 | 92 | 102 |
| Solaire thermique | 1,3 | 6 | 10 | 10 |
| Récupération de chaleur fatale livrée dans les RCU | 5,4 | 20 | 25 | 29 |
| Biogaz injecté + cogé biogaz | 7,5 | 37 | 35 | 61 |
| CSR* | 0,2 | 10 | 11 | |
| Total | 182,7 | 297 | 330 | 419 |

Table3: Targets for the production of heat by sector

In order to develop renewable heat, the government has four widely proven main schemes:

- The MaPrimeRénov' aid scheme for private individuals;

- The Energy Economy Certificates scheme;
- The Heat Fund scheme to support the development of renewable and recovery heat in all sectors of activity;
- France 2030 aid for the decarbonisation of industry for the development of low-carbon heat.

Created in 2009, the Heat Fund, managed by ADEME, enabled the massive deployment of renewable heat production installations on French territory. During that period, this investment aid supported more than 8500 projects for an amount of EUR 3,88 billion of aid out of EUR 14 billion of investment and an annual production of 45.3 TWh of heat from ENR. Increased by 40 % in March 2022 to EUR 520 million for the whole of 2022, it was increased again in 2023 to EUR 601 million and in 2024 to EUR 820 million.

2.1.2.5 urban heating networks

The concomitant development of district heating networks is also essential in order to develop the use of this renewable heat. Indeed, district heating networks represent a long-term economic solution for consumers thanks to stable prices for heat delivered over the long term, while facilitating the transition from fossil to renewable energy for domestic needs.

The Government has therefore decided to also set targets for the quantities of heat delivered by the networks. These will have to increase from 30 TWh, of which 60 % is heat ENR in 2021 to 68 TWh, of which 75 % is heat ENR in 2030 and then up to 90 TWh, of which 80 % is heat ENR in 2035 (Figure 29).

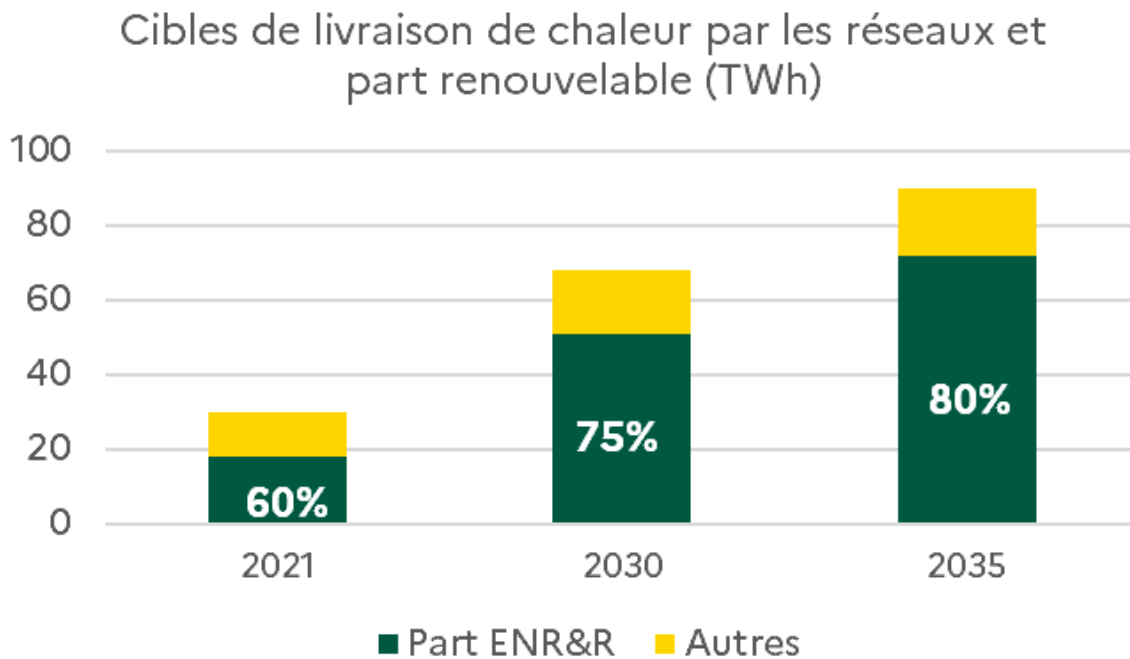


Figure 31: Delivery to ENR & R heating networks in 2030 and 2035

This level of delivery requires an average connection of between 300 000 and 360 000 dwellings per year until 2035. This represents between 5,8 and 6.7 million dwellings connected in 2035, compared to less than

1.3 million in 2020. In the vast majority of cases, these connections will concern collective residential homes with collective heating, but, to a significant extent, they may be an alternative to individual fossil heating through the creation of a secondary water loop in the home.

2.1.2.6 biogas

As of 23 October 2023, 617 installations have injected biomethane into natural gas networks. Their capacity is 11.1 TWh/year, up 22 % compared to the end of 2022.

In 2030, it is proposed to set a target of 50 TWh of annual biogas production, of which 44 TWh in the gas network distributed in France (which would lead to at least 15 % of biogas injected into gas networks) and a moderate increase in the amount of biogas used for the production of electricity in cogeneration and heat. The development of biomethane would be mainly driven by the development of intermediate crops for energy use (CIVE) and the mobilisation of livestock manure. It is important to emphasise the importance of developing intermediate crops between main crops with an agro-ecological objective, as well as of making better use of existing livestock manure, allowing for a reduction in GHG emissions (methane), better nitrogen management in agriculture and a reduction in the use of synthetic mineral fertilisers.

In 2035 biogas production by methanisation could be between 50 and 85 TWh. Depending on their maturity, other technologies could enable this production to be increased, such as pyrogasification, hydrothermal gasification or methanation, which are currently subject to demonstrators.

Support for methanisation is now largely supported by budgetary funding and is intended to evolve, following the Climate Resilience Act, towards a development driven by a system of incorporation obligations based on those placing them on the market. The price of biogas remains higher than the cost of natural gas, but it directly benefits agriculture (purchase of biomass) and French and European companies, which are well positioned on the sector, while fossil gas is imported and thus degrades the French and European trade balance, while also presenting climate and energy sovereignty issues.

2.1.2.7 hydrogen

Each year, in France, around 900 kilotonnes of hydrogen are produced or co-produced from fossil sources, mainly supplying refining, fertiliser production or the chemical sector.

In order to achieve the objectives of carbon neutrality, it is necessary to:

- switch the production of substitutable fossil hydrogen towards decarbonised production, i.e. around 430 kilotonnes of hydrogen over the 900 kilotonnes of hydrogen⁵⁰;
- meet the need for decarbonised hydrogen from new uses by prioritising them (industrial or heavy mobility) in view of the large volume of electricity generated by electrolysis.

France adopted in 2020 an ambitious strategy to accelerate the deployment and use of hydrogen production by electrolysis. The recovery plan and the France 2030 investment plan have made hydrogen and its technologies a pillar of France's green and industrial recovery. The government is committing almost EUR 9 billion by 2030, with a dual objective of technological development and the green transition.

⁵⁰ Part of the hydrogen is inherent in the refining process and consumed on site. The exit from fossil fuels will require the end of this fossil hydrogen production.

Thanks to the various support schemes put in place by the government, more than 100 projects for research, development, industrialisation of hydrogen equipment and hydrogen production have already been supported by the French authorities in order to create a sector of excellence.

After consulting a draft text at the end of 2023, an updated French hydrogen strategy will be published in the course of 2024. The launch of a mechanism to support the production of 1 GW of electrolysis capacity for the production of decarbonised hydrogen for industry will meet the collective European ambitions of using this particular vector to disturb industry.

- **One objective: install 6.5 GW of electrolyzers in 2030 and meet a need for 10 GW in 2035.**

This production will be powered by the French electricity mix, decarbonised, or by dedicated renewable electricity generation installations, depending on the economic optimum that will be found for each of the installations.

- **The deployment of hydrogen production must continue along three axes:** centralised consumption sheets in the largest industrial platforms (Fos-sur-Mer, Dunkirk), semi-centralised clusters around smaller industrial platforms, and, if the economic balance is confirmed, a more diffuse activity, limited to special use cases or the need for a mesh size for heavy mobility.

A particular effort must be made to ensure, by 2030, that the main French industrial basins benefit from the first hydrogen production capacity. In addition to these priority hydrogen hubs, local territorial deployments will be consistent with the needs of heavy mobility uses.

- **Strengthening hydrogen value chain ownership and its technologies:**

The priority of the French authorities will be (1) to ensure the industrialisation of projects previously supported, for example through IPCEIs and (2) to strengthen ecosystem integration and full supply chain coverage.

- **Consolidating an international hydrogen strategy:**

The French strategy consisted of the emergence of flowers and a hydrogen ecosystem in France. The sector must henceforth be accompanied by initial market shares outside our borders and access a more diverse overview of projects to secure its industrialisation trajectories.

France will continue to unequivocally support the deployment of domestic hydrogen production in the coming years.

At the same time, in order to meet all future hydrogen needs in the context of a forced electricity loop by 2030, our structures for importing hydrogen (or its derived products) will need to be anticipated now after 2030. This includes, in particular, a more detailed assessment in the context of the new strategy of national hydrogen needs versus imported, the necessary infrastructure and associated business models.

2.1.2.8 biofuels and synthetic fuels

Currently, the consumption of biofuels comes mainly from first-generation biofuels (so-called "1G"), which are produced from agricultural resources that can also be used for food purposes, partly imported. In order to limit the impact of the production of these first-generation biofuels on food crops, their use is capped at 7 % by European legislation. The production of first-generation biofuels is integrated into the French agricultural/agri-food sectors, allowing the production of co-products valued in livestock farming and ensures the agility of businesses in highly competitive global food markets, in particular sugar, thanks to the subtitlement of uses.

The current challenge is therefore to develop the production of 'advanced' biofuels, mainly from co-products, residues and waste which are not in competition with food or are integrated into sustainable forest management. Biofuels will accompany the decarbonisation pathway of mobility.

In the short term, the production of these advanced fuels must complement the supply of 1G biofuels in order to increase the decarbonisation of land transport, including rail, maritime and inland waterway transport (regional passenger and freight mobility uses).

In the medium and long term, with the electrification of the fleet and the end of thermal engines for light-duty vehicles, these fuels must enable heavy mobility to be more decarbonised (air and maritime transport, agricultural and forestry machinery, BTP, fisheries, etc.). New facilities for the production of synthetic fuels can also be developed to enhance the decarbonisation of heavy mobility.

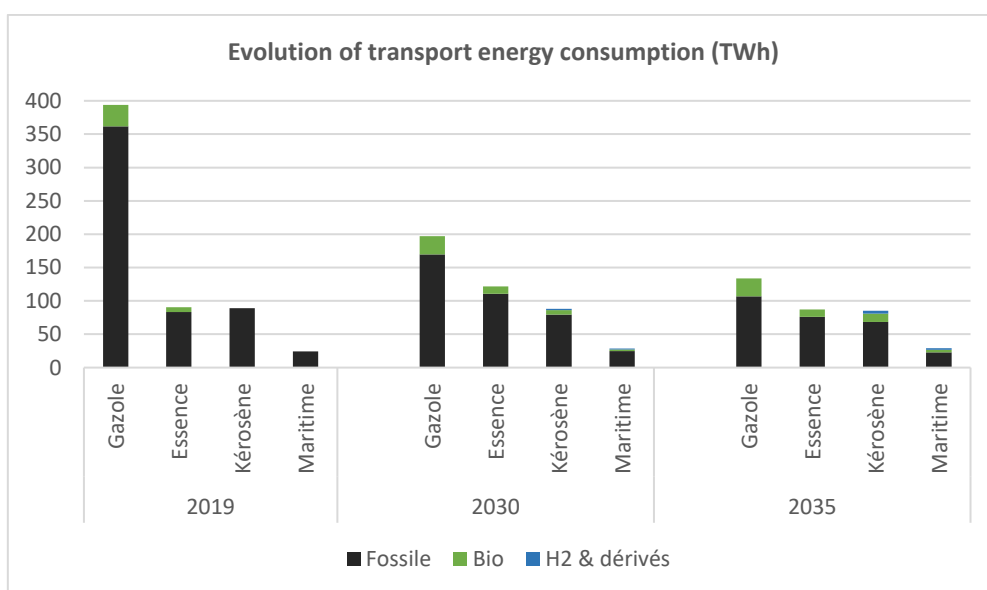


Figure32: Changes in transport energy consumption (TWh). As consumption data for 2021 are affected by the COVID crisis, 2019 is used as a reference year.

In 2030, the need for biofuels and bioliquids is estimated at 48 TWh in metropolitan France.

In 2035, the assumptions of the provisional energy and climate scenario could lead to consumption in the order of 90 TWh, with the volume of 2030 for land transport biofuels (with the incorporation rate increasing at the same time as consumption falls), non-energy uses and electricity production overseas, and an increase for agriculture, maritime transport and the aviation sector.

The national biofuel production expected in 2030 and 2035 will be around 50 TWh. As today, it will be partly based on imports of raw materials from sectors whose sustainability is traceable and secure (particularly for waste oils). France has set up a tracking register for all sustainability certificates (carbide) and strengthens the requirements to benefit from double counting recognition, in order to improve the traceability of products. It was stressed that biomass consumption and production figures were subject to modelling being finalised as part of the preparation of the SNBC, which could lead to a revision of the above trajectories.

The incentive tax on the use of renewable energy in transport (TIRUERT) sets a target for the incorporation of renewable energy for fuels. The incorporation of renewable energy allows the taxpayer to reduce the amount

of tax he has to pay until the amount of the tax is zero once the target rate of incorporation of renewable energy is reached.

In order to enhance the value of alternative fuels with the best environmental impact, the TIRUERT mechanism will be revised in order to set greenhouse gas emission reduction targets for 2030, in the form of a reduction in the carbon content of each unit of energy used in the transport sector, taking into account the whole life-cycle of alternative fuels, in addition to a rate of incorporation of renewable energy, in accordance with Directive 2023/2413 of the European Parliament and of the Council of 18 October 2023 revising the Directive on the promotion of renewable energy, known as RED2. These targets should lead to a 14.5 % reduction in the carbon intensity of transport in 2030, and an energy supply to the sector from advanced biofuels and renewable fuels of non-biological origin (H2 and derivatives) of 5.5 % (including multipliers), of which 1 % for renewable fuels of non-biological origin only.

Based on previous trajectories (diesel and petrol consumption, volumes of biofuels to be incorporated, number of electric vehicles, amount of electricity consumed in mobility, volume of hydrogen consumed in mobility), the proposed national greenhouse gas emission reduction trajectory for TIRUERT would be as follows.

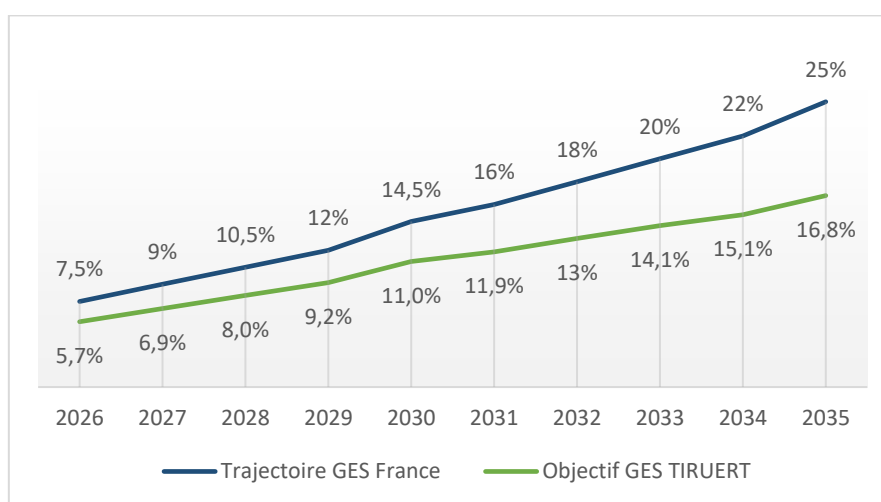


Figure33: National trajectory and TIRUER to reduce GHG emissions from energy used in transport

This trajectory is notably based on an evolution of 1028 % of electric vehicle charging in the public grid and an evolution of 2534.5 %51 of renewable electricity in the electricity mix in 2030 and 40 % in 2035.

The TIRUER applied to aviation currently in place will also be reviewed in order to take account of the provisions of the ReFuelUE Aviation Regulation and to ensure that they are properly linked to RED III.

Special measures may be taken to support the decarbonisation of vehicles which are difficult to electrify, such as non-road machinery (agricultural machinery, construction, etc.).

Consumption of RES in industry:

⁵¹ Working hypothesis for SFEC, indicated on page 24 of the SGPE presentation of 12 June 2023 on Ecological Planning in Energy

The consumption of RES in industry for energy uses is increasing by 2030 to 37 %, with greater use of electrification and biomass use.

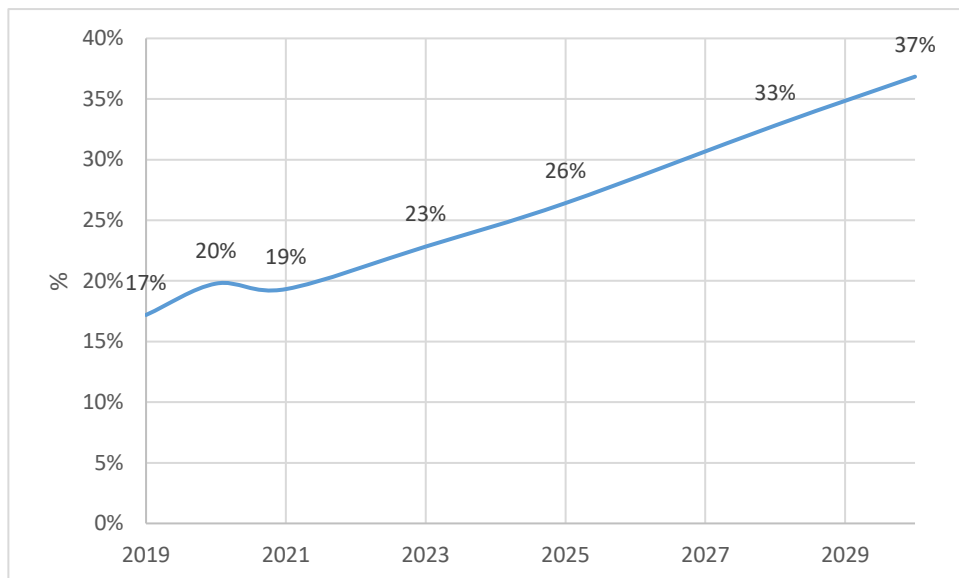


Figure34: Share of RES in industrial final energy consumption

2.1.2.9 biomass as a key driver for decarbonising the economy

Biomass is a key driver of the decarbonisation of the economy. Its growing demand, in order to meet decarbonisation objectives, raises an important challenge to the availability of the resource. In addition, the resource must be available both in total and as a specific vector (solid, liquid or gaseous).

Despite the limited nature of the resource, in view of **France’s potential for biomass production (1st agricultural area and 4th forest area in the EU), it seems reasonable in the long term to aim for an overall balance between the supply and domestic demand of biomass in the hexagonal territory.** At present, imported biomass accounts for less than 10 % of the biomass used in France (all uses).

The modelling work carried out as part of the preparation of SNBC 3 is in line with previous ones and **supports the hypothesis of a foreseeable increase in biomass consumption for energy purposes in a context of decarbonisation of all sectors of the economy** and limited possibility of using other vectors, in particular electricity, for all energy consumption.

Faced with this foreseeable increase in biomass consumption, a first challenge is to **deploy sector-specific measures to increase the supply of biomass that can be used for energy purposes compared to a trend scenario, without prejudice to the priority to be given to food uses (for agricultural biomass), carbon sink and production for non-energy industrial uses, in particular in the form of materials (for agricultural and forestry biomass).**

At this stage, the provisional version of the reference scenario provides for **the production of biomass for energy purposes of 230 TWh NCV Ew by 2030, compared with 209 TWh NCV Ef in a trend scenario, as illustrated in the**

following figure⁵². **This development is based both on improved collection arrangements, and on significant changes in the cultivation practices and/or areas concerned**, reflected in the assumptions of the provisional SNBC 3 reference scenario, and in the guidelines and levers of this strategy.

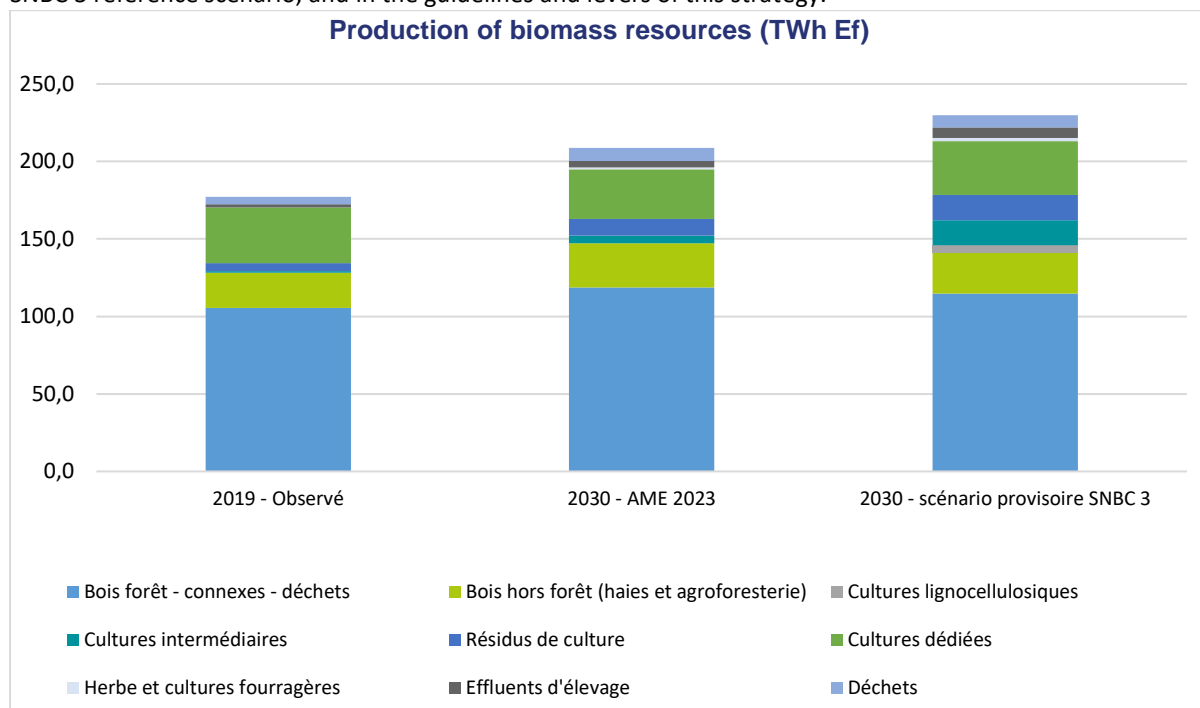


Figure35: Evolution of biomass resource production between the trend scenario (AME) and the provisional reference scenario (AMS) of SNBC 3 by 2030

Increasing the need for biomass resources must **also be part of a sustainability approach**. The environmental framework for biomass cultivation or management and harvesting practices must be clear and transparent and be based on the latest available scientific knowledge⁵³. **This framework is based on a set of European requirements, first and foremost the environmental provisions of the common agricultural policy and the sustainability of bioenergy within the meaning of the European RED Directive**, recalling that biomass used for energy purposes is often a co-product or residue of other biomass producing activities, often has a strong territorial component and that, as regards forest biomass, it already benefits from a national framework (forestry code) providing a 'guarantee of sustainable management' in the French sense.

It should be stressed that biomass availability modelling is done in an integrated way with the modelling of the forestry and agricultural sectors (see below). Close-out is ensured on land use, which in particular ensures that agricultural biomass is not produced at the expense of grassland or afforestation. In particular on forests, the

⁵² A **significant effort is to be made in the agricultural sector** on intermediate crops (+ 14 TWh Ef between 2019 and 2030), lignocellulosic crops (+ 7 TWh Ef between 2019 and 2030), crop residues (+ 11 TWh Ef between 2019 and 2030), livestock manure (+ 5 TWh Ef between 2019 and 2030), wood from agroforestry (+ 2 TWh Ep between 2019 and 2030). **In the case of woody biomass**, the main quantitative gain would be expected on the mobilisation of primary biomass and related to the increase in harvest (+ 9 TWh Ep between 2019 and 2030) and on end-of-life bois en waste (+ 3 TWh Ep between 2019 and 2030).

⁵³ In this sense, a bibliographic summary of INRAE, completed in 2023, sets out **the basis for reflection on potential environmental impacts and identifies the knowledge to be strengthened**.

availability of energy wood is directly linked to timber harvesting necessary for the decarbonisation of the rest of the economy, and the share of harvesting devoted to energy is decreasing over time (in order to gradually increase the share dedicated to long-term uses). In particular, it is necessary to take into account the impact of the decrease in the carbon sink and the risk of non-renewal of the entire biomass energy resource, in order to ensure the best carbon balance.

As it stands, the total consumption of biomass in its various forms of final energy could amount to **238 TWh in 2030 according to the reference scenario (compared to 186 TWh in 2030 under the trend scenario)** for an estimated output of 230 TWh of NCV by that date. The provisional version of the reference scenario thus points to **an imbalance in biomass supply/demand in 2030**. On the other hand, uncertainties about the **projected figures suggest caution as early as 2025**, as a number of sub-sectors may see their consumption increases.

Greater mobilisation cannot therefore fully address the issue of matching biomass supply and demand in particular at longer horizons (post 2030): securing this long-term closure is one of the challenges of complementary work on planning, which must continue in the coming months.

Beyond the 'quantity' challenges, the **question of supply-demand adequacy also arises from the solid/liquid/gaseous nature of the energy carriers used**.

These findings make it necessary to make strategic choices on prioritising certain uses and taking into account the specific characteristics of each type of biomass. They also stress the importance of achieving our energy consumption reduction targets. The third iteration of the baseline **will have to include additional demand moderation measures compared to this interim scenario to ensure the supply /demand loop by 2030 and beyond**.

Demand moderation will be driven primarily by **strategic choices to prioritise the uses of the highest priority at least**, building in particular on the availability of energy alternatives to biomass for certain uses (e.g.: the increased use of heat pumps or geothermal for heating certain residential or tertiary buildings), as illustrated in the following table. The **moderation in demand for biomass is also in line with the challenge of reducing overall energy consumption**. A prioritisation of the resource has been established: it prioritises, among energy uses, uses which do not have the best alternative, in particular for producing high-temperature heat in industry.

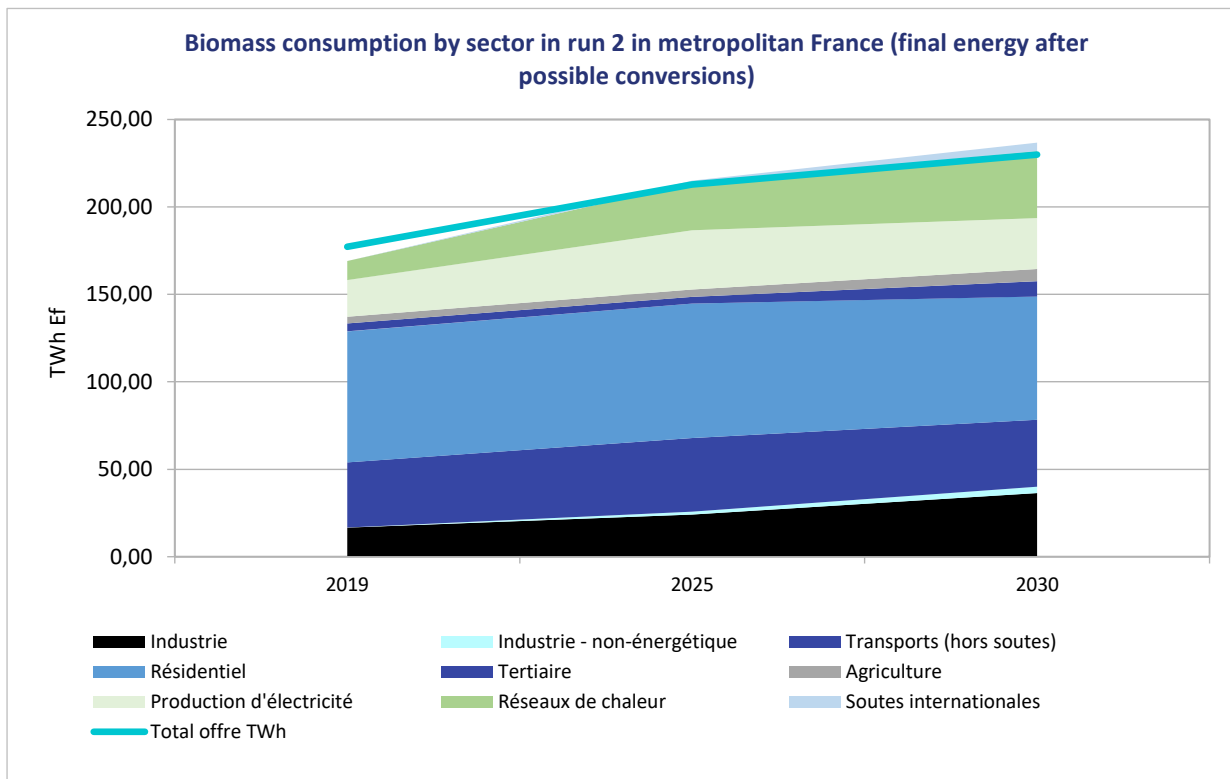


Figure36: Biomass consumption per sector in the current modelling of the provisional SNBC 3 Reference Scenario

| USES OF BIOMASS | EXPLANATION |
|---|--|
| USES TO BE CONSIDERED AS A MATTER OF PRIORITY | |
| HUMAN FOOD | Food sovereignty challenge. |
| ANIMAL FEED | Protein autonomy challenge – commensurate with the need for lower consumption of animal proteins consistent with the overall dietary transition scenario. |
| CARBON SINKS – TIMBER PRODUCTS AND FORESTS | At the level of the requirements determined by the SNBC to ensure GHG closure. |
| SOIL FERTILITY (RETURN OF RESIDUES AND CUTLERY TO SOIL) | At the level of requirements to maintain the efficiency. |
| INDUSTRY – HIGH °C AND NON-ENERGY HEAT | No decarbonised alternatives. |
| DISTRICT HEATING | Few alternatives to decarbonise the energy mix of district heating networks. |
| ENERGY CONSUMPTION IN AGRICULTURE AND THE FOREST-WOOD SECTOR | In particular for agricultural machinery. Possibilities for short supply chains and valorisation of energy production in agriculture (also possibility to consider more electrification). Forest-wood sector: own consumption of own resources and energy production that can be recovered on site. |
| HEAVY CONSTRUCTION PLANT | Few decarbonised alternatives. Consistency to be ensured with the SNBC scenario for the BTP sector. |
| USES TO BE DEVELOPED REASONABLY AND UNDER CONDITIONS | |
| AIR TRAFFIC (DOMESTIC AND INTERNATIONAL) | Possibility of reducing traffic through price signal, modal deferrals and sobriety. Limiting the biomass allocated to this sector, which will have to finance more e-fuel. |
| MARINE BUNKERS | Possibility of using e-fuel (in particular e-diesel from the production of e-kerosene). Question of the level of traffic, with a desire to re-bunker in France and a reduction in imports linked to reindustrialisation. |
| TRANSPORT – PL, BUS AND CARS, AND INLAND WATERWAY AND RAIL TRANSPORT | Possibility to further electrify (including via H2), the question of having two co-existing infrastructures for H2 and GNV. |
| TRANSPORT – LIGHT VEHICLES | Through controlled incorporation rates, and maintaining a priority given to the progressive electrification of the park. |
| INDUSTRY – LOW TEMPERATURE HEAT | Existence of decarbonised alternatives (heat pump, solar thermal, UCR ⁵⁴ , geothermal energy, etc.). |

⁵⁴ District heating network

| | |
|---|--|
| RESIDENTIAL AND TERTIARY – SOLID BIOMASS FOR HEATING AND EFFICIENT CIE | Possibility of prioritising the use of solid biomass over high-performance (after 2005) and high-performance appliances (after 2015) by incentivising the replacement of non-performing appliances. Prioritise appliances that replace fossil equipment (fuel oil/LPG) in rural areas. |
| OVERSEAS (MAYOTTE, GUYANA, CORSICA) | Questions on the sustainability of the importation of biomass from metropolitan areas into OM. Possibility of further developing electric RES. |
| MODERATELY DEVELOPED USES | |
| ELECTRICITY GENERATION | Favour other technical solutions (e.g.: H2, batteries) to ensure advanced thermal production. |
| RESIDENTIAL AND TERTIARY – NON-PERFORMING HEATING AND CIE | Reduce the use of low-performing appliances (installed before 2005) consuming solid biomass. |
| RESIDENTIAL AND TERTIARY – COOKING | Electrical alternative (e.g. induction) more efficient and less dangerous. |

Figure37: Prioritisation of biomass uses

These strategic choices (to be confirmed and refined by the final version of SNBC 3) for prioritising uses are reflected in the assumptions of the provisional reference scenario.

In view of the many challenges identified around the subject of biomass (increase in production, increase in consumption and associated moderation, monitoring of demand matching, etc.), **France needs to establish stronger governance on the subject, both at national and regional level, with a view in particular to:**

- Estimate the available or possible resource in a finely and regularly updated manner, including by integrating uncertainties linked to the impacts of climate change and ensuring the sustainable management of the resource in order to achieve optimal carbon impact, taking into account the evolution of the carbon sink;
- Continuously monitor the installed uses of biomass, including the consumption of energy installations;
- Decide on the relevance of new uses or new operators and their projected consumption in the light of the resources still available and planned, applying the hierarchy of uses defined above;
- Ensure that projects accompanied throughout the country are consistent with this strategy and the balances and priorities defined at national level.

In this connection, the **question of data and its accessibility, and the related legal framework, has already been identified as a key point.** ‘Regional biomass cells’ are currently responsible for verifying the adequacy at regional level between the locally available biomass supply and the needs of the various projects, in line with the prioritisation of uses. The role of state services and public institutions, and in particular that of “regional biomass cells”, will need to be consolidated legally and in their access to data, ensuring the involvement of stakeholders. This mechanism will meet the new European requirements on the cascading principle of woody biomass, prior to energy recovery, imposed by the European Directorate “RED”, in line with the hierarchy of uses defined at national level.

Response to the provisions of paragraph 7b of Directive 2018/2001 as revised on 20 November 2023

Assessment of the national supply of forest biomass available for energy purposes for the period 2021-2030, in accordance with the criteria set out in Article 29 of Directive 2018/2001

The development of the forest-wood sector in France has been the subject of dedicated modelling, developed for several years, already used for the previous version of the PNIEC, and continuously improved.

This model operates on the basis of 26 independent input parameters, 9 relating to upstream forestry (gross biological increase, mortality, afforestation, harvest level, etc.), the rest relating to downstream (with detailed configuration of the allocation of the harvest according to the different types of ‘wood products’ and the half-life of the various products), the destination of the waste and the rate of paper recycling. This configuration is fixed for the horizons 2025, 2030, 2050 and 2080, the parameters of the intermediate years being determined by linear interpolation.

The entire configuration of this model shall be established in consultation with stakeholders in the sector: public and research institutions⁵⁵, professional organisations in the sector, NGOs, competent administrations. It therefore incorporates the latest available knowledge or expert opinion.

This model focuses on metropolitan forests, given the lesser availability of reliable data in the French outermost regions: work on extending a forest inventory to these territories is ongoing. Only the deforestation dynamics are taken into account for French Guiana, in line with national greenhouse gas inventories.

The parameters for the breakdown of the harvest are as follows:

| Developing the material use of wood and the circular economy | History | | | Scenario AMS Run2 | |
|--|---------------|---------------|---------------|-------------------|---------------|
| | 2015 | 2019 | 2021 | 2025 | 2030 |
| Share of harvest entering the stock of timber products – sawmills + panels (after harvesting and processing) | 23.9 % | 20.3 % | 20.0 % | 24.9 % | 30.0 % |
| Share of harvest entering the stock of timber products – paper (after harvesting and processing) | 8.1 % | 6.1 % | 7.1 % | 6.2 % | 6.2 % |
| Share of harvest recovered in energy (after processing) | 65.2 % | 60.7 % | 62.9 % | 62.0 % | 58.0 % |
| Unallocated harvest share ⁵⁶ | 2.8 % | 12.8 % | 10.0 % | 9.2 % | 8.9 % |

The harvest level is itself subject to the following parameters in the AMS Run2 scenario (most recent version):

| Mobilise more and more effectively | History | | | Scenario AMS Run2 | |
|------------------------------------|---------|------|------|-------------------|------|
| | 2015 | 2019 | 2021 | 2025 | 2030 |

⁵⁵ Such as the Institut Géographique National in charge of the French Forest Inventory, the National Forestry Office responsible for managing or supporting the management of public forests, the National Forest Property Centre responsible for support for private forest management, and the National Research Institute for Agriculture, Food and the Environment.

⁵⁶ Related to discrepancies between statistical sources (not solved at date)

| | | | | | |
|----------------------|------|------|------|------|------|
| Harvest (Mm3) | 48,0 | 54,5 | 55,4 | 62 | 63 |
| Operating losses (%) | 21 % | 21 % | 21 % | 21 % | 21 % |

As illustrated in the previous table, it should be pointed out that modelling includes operating losses of 21 % of the aerial biomass that feed in particular the deadwood stock in the forest, as well as the root biomass that is assumed to be left in the soil.

The combination of these factors gives the following changes in the availability of energy wood at the output of the sector calculator:

| | History | | | Modelled | |
|---|---------|------|------|----------|------|
| | 2015 | 2019 | 2021 | 2025 | 2030 |
| Material use (Mm3) | 15 | 14 | 15 | 19 | 23 |
| Energy use (primary biomass and co-products, Mm3) | 31 | 33 | 35 | 38 | 37 |
| Use of waste wood energy at the end of life (Mm3) | 8 | 9 | 10 | 10 | 11 |
| Total energy use (Mm3) | 39 | 42 | 45 | 48 | 48 |
| Total energy use (TWh) | 8,3 | 8,9 | 9,4 | 10,1 | 10,1 |

These data, supplemented by other modelling outputs dedicated to the agricultural sector, are **used to compare biomass supply and demand** at different horizons on the assumption that France seeks to be almost self-sufficient in biomass for its energy needs given its agricultural and forestry potential.

Biomass demand is modelled on a sector-by-sector basis. These different models are well understood to be influenced by the sectoral objectives assigned to the various sectors, in particular under European law, and the related assumptions and trajectories (decarbonisation of different means of transport, improvement of the energy performance of buildings, etc.).

However, it should be stressed that there is no feedback loop in the models between demand and supply. In other words, biomass production, and in particular forest harvesting, is not driven by energy considerations. In practice and to date, this leads to a discrepancy between supply and demand, with the latter likely to exceed the former. This was already reflected in the National Low Carbon Strategy published in 2020, and was again publicly established in [documents submitted for consultation in November 2023](#).

Work is ongoing to identify the appropriate levers to reduce this gap, in particular by 2040⁵⁷ through an effort to prioritise the use of biomass in order to direct certain types of demand towards other energy production solutions. Work is also ongoing to refine modelling on how to take account of self-consumed harvesting by private individuals, which is outside the market channels.

Assessment of the compatibility of the planned use of forest biomass for energy production with the objectives and budgets of the Member States for the period 2026-2030 set out in Article 4 of Regulation (EU) No 2018/841

Trajectory and uncertainty

⁵⁷ Mainly related to the consumption of the fleet of thermal vehicles still in service at this time

The AMS trajectory used to prepare this national plan is based on the assumption⁵⁸ that the current crisis on the French forest would continue until 2025 and then be subject to a relative 'exit from the crisis' in 2030, hence the LULUCF graph presented in the plan showing a clear sink subsidence around 2025 (see Figure 24).

This AMS scenario shows a carbon sink reaching a level of -18 MtCO₂e in 2030.

At the time of submission of this plan, the average of emissions from the LULUCF sector over the period 2016-2018 (UNFCCC submission 2023) is -24,7 MtCO₂e in the 2024 inventory. **According to these data, the LULUCF Regulation would therefore require reaching a level of -31,4 MtCO₂e in 2030 in order to meet the target of -6,693 MtCO₂e assigned to France.**

This provisional finding calls for several remarks.

On the one hand, the French authorities stress the instability of LULUCF inventories in France at present in a context of **strong methodological developments**. This is reflected in recent developments in the 2016-2018 average of the sector inventories out of the last 3 submissions: -18,8 MtCO₂e according to inventory 2022, -23,5 MtCO₂e according to inventory 2023, -24,7 MtCO₂e according to inventory 2024. **The change in the inventory is therefore of the same order of magnitude as the target set by the LULUCF Regulation**, which makes it very difficult to draw conclusions before having the final inventory for 2032.

This instability is reinforced by Regulation 2023/839 revising the LULUCF Regulation, and more specifically the revision of Annex V to Regulation 2018/1999, which requires further substantial changes in these inventories (see section on the implementation of Regulation 2018/841).

It is therefore difficult to draw definitive conclusions on the LULUCF sector at this stage, especially since the revised Regulation No 2018/841 provides that the results on the sector can only be assessed on the basis of the inventory submitted in 2032.

It is a fortiori very difficult to draw conclusions with regard to the 2026-2029 budget provided for in the revised Regulation 2018/841, given that this budget will be defined in 2025 on the basis of the most recent inventory submitted.

Use of forest biomass

In any event, the French authorities stress that the planned use of forest biomass for energy purposes is in no way a steering factor for French forestry policy as part of France's energy and climate scenario. The latter addresses the challenges of maintaining production capacity for materials consistent with increasing national demand in a context of decarbonising society, and strengthening the resilience of forest ecosystems and preserving their biodiversity, in the interests of the scientific basis of the measures, and technical pragmatism and support for the operators concerned. With regard to the resilience of forest stands, the French authorities are working more specifically to find the best balance between maintaining a carbon sink in the short term (2030) set by European law, and the longer term horizon. Significant short-term forest renewal may involve storage in order to preserve the capacity of the carbon sink in the future.

⁵⁸ It is difficult to confirm, including from experts, and in the light of the most recent data

The production of wood energy is explicitly conceived as a co-beneficiary of this policy, and it has been very clearly explained that the demand for biomass should adapt to the availability of the resource.

The main issue, therefore, is the measures put in place to ensure, on the one hand, the sustainable management of the forest and its long-term resilience, and, on the other hand, the management of the demand for forest biomass for energy purposes and the conditions under which forest biomass is produced.

Description of national measures and policies ensuring compatibility with these objectives and budgets.

Several policies and measures are in place or in the process of being deployed to ensure that the actual pathways for wood energy will remain consistent with the modelling principles outlined above.

First, the provisions on forest biomass, and forest management in general, in force in French national law were described in the risk analysis⁵⁹ carried out in the context of the application of the RED 2 Directive No 2018/2001 in the version applicable until 19/11/2023.

Moreover, Directive 2018/2001, in its 'RED 3' version applicable from 20/11/2023, provides for a **substantial strengthening of the sustainability requirements** for forest biomass used for energy purposes. **The transposition work started at the beginning of 2024**, with a consultation mechanism for stakeholders (industry, NGOs, public institutions, etc.) put in place from March 2024 to define the new measures to be put in place.

For the application of Article 3 of the Directive (cascading use), discussions are based on an existing administrative mechanism for managing the allocation of public aid to energy production from biomass. The ongoing work highlights the issue of the reliability and regularity of wood energy data with a view to aligning the existing system with the new requirements of the Directive.

For the purposes of applying Article 29 (6) of the Directive, the French authorities have not yet formalised a comprehensive decision as to whether to strengthen national law on some of the provisions contained in RED3, or to refer to a demonstration at the level of the 'forest supply area', building on existing law. Discussions on Article 29 (3) to (5) of the Directive on forest biomass focus on clarifying the definitions and tools available, including maps, for the implementation of the new requirements.

This transposition work builds on processes already initiated at French level, in particular the identification of old-growth forests, greater attention paid to forest soils through a dedicated national plan, and the introduction of the EU's 'deforestation regulation'.

This work is also consistent with the **gradual strengthening of the specification of public aid for forestry renewal**⁶⁰ (climate diagnosis, diversification of species, restriction of eligibility of white-cutting operations, etc.): these provisions apply to forestry renewal operations in the broad sense and apply in particular to the 'energy wood' component of the harvest resulting from these operations (large branches, wood from damaged stands whose qualities no longer permit material use, etc.).

⁵⁹ <https://agriculture.gouv.fr/durabilite-de-la-biomasse-forestiere-criteres-red-ii>

⁶⁰ See the specifications of the aid applicable until 31/05/2024:
<https://agirpourlatransition.ademe.fr/entreprises/sites/default/files/Renouvellement%20Forestier%20-%20Cahier%20des%20charges%20-%20Volet%201%20-%202023.pdf>

More generally, national policies and measures relating to the forest and wood sector are covered by the dedicated section of this plan.

The transposition of RED 3 is part of a broader context of gradually strengthening the governance of biomass in France, in the face of a difficulty in closing biomass supply and demand (see graph above published in November 2023) and a desire to prioritise biomass uses in order to contain growth in demand, in particular by further steering public aid that could lead to increased biomass consumption.

This strengthening of governance is accompanied by extensive coordination of the French Government's technical and scientific support by the competent public institutions, with the creation of a dedicated Scientific Interest Grouping announced in March 2024⁶¹ and currently being formalised.

2.2. Energy efficiency dimension

2.2.1 Elements set out in Article 4 of Directive (EU) 2023/1791

National reduction in energy consumption

Article 4 of Directive (EU) 2023/1791 on energy efficiency sets a European target for 2030 of maximum final energy consumption of 763 Mtoe and primary energy 992,5 Mtoe. These targets aim to reduce energy consumption by at least 11,7 % in 2030 compared to the projections of the 2020 EU baseline.

France aims to achieve a 30 % reduction in final energy consumption in 2030 compared to 2012, which translates into the following consumption targets for 2030:

- final energy consumption: 1 243 TWh (106,9 Mtoe);
- primary energy consumption: 1 844 TWh (158,6 Mtoe);

Both objectives were notified to the European Commission on 31 January 2024.

The trajectories modelled at this stage⁶² lead to France's final energy consumption in 2030 of 1 381 TWh requires an additional effort to secure France's target of 1 243 TWh.

However, the following should be noted with regard to modelling:

- they incorporate ambitious reindustrialisation assumptions, which reduce the French and European carbon footprint, but also mechanically increase energy consumption on national territory, by around 50 TWh. The reindustrialisation of France leads to positive effects on employment and climate, as the electricity mix in France is largely decarbonised.
- they include indirectly all policy measures stemming from the EED (e.g. application of the energy efficiency first principle, mandatory waste heat recovery for datacenters, etc.) and more generally from the Fit for 55 package (EPBD, etc.) and other regulations such as those related to product eco-design. These measures are considered to be 'in support' of other modelled policies (aid for

⁶¹ <https://agriculture.gouv.fr/sia2024-lancement-dun-groupe-dinteret-scientifique-gis-en-faveur-de-la-biomasse>

⁶² Scenario AMS run 2, for modelling the National Low Carbon Strategy (SNBC 3)

energy renovation, tertiary decree, development of waste heat, etc.) since their individual impact is difficult to estimate; it could in fact prove to be additional to other policies.

- Finally, the final energy consumption in 2023 (1 510 TWh, provisional data) is below the level of final energy consumption projected in the modelling for the year 2025 (1 530 TWh). This difference is due in particular to the energy crisis following the invasion of Ukraine, which led to a sharp increase in energy costs and the massive deployment of energy sobriety plans in the course of 2022-2023. Thus, the actual French energy consumption trajectory is currently more favourable than modelling.

New levers towards the target of reducing energy consumption in France by 30 % in 2030 compared to 2012 have been identified in part 3.2.

2.2.2 Elements set out in Article 8 of Directive 2013/1791/EU

Energy saving obligations

Article 8 of Directive (EU) 2023/1791 on energy efficiency sets the energy savings obligation levels for the period 2021-2030 at the following pace (in% of France’s final energy consumption over the reference period 2016-2018):

- 2021-2023: 0.8 %, i.e. 13.2 TWh/year;
- 2024-2025: 1.3 % or 22.0 TWh/year;
- 2026-2027: 1.5 % or 25.4 TWh/year;
- 2028-2030: 1.9 % or 32.1 TWh/year.

The reference energy consumption is⁶³ defined in the table below:

| Obligation | REF pour le calcul | Consommation de référence | EE associée |
|------------|---|---------------------------|-------------|
| 0,80% | 2016-2018, EED dans sa version en vigueur avant la révision | 1 651 TWh | 13,2 TWh/an |
| 1,3% | 2016-2018, EED révisée (2023/1791/UE) | 1 691 TWh | 22,0 TWh/an |
| 1,5% | | 1 691 TWh | 25,4 TWh/an |
| 1,9% | | 1 691 TWh | 32,1 TWh/an |
| 1,9% | | 1 691 TWh | 32,1 TWh/an |

Table4: determination of the reference energy consumption period under the revised EED (2023/1791/EU)

Thus, the cumulative annual energy saving over the period 2021-2030 is 1 063 TWh according to the following table:

| | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|------|------|------|------|------|-------|-------|-------|-------|-------|
| Cumulative annual energy savings (TWh) | 13,2 | 26,4 | 39,6 | 61,6 | 83,6 | 108,9 | 134,3 | 166,4 | 198,5 | 230,7 |
| EEC period (energy saving certificates) | P4 | P5 | | | P6 | | | | | |

⁶³ The new definition of final energy consumption should be taken into account for the calculation of the baseline consumption 2016-2018 in order to apply the energy savings rate for the sub-period 2024-2030. For subperiod 2021-2023, Member States can still rely on the previous definition

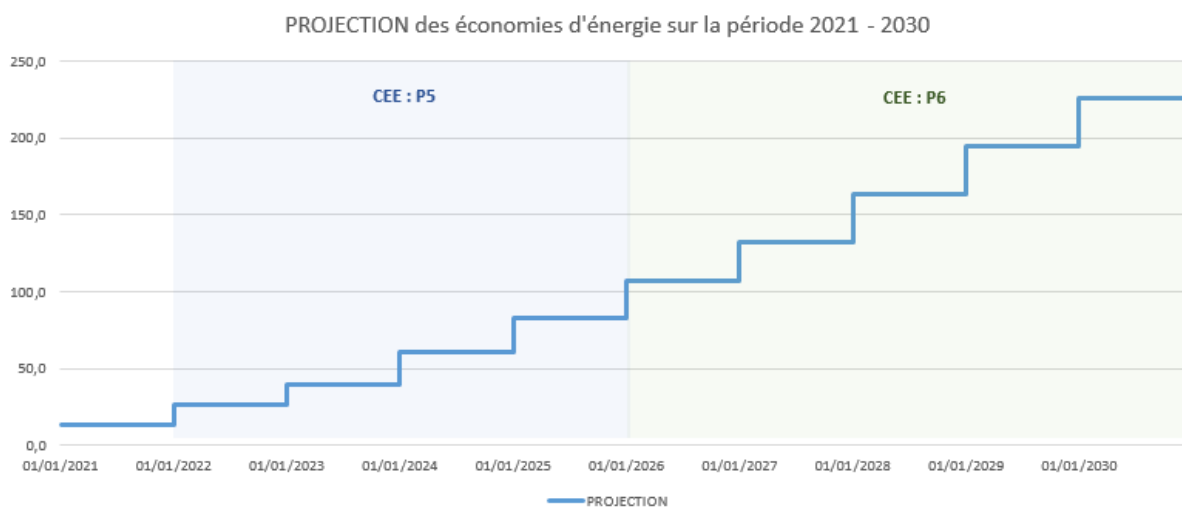


Figure38: Projections of energy saving bonds acquired under Article 8 EED (2023/1791/EU) over the period 2021-2030

The target for the period 2021-2030 would therefore be 1 063 TWh or 91 445 ktoe.

Under Article 8 of Directive (EU) 2023/1791 (EED), France plans to use the obligation for energy vendors to justify energy savings operations via the Energy Saving Certificates (EWC) scheme.

Furthermore, Article 8 EED requires Member States to establish and achieve a share of the required amount of cumulative end-use energy savings among people affected by energy poverty, vulnerable customers, low-income households and, where applicable, people living in social housing. This share must be at least equal to the proportion of households in energy poverty. France complies with this obligation. Indeed, and as mentioned in paragraph 2.4.3, in 2 022 the energy poverty indicator based on the energy effort rate amounted to **10.8 % (11.6 % corrected for meteorological data)**.⁶⁴

The^{5th} period of the EWC scheme (2022-2025) requires energy suppliers to achieve 3 100 TWhc of energy savings, including 1 130 TWhc in energy poor households, or 36 % of the total obligation level.

2.2.3 Elements set out in Articles 5 and 6 of Directive (EU) 2023/1791

Public

For the application of Articles 5 and 6 of the revised EED, it is requested to list all taxable public bodies. Due to the recent publication of Directive (EU) 2023/1791 in the Official Journal of the EU, transposition work is ongoing to identify all of them.

At this stage, it is envisaged to define the concept of public bodies in accordance with the strict provisions of Article 2 of the revised EED (2023/1791/EU) and recital 35 thereof, i.e.:

⁶⁴ CGDD, model Prometheus 2024

- the State (central and devolved administration), in particular:
 - o 13 ministries;
 - o 51 departmental Directorates for the Protection of the Population (DDPP);
 - o 46 departmental Directorates for Employment, Labour, Solidarity and Protection of the Population (DETSPP);
 - o 3 Directorates for Economy, Employment, Labour and Solidarity (DEETS Cluster C);
 - o 1 Directorate-General for Cohesion and Population of Guyana (DGCOP);
 - o 1 Directorate for Social Cohesion, Labour, Employment and Population of Saint-Pierre-et-Miquelon (DSTECF);
 - o 93 departmental Directorates for Territories (DDT) and Directorate for Territories and the Sea (DDTM);
 - o 19 regional Directorates for Economy, Employment, Labour and Solidarity;
 - o 13 regional Directorates for Environment, Planning and Housing (DREAL);
 - o 20 regional Academic Delegations for Youth, Engagement and Sport (DRAJES);
 - o 28 regional Directorates for Food, Agriculture and Forestry (DRAAF);
 - o 28 regional Directorates for Cultural Affairs (DRAC);
 - o 23 regional Directorates for Public Finances (DRFIP);
 - o 30 rectorates of academies;
 - o 20 regional health agencies (ARS).
- State operators shall:
 - o 438 operators in 2023: universities, research centres, etc.
- local and regional authorities and their groupings:
 - o Local authorities: 34 945 municipalities, 101 departments, 18 regions
 - o Groupings of local and regional authorities: 229 conurbation communities, 990 municipalities, 14 urban communities, 22 metropolises, 11 public territorial establishments, 26 metropolitan clusters, 125 centres of territorial and rural balance, 1 207 multi-purpose inter-municipal unions, 4 626 single-purpose inter-municipal unions, 1 971 closed mixed unions, 800 mixed trade unions open
- public or private entities meeting the following cumulative criteria:
 - o established for the specific purpose of meeting needs in the general interest not having an industrial or commercial character;
 - o mostly and directly financed by the State, local and regional authorities or their groupings; and
 - o of which the administrative, management or supervisory body is composed of members more than half of whom are appointed by at least one entity mentioned in point (a), excluding State operators.

Reduction of final energy consumption by public bodies

In order to achieve Article 5 of Directive (EU) 2023/1791, which calls for a 1.9 % reduction in the final energy consumption of public bodies compared to 2021, France plans to set trajectories with concrete targets in 2030, 2040 and 2050.

To this end, an energy consumption data collection tool is being developed. It is expected to estimate the level of energy consumption of public bodies in 2021 and collect their annual energy consumption data to assess compliance with Article 5 EED.

As work on transposing the EED is ongoing (identification of public bodies, estimate of their energy consumption in 2021, etc.), it is difficult at this stage to specify the amount of cumulative annual energy savings corresponding to the value of 1.9 % of energy consumption in 2021.

The current estimate of the volume of reduction in the final energy consumption of public bodies is as follows:

- Consumption of Ef from the state and its operators in 2021: 14.3 TWh
 - o Distribution of uses
 - Energy consumption of buildings in 2021: 13 TWh⁶⁵
 - Other consumption: 1.3 TWh (10 % of buildings consumption)
- Consumption of local and regional authorities and their groupings: 41.3 TWh
 - o Energy consumption in 2017: 39.7 TWh, with a breakdown of the following uses⁶⁶:
 - 78 % of energy consumption for the building;
 - 12 % for street lighting;
 - 7 % for fuel;
 - 3 % for water and waste management.
 - o Changes in consumption in the residential services sector between 2017 and 2021: + 0.4 %⁶⁷
- **The equivalent cumulative reduction in energy consumption (1.9 %) is therefore in the order of 1 TWh/year.** This figure is a first estimate that needs to be refined.
 - o Sectoral breakdown⁶⁸:
 - Residential: ~ 0.2 TWh/year (18.3 % in 2023 for the State and its operators),
 - Tertiary: ~ 0.8 TWh/year (81.7 % in 2023 for the State and its operators).

At the same time, it is notable that the number of municipalities subject to this obligation will increase significantly over time since⁶⁹:

- 32 720 municipalities have 5 000 inhabitants or less (93.6 %);
- 2090 municipalities have between 5 000 and 50 000 inhabitants (6.0 %);
- 141 municipalities have a population of up to 50 000 (0.4 %).

In order to achieve these energy consumption reduction targets, tertiary buildings of more than 1 000 m² owned by public bodies are subject to the tertiary eco-energy decree,⁷⁰ which requires a 40 % reduction in final energy consumption in 2030 compared to a reference year in the period 2010-2020, or the achievement of an absolute consumption value. As this regulatory system has been in place since 2022, public service operators are therefore invested in reducing their energy consumption. The implementation of this decree will therefore contribute significantly to reducing the energy consumption of public bodies.

⁶⁵ Annual report of the State Buildings Directorate for 2021, Link:

https://www.economie.gouv.fr/files/files/2022/DIE_Rapport%20d%27activit%C3%A9_2021.pdf

⁶⁶Local authorities' energy expenditure for 2017, September 2019, Access: <https://librairie.ademe.fr/urbanisme-et-batiment/493-dependances-energetiques-des-collectivites-locales.html>

⁶⁷ Final energy consumption data for tertiary and residential sectors, SDES, May 2024: <https://www.statistiques.developpement-durable.gouv.fr/chiffres-cles-de-lenergie-edition-2023>

⁶⁸ Annual report of the State Buildings Directorate for 2023, Link: <https://immobilier-etat.gouv.fr/pages/rapports-dactivite-die>

⁶⁹Sources: INSEE, population census as at 1st January 2021, data published online in December 2023. Link:

<https://www.insee.fr/fr/statistiques/2522602>

⁷⁰Decree No 2019-771 of 23 July 2019 on action obligations to reduce final energy consumption in tertiary buildings. Link

<https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000038812251>

Renovation of buildings owned by public bodies

Tighter regulation for new buildings

In the reference scenario of the multiannual energy programming (EPP), the strengthening of environmental regulation for new construction has been integrated, in particular through the introduction of a criterion for greenhouse gas emissions over the whole life cycle of the building. This new environmental regulation (RE2020) applies to dwellings, offices, educational and other specific tertiary buildings. This choice is consistent with an exemplary approach to public action, whereby buildings owned by public bodies are intended to be part of best practice in terms of decarbonisation.

Renovation trajectories

In order to comply with Article 6 of Directive (EU) 2023/1791, which requires 3 % of the heated or cooled surface of buildings over 250^m 2 owned by public bodies to be renovated at NZEB level, France plans to set ambitious renovation paths. These trajectories will be specified when a precise inventory of public buildings and their performance can be carried out.

In December 2023, France notified the European Commission of the use of the alternative measure to meet the requirements and objectives of Article 6 EED. The estimate of energy savings equivalent to those that would have been achieved with the renovation of buildings at NZEB level over that period, between October 2025 and December 2030, would be in the order of 4.5 TWh. However, this is an initial estimate and a reassessment will be needed to redefine this figure.

The total area of buildings owned by public bodies to be renovated at NZEB level is estimated at 400 billion m².

In March 2020 France submitted its long-term strategy to mobilise investment in the renovation of the national stock of residential and commercial buildings, both public and private. This document was prepared as part of the transposition of Article 2a of the Energy Performance of Buildings Directive as amended by Directive 2018-844 of 30 May 2018.

Since the previous Shared Strategy, France has introduced minimum energy performance standards aimed at gradually banning the most consumer-friendly housing from renting. Thus, the maximum final energy consumption threshold for a dwelling has been set at 450 kWh/m² since¹ January 2023 for hexagonal France. The Climate and Resilience Act, adopted in 2021, reinforced this provision. As from 2025, it will be forbidden to rent thermal passoires classified as G label in the sense of the health performance diagnosis, and from 2028 for the rest of the F A passoires from 2034, housing classified as E (addition voted by the national representation) will be prohibited.

This is because these dwellings will gradually be considered indecent under the law. The dwellings can therefore no longer be rented, and the current tenant, for example in the case of tacit renewal of the lease, may require the owner to carry out works.

Near-zero energy buildings (NZEB) and zero-emission buildings (ZEB)

The definition of nearly-zero energy buildings still corresponds, for new buildings, to compliance with thermal regulation 2012 (known as RT 2012). On the other hand, new rules entered into force for new buildings on¹ January 2022. This new environmental regulation, known as RE2020, already applies to residential buildings, offices and schools. It will subsequently apply to other non-residential buildings. This legislation goes further than the previous one by introducing thresholds for greenhouse gas emissions, calculated in a life-cycle analysis, allowing for the carbon impact of energy consumed and that of construction to be taken into account.

For existing buildings, the definition of NZEBs corresponds to the BBC Renovation label.

As part of the transposition of Directive 2024/1275 on the energy performance of buildings, a definition of zero-emission building (ZEB) will be established for new and existing buildings. In particular, the BZs must not cause on-site CO₂ emissions from fossil fuels and have a very high energy and carbon performance. New buildings will have to meet the requirements of zero-emission buildings by 2028 for public bodies' buildings and by 2030 for other buildings.

National energy demand management targets

The national objectives in terms of controlling energy demand are:

- Decrease in final energy consumption by 50 % in 2050 compared to 2012 (as defined in the Law on Energy Transition for Green Growth and the Energy and Climate Law);
- The draft multiannual energy programming (EPP) also includes targets for energy consumption by type of energy. All the measures envisaged are set out in detail in section 3.2.

The 'low-consumption building' or equivalent building stock target for 2050 laid down in Article L.100-4 of the Energy Code will have to be updated to reflect the EU-wide target for a zero-emission building stock by 2050. The National Energy Renovation Strategy for long-term buildings will be replaced by a National Building Renovation Plan, which aims to ensure the renovation of the stock of residential and tertiary buildings, both public and private, with a view to building a highly energy efficient and decarbonised building stock by 2050 and to transform existing buildings into zero-emission buildings. A first draft will be established by 31 December 2025 and the final plan by 31 December 2026.

In addition to the Union-wide targets set by Regulation (EU) 2023/851, in 2030 France set a target for the end of the sale of new passenger cars emitting more than 123 gCO₂ per km. Vehicles emitting more than this threshold will have to account for a maximum of 5 % of the total annual sales of new passenger cars by that date.

France also set itself in 2019 a target for ending the sale of new heavy-duty vehicles used for the transport of persons or goods and mostly using fossil fuels, by 2040, a target now reinforced by the end of the sale of new thermal vehicles in 2035 decided at European level.

As part of the ecological planning work, the French authorities also envisage targets of 66 % for electric cars, 51 % for light electric vehicles and 50 % for electric heavy goods vehicles in new sales in 2030.

2.3. Dimension energy security

The war in Ukraine and the resulting decrease or even stop of Russian pipeline gas and oil imports has put our security of supply under severe strain. It has largely demonstrated the stalemate of an energy strategy based on maintaining a substantial share of fossil energy imports, and the top priority for the EU to move away from fossil fuels.

As regards natural gas, the rapid decline in Russian gas exports has created tensions at European level. Much of the European supply historically provided by Russian pipeline gas imports had to shift to liquefied natural gas (LNG) imports per ship.

This has required a short-term reinforcement of import and storage capacity, but in a reasoned way to avoid investment in infrastructure that will be less useful in the medium term. Similarly, solidarity mechanisms at European level have been put in place.

The significant reduction in gas consumption in France caused by the introduction of a major sobriety plan has made it possible to ensure security of supply and must be maintained.

The next EPP reassesses the relevance of gas storage infrastructure in view of the evolution of our consumption and the new natural gas supply context.

On electricity consumption, EPP 3 will focus on studying and fostering the resilience of our electricity system through stress tests. It will also pursue the objective of controlling consumption at the forefront and the development of the available flexibility mix, in particular demand management (demand response), battery storage, pilotable means of production such as nuclear power plants, pumped power transfer (STEP) or thermal transfer stations and interconnections.

2.3.1 Security of fuel supply

With the overall reduction in the use of fuels, particularly fossil fuels, and the development of the production of 'advanced' biofuels (see section 'Biofuels and synthetic fuels' above), measures to ensure security of supply of fuels will evolve and take account of new products.

Strategic stocks of fuels and crude oil are built up in France in order to be able to respond collectively and rapidly to major disruptions in the supply of petroleum products. These strategic stocks are currently composed of the following fossil products: diesel, SP95 ethanolable base, heating oil, crude oil and jet fuel. The definition and management of strategic stocks will therefore evolve in line with changes in our consumption, for example with a reduction in diesel consumption towards petrol or an increase in biofuel consumption, with a view to maintaining the resilience of this national energy logistics.

On the effects of climate change, the International Energy Agency discussed the effects of climate change on oil and gas supply in its latest Climate resilience for energy security report of November 2022. It addresses the effects of sea level rise and the intensification of tropical cyclones on coastal refineries, forest fire risks for refineries, and the effects of droughts on shale production. However, this analysis does not include the effects of climate change on transport routes.

Pipelines are designed to be operated over a wide range of temperatures, well above what could happen with global warming. The main climate change-related phenomena that can affect oil and gas pipelines are the effects of secheresses on the soil (withdrawal from the soil or removal and swelling of clay).

Fuels are also supplied by river barge in certain regions. This is particularly the case in the east, where the Rhine is particularly affected by repeated droughts or floods, and this may lead to the total cessation of barges or reduced tonnage traffic. Alternative fuel supply solutions exist, but if the impossibility of navigation continues, other solutions, such as the use of the release of strategic stocks, may be necessary.

2.3.2 Security of gas supply

France has import capacities through the Franpipe pipeline, which connects natural gas production fields located in the Norwegian North Sea with France, as well as 4 LLNGC terminals (located in Dunkerque, Montoel-de-Bretagne, and, in two cases, Fos-sur-Mer) enabling the import of liquefied natural gas.

The French gas storage infrastructure, with a capacity of 130 TWh, is designed to cope with the seasonality of natural gas consumption. Natural gas stocks are built up during the summer, during the period of low consumption of natural gas, and are used during winter when natural gas consumption is high. The French gas storage infrastructure thus makes it possible to smooth imports of natural gas throughout the year.

On national targets for diversification of energy sources and supply from non-EU countries

In the absence of significant domestic production, the supply of natural gas is based on imports. In order to ensure security of supply, France has built up an infrastructure comprising seven interconnectors for imports and five LLNGC terminals. This infrastructure enables natural gas suppliers to have access to diversified sources of natural gas.

Natural gas imports are indeed the responsibility of natural gas suppliers. In accordance with the principle of third party access, they may use the infrastructure to import natural gas, irrespective of its origin, provided, however, that it is not subject to an import ban.

The origin of natural gas imported into France is monitored through surveys of natural gas suppliers. These investigations show that Norway is France's main supplier of natural gas, supplying almost a third of natural gas imported into France (32 % in 2023), ahead of the United States (24 %), Russia (12 %) and Algeria (12 %).

In recent years, the diversity of sources of natural gas imported into France has tended to increase. The Herfindahl-Hirschmann index based on the countries of origin of natural gas imported into France has been on a downward trend since 2015.

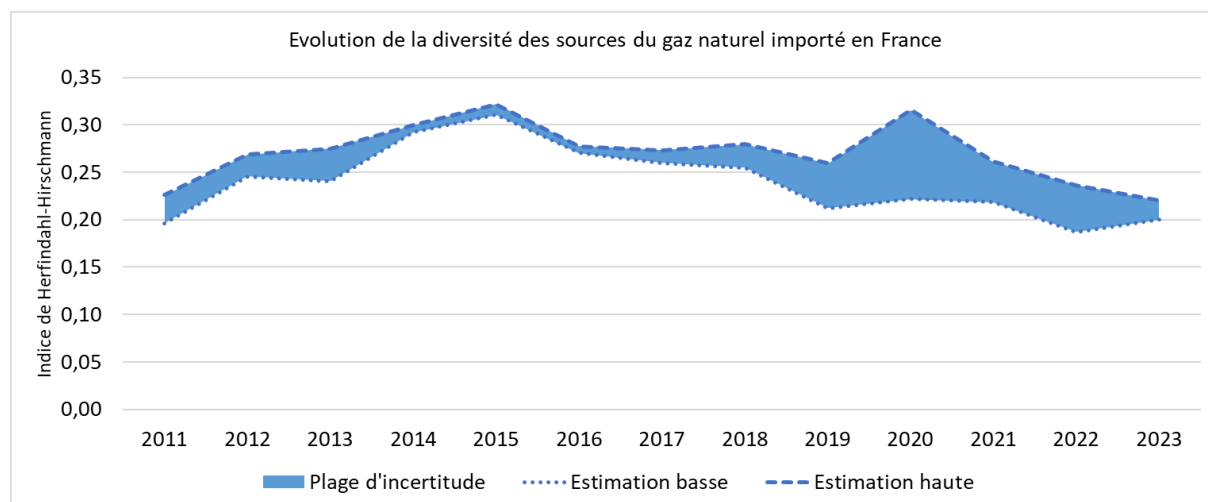


Figure39: Changes in the diversity of natural gas sources imported into France

On demand reduction plans:

France published an energy sobriety plan on 6 October 2022⁷¹ and recently on 20 February 2023 and recently on 12 October 2023 energy sobriety⁷² plans to ensure that our energy consumption is reduced over time and, in particular, to achieve a 15 % reduction in gas demand. More details on these sobriety plans can be found in section 2.3.3 below.

⁷¹ <https://www.ecologie.gouv.fr/sites/default/files/dp-plan-sobriete.pdf>

⁷² https://www.ecologie.gouv.fr/sites/default/files/Plan_Sobriete_energetique_un%20an%20apres.pdf

On national targets to replace Russian fossil fuels with domestic energy sources, in particular renewable energy and low-carbon gases:

France makes the exit from fossil fuels a priority. This is done through four pillars: energy sobriety, energy efficiency, the acceleration of all renewables and the relaunch of nuclear power. The EPP defines the state's action over the next ten years to reduce energy consumption in all sectors and decarbonise the energy mix.

As regards biogas in particular, as mentioned above, France has taken strong measures to speed up its development, in particular by upgrading the indexation formulas for biogas injection tariffs, by allowing the indexation of the tariff twice a year and by giving more flexibility to those involved. As of 23 October 2023, 617 installations have injected biomethane into natural gas networks. Their capacity amounts to 11.1 TWh/year, up 22 % from the end of 2022. In 2030, at least 15 % of the gas in the networks will be biogas, reducing our import needs accordingly.

On the gas storage level of at least 80 % on 1 November²⁰²², increasing to 90 % in the following years:

The Law of 16 August 2022 allows the Minister for Energy to assign a filling trajectory to each operator of the storage infrastructure.

So far, it has not been necessary to use this provision to meet the 90 % load factor of the storage infrastructure on 1 November. This point will be checked and updated when the PNIEC is updated in 2024 on the basis of feedback from experience.

Solidarity mechanism for the supply of natural gas

Over recent years, priority has been given to actions aimed at strengthening the functioning of the internal market in natural gas and reducing the risk of a disruption of natural gas supply in France and neighbouring Member States, including the establishment of export capacity to Germany and the increase in the capacity of LNG terminals. In parallel, work has continued to be able to implement a possible activation of the solidarity mechanism for the supply of natural gas in two phases: a first phase with calls to the market and a second phase with load shedding. The possible activation of the solidarity mechanism for the supply of natural gas is envisaged within the transitional framework set out in Article 28 of Regulation (EU) 2022/576.

2.3.3 Security of electricity supply

The main challenge is, on the one hand, the dimensioning of the electricity system to cover the annual energy needs and the passage of peak energy consumption and, on the other hand, its decarbonisation.

The shift from peak consumption is primarily based on the flexibility of the electricity system in order to be able to ensure a balance between consumption and production at all times.

The flexibility of the electricity system is an essential tool contributing to the achievement of climate objectives and the associated transformation of production technologies, in particular to integrate an increasing share of variable renewables into the grid. It contributes to ensuring security of supply and enables the electricity system to function more efficiently. Moreover, it is a lever to optimise the investments needed for the network.

This flexibility can be mobilised both on the supply side (means of production such as hydropower plants, for example) and on the demand side (smoothing consumption peaks, shifting consumption to off-peak times), and also includes storage (including in particular electric batteries and pumped power transfer stations (STEP)) as well as interconnections between neighbouring countries.

As regards the existing thermal park, the capacity currently installed in France is around 18 GW, divided between coal, gas, fuel oil and biomass or biogas plants. In order to ensure its decarbonisation, two options are considered for installations remaining necessary for security of supply:

- As a matter of priority, switching to decarbonised fuels (biomass, biogas, bioliquids or hydrogen);
- Where this is not possible, in the case of ‘uncompressible’ emissions by other decarbonisation levers, the continued use of fossil fuels using technologies for capture, transport, use or storage of emitted CO₂ (CCUS).

The TEN study “Energy Bees 2050” shows that the expansion of renewable energies, which is necessary to achieve the objective of carbon neutrality, should be accompanied by increased use of flexibilities, particularly from 2035. RTE identifies additional requirements of between 28 and 68 GW (including production, demand and storage) by 2050. These needs are all the more important as the share of renewables in the electricity mix is.

The TENs 2023-2035 forecast report published on 20 September 2023⁷³ contains initial analyses of the needs for flexibilities over time of multiannual energy programming. These needs will be reassessed in a dedicated chapter on flexibility to be published soon by RTE.

While RTE considered that security of supply would improve in the coming years, it pointed out that the existing fleet alone was not sufficient to meet the need for flexibility by 2030 and thus identified a need for additional capacity that could be ensured by various combinations of control of consumption and production.

The provisional balance sheet defines four types of flexibility needs: structural and regular flexibilities to smooth cyclical changes in production or consumption (alternating day-night), dynamic flexibilities to adapt to day-on-day variations, balancing flexibilities to ensure balance between production and consumption in real time and to deal with contingencies and finally safeguard flexibilities.

Four solutions/tools are defined in the forecast balance as helping to cover the different flexibility needs.

- 1) Demand flexibility (demand-side response, control of refill, modulation of peak electrolyser consumption)
- 2) Stationary batteries can meet, in addition to or as an alternative, balancing needs on a time scale of a few hours
- 3) Thermal power stations
- 4) Hydraulic pumping stations (STEP).

For longer periods, the development of additional decarbonised thermal capacities will largely depend on the level of nuclear availability, as well as on additional sobriety efforts. In the event that the need for decarbonised thermal capacity is proven, it would be limited and would have a low average volume of hours.

The provisional report stresses the importance of positioning certain uses in the best way in relation to the new realities of the electricity system and considers that, in order to ensure security of supply and optimise the operation of the electricity system by 2030 and 2035, developing consumption modulation and battery storage will play an increasing role in increasing the flexibility of the electricity system.

The management of peak demand requires the use of both ad hoc consumption reductions in response to short-term market signals (demand response), but also more structural reductions in consumption, making it possible

⁷³<https://www.rte-france.com/actualites/bilan-previsionnel-transformation-systeme-electrique-2023-2035>

to move larger volumes at the best time for the proper functioning of the electricity grid and at a lower cost to the community, in particular by means of time-to-seasonal supply offers.

France has a long tradition of demand management: since the 1980s, there have been supply offers that exploit the possibility of shifting consumption from certain uses by linking them to a peak/off-peak signal (e.g.: electric water heaters), which are still very efficient and still allow nearly 10 GW of consumption to be offset today. These structural shifts make it possible to avoid the use of cutting-edge or semi-advanced means of production and to place consumption at times when (decarbonised) production is the most abundant (night, afternoon summer, etc.).

France considers that it is possible to strike a balance between the transmission of a price signal and consumer protection (mobile offers such as EJP/TEMPO), especially as the crisis has shown that consumers were reacting to the price signal even when they were partially covered (e.g. companies choosing to resell their cover rather than consume electricity).

Specific support measures have also been put in place in recent years, such as the call for demand response by which RTE contractualised demand response capacities between 2018 and 2023 each year. In 2024, France launched a new support scheme by means of a call for tenders open to decarbonised flexibilities, i.e. including demand-side response but also storage, which was approved by the Commission on 21 December 2023 as State aid for the period from 2024 to the first quarter of 2026.

Furthermore, discussions are ongoing to define the *design* of the next capacity mechanism in order to enable the development, through it, of a target “flexibility mix” for 2030 and 2035, which is currently being defined with RTE.

In order to overcome the obstacles preventing demand-side response from participating in the markets, France has also introduced a mechanism called ‘NEBEF’ allowing for erasure to participate in the J-1 and intraday markets on an equal footing with production. Since 2016, measures have been taken to reduce as far as possible the legal bottlenecks faced by innovative players, for example through a broader mechanism called “France Experimentation” or a mechanism that allows derogations to be granted to electricity networks.

The next EPP should consider the development of consumption flexibilities as a whole, ranging from consumption shifts for regular and structural needs (e.g. through the development of supply offers at rates differentiated according to time/seasonal items) or reductions in consumption for more specific needs related in particular to security of supply (via explicit demand response or EJP/TEMPO mobile peak supply offers).

In order to meet the needs of the electricity system in 2030 and 2035 and to comply with the new provisions of the reform of the electricity market, France will define indicative national flexibilities targets, based in particular on RTE’s forecast balance sheet and its flexibility chapter, which will be published shortly.

Climate adaptation

Climate change has a direct impact on production levels (for nuclear and hydropower, PV: reduction in efficiency with high temperatures, and wind, depending on wind patterns) and consumption profiles (increase in use of air conditioning in summer, etc.).

The priority challenges for the nuclear reactor fleet in terms of climate change and associated risks are:

- Rising air and water temperatures
- Drought leading to a decrease in river flows (including stretching)

- Marine level (risk of marine submersion).

The main impact of climate change on hydropower infrastructure is the hydrology change caused by rising temperatures and changing precipitation patterns. Climate change also has an impact through extreme events for hydropower installations, such as heat waves, droughts, extreme precipitation and floods.

Climate change could affect the operation, the economic performance of the park, but also water management (reconciliation of uses), the environment and safety. Hydropower production depends on the availability of water resources and is therefore heavily conditioned on precipitation (snow and rain) and temperatures (and their influence on the evaporation of lakes).

Studies should make it possible to assess the possible need for additional pumping stations for non-energy purposes. Since deductions are requested for uses other than hydropower production, consideration could be given in certain sectors to introduce pumping systems to replenish a stock of water and thus make the resource more available.

On the reduction of electricity consumption by 10 % compared to the reference period and the reduction of electricity consumption at peak hours by 5 %:

The next EPP will set more ambitious targets for reducing our energy consumption: 1 243 TWh of final energy consumption (an increase of around 30 % compared to 2012) in 2030 against a target of 1 378 TWh (a reduction of 16.5 % compared to 2012) in 2 028 in the previous EPP.

Furthermore, in line with the monitoring obligations of Council Regulation (EU) 2022/1854 of 6 October 2022 on an emergency intervention to remedy the increase in energy prices, the French authorities have implemented 4 major axes to achieve the objective of reducing overall electricity consumption:

- The implementation of a sobriety plan: On 6 October 2022, France published an energy sobriety plan, extended an 'act 2' dedicated to summer measures launched on 20 June 2023, and produced a conference on the anniversary of the launch of the plan on 12 October 2 023 in order to maintain constant mobilisation of stakeholders on the subject of energy sobriety and to ensure that our energy consumption is reduced over time.
- The deployment of a communication plan;
- The continuation and strengthening of the incentive to achieve energy savings through energy saving certificates (EECs);
- The continuation of actions related to the policy on energy performance and energy renovation of buildings.

The French authorities have also implemented additional measures to achieve the objective of reducing electricity consumption during peak hours such as:

- Communication plans and actions to reduce or defer certain consumables that can be moved outside peak hours;
- A voluntary commitment by stakeholders to implement measures to reduce peak consumption (Ecowatt charters, sectoral sobriety plans);
- Development of control and demand response;
- The obligation to switch off light advertisements during peak hours on days of high voltage (red Ecowatt days);

- Longer-term actions aimed at sustaining consumers' interest in shifting consumption away from peak hours every day on the basis of a full-hour/off-peak tariff signal, or to encourage demand-side response on certain particularly tense days by means of a mobile peak tariff signal.

Below you will find France's reporting on the reduction in electricity consumption for the period 1 December 2022 and 30 April 2023 compared with the reference period (Table 1) and during peak hours (Table 2). The measures put in place enabled France to achieve a range of monthly consumption reductions at peak hours of 4-7 % during the period under investigation and up to 7-10 % for December and February.

| Mois | Automne/hiver 2022-2023 (TWh) | Moyenne automne/hiver période de référence (TWh) | Différence relative | Différence absolue (TWh) |
|----------|-------------------------------|--|---------------------|--------------------------|
| Avril | 34,29 | 35,48 | -3,34% | -1,19 |
| Mars | 42,09 | 44,69 | -5,56% | -2,48 |
| Février | 41,99 | 45,58 | -7,88% | -3,59 |
| Janvier | 49,63 | 53,13 | -6,59% | -3,50 |
| Décembre | 46,47 | 50,87 | -8,64% | -4,40 |
| Novembre | 39,61 | 43,10 | -8,09% | -3,49 |
| Octobre | 34,04 | 36,89 | -7,70% | -2,84 |

Figure40: reduction in monthly electricity consumption in France between 1 December 2022 and 30 April 2023 compared to the reference period

| Mois | Automne/hiver 2022-2023 (TWh) | Moyenne automne/hiver période de référence (TWh) | Différence relative | Différence absolue (TWh) |
|----------|-------------------------------|--|---------------------|--------------------------|
| Avril | 7,11 | 7,36 | -3,40% | -0,25 |
| Mars | 10,07 | 10,73 | -6,08% | -0,65 |
| Février | 9,75 | 10,58 | -7,86% | -0,83 |
| Janvier | 11,44 | 12,29 | -6,96% | -0,85 |
| Décembre | 10,62 | 11,65 | -8,78% | -1,02 |
| Novembre | 8,76 | 9,54 | -8,23% | -0,79 |
| Octobre | 7,71 | 8,41 | -8,33% | -0,70 |

Figure41: reduction of monthly electricity consumption in France between 1 December 2022 and 30 April 2023 at peak times compared to the reference period

It should be noted that electricity consumption in France decreased between 2005 and 2023 (see graph below).

Évolution entre 2005 et 2023 de la consommation corrigée des effets météorologiques et calendaires

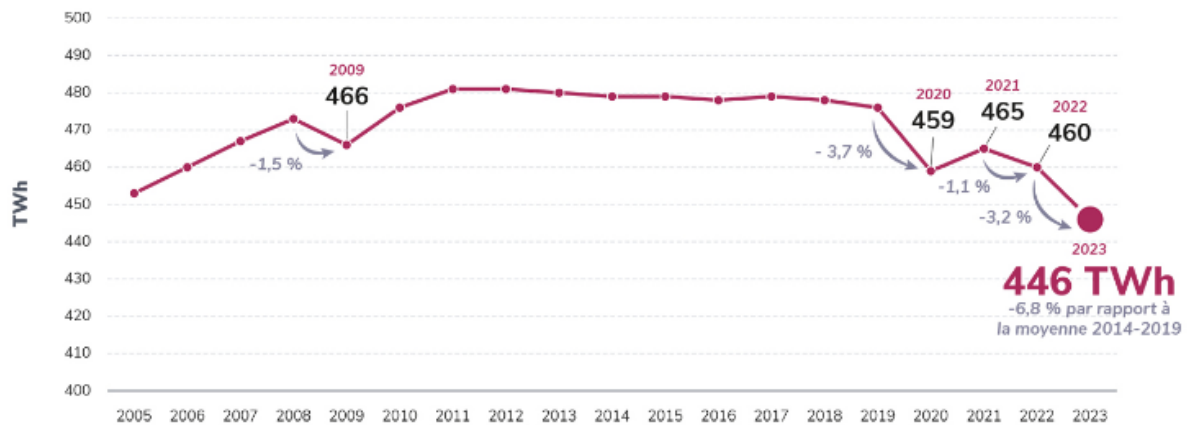


Figure42: Changes in meteorological and calendar corrected consumption between 2005 and 2023 ([Electricity balance sheet 2023 – consumption | RTE \(rte-france.com\)](https://www.rte-france.com/fr/bilan-energetique/le-bilan-energetique-2023))

2.4. Internal energy marchdimension

2.4.1 Energy infrastructures

2.4.1.1 Grid technologies

The challenges of accelerating and masking renewable energies, as well as increasing consumption, particularly in industry with high new needs for, inter alia, large sites and in ports in connection with the charging of large hybrid powered vessels such as ferrys, will entail structural changes in network development strategies and associated investments.

The challenges are both financial, with massive investment trajectories in the coming years (programmes in the order of EUR 100 billion for the transmission manager and EUR 100 billion for the distribution system operator by 2040), industrial (availability of equipment, challenge of connecting offshore wind, standardisation/massification, expansion of industrial equipment), and human (recruitment).

The TEN transmission system operator is currently revising its trajectories to take into account the context of accelerating the energy transition. These new trajectories will be presented in its ten-year transport network development plan, to be published by early 2025. In particular, they will take account of the need to speed up the connections of industrial or renewable energy projects. As regards the distribution network, the main French network operator Enedis plans to increase its annual investments by 20 % by 2032.

Better planning and anticipation of network developments is in this context a key challenge for the success of the energy transition. This is why the legislative framework has evolved with the Acceleration Law for the production of renewable energy, which includes a reform of the regional plans for connection to the RES network (S3REnR). The APER law thus strengthens the anticipatory scope of these schemes by establishing a

time horizon of 10 to 15 years, instead of currently five to ten years, by making planning more robust by encouraging producers to register with RTE upstream, and by providing that certain priority investments may be undertaken as soon as the share is approved when they are judged to be 'no-regret'.

Networks face twice the challenges of climate change. On the one hand, physical infrastructure needs to be adapted to take better account of environmental changes linked to global warming (rising temperatures, changing hazards). On the other hand, as explained above, climate change directly influences consumption and production profiles and requires a corresponding adaptation of the network structure.

The increase in summer temperatures may lead to parts of low-distribution transport works being outside normal operating conditions, requiring a reduction in their transit capacity or even de-energising them. With regard to the distribution network, HTA underground cables insulated with impregnated paper installed until the early 1980s are particularly sensitive to heat-wave episodes.

The risk of flooding (overflow, run-off, sludge casting and marine submersion, rising groundwater) also threatens some extra high voltage conversion stations, or source stations that provide the interface between the transmission and distribution network. Violent winds can cause significant damage to networks, including distribution, often due to falling trees on the lines.

Improving the resilience of this electricity infrastructure requires in particular:

- Appropriate sizing of the infrastructure, at the time of its construction or renewal,
- if necessary, changes in the regulations or standards in force for the sizing of future renewed works or works,
- renewal policies consistent with the challenge of adapting to climate change and, where relevant, targeting existing infrastructure identified as most climate-sensitive,
- adapting the operation of existing works which are not resilient to changes in the climate, taking into account the dimensioning of the infrastructure (the operating levers are not the same for works sized for future temperatures and for those which are not),
- the quality (geographical accuracy, treatment of extremes, etc.) of the climate data taken into account in the forecasting and operation of networks, and the improvement of scientific knowledge and models.

To address these challenges, the ongoing work on the Third National Climate Adaptation Plan has identified at this stage the following actions:

- The Minister for the Economy, Finance and Industrial and Digital Sovereignty, the Minister of State for Industry and Energy, the Minister for Ecological Transition and Territorial Cohesion and the Minister of State for Transport called on companies essential for the functioning of energy and transport systems to prepare rapidly for the impact of climate change on their infrastructure and activities. In a letter sent to around 40 public and private companies, they asked them to carry out a vulnerability study by the end of 2024, which will take place in the short (2030) and medium term (2050) or even long-term (2100) for long-term assets. This vulnerability study must be based on the reference warming trajectory (TRACC) adopted by the State, which anticipates a warming of + 4 °C in hexagonal France in 2100. By the end of 2025, these companies will have to finalise a detailed climate change adaptation plan that will build on the vulnerability study and propose measures to increase the resilience of energy and transport systems to changing climate hazards. This work should include particular attention to overseas countries and include a territorial dimension.

- Integrate into network operators' planning exercises the impact of climate change on consumption and generation profiles: this would involve adapting the technical characteristics of overhead and underground lines; report that the structures are dimensioned and operated during their construction/renewal on future temperatures; continue the policy of replacing IPC HTA cables; continue Enedis' programmes to strengthen the resilience of air HTA networks (Climate Aléas Plan and Programmed Renovation).
- Improving the resilience of the network to floods: the aim would be to locate and design future or renewed posts on the basis of the information provided by the Flood Risk Prevention Plans (PPRI) and the modelling of flood risk (overflow) by 2040/2050. Among the existing posts, technical solutions should be implemented as a matter of priority for those posts which are both the most exposed to this risk and the most critical to the network.

One of the objectives of RTE's future ten-year network development plan (SDDR) is to define a programme for the renewal of works to meet the challenges of adapting to climate change. This renewal programme takes into account several factors such as the old age of the works and their importance for the electricity grid.

Smart grids

Smart grids solutions benefit all actors in the electricity system.

They shall promote the strengthening of the role of consumers by enabling them to participate in the optimal operation of the system, including the development of self-consumption, demand response or smart charging.

They enable network operators to optimise their operation: in particular, through closer knowledge of constraints and the possibility of remote ordering of many network elements, they can steer the network as close as possible to its boundaries, make it more resilient to contingencies – for example by self-healing incidents, and avoid costly investments. Optimising flows also reduces network losses, which currently account for 8 % of electricity consumption.

They shall also encourage optimisation of the production fleet in order to avoid investing in new carbon generation capacity, enabling renewable production to be piloted where possible, and to exploit new sources of flexibility through storage. Finally, they allow for a consistent deployment of demand-side flexibilities, by controlling the charging of electric vehicles or optimising consumption.

Smart meters

The deployment of the Linky electricity meter started on 1^{December} 2015.

The investment of around EUR 5 billion is borne by distribution system operators through the TURPE. To date, more than 36 million low-voltage customers are equipped with a Linky meter and are already benefiting from the new related services. The deployment and budget objectives have been met, allowing for a positive track record of the realisation of community-wide gains, with EUR 1 billion saved over the period 2021-2024.

The communicating meter brings two main innovations compared to existing meters:

- a much more detailed measurement of consumption and information on the quality of the electricity supplied;
- bi-directional communication capability: it can transmit information and receive instructions using online carrier current technology.

The communicating meter plays a fundamental role in the modernisation of the grid by significantly increasing the observability of the low voltage grid for system operators, including further monitoring of the voltage level on the low voltage grid, as well as faster detection of failures and demand faults.

The meter promotes the emergence of consumption control services, which it will serve as a support. It also allows the deployment of new tariff mechanisms to better reveal the costs of the electricity system and provide the right incentives, be it in terms of transmission tariffs (TURPE) or electricity suppliers' offers. By enabling consumers to better control their consumption, it will help optimise the electricity grid and the means of production.

2.4.1.2 Gas networks

A study was carried out by the CRE and DGEC in 2022 to identify the challenges associated with gas infrastructure in a context of decreasing methane gas consumption. This study will be complemented by a financial trajectory that will build on the work of the CRE.

Almost all the natural gas transmission network is still necessary to manage seasonal and regional differences between production and consumption and transit between Member States, as few pipelines can be converted for the transport of other gases (H₂, CO₂, etc.).

The distribution network has been widely renewed in recent years and will have a role in integrating biogas. There is little scope for significantly reducing the costs of using natural gas distribution networks by 2030, although adjustments can be made and need to be planned, especially in priority areas for district heating.

2.4.1.3 Oil logistics

Oil logistics will evolve to accompany the energy transition: development of refining to ensure the production of alternative fuels and to reduce the use of fossil energy in processes, changes in deposits to absorb a larger share of biofuels, change in the business model of service stations as a result of changing usage while maintaining a sufficient network of service stations to avoid the creation of white areas. The monitoring of the density of the network in service stations is part of the EPP provisions.

2.4.1.4 Hydrogen infrastructure

Following the priority development of intra-hub networks and their connection to storage infrastructure, the development of the hydrogen transport network between the hubs could be the second phase of the deployment of the hydrogen network. This network will optimise the production, storage and use of hydrogen between French and European sites. The route of this priority transport network will be completed by 2026, together with the related regulatory options. In this respect, the CRE has been entrusted with a task.

In order to meet all future hydrogen needs, our structures for importing hydrogen (or its derived products) need to be frontloaded now after 2030. This means assessing in the context of the new strategy the needs of domestic hydrogen versus imported, the necessary infrastructure and associated business models.

2.4.2 Energy market

The current European market framework for electricity is based on the remuneration of generation capacity according to its marginal cost, i.e. the production cost of one additional MWh by the most expensive power plant. It makes it possible to ensure the continuous efficient dispatch of installations throughout Europe at the

least cost to ensure security of supply in the short term, and the most relevant use of interconnections between national markets, for more than 20 years, and is therefore an important element in European energy integration.

The current European market framework does not provide a long-term price signal for consumers to invest in electrification of uses, efficiency and sobriety. The rules of the electricity market must therefore be supplemented in order to allow the emergence of this long-term signal to protect consumers.

Ensuring low-carbon and competitive energy is essential for the decarbonisation of the French economy. However, the current system of Regular Access to Historical Nuclear Electricity (ARENH) will come to an end on 31 December 2025. It is therefore important that the future design of the French electricity market allows all French consumers to benefit from the competitiveness of historical nuclear electricity.

The agreement reached on the reform of the European electricity market (EMD general approach of 17 October 2023) is in this direction.

The energy mix of the future, and in particular the electricity mix, will thus be built on the basis of a reindustrialisation scenario, which has been considered as the reference scenario for defining the trajectories of the decarbonised energy production stock in the multiannual energy programming.

It should also be noted that during the energy price crisis, price shields were put in place to protect households from unprecedented increases in energy prices.

Finally, in accordance with Article 20 of Regulation (EU) 2019/943, in 2022 we had an implementation plan with 20 measures to improve the functioning of the market.

2.4.3 Energy poverty

According to the Law of 12 July 2010 establishing a national commitment for the environment, '*energy poverty is a person who has particular difficulties in obtaining the energy supply necessary to meet his or her basic needs because of the inadequacy of his or her resources or housing conditions*'.

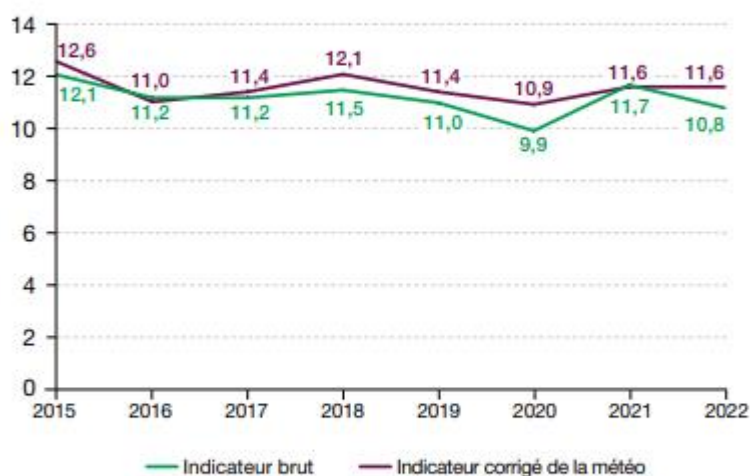
The National Energy Observatory has become a reliable and shared reference tool on energy poverty in France, for knowing, monitoring and analysing this phenomenon and on the measures put in place to combat energy poverty. A basket of indicators has been defined to characterise and quantify energy poverty related to housing and mobility, and their evolution is monitored annually and is published as part of a scoreboard. **2 indicators mainly assess energy poverty:**

- the indicator based on the energy effort rate, now estimated annually by the Commission General for Sustainable Development using the microsimulation model Prometheus. This indicator considers a household in energy poverty when its energy expenditure in the household exceeds 8 % of its income, and its income per consumption unit (UC) is less than 3 decimal^{places} per unit of income. The share of households in energy poverty is estimated annually by the General Commission for Sustainable Development (CGDD) using the 'Prometheus' model;
- the indicator on the feeling of cold, taken from the Energie-info barometer carried out by the National Energy Ombudsman from a sample of more than 2000 people. This reporting indicator quantifies self-restraint phenomena that the economic indicator does not capture. This indicator shall consider a household in energy poverty if it declares that it feels cold according to at least one of the following five reasons: poor insulation, insufficient heating installation, failure of heating, limitation of heating due to cost, energy cut due to unpaid.

According to the National Observatory on Energy Poverty (ONPE), in 2021, 11,9 % of French households, or 3.4 million households (2020: 3 million), spent more than 8 % of their income on paying their energy bills for housing (compared to 10.5 % in 2020 and 11.4 % in 2019). The 'weather corrected' indicator, which neutralises the effect of weather on heating consumption, stood at 11.7 % in 2021 (compared to 11.5 % in 2020 and 11.9 % in 2019). The effort rate has evolved as follows in recent years:

Graphique 1 : évolution de l'indicateur de précarité énergétique basé sur le taux d'effort énergétique

En %



Note de lecture : en 2022, l'indicateur de précarité énergétique basé sur le taux d'effort énergétique s'élève à 10,8 %. Corrigé des conditions météorologiques, il est de 11,6 %.

Champ : France métropolitaine, hors ménages étudiants.

Source : CGDD, modèle Prometheus 2024

Figure43: Evolution of the energy poverty indicator based on the energy effort rate

The regular monitoring of these energy poverty indicators, as well as the analysis of the impact of the various measures put in place to combat energy poverty, enables France to steer its actions to reduce energy poverty.

France shall set a target of reducing the energy poverty indicator based on the (weather) energy effort rate of 0.5 % compared to 2022 by 2030.

The fight against energy poverty relies on preventive measures (such as support for the energy renovation of housing or the implementation of the tariff shield during the recent crisis) and support for households in energy poverty (support to pay bills with the energy voucher). This is further developed below.

Preventive and curative measures

74Raw indicator, uncorrected for weather

Several schemes to tackle energy poverty have a particular focus on the smallest households, which are detailed in section 3. Policies and measures' (Part 3.1):

The Energy Saving Certificates (EECs) scheme

- TheMaPrimeRénov' aid (grants to individuals to finance energy renovation projects – insulation, change of heating system, installation of ventilation, carrying out an energy audit – including comprehensive renovations)
- Zero Rate Eco-Loan (EcoPTZ)
- Tariff shields
- Winter truce and minimum electricity supply service
- Aid for the payment of invoices: the energy voucher

2.5. French innovation research strategy, deployment of new technologies and competitiveness

2.5.1 Industrial challenges and competitiveness of the energy system

Industrial recovery must continue and accelerate to prepare France for the future, preserve the social model, improve our industrial sovereignty and achieve full employment. On the other hand, reindustrialisation has climate benefits as it can deliver very substantial gains on the French carbon footprint, taking advantage of the very largely decarbonised French electricity mix. The Government therefore intends to support the reindustrialisation of France, linked to the ecological transition objectives. This should improve France's footprint, develop its resilience and create added value and new jobs.

Decarbonising industry and reindustrialisation require a significant increase in electricity generation (+ 60 TWh by 2030 and 160 TWh by 2050), while maintaining a price compatible with industrial competitiveness.

It is with this in mind that in May 2023 the President of the Republic brought together French industry stakeholders, business leaders, elected representatives, representatives of local authorities and associations at the "Accelerating our reindustrialisation" event.

The energy mix of the future, and in particular the electricity mix, will thus be built on the basis of a reindustrialisation scenario, which has been considered as the reference scenario for defining the trajectories of the decarbonised energy production stock in the multiannual energy programming.

In addition, revitalising a French industrial renewable energy production sector, across its entire value chain, from production to recycling, extraction and security of supply of strategic metals, is necessary in order to meet France's objectives in the development of renewable energies while reducing dependence on the international market. France has very advanced research schemes in the field but faces difficulties in seeing competitive industrial sectors emerge. The reindustrialisation of France in the field of renewable energy must involve the development of gigafactories in order to enable the emergence of French and European champions that are competitive on the international stage. The valuation of the entire value chain must be guaranteed on French territory. It is therefore necessary to set up a process for the recovery of energy waste and the reprocessing of materials, in particular composite materials.

This reindustrialisation cannot be achieved without public support to ensure sustainable settlement and growth. It must also involve Community work to promote local know-how by means of a set of criteria and subsidies necessary to ensure the sustainability of these European sectors (technical, environmental and social criteria). This Community work may also provide that support mechanisms for renewable energy can be prioritised over projects using components produced in Europe. This will require changes in the criteria for calls for tender to support the sectors, validated by the European Commission.

The Government's strategy aims to make France the leader in the green technologies needed for decarbonisation and to green existing industries. In response, several measures have already been announced, including in the context of the Green Industry Law recently adopted by Parliament. Supported by contributions from the sectors, this law will contribute fully to this objective of accelerating each of its 4 axes:

- Finance green industry through the mobilisation of public and private funds to make France even more attractive for large-scale industrial projects, in particular through the creation of a future climate saving plan;
- To facilitate and speed up procedures to reduce the time taken to locate industrial sites in France, in particular by dividing the lead times for industrial sites by two;
- Favour virtuous enterprises in all State interventions, using the important leverage of public procurement;
- Training in green industry professions by putting industry at the heart of training in order to increase its attractiveness and respond to the growing demand for work for the green transition.

A working group involving all renewable sectors is also responsible for making proposals for the reindustrialisation of renewable production. Sectoral agreements, such as the offshore wind pact, must therefore be implemented shortly, particularly on photovoltaic, land-based wind and network industries.

Finally, with a view to providing clear signals to industry and promoting the development of the sectors needed for the transition, **the EPP will define industrial targets which will be targets for deployment on national territory.**

2.5.2 French strategies for investment in low-carbon technologies

France considers research and innovation (R & I) to be a key and cross-cutting lever for its path towards achieving carbon neutrality.

The financing of public R & D bodies is defined annually in the Finance Act, through budget programmes which identify the priority themes of the sector. This framework may therefore be subject to changes, depending on the guidelines laid down by public authorities in the budget category 'Research and higher education' (mires).

In the Budget Law for 2023, two budgetary programmes from the budget are allocated to public R & D actors in the field of energy:

- The 172 programme: "Multidisciplinary scientific research and technology",
- The 190 budget programme "Research in the field of energy, risk, development, construction, planning and sustainable mobility"

As early as 2010, France has set up a Programme for Future Investments (PIA) to provide the French R & D ecosystem with the necessary means to align with the country's long-term objectives, in particular from the climate point of view. In 2021, the France 2030 investment plan was launched to take over from the fourth phase

of future investments (AIP 4), announced in 2020. In total, France 2030 provides EUR 54 billion for research and innovation in key sectors of the country's economic future. The plan is underpinned by two cross-cutting objectives, namely to devote 50 % of its expenditure to decarbonise the economy and 50 % to emerging innovators without environmentally friendly expenditure (*Do No Significant Harm* principle). France 2030 broadens the objectives of the Future Investment Mission by integrating support for deployment on an industrial scale (TRL 7-9), complementing public support for research and technological innovation (TRL < 7). With this development, the plan aims to bridge the gap between research, innovation and market uptake of new technologies.

The allocation of France 2030 appropriations is structured in two ways. The first is 'structural' innovation: the plan provides for increased funding for the higher education, research and valorisation ecosystem as a whole, in order to provide the ground for unexpected disruptive innovations. The second is 'managed' innovation, which responds to the need to define investment priorities to meet the transition challenges facing the French economy. This component therefore targets key sectors, markets or technologies on which public support should be concentrated. It consists of ten major industrial and technological objectives, underpinned by five "prerequisites for success" of the plan.

Five of the ten "strategic priorities" of France 2030 apply directly to the field of energy:

- **Encourage the emergence of a French supply of small modular reactors (SMR) by 2035 and support disruptive innovation in the sector.** The aim is to preserve the comparative advantage of nuclear energy in France by stimulating breakthrough innovation on advanced nuclear reactors (MRS, new uses) and by being at the forefront of research into safety and waste management. France's objective is to achieve a first concrete in a series header in France by 2030.
- **Becoming the leader in decarbonised hydrogen and renewable energy in 2030.** As French electricity is already largely decarbonised, France has a unique opportunity to position itself as a leader on the production of hydrogen by electrolysis, as well as on the whole value chain (membranes, fuel cells, reservoirs, etc.). France therefore aims to have at least two giga-factories of electrolysers on its soil and all the technologies necessary for the use of hydrogen. This objective goes hand in hand with strengthening the renewable energy industry (photovoltaic cells, wind turbine floats, heat pumps, intermittency management, etc.) and the nuclear industry. The triptych of nuclear, hydrogen and renewable energy must enable France of the future to produce decarbonised, stable and competitive energy. The following graph shows France's strategy and associated deadlines:

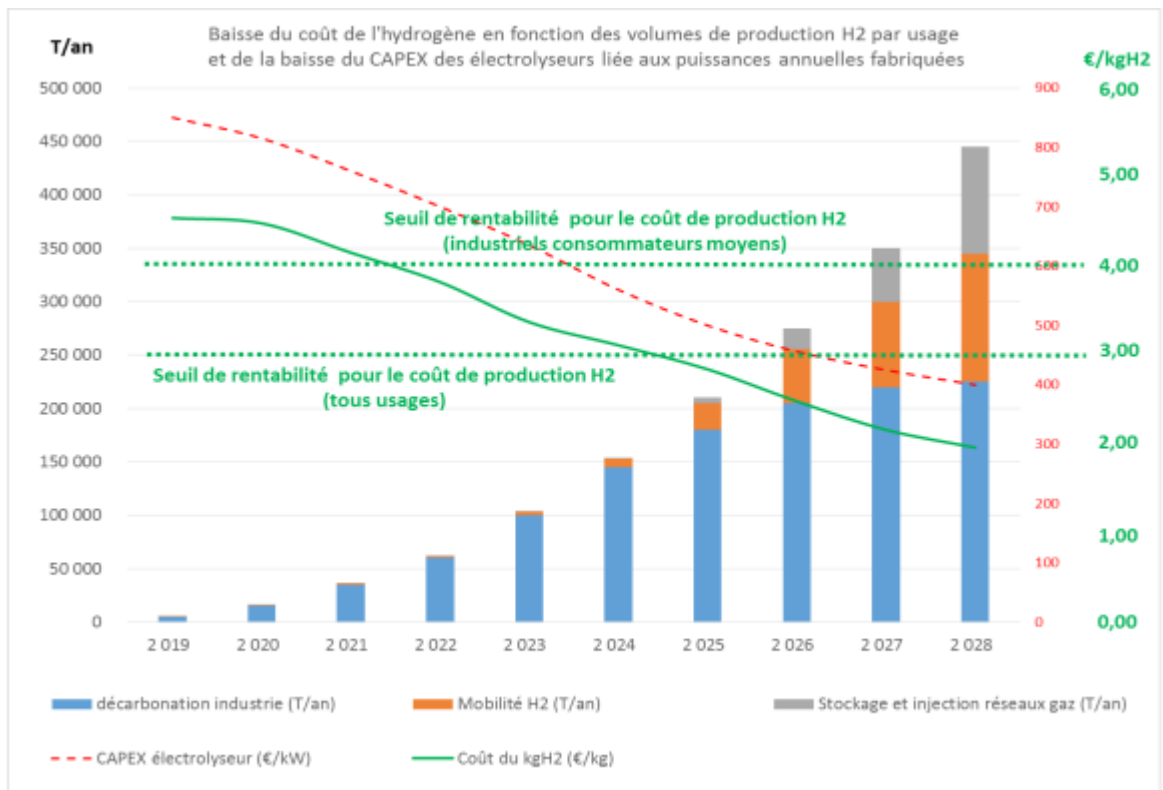


Figure 44: Decrease in the cost of hydrogen based on H2 production volumes per use and the decrease in the CAPEX of electrolyzers linked to frapped annual power levels

- Decarbonise our industry to meet our commitment to reduce greenhouse gas emissions in this sector by -43 % between 2019 and 2030.** This objective is to accompany private investment in order to bring the technological transformations needed to align French industry with the objective of carbon neutrality, while ensuring its competitiveness. This massive investment targets the decarbonisation of highly emitting industrial sites (e.g. steelworks, heavy chemicals, cement plants, aluminium) and the deployment of mature solutions (renewable heat, energy efficiency, electrification). The government, in conjunction with the industry concerned, has produced roadmaps on the decarbonisation of the 50 most GHG emitting sites, including the cement, glass, lime lime, roasting of tiles and bricks, the agri-food industry and chemicals. A partnership between the state and industry has been signed in which companies also commit to reduce their emissions to 45 % by 2030 and 50 % by 2032. The 7 roadmaps are available here: <https://www.entreprises.gouv.fr/fr/publication-contrats-transition-ecologique-50-sites-industriels>.
- Producing 2 030.2 million zero-emission vehicles in France and developing low, sovereign and resilient mobility. The transition efforts of the automotive industry must be supported by public authorities' support for the industrialisation of new mobility solutions (electric vehicles powered by batteries, hydrogen, collective transport, light mobility, etc.). The whole industrial ecosystem needs to be mobilised to anticipate and drive technological developments, in the context of the planned end of thermal vehicles in 2035. This development requires, in particular, the construction of gigafactories for battery production. The Innovation Fund could be an accelerator for gigafactories already funded by

Member States' programmes. The supply of electric vehicles produced in France is also expected to increase from autumn 2024 and 2025 onwards.

- **Produce the first low-carbon aircraft in France by 2030.** This project must be both French and European, in order to continue the intense R & D dynamics of the aeronautics industry. It mobilises large groups, as well as innovative SMEs and start-ups in the sector. The associated objective is largely dependent on the production of low-carbon hydrogen, a topic mentioned above.

In addition to these five objectives, one of the five “pre-conditions for success” of France 2030 is a key lever for the French energy transition: “In the field of raw materials, secure access to our materials as much as possible”. In many respects, the French energy system will see its dependence on the supply of critical materials increase in the coming decades, particularly with the high penetration of renewable energy sources (highly concentrated in materials per kWh produced, and with a limited lifetime). France 2030 should make it possible to secure the plastic and metal sectors, the consolidation of the forest-based sector, invest in the circular economy and, in general, reduce our dependence on imports. For example, recycling 100 % of plastic will drastically reduce our dependence on oil-derived polymers. In addition, securing the supply, refining and recycling chain of critical metals will help anticipate the risk of bottlenecks upstream in the low-carbon technologies value chain.

France also intends to increase the international dimension of its energy research. Its participation in the Mission Innovation initiative was renewed as part of Mission Innovation 2.0: France is a member of the Zero-Emission and Green Hydrogen Working Groups. The French R & I objectives for the energy transition also form part of a European framework, with a dynamic commitment to the various partnerships that make up the SET-Plan.

Lastly, for renewable energy, two sectors are specifically targeted by France's 2030 'Advanced technologies for energy systems' (tase) acceleration strategy:

- **Offshore wind:** France sets an offshore wind deployment target of 18 GW in operation in 2035. In particular, floating wind could contribute to this objective. The winner of the tender for the floating offshore wind farm project in the south of Brittany was announced on 15 May 2024. With a capacity of 250 MW, it is the world's first commercial floating wind farm to be allocated a purchase tariff. Innovation in this area continues to bring about the transition to industrial scale, with coordination by sea facade and adaptation of port infrastructure.
- **Photovoltaic:** the research programmes are continuing with a target set by the President of the Republic of 100 GW by 2050. The challenge is to industrialise production on European soil. Several innovative gigafactories projects are currently supported by France and are being deposited for innovation fund.

3. POLICIES AND MEASURES

France's policies and measures for a fair and just transition are described below.

Financing for a just transition

Several arrangements have been put in place to **facilitate the accessibility of the transition to all**:

- Generalised in 2018, **the energy voucher** is state aid to small households to help them pay their energy bills, regardless of the type of heating (electricity, gas, wood, fuel oil, LPG, etc.) or energy renovation works. This tool mitigates the cost of the transition on small households. It is a key element to ensure a just transition. Based on household income and composition (all persons living under the same roof), it is granted on the basis of the reference tax income for consumption unit (RFR/UC). Households do

not have to take any steps to obtain it, it is sent to them automatically on the basis of the data in the possession of the tax administration. In 2022, 5.8 million households benefited from the energy voucher, ranging from EUR 48 to EUR 277. 82.6 % used it. An exceptional energy voucher of EUR 100 to EUR 200 was distributed between the end of 2022 and the beginning of 2023 to the bottom 40 % of households. The energy voucher reduces the climate-adjusted energy poverty indicator from 11.7 % to 10.2 % (the gross indicator increases from 11.9 % to 10.4 %) or by 1,5 points. The exceptional energy cheque decreases the climate-corrected energy poverty indicator by an additional 1 point, with a total reduction of 2,5 points.

The modalities for the development of the energy voucher after the abolition of the housing tax, which is necessary to target beneficiary households, are being studied. Improvements to the scheme could also be explored as part of this reform. The partnership between the DGEC and the French Services houses since 1 January 2024 has made it possible to increase information and support for beneficiary households to facilitate the use of the energy voucher and associated rights.

- **The Energy Saving Certificates (EECs) scheme** requires energy suppliers to finance a certain amount of energy saving works in buildings, industry and transport, some of which are in households affected by energy poverty. From 2016, when the energy poverty obligation was created, to 2022, around EUR 6.7 billion of works⁷⁵ were financed under energy poverty EWCs, 23 % of which since the beginning of 2022. The level of EWC obligation was increased in October 2022 by 25 % for the 5th period 2022-2025 to reach 3 100 TWhc, including 1 130 TWhc to the benefit of energy poor households. It is within the framework of the EWC scheme that programmes for the smallest households are implemented. For example:
 - the SLIME + programme (EUR 56 million) aims to facilitate the identification and support of households facing energy poverty;
 - the Toits programme (EUR 8 million), which aims to support the creation of a rental offer with very social rents and high energy performance for the most disadvantaged households;
 - the Mon Accompagnateur Renov' programme (EUR 300 million), which aims to support individuals, including the most vulnerable households, and in particular in connection with the SLIME + programme, for energy renovation.
 - The Energy Renovation Guarantee Fund (FGRE, EUR 19 million), guarantee for zero-interest eco-loans, advanced loans and loans for the renovation of co-properties.
- **MaPrimeRénov' (MPR)** is a private grant scheme to finance energy renovation works: insulation, change of heating system, installation of ventilation, energy audit, or even overall renovation. In 2023, 569 243 dwellings were renovated for EUR 2.74 billion in aid. 70 % of the projects concern small and very small households⁷⁶, for which the grant ceiling is increased. The strengthening of the French Rénov'

⁷⁵1358 TWhcumac of EWCs "energy poverty" registered in the national register of EWCs.

The term cumac (cumulative and updated) takes into account energy savings over the lifetime of the action concerned (product, equipment, etc.), for example 15 years for a freezer or 30 years for the insulation of a house. 100 TWh cumac are equivalent to residential energy consumption of one million French people for 15 years.

⁷⁶Key figures 2023, ANAH, January 2024, Link: https://www.anah.gouv.fr/sites/default/files/2024-01/202401_ChiffresCles2023_WEBEA.pdf

advisory network and the development of ‘accompanying Rénov’ will improve advice for all households, in particular those leading to major renovations.

In 2024, the MaPrimeRénov’ and EEC systems changed significantly in order to facilitate the ‘user’ path for individuals as part of major renovations: they can now benefit from the combined premium for MPR and CEE after a single application has been submitted. In addition, the aid amount was significantly increased in 2024 in order to reach up to 90 % of the amount of energy renovation works for the most precarious (EEC and MPR cumulation)⁷⁷.

- In order to better finance the remainder and facilitate access to bank loans for households, in addition to existing tools such as the zero-rate eco-loan (ecoPTZ), **the Advanced Renovation or Translocation Loan** is a tool created in March 2022, which makes it possible to repay the remainder at a later stage, for example when the house is sold or as part of a succession, with a public guarantee of 75 % of any loss incurred;
- The French authorities have introduced **two main aid measures for the purchase of low-polluting vehicles**: the green bonus, which supports the purchase of a passenger car, van or two- or three-wheel motor vehicle or a clean quadricycle; and the conversion bonus, which can be combined with the bonus, which supports the acquisition of a low-polluting vehicle of the same categories and electrically assisted bicycles, provided that an old pollutant car or van is discarded. Only new 100 % electric motor vehicles are eligible for the green bonus. It is increased for households in the top 5 income deciles, and since the end of 2023 the eligibility of passenger cars has been subject to an eco-score linked to their production carbon footprint. Similarly, the amounts of the conversion premium are increased for households in the first 2 decimal places of income and households in the first five income deciles with a ‘large router’ profile. Finally, since February 2024, new Criterion’Air 1 vehicles are no longer eligible for the conversion premium.
- In addition to the environmental bonus and the conversion bonus referred to above, the French authorities have introduced a **clean vehicle microcredit** of up to EUR 8 000 for the purchase of a low-polluting vehicle by private households with access to the traditional banking network.
- The French authorities have also put in place a **zero-rate loan experiment, in low-mobility emission zones regularly exceeding** air quality standards, for the purchase by a microenterprise or a household of the first five income deciles of a light vehicle emitting less than 50 gCO₂/km. The maximum amount of the loan shall be EUR 30 000.

- Finally, on 1 January 2024, the French authorities launched the leasing support scheme for electric passenger cars, which allows small households to access a long-term offer of environmentally efficient electric cars for around EUR 100 per month.

These mobility related measures are further detailed in Part 3.1.3.3.

Adaptation and skills development

Ecological planning aims to set ecological objectives in a coherent manner and articulated with the reality of implementing the levers to achieve them. In this context, the **strategy aims to incorporate a genuine industrial and skills dimension**. This means identifying the underlying industrial sectors and associated value chains, then identifying the need for investment in the French economic fabric and the human resources needed for this transition, and finally equipping ourselves with the means to **attract, train and recruit the people who will contribute to it**.

France is currently preparing a national strategy on adapting jobs and skills in ecological planning, a first outline of which was published in early 2024.

These issues are set out in Part 5 of this PNIEC.

Accompanying labour market developments

See Parts 2.5.1 and 3.5.1.

Approach for transition regions

The budget programme of the Ministries responsible for energy and climate finances appropriations relating to the implementation of 4 pacts of the 'Charbon' territory and the 'Fessenheim' seed fund. The purpose of these appropriations is to co-finance projects geared towards the decarbonised energy transition in order to ensure the economic resilience of these territories which are affected by the cessation of an activity of major importance for their balance.

In practical terms, these appropriations can finance preliminary studies of projects, help finance the infrastructure needed to carry out these projects or, more broadly, to revitalise the territories, or even aid to companies for setting up them, provided that their project is part of a continuum of energy and decarbonised activities (hydrogen, biofuels, etc.).

Most coal-fired power plants were shut down pursuant to the Law on energy and climate of 8 November 2019, which limits CO₂ emissions from¹ January 2022 for installations producing electricity from fossil fuels. The law leads to the closure by 2022 of several coal-fired power plants located in the following municipalities: Le Havre and Cordemais, belonging to EDF and Gardanne and then ultimately Saint-Avoid belonging to Gazel Energie.

In the case of plant employees, job losses are expected to be limited. The measures are taken by the State in addition to the financing by the company of a plan to safeguard employment and redeployment leave. Their purpose is to enable them to return to employment as soon as possible, while taking into account the specific situation of these employees.

Information for consumers

Commercial communications play a daily and powerful role in influencing consumer behaviour and, beyond, their imaginatives and desires of lifestyle. Through advertising, companies can help promote products or consumption patterns with a lower impact in terms of greenhouse gas emissions, air, water, soil, waste production, use of raw materials.

Several recent regulations provide a framework for commercial communications in the context of the green transition: since 1^{January} 2023, claims of carbon neutrality of products and services have been strongly regulated by Article 12 of the Climate and Resilience Law. In this sense, in order to be used, these claims must comply with a strict regulatory framework to combat greenwashing. Alternative example: vehicle advertisements are required to communicate on the importance of soft and active modes of travel, and to make the greenhouse gas emissions of vehicles visible. Finally, the Climate Contracts have engaged several companies in responsible communication processes.

Article 2 of the Climate and Resilience Law also provides for the introduction of an environmental notice to inform consumers of the environmental impacts of products. In order for environmental labelling to be effective, it is for the Government to lay down by decree the method of calculation and the rules for displaying each of the product categories concerned. Work has so far focused on food and textiles. As provided for in the law, experiments were carried out with a strong involvement of stakeholders: 18 experiments for food products (including Yuka eco-score and Planet score), 11 textile experiments. On the basis of these tests, a proposal for a calculation methodology has been drawn up for clothing (published online on 3 April 2024) and for food products. As regards clothing, it is currently under discussion, before adoption in autumn 2024. Environmental display on clothing is an impact measure built around its environmental cost. The higher the result, the more the product has a cost to the environment. This result is expressed in 'impact points'. This environmental cost relates to all dimensions of the environmental impact of clothing, including greenhouse gas emissions. In addition to food and textile products, the methodology which has been developed, in conjunction with the Ademe and various scientific experts, may in future be adapted to cover new categories of products.

Energy savings

In terms of energy saving, France has put in place mechanisms to focus its action on helping households in poverty.

For example, under the Energy Transition and Green Growth Act, the Energy Saving Certificates scheme has imposed energy savings obligations for households in precarious situations since 2016. These "blurring" obligations are increasing, in line with the overall increase in the energy efficiency target:

- 3th^{EEC} period (P3): 150 TWhc on the period 2015-2017
- 4th^{EEC} period (P4): 533 TWhc on the period 2018-2021
- 5th^{EEC} period (P5): 1 130 TWhc on the period 2022-2025

Due to the recent publication of the revised Energy Efficiency Directive (2023/1791/EU), work is ongoing to identify the amount of the 6th EWC^{period} (P6) corresponding to the years 2026-2030 as well as actions to further develop and improve the energy saving certificates scheme.

In addition, the amount of support from households associated with the energy renovation support scheme ('MaPrimeRenov', MPR) depends on their income.

The graph below shows that the works supported by MPR in 2021 and 2022 generated more energy savings in 2021 and 2022 for small and very modest households compared to the wealthiest households:

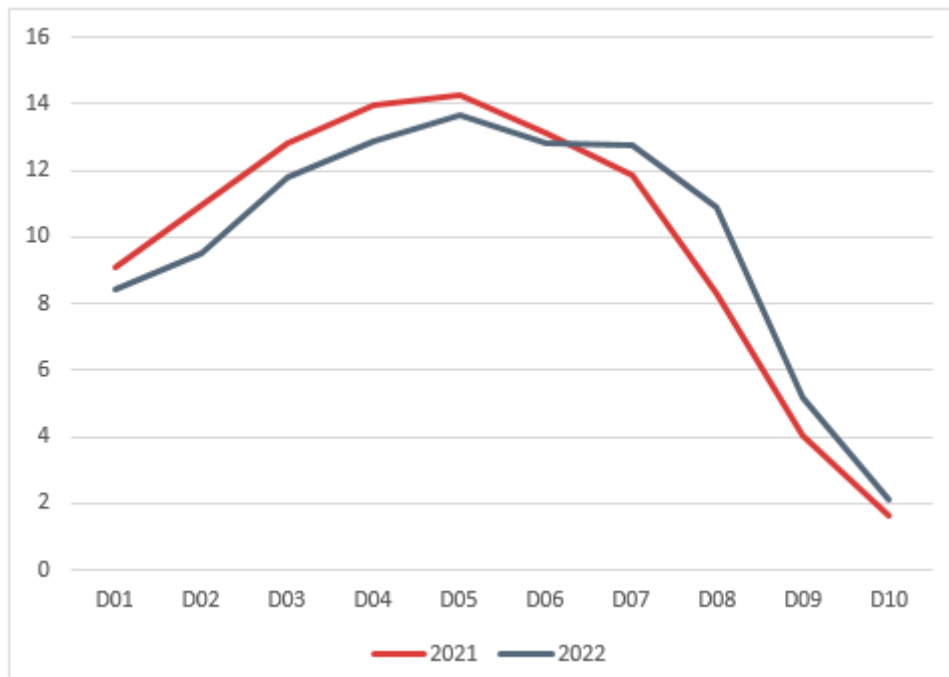


Figure45: Energy savings associated with works supported by MaPrimeRénov', by deciles of living standards for occupying households (%)

* Niveau de vie = revenu disponible (yc prestations sociales) par nombre d'unités de consommation du ménage

Champ : France métropolitaine.

Sources : fichiers détaillés MaPrimeRénov' (Anah) ; Fidéli, calculs SDES

It is notable that the MPR scheme was strengthened in favour of the smallest households in 2024⁷⁸.

Finally, the public service for the renovation of the habitat, France Rénov', is the one-stop-shop for individuals, particularly the smallest ones, to obtain independent advice and information on the renovation of their homes. The 'France R nov' coaches therefore accompany individuals and help them obtain the financial aid to which they are eligible.

Renewable energy communities

⁷⁸ Since 1^{October} 2023, low-income households carrying out an overall renovation have been eligible for enhanced support:

- for very low income households: the rate of financing is increased to 65 % of the value of the works (previously 50 %);
- for low-income households: the rate of financing is increased to 50 % of the value of the works (previously 35 %).

France supports renewable energy communities and many legislative and regulatory measures have been put in place to accelerate the development of self-consumption (individual and collective): clarification of the public procurement code for local authorities, exemption from the obligation to create an ancillary budget for local authorities which make self-consumption below a certain budget, extension of the scope of collective self-consumption in order to take account of the specific characteristics of peri-urban areas, etc.

3.1. Dimension “Decarbonisation”

3.1.1 *Greenhouse gas emissions and removals*

3.1.1.1.1 Policies and measures to achieve the target set under Regulation (EU) 2018/842 as referred in point 2.1.1 and policies and measures to comply with Regulation (EU) 2018/841, covering all key emitting sectors and sectors for the enhancement of removals, with an outlook to the long-term vision and goal to become a low emission economy and achieving a balance between emissions and removals in accordance with the Paris Agreement

The following section describes the main existing policies and measures and planned policies and measures for each issuing sector, i.e. options that are under review and have a real chance of being adopted and implemented after the date of submission of the integrated national energy and climate plan, in line with the definition of the Governance of the Energy Union Regulation.

The planned policies and measures stem from ongoing work at national level. This follows on from the work of the Ecological Planning launched by the President of the Republic in 2022. They report on the structural changes planned by France by 2030 to reduce its gross emissions by -50 % compared to 1990 and to move towards carbon neutrality in 2050. **The first assumptions and guidelines described below are not final and are likely to evolve in the light of the next steps in the preparation of the future SNBC (prior consultation and consultation of future bodies, environmental assessment and final public consultation via electronic means).**

Once the strategy is adopted, these guidelines will be legally enforceable for the public sector and should guide future public policy making.

It is difficult to estimate the isolated impact of each of the policies and measures implemented without double counting, as the different policies and measures interact with each other in a systemic way. In order to have an overall estimate of the impact of existing or planned policies and measures, France regularly conducts integrated modelling exercises (see sections 4.1 and 5.1). As part of the revision of its long-term strategy, **France has undertaken work to better assess the impact of GHG emission reduction levers** (e.g. the impact of an increase in car-sharing) **using a systemic approach**: the ‘cascade’ graphs presented for each sector in part 5.1 make it possible to visualise these assessments. For each lever, we are continuously working to improve our modelling to better assess the impact of related policies and measures.

3.1.1.1.1.a) *Transport*

The planned policies and measures and the guidelines of the provisional version of SNBC 3 in the transport sector are described in Part 3.1.3.3 policies and measures in support of low-carbon mobility.

3.1.1.1.1 (b) *Residential/tertiary*

- **Existing policies and measures**

Many existing policies and measures to reduce GHG emissions from the residential/tertiary sector are measures to improve the energy efficiency of buildings, as reported in section 3.2. Energy efficiency and development dimension of renewable energy, as reported in Part 3.1.2 Low-carbon energy.

For new buildings, the RE2020 environmental regulation imposes ambitious and demanding standards. Its aim is to further improve the energy performance and comfort of buildings, while reducing their carbon impact. Energy consumption thresholds are lowered, with strong insulation quality requirements. The installation of gas-fired boilers in individual houses as the sole source of heating is no longer possible since the entry into force of RE2020 in January 2022, the same will apply to new multi-dwellings and service buildings from 2025 onwards. The carbon impact shall be minimised and taken into account in a comprehensive manner, through a life-cycle assessment, from the manufacture of materials to dismantling. Finally, buildings must be more resilient to the conditions of the future climate, in particular by making them more resistant to heatwaves.

Improving the energy performance of existing buildings requires fiscal, fiscal, regulatory and accompanying measures: financing of energy innovation (progressive “MaPrimeRénov” aid on the basis of income, energy saving certificates, zero-rate eco-loan, reduced VAT, etc.), labelling of recognised environmentally-guaranteeing businesses, training professionals, raising awareness among households in order to trigger renovation decisions or encourage virtuous uses (public one-stop shop service for information, advice and support to households, obligations relating to the individualisation of heating costs in collective housing), obligation to implement thermal insulation when major building renovation works are carried out (plumbing, rebuilding of roofs, room refurbishment).

Recently, the Law on Climate and Resilience, which was promulgated in July 2021, strengthens all these measures, including: in the form of a carbon component in the Energy Performance Diagnostic (DPE) of buildings, which is mandatory for rental and sale; by obliging landlords of the most energy-consuming and greenhouse gas emitters to undertake renovation works (from 2023 onwards for the most energy-intensive dwellings and then classified as G in the DPE in 2025, F in 2028, E in 2034). The recovery plan following the COVID-19 epidemic reinforced the aid amounts of MaPrimeRénov’. These amounts were increased again for the 2024 budget, with more incentives for major renovations.

Finally, the service sector is now under an obligation to reduce its final energy consumption through the tertiary eco-energy system, which applies to buildings with an area equal to or greater than 1 000 m², with ambitious targets: —40 % in 2030, -50 % in 2040, -60 % in 2050 compared to a reference year (set between 2010 and 2019). As tertiary buildings are now more efficient, for which a reduction of -40 %, -50 % and -60 % would be too ambitious, an absolute target is set by decree and adjustable according to the scenario of occupancy of the building.

- **Planned policies and measures (first orientations of the National Low-Carbon Strategy for 2030)**

The draft SNBC 3 sets out the following strategic guidelines for the residential/tertiary sector:

(a) Residential

- **Increase and recast of aid for energy renovation**

After an increase in the budget for aid for energy renovation of housing in 2024, the budget for aid for renovation up to 2030 will be adjusted in line with the targeted renovation trajectory⁷⁹, taking into account the financing provided by energy saving certificates elsewhere.

From 2024, the **MaPrimeRénov'** scheme evolved to better adapt support to the needs of housing and households. It is thus restructured around two tracks: a MaPrimeRénov' pathway accompanied by a trusted third party that finances large-scale innovation (if necessary in stages) and an unaccompanied pathway aimed at accelerating the decarbonisation of heating with a flat-rate scale for gestures or small packages of works. The level of aid granted for major renovations has thus been increased, in order to accompany the exit of the energy passives in particular (accompanied route), while maintaining a strong basis for the decarbonisation of heating systems.

Due to the very high carbon intensity of fuel oil, the replacement of fuel boilers will be prioritised by 2030 to significantly reduce CO₂ emissions from housing. The rate of replacement of these boilers, the installation of which has been prohibited since July 2022, will speed up thanks to the MaPrimeRénov' and EEC subsidies which subsidise the purchase of decarbonised heating systems (including heat pumps). In line with the Energy Performance of Buildings Directive, the remaining financial incentives for gas and fuel boilers will be abolished by 1^{January} 2025.

► Structuring of a heat pump sector in France

Public support for the development of the French heat pump (PAC) sector will make **it possible to produce and install one million CAP each year by the end of 2027**⁸⁰. Air/water heat pumps will mainly be installed as a substitute for gas or fuel oil boilers. Support will be provided to develop heat pump technologies in collective housing to replace gas boilers. Legislative simplification will be adopted to facilitate the installation of heat pumps in collective housing, allowing derogation from local urban planning. In the absence of a hot water loop, air/air sockets will replace low-efficient toy electric heating, thus improving the energy efficiency of housing and lowering the electricity peak. **A centre of expertise on the heat pump** (CEPAC) will be set up by 2025, with the financial support of the State, with the task of informing and equipping all building professionals.

► Massive development of district heating networks

District heating networks will make it possible to significantly decarbonise housing, especially communal gas-fired homes in urban areas. Following the increase foreseen in PLF2024 to EUR 820 million, the Chaleur de l'Ademe Fund will continue to evolve until 2030, in order to **facilitate the achievement of the decarbonisation pathway, the number of connections per year (EPP) and renewable heat and recovery delivered** by the networks. This will make **it possible to multiply and expand the number of district heating networks**. The number of annual connections will have to increase very rapidly until around 300 000-360 000 in 2030 and will continue until 2040.

► Strengthening support for the renovation of the residential stock

⁷⁹The trajectory for energy renovations of housing by 2030 is documented, in particular, p. 16 in this publication of the Secretariat-General for Ecological and Sustainable Development. Planning: <https://www.gouvernement.fr/upload/media/content/0001/06/a993c427592c797e5dabe72fca57013f989d24a8.pdf>

⁸⁰ In accordance with the 'Heat pumps' plan: <https://presse.economie.gouv.fr/plan-daction-pour-produire-1-million-de-pompes-a-chaleur-en-france/>

The network of advisory areas France Rénov' (589 today) and the number of advisers responsible for information and advice to households (2 643 today) will be strengthened. The **number of 'Rénov' Accompagnateurs**, which will provide personalised support to households in their major renovation projects, **will also increase** to 4000 to 5000 accompanying persons Rénov' at the end of 2024. Support will be free of charge for the smallest households. Steps will be taken between the State and local authorities to reach households, including landlords and co-owners, to trigger ambitious renovation operations.

- **Renovation of the social park**

Social donors will organise themselves collectively and in conjunction with the State in order to comply with the decarbonisation pathway provided for by SNBC 3, and plan the work to renovate and reduce gas consumption accordingly, compatible with the rental park's decency obligations. The social park thus complies with the decency requirements laid down in the Climate and Resilience Law (more G dwellings rented from 2025, F from 2028). They may be subject to enhanced obligations, with the obligation to carry out balance sheets of their emissions and to design renovation plans in line with the objectives set.

- **Development of the renovation industry**

The **economic sector of energy renovation will have to evolve rapidly and strengthen** strongly in order to meet the growing needs, estimated at around 210 000 jobs by 2030 by the SGPE.⁸¹ In particular, the efficient renovation sector will have to speed up its structuring. The State will accompany the sector in its development and structuring, in conjunction with the local authorities responsible for training and economic development.

A number of levers to structure the sector could be implemented, such as the promotion of measures enabling companies to come together; implementing the digitalisation of the sector and building *information modeling* (BIM) and off-site renovation; a simplification of the Reknown Garant de l'Environnement label to attract businesses to this label needed to benefit from MaPrimeRénov'; anticipating employment needs and increasing efforts in particular on initial and continuing training.

Reflections on the bridges between construction/carcass and renovation could also be explored.

At the same time, the fight against energy renovation fraud will also need to be stepped up in order to ensure the emergence of a high-quality renovation sector.

- **Planned renovation of worst-performing housing in the private rental stock and renovations to change dwellings**

The requirement of decency in the private rental stock will make it possible to renovate the dwellings concerned (G in 2025, F in 2028 and E in 2034). **Renovation of energy passoires at key times of housing** (in particular change) should become more widespread, on the basis of incentives or more stringent schemes to be defined. **The most energy-intensive co-properties (G, F, then E) will plan their renovation** in the next decade through their multi-annual works plan.

(b) Tertiary

- **Planning the transition to low-carbon heating**

⁸¹ <https://www.info.gouv.fr/upload/media/content/0001/08/b39c3783c75b547f270ece5b182cb5bf92c7a53e.pdf>

Except by way of derogation, **tertiary areas will no longer consume fuel oil from 2030**. At the end of life of gas boilers in the tertiary sector, the decarbonisation of the heating mode will become widespread from 2027 onwards through the installation of heat pumps as a substitute for heat pumps and the connection to a district heating network depending on the situation.

- **Development of the heat pump sector and district heating networks**

As indicated in the previous section on residential areas, **the development of the heat pump** sector will enable the tertiary park to be decarbonised (replacing gas and fuel boilers with air-to-water heat pumps) and to replace inefficient electric convectors with air-to-air heat pumps. Energy efficient **geothermal heat pumps will be preferred** where possible. **The development of district heating networks** (supported by the Heat Fund, see previous section) will also help to connect tertiary areas in urban areas, particularly for offices, educational and health places.

- **Reduction of energy consumption of the tertiary eco-energy system**

The trajectory of the Eco Energie Tertiaire system requires tertiary areas of more than 1 000 m² to reduce energy consumption by 40 % in 2030, 50 % in 2040 and 60 % in 2050 (compared to a reference year which cannot be before 2010), or failing this to achieve an absolute value expressed in kWh/m²/year. This trajectory can be met by generalising equipment for tertiary areas in energy consumption monitoring systems (see BACS decree⁸² presented in the sobriety section below), and systematic checks and penalties for compliance with the obligations of the Eco Energie Tertiaire system. This will trigger many renovations and encourage sobriety.

Compliance with this scheme is conditional on a sharp increase in investment in the energy renovation of buildings (an additional EUR 22 billion per year by 2030 according to the Pisani-Ferry report, of which EUR 10 billion for public buildings), with support for the smallest private stakeholders (VSEs/SMEs) that are least able to make these investments. Aid under energy saving certificates will continue to finance investments to save energy in the service sector.

- **Implementation of the Energy Efficiency Directives (EED) and Energy Performance of Buildings (EPBD)**

The **transposition of the Energy Efficiency Directive** (EED) requires public bodies (including the State, state operators, local and regional authorities and their groupings) to renovate 3 % of the stock per year to a level of near-zero energy building (NZEB), enabling the public sector to be exemplary. **The renovation requirements for the worst energy efficient tertiary buildings**, set by the **Energy Performance of Buildings Directive**, will also make it possible to target the most energy-intensive tertiary areas.

- **Support for the financing of renovation works as part of the renovation of the service sector**

State support for local authorities through the Green Fund⁸³, which has been in place since January 2023, will make it possible to speed up the renovation of their buildings, in particular primary schools ('School Plan').

EWCs will be mobilised more heavily by the private sector to finance renovations.

(c) Sobriété

⁸² Building automation and control system, building automation and control systems

⁸³ GreenFunds, Green Transition and Coherence for Ecological Transition. Link: <https://www.ecologie.gouv.fr/fonds-vert>

► Continuation of the Sobriety Plan

The **energy sobriety** plan launched by the Government on 6 October 2022 now represents a potential for reducing consumption by 50 TWh by 2024 if all the objectives are met. In particular, the plan encourages changes in habits and behaviour (lowering the target temperature, driving the consumption of buildings, individualising collective heating costs, etc.) in order to make energy savings with the aim of consolidating the 10 % reduction in gas and electricity consumption compared to 2019 recorded at the end of 2022 and to help achieve the target of a 40 % reduction in final consumption by 2050. As the energy consumption of gas and electricity fell to -12 % for the year 2022-2023 and -12.6 % for 2023 to 23 June 2024, these reductions in consumption should now be sustained over a long period of time.

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► Compliance with the BACS (Building automation and control system, building automation and control systems) decree

Compliance with the BACS Decree (for building automation and control system) of 7 June 2023 on temperature control systems for heating and cooling systems will make it possible to **generalise the installation and use of intelligent energy management systems in buildings** with an effective rated output of more than 70 kW by 2027. Checks and penalties may be generalised for the largest buildings.

► Sobriety in electricity consumption

Electrical uses are gradually reduced to what is necessary: regulating temperature for heating (19°) and air-conditioning (26°) in particular in public buildings, regulation of digital advertising and night lighting. Public buildings are exemplary in this sobriety, and it has an incentive for the private service sector and housing by means of awareness-raising campaigns or the setting up of objectives shared with the sectors.

3.1.1.1.c) Industry (excluding ETS)

• Existing policies and measures

Some mitigation measures in the industry sector are already detailed in other parts: these are the energy efficiency measures reported in section 3.2. Energy efficiency” and development dimension of renewable energies reported in section “ 3.1.2 Renewable energy”.

Other policies and measures to reduce greenhouse gas emissions in industry are being implemented.

Cross-cutting measures to reduce greenhouse gas emissions from industry

At national level, significant resources are deployed for the decarbonisation of industry. For example, **the fund for decarbonising industry** implemented under the Recovery Plan for the period 2020-2022 was allocated EUR 1.2 billion. This fund has made it possible to support the production of heat from biomass, the deployment of energy efficiency projects and the decarbonisation of industrial processes, through various calls for projects

carried out by ADEME (Ecological Transition Agency). Almost 230 projects were supported with an estimated emission reduction of 4,5MtCO₂/year.

For the period 2022-2026, the **'France 2030' investment plan** devotes EUR 4.5 billion to the decarbonisation of industry along two main lines:

- EUR 4 billion is dedicated to the deployment of solutions to decarbonise industrial sites.
- EUR 500 million is dedicated to the emergence and industrialisation of industrial decarbonisation solutions (support for innovation)

In addition to public support, important work has been launched by **the Government with industrial stakeholders since 2019 to initiate the transition of industrial sectors in drawing up roadmaps for the decarbonisation** of industrial sectors. Some sectors have published roadmaps (Chimie, Mines Metallurgy, Papier Carton, Cement, Agri-food industries, Glass, Tuiles and bricks, Chaux), which constitute cross-State/sector commitments by 2050, with a step point to 2030.

As regards the perimeter of industrial sites, at the end of 2022, the President of the Republic asked the 50 most emitting industrial sites on French territory to draw up, in consultation with the ministries concerned, roadmaps identifying the decarbonisation routes to reduce their greenhouse gas emissions in accordance with the French objectives for the industry sector. For example, the 23 industrialists concerned worked on roadmaps with milestones for 2030 and 2050. The elements of the roadmaps are intended to remain confidential but give ministries the keys to supporting industry in their implementation: identification and assessment of decarbonisation levers, estimates of public support needs and adapted modalities, needs for low-carbon or renewable energy (electricity, biomass, etc.) and infrastructure (CO₂, H₂ transport), as well as any necessary regulatory developments. This work is all the more important given that these 50 sites account for 55 % of the French industrial sector's greenhouse gas emissions.

In addition, since 2020, ADEME has been building Sectoral Transition Plans for the 9 most intense industrial sectors (steel, aluminium, glass, cement, ethylene, chlorine, ammonia, paper/board, sugar), a methodological initiative proposing to model different decarbonisation pathways by 2050, quantify the impact on production costs, assess climate investment needs and analyse changes in employment. These plans are being developed as part of the European LIFE Finance Climate project and will be finalised by the end of 2024.

Measures to encourage energy efficiency actions:

Greenhouse gas emission reductions in industry are also generated by some cross-cutting measures (reported in the section 'Reducing energy consumption across sectors'): **energy Saving Certificates (EWC) scheme, Ademe Heat Fund and obligation for large companies to carry out energy audits.**

Certain additional measures specific to industrial enterprises have also been put in place:

- The **Eco Energy** loan, ranging from EUR 10 000 to EUR 500 000, makes it possible to finance the acquisition or installation works carried out by VSEs and small SMEs which invest in equipment generating energy savings certificates;⁸⁴

⁸⁴Eco-energy loan: <https://www.bpifrance.fr/catalogue-offres/pre-ekonomies-denergies>

- The Ademe subsidises studies on energy efficiency in industry, including energy diagnostics, as long as they are not made mandatory by regulation, and the establishment of energy management systems.
- **The Chaleur Fund**, managed by ADEME since 2009, aims to encourage the replacement of installations consuming fossil fuels by installing renewable heating and cooling equipment using biomass, geothermal, solar, biogas and recovered energy, coupled with district heating and cooling networks. In 2024, the Heat Fund's funding increased sharply to EUR 820 million
- The **EEC programme "PACTE Industry"**,⁸⁵ developed under the Energy Saving Certificates scheme, aims to offer companies in the industrial sector an offer of training and support for the energy transition that promotes the decarbonisation of industry. The programme will provide training and coaching tailored to beneficiaries, engage companies towards ISO 50 001 certification and promote the recognition and deployment of energy focal points in industry. The objectives for the duration of the programme (01/01/2024-31/12/2026⁸⁶) are:
 - 2 700 industrialists trained in the challenges of the energy transition in industry;
 - 700 sites involved in an energy mix opportunity study;
 - 600 companies with a strategy and pathway for energy efficiency and low-carbon investments;
 - 100 coachings for investment projects;
 - 280 industrial enterprises certified as ISO 50 001.

During the 4th EWC period, several EEC programmessupported industrialists (PRO-SMEn) and tested the increase in energy efficiency skills (PROREFEI and INVEEST). The PACTE Industry programme aims to move to a higher scale.
- Since 1^{January} 2015, pursuant to Article 14 of Directive 2012/27/EU on energy efficiency, industrial installations **generating unrecovered waste heat must carry out a cost-benefit** analysis in the case of new installations and in the event of substantial renovation. This analysis shall make it possible to assess, for an industry, the cost-effectiveness of the recovery of waste heat through a connection to a district heating or cooling system and shall be accompanied by the implementation of solutions deemed to be cost-effective. The main industrial sectors concerned by the measure are chemical, glass, cement, lime, plaster, paperboard, metal processing and agri-food;
- Since 2016, electricity intensive companies have been able to benefit from a **reduction in the tariff for the use of public electricity networks (TURPE)**. In return, they must implement an energy performance policy (implement an energy management system according to ISO 50001, achieve a performance target monitored by means of certified indicators within 5 years and draw up an energy performance plan to achieve this objective);

Measures to reduce F-gas emissions from industry:

Since 2013, perfluorocarbons (PFCs) emissions from aluminium production have been subject to **the EU Emissions Trading System**.

At national level, the Finance Law for 2019 provided for the introduction from 1^{January} 2021 of a **tax on HFCs**, the tariff of which was to evolve as follows: EUR 15 per tonne of CO₂ equivalent in 2021, EUR 18 in 2022, EUR 22 in 2023, EUR 26 in 2024 and EUR 30 from 2025 onwards. The entry into force of the HFC tax was postponed to¹ January 2025 by the 2022 Finance Law in view of the attainment of the objectives for reducing the use of HFCs which had been set for refrigeration and refrigeration professionals in 2019.

⁸⁵Industry PACTE Programme: <https://agirpoulatransition.ademe.fr/entreprises/demarche-decarbonation-industrie/pacte-industrie>

⁸⁶ https://www.ecologie.gouv.fr/sites/default/files/documents/2024_02_Catalogue%20programmes%20en%20cours.pdf

The 2019 budget law also created an over-amortisation scheme to accompany, until the end of 2022, companies' investment efforts in refrigeration equipment using refrigerants with low global warming potential. Undertakings subject to corporation tax or income tax under an actual tax system were thus able, in the context of that scheme, to deduct from their taxable income a sum equal to 40 % of the original value of the refrigeration and air-treatment capital goods operated without HFCs acquired as new between 1^{January} 2019 and 31 December 2022.

Fluorinated greenhouse gases are also widely regulated at international and Community level. These regulations are detailed in the section "Policies and Cross-cutting Measures on F-gases" later in this document.

Measures to reduce N₂O emissions from industry:

Since 2013, N₂O emissions from the chemical_{sector} have been subject to the EU Emissions Trading System.

- **Planned policies and measures (first orientations of the National Low-Carbon Strategy for 2030)**

The draft SNBC 3 sets out the following strategic guidelines for the industry sector:

- ▶ **Financial support for investments in decarbonising industry**

The majority of investments in decarbonising industry are more expensive than investments with fossil technologies. Public intervention makes it possible **to provide the necessary top-up to trigger investments**, while preventing deadweight effects. The needs for 2030 are substantial and the resources provided tend to meet them: EUR 1.2 billion with France Relance, EUR 4.5 billion with 'France 2030'. The Heat Fund, Energy Saving Certificates, European Funds, in particular the Innovation Fund, and the upcoming perennisation of certain national support schemes will complement this funding and achieve the objective of reducing emissions by 45 % between 2019 and 2030.

The use of hydrogen will be supported by investment or operating aid, in particular in the context of the Important Project of Common European Interest (IPCEI) hydrogen and the call for tenders to support the production of decarbonised electrolytic hydrogen: this will make it possible to copewith the significant excess costs linked to initial investments and the use of electricity. This support will, however, be conditional on priority use of hydrogen, given the large volume of electricity generated by electrolysis. Energy savings will be supported by energy saving certificates. Electrification of industrial processes will also be supported under France's decarbonisation support schemes 2030.

- ▶ **Enhanced incentives to implement energy efficiency improvements**

Financing permitted by energy saving certificates (EECs) applicable to industry will be mobilised, and public support will be proposed to accelerate investments, building on existing support.

The reform of the carbon market **increases incentives for energy savings and decarbonisation of emissions**: the price of allowances will increase with the reduction of the European Emissions Trading System (ETS) ceilings; free allocation will be conditional on compliance with energy efficiency requirements from 2026 (implementation of investments with a payback period of less than 3 years).

- **Strengthening the electricity grid and low-carbon generation**

Demand for electricity in industry will increase considerably to replace fossil fuels, regardless of industrial technological choices (hydrogen, carbon capture and storage, direct electrification, etc.). The significant and rapid development of decarbonised electricity generation capacities will aim to ensure the availability of this resource, which is necessary for the decarbonisation of the sector and for the re-trialisation of the country. Due to the concentration of Energy-intensive industrial sites around a few areas, the **electricity transmission and distribution network will be adapted**. Connection times will be reduced, under the Renewable Energy Acceleration Law, and in congested areas and pending the development of the necessary grid infrastructure, the connection of projects may be prioritised according to their impact on emission reductions or their level of maturity.

- **Ensuring a competitive price for decarbonised electricity compared to fossil solutions**

The **competitiveness of the electricity price** is a prerequisite for the realisation of decarbonisation projects based on electrification. Thus, the ARENH, which ends on 31 December 2025, will have to succeed a new system for regulating the existing nuclear power park, linked to changes in market solutions, which will facilitate the electrification of the French industry. In addition, incentives for the use of fossil fuels will be reduced to foster electrification.

- **Development of solutions for capture, transport and geological storage of CO₂**

Despite an increasing carbon quota cost, the still emerging CO₂ capture technologies are not profitable without public support in the short term. For example, a call for tender currently being notified to the European Commission should be published at the end of 2024 in order to support, **inter alia, the installation of CO₂ capture units on sites without decarbonisation alternatives**. A public consultation on the draft tender specifications, accompanied by a call for expressions of interest, was published in June 2024⁸⁷, prior to the publication of the call for tenders.

The Government has already concluded a bilateral agreement with Denmark for the export of CO₂ in order to secure outlets for French industrial sites. A similar agreement could be signed with Norway. The Government will also encourage the planning and development of CO₂ transport networks.

For reasons of sovereignty, optimisation of energy costs linked to the transport of CO₂ and difficulties for certain emitters to access future export hubs, **France will also develop its own CO₂ storage capacity** by launching exploration campaigns and injection tests.

- **Support for industrial transformation, particularly in terms of employment**

Industrial developments in terms of jobs and skills by activity basin will be anticipated to enable alternative activities to emerge in areas potentially affected by disappearances of economic activities, maintain local economic dynamism and give people visibility on their jobs.

- **Mobilising the circular economy as a lever for decarbonisation**

The green transition will create new activities and value chains in France (PV, wind, batteries, hydrogen, electric vehicles, etc.), whose **recycling and reparability** is anticipated already today. Reuse of materials will reduce demand for primary production but also improve its efficiency (e.g.: increased use of scrap metal).

⁸⁷ https://agirpoulatransition.ademe.fr/entreprises/actualite-entreprises?ressource_id=1132

3.1.1.1.d) Waste treatment

- Existing policies and measures

The reduction of emissions from the sector is based on waste reduction (ban on single-use plastic bags, combating food waste, penalising planned obsolescence), strengthening prevention in extended producer responsibility chains and introducing new extended producer responsibility schemes, measures to encourage sorting to increase the quantities of recovered waste (obligation to sort paper, cardboard, plastics, metals, wood, glass from economic activities, obligation to sort bio-waste since January 2024, extension of sorting instructions, etc.), an improvement in the methane capture rate of waste storage facilities, and fiscal measures to limit waste disposal in landfills or incinerators (waste component of the general tax on polluting activities). The policy on waste prevention and management is financially supported by the Circular Economy Fund, formerly the waste fund operated by ADEME, the amount of which has almost doubled since 2023. At the same time, the Green Fund supports local authorities in the effective deployment of bio-waste sorting at source and its recovery. The deployment of bio-waste sorting at source is one of the government's priority policies and is therefore subject to special monitoring to ensure its effectiveness.

Finally, financial support for recycling has also been considerably increased in the context of France 2030 with two calls for projects dedicated to this topic.

- Planned policies and measures (first orientations of the National Low-Carbon Strategy for 2030)

The draft SNBC 3 sets out the following strategic guidelines for the waste treatment sector:

- Avoidance of waste

The total amount of non-inert non-hazardous waste stabilises by 2030, despite population growth and reindustrialisation. This is based on a **reduction in the amount of household and similar waste**, which will include **raising awareness of the environmental issues of waste, developing bulk**, and **reducing the use of single-use plastic**, with the objective of ending its placing on the market in 2040 (Anti-Waste Law for a Circular Economy (AGEC)).

- Compliance with the obligation to sort bio-waste at source

The obligation to sort bio-waste at source, laid down in 2024 by the Anti-Waste and Circular Economy Law (AGEC), will allow **bio-waste to be directed towards methanisation and composting**, with a target of reducing food waste by 50 % in 2050. Measures will be considered to secure the implementation of this obligation in all territories. The composition of the waste in ISDND will therefore be increasingly inert and less and less emitting methane.

- Massive development of sorting and recycling, in particular via the EPR sectors

Sorting will become more widespread by 2030 and even more so in 2050, both for household waste and for waste from economic activities. This will **feed the industry with increasing volumes of recycled raw materials**. The new EPR sectors (Responsibility for Enlargement of the Producer) introduced by the AGECE Law will speed up this process for the activities concerned, as well as the financing of the Circular Economy Fund of Ademe and France 2030 for innovation (call for projects 'Innovative solutions for improving recyclability, recycling and reincorporation of materials (RRR)').

- Improvement of technologies for the coverage of non-hazardous waste storage facilities (ISDND)

Technological improvements in membranes covering the pots of the new ISDND will **increase the methane capture rate** by up to 85 % in 2030 on average across all installations.

► **Development of waste stabilisation before storage**

Stabilisation will **make waste inert**, which will therefore no longer emit GHG once stored in ISDND.

3.1.1.1.1.e) Agriculture

• **Existing policies and measures**

Agriculture accounted for 19 % of France's emissions in 2023. It is the second most emitting sector after transport. Emissions from the agricultural sector comprise 59 % of emissions from livestock farming (and 50 % cattle), 27 % of crops and 14 % of machinery, engines and boilers.

The National Strategic Plan (NSP) for 2023-2027 was drawn up following a public debate and an electronic public consultation. The NSP can contribute to the drive for reducing emissions from agriculture and increasing carbon storage potential for agriculture and forests, in particular through the new ecogrim, enhanced conditionality and Pillar 2^{measures}. Article 274 of the Climate and Resilience Law provides that the NSP must be compatible with the SNBC. The provisions of the NSP proposal contributing to the climate objectives set out in European legislation and the resulting national plans and programmes are set out in the target plan contained in the French NSP proposal. In particular, the priorities set for maintaining and limiting the ploughing of permanent grassland, encouraging the planting and sustainable maintenance of hedgerows, the objective of doubling agricultural areas with leguminous crops and those under organic farming, and incentives to maintain and develop more autonomous and grassland farming systems can contribute to achieving climate change objectives.

In addition, the FRAA for water and climate change adaptation aims to strengthen the resilience of agriculture in a holistic approach by addressing, inter alia, soil, varieties, cultivation practices, agro-ecological infrastructure and irrigation water efficiency. The work resulting from the Varenne agricole de l'eau has been available for consultation since December 2021⁸⁸, and the plans France Relance and France 2030 will allow implementation from 2022 onwards through support for equipment under the 3th Agricultural Revolution and support for the sectors, part of which will be dedicated in particular to support innovation in water supply.

Finally, **the Ministry of Agriculture's climate action plan**, published in June 2021, sets out a roadmap for achieving the climate objectives of the agricultural and forestry sectors, and recalls the overall coherence of the various levers and tools mobilised by the Ministry.

Reduction of CH₄ emissions from manure management

Methane emissions are the largest greenhouse gas emissions in agriculture (45 %): improving manure management, optimising the management of herds and adjusting animal feed meet this challenge.

Agricultural methanisation reduces methane emissions through manure treatment. **Biogas production by methanisation is booming. At the end of March 2024, 1759 methanisers produce biogas and use it by injection into natural gas networks (674) or electricity generation (1075), i.e. 225 new methanisers put into operation in one year.**

⁸⁸ <https://agriculture.gouv.fr/tous-les-travaux-autour-des-3-thematiques-du-varenne-agricole-de-leau-et-de-ladaptation-au>

- The multiannual energy programme (2019-2028)⁸⁹ provides for a commitment envelope increased to EUR 9.7 billion to support the development of methanisation. In order to speed up the development of the sector, the Climate and Resilience Law created biogas production certificates to impose an obligation on natural gas suppliers to support biogas production. Support for the biogas sector is maintained for the next multiannual energy programme.
- The production target of 6 TWh in 2023 of biomethane injected into natural gas networks was exceeded already in 2022, with production of 7.0 TWh in 2022 and 9.1 TWh in 2023. The cumulative forecast annual production of signed capacity (commissioning and queuing) is 19.6 TWh, which is above the 2028 EPP low target (14 TWh – 22 TWh being the top target). The target of the next EPP could be raised to 44 TWh in 2030, representing 15 % of biomethane in natural gas networks. This objective would be achieved by means of compulsory purchase at a regulated tariff and following a call for tenders and biogas production certificates.
- The purchase tariff for electricity produced by methanisation plants, created in 2006, was upgraded in 2016 for small and medium-sized installations (less than 500 kWe), and a tender was created for larger installations (500 kW to 1 MW) in the form of a “methanisation” family integrated into tenders for electricity production from biomass; a supplementary payment scheme for electricity produced by biogas from methanisation is intended for installations distant from natural gas networks;
- A purchase tariff for biomethane produced by agricultural methanisation plants, and injected into natural gas networks, was introduced in 2011, complemented by several measures to facilitate the connection of the installations to the natural gas networks and the injection of the volumes of renewable gas produced in this way. It was revised for the first time in November 2020, reserved for projects with a production capacity of less than 25 GWh/year, in order to take account of the level of maturity achieved by the sector and the decrease in production costs. The most recent tariff order dates from June 2023. The purchase tariff now takes into account electricity supply costs, following the difficulties arising from the Ukrainian crisis in 2022. In addition, this tariff decree provides for the possibility of combining the purchase tariff with additional investment aid (Ademe, Regions of France, etc.) provided that the project’s internal rate of return is below 10 % in nominal value;
- The purchase obligation scheme for biomethane injected into a natural gas network following a tender is intended to support projects with a production capacity exceeding 25 GWh/year. The invitation to tender was launched on 27 December 2023, with a first tender submission period running from 1 to 15 February. The capacity called for for this first is 500 GWh/year. Two others may take place in 2024 depending on the level of subscription to the first, for a capacity called 550 GWh/year each;
- Since 2015, the Competitiveness Plan and Farm Adjustment Plan (PCAE) has proposed financial support for investments made by agricultural holdings, such as the modernisation of livestock buildings, better manure management (covering pits), improving the food autonomy of livestock and improving the energy performance of farms by developing, in particular, methanisation. It makes it possible to modernise the production system, to innovate, to combine economic, environmental, health and social performance, and to encourage the setting up of new farmers. It is set out in each of the regional rural development programmes, the regions of which are the managing authority. Since 2018, it has been integrated into the tools of the agricultural component of the Grand Investment Plan to address farm modernisation challenges. It also supports the implementation of the ‘Biosafety and Animal Welfare in Livestock Animal Welfare’ measure of the Recovery Plan, endowed with EUR 90 million (including EUR 86.5 million for investment support). Between 2015 and 2019, the overall annual allocation for the PCAE almost doubled from EUR 313 million in 2015 to EUR 621 million in 2019; in 2019, a guarantee fund was set up by the Ministry responsible for agriculture and allocated EUR 25 million to enable BPI

⁸⁹<https://www.ecologie.gouv.fr/programmations-pluriannuelles-lenergie-ppe>

France to offer up to EUR 100 million of unsecured loans for agricultural methanisation projects with injection into the gas network of more than 125 Nm³ with the aim of helping to implement the financial table towers (covering up to 20 % of the amount of the investment in the form of loans);

- **The draft 2023-2027 CAP National Strategic Plan promotes** the development of agro-ecological practices in livestock farming through enhanced cross-compliance, ecoregime, agri-environment-climate measures (AECMs), investments, the reinforcement of coupled leguminous aid and the ceilings of the INHCI and coupled bovine aid, which take account of the forage area, which is largely made up of grassland in our country. These measures encourage the extensification of livestock farming with increased grazing and the protein autonomy of farms by increasing the production of legumes. The NSP promotes the closure of crop and livestock cycles at farm and territorial level, and improved manure management.
- **The National Programme for Agricultural and Rural Development (PNDAR)** includes from 2023 the priority on reducing GHG emissions from agriculture and developing carbon storage techniques (priority theme 3 of the 2022-2027 programming). In particular, the PNDAR supports R & D projects and knowledge transfer markets, which can therefore contribute to reducing GHG emissions, for example by reducing the unproductive periods of animals, working on their longevity, food efficiency, in particular grazing and their ability to exploit a diversity of forage resources (including herbaceous and woody).
- Consumption of legumes (plant proteins) is increasing in households in France. It increased by 9 % between 2015 and 2017. Allowing French people to **diversify their protein inputs by eating dried vegetables from local production is a priority, in line with the recommendations of the National Nutrition Health Programme (PNNS)**. The challenge is therefore to encourage the development of a local French supply in order to meet this growing demand. Legumes have an unquestionable nutritional value in food, but also in reducing associated GHG emissions (leguminous crops contribute to the development of practices requiring less fertilisation on rotation, provide feed materials to replace imported soya that can be sourced from deforested areas, and produce dried vegetables for human consumption). The **National Programme for Food and Nutrition⁹⁰ (2019-2023) plans to accompany this rebalancing of plant and animal proteins in diets**. In this context, the EGALIM Law⁹¹ introduces the proposal for a weekly vegetarian menu in mass catering services in an experimental context. This proposal became mandatory with the Climate and Resilience Law (Article 252), which also provides for a daily proposal for a vegetarian menu, on an experimental basis, for mass catering managed by voluntary local authorities. The State, for the sake of example, has been offering a vegetarian menu since 2023 on a daily basis in the event of multiple choices made available to guests in its canteens and those of its public institutions and national public undertakings. This provision also concerns universities (Article 252 of the Climate and Resilience Law).

Measures to reduce N₂O emissions from agriculture

French agriculture contributes significantly to the emission of certain greenhouse gases (GHG), in particular nitrous oxide (N₂O) emissions (around 90 %). The **policies accompanying the decrease in the use of mineral**

⁹⁰<https://agriculture.gouv.fr/programme-national-pour-l'alimentation-2019-2023-territoires-en-action>

⁹¹<https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000037547946/>

nitrogen fertilisers are based on the Nitrates Directive with the 6th Nitrates Action Programme, the Climate and Resilience Law and the National Plant Protein Strategy⁹².

The **Climate and Resilience Law** (published in August 2021 – Article 268) provides for a 15 % reduction in nitrous oxide emissions in 2030 compared to 2015, consistent with the current carbon budgets of the national low-carbon strategy. The implementing decree defining the trajectory for the agricultural sector was published on 26 December 2022⁹³. The Climate and Resilience Law also provides for a national action plan for the reduction of nitrous oxide emissions from mineral nitrogen fertiliser uses (National Eco-Nitrogen Action Plan known as PANEA) to support actors in this direction; it shall also consider the possibility of a charge if the emission reduction trajectory of N₂O was not respected for two consecutive years. This is consistent with NH₃ emissions for air quality.

The national strategy on plant proteins aims in particular at the development of legumes through the plant-based protein plan worth more than EUR 150 million from the France Relance plan, supplemented by the 4th Investment Plan for the Future (PIA4). It shall support research and innovation activities, support for physical investment, support for the structuring of plant protein sectors and downstream investment, and aid for the promotion of legumes. The strategy should allow by 2030 to **double the area dedicated to these crops to 2 million hectares** (8 % of the utilised agricultural area). By increasing leguminous surfaces, it will contribute to reducing the use of synthetic nitrogen fertilisers, which are strong contributors to N₂O emissions, and to strengthen our independence for imports of protein-rich materials, including soya imported from third countries.

In addition, the **National Strategic Plan (NSP) 2023-2027** provides for a doubling of coupled aid to accompany the development of legumes (from EUR 134 million in 2020 to EUR 236 million per year at the end of the programming period), in order to encourage a reduction in the use of synthetic nitrogen fertilisers in arable crop systems and to strengthen the protein autonomy of livestock farms. NSP aid is also aimed at doubling the area under organic farming by 2027 (18 % of the total UAA), thereby increasing crop diversification with legumes in rotations, reducing the uses and risks associated with plant protection products and making better use of organic fertilisers.

The target of 8 % of the utilised agricultural area under legumes by¹ January 2030 was also adopted (Article 261 of the Climate and Resilience Law).

Reducing N₂O emissions requires better control of nitrogen fertilisation and combating nitrogen surpluses, which is a priority for the agricultural sector. Steadily increasing since the 1970s, the quantities of mineral nitrogen sold (kg) in relation to the fertilisable area (ha) reached a plateau of around 90 kg in the 1990s, followed by a slight decrease in the 2010s (around 85 kg). This decline was confirmed in the last 3 known marketing years (2018 to 2021), with values of 75, 77 and 69 kg respectively.

Nitrate action programmes, which are compulsory in vulnerable zones, require the balance of nitrogen fertilisation and the sound management of livestock manure. They aim to bring nitrogen to the right dose and at the right time so that the crop takes it quickly, thereby limiting leaks to the environment. Soil cover is

⁹²<https://agriculture.gouv.fr/lancement-de-la-strategie-nationale-en-faveur-du-developpement-des-proteines-vegetales>

⁹³ <https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000046806990>

mandatory for all parcels in vulnerable areas with long intercropping duration⁹⁴, which can help temporarily immobilise nitrogen to make it available when the main crop needs it.

The **Energy Autonomous Nitrogen Plan** is part of an agronomic approach based on respect for the balance of fertilisation and the overall reduction in input use. The plan contains a set of tools for better nitrogen management, including calls for projects, the valorisation and dissemination of knowledge, and the simplification of administrative rules.

The **“Ambition bio 2027”** programme was presented in April 2024. It aims to cover 18 % of the utilised agricultural area in organic farming by 2027. It focuses on three areas: stimulating demand and building trust; consolidate the sectors; support operators. NSP aid is also aimed at doubling the area under organic farming by 2027 (18 % of the total UAA), thereby increasing crop diversification with legumes in rotations, reducing the uses and risks associated with plant protection products and making better use of organic fertilisers.

The **Sustainable Seed and Agriculture Plan**, launched in 2016, by supporting the selection of nitrogen-efficient plants as well as improving the resources of leguminous seeds, contributes to limiting emissions of N₂O. On the occasion of the International Conference on the Green Development of the Seed Sector organised by the FAO on 4 and 5 November 2021, a new plan for seedlings for agro-ecology, adaptation to climate change and food sovereignty was launched. It provides for actions organised around four work streams: diversity of varieties and species, environmentally-friendly quality food, participatory approaches and the use of new techniques, scientific expertise for the benefit of public authorities and society⁹⁵.

The Farm Competitiveness and Adaptation Plan proposes investment aid to encourage, inter alia, the rational use of mineral fertilisation and the development of leguminous crops.

Reduction of CO₂ emissions through the control of energy consumption and the development of renewable energies in agriculture

Agricultural methanisation, mentioned above, allows biogas to be produced. This biogas can be used as renewable energy in different forms:

- Simple production of heat to be consumed near the production site;
- The combined generation of electricity and heat (cogeneration) by combustion in an engine;
- By injection into natural gas networks after a purification step (biogas then becomes biomethane);
- By converting into fuel as a vehicle natural gas (NGV).

The plan for the competitiveness and adaptation of agricultural holdings, cited above, also makes it possible to subsidise additional measures to reduce energy consumption and develop renewable energies.

Measures addressing the various emission reduction levers from agriculture

⁹⁴ Order of 19 December 2011 on the national action programme to be implemented in vulnerable zones to reduce water pollution by nitrates of agricultural origin

⁹⁵<https://agriculture.gouv.fr/lancement-du-nouveau-plan-semences-et-plants-pour-une-agriculture-durable>

Agri-environment-climate measures (AECMs) provide financial support to farms engaged in the development of practices combining economic and environmental performance or in maintaining such practices where they are at risk of disappearance.

For the period 2023-2027, the AECMs with a particular focus on climate mitigation include the AECM 'transition of practices', 'quality and preservation of the soil', 'climate – animal welfare – fodder and feed autonomy for livestock farms'.

The 2030 National Biodiversity Strategy published in 2023 provides for the preservation of sensitive ecosystems, including carbon-rich ecosystems such as grasslands, inter^{alia} through the 4th Wetlands Action Plan 2022-2026.

Led by the Ministry responsible for the green transition, the low-carbon label⁹⁶, **launched in 2019**, aims to reward virtuous behaviour in reducing greenhouse gas emissions and carbon sequestration in all sectors (forestry, agriculture, transport, buildings, waste, etc.), which go beyond usual practices, and to value them economically through voluntary funding by private or public actors, in order to stimulate local and additional action. The low-carbon label makes it possible to trigger public or private funding on a voluntary basis or corresponding to the fulfilment of the offsetting obligation (see Article 147 of the Climate and Resilience Law on offsetting emissions from domestic flights). It does so by recognising "emission reductions", based on methodologies developed by stakeholders and approved by the Ministry of Energy Transition, which can be acquired by actors wishing to offset their emissions, allowing for project financing.

Already 6 methods approved by the Ministry of Energy Transition in the agricultural sector:

- The Carbon Agri method, developed by the Institute of Livestock, valuing practices to mitigate GHG emissions and increase carbon storage in the soils of cattle and arable crops farms;
- The 'Haie' method, developed by the Chamber of Agriculture of Pays de la Loire, targets the sustainable management of hedgerows;
- The 'Plantation de orchards' method, developed by Compagnie des Amandes, valuing the emission reductions and carbon storage allowed by planting orchards;
- The 'Granted Crops' method, developed by a consortium of technical institutes including Arvalis, Terres Inovia, ITB, ARTB and AgroSolutions, allowing farmers to value emission reductions and increased carbon storage linked to the implementation of a set of practices at arable crop level (e.g. soil cover or intercropping);
- The 'SOBACT'ECO TMM' method developed by SOBAC and targeting input management;
- The Ecomethane method', developed by Bleu Blanc Cœur, targeting the reduction of digestive methane emissions by feeding dairy cattle.

⁹⁶<https://www.ecologie.gouv.fr/label-bas-carbone>

The scheme grew strongly in 2023, with several hundred projects totalling almost 2 MtCO₂e reducing potential emissions in the agricultural sector. The bulk of this volume is achieved by two methods: “Carbon Agri” and “Large Crops”. Compensation obligations for airlines for emissions from domestic flights (Article 147 of the Climate and Resilience Law and Enforcement Decree published on 27 April 2022) and for coal-fired power plants whose operation is extended (Article 36 of the Purchasing Power Act), will significantly increase demand for low-carbon labelled projects. Farmers therefore have an interest in taking steps to receive funding and participate in the decarbonisation of the sector.

Measures to influence demand and patterns of food consumption

GHG emissions from food account for 21 % of households’ carbon footprint in France according to the latest SDES publication⁹⁸.

The Government has included in the Law of 30 October 2018 on the balance of trade relations in the agricultural and food sector and healthy, sustainable food accessible to all and in the Climate and Resilience Law of 22 August 2021 a series of **measures designed to bring about a significant change in the way we feed us in order to support a more environmentally-friendly farming system, including:**

- **The extension of the obligation to supply at least 50 % of sustainable and quality products**, including at least 20 % **organic products** on 1^{January} 2022 for public catering and public service charges, to all public restaurants, including those of private companies from 2024 (Article 257 of the Climate and Resilience Law). In particular, this measure ensures an outlet for organic farming that does not use synthetic mineral fertilisers and that the environmental performance of products is taken into account when awarding contracts. In addition, **products from farms with environmental certification level 2 or level 3 (‘high environmental value’)**, which encourages virtuous farming practices, are part of this objective with a strong dynamic (the number of farms with high environmental value (HVE) increased by more than four between July 2020 and July 2021). The Climate and Resilience Law shortened the time taken into account for products from farms benefiting from level 2 in order to speed up the transition of farms to level 3 (deadline at the end of 2026 compared to the end of 2029 initially). Since 1 January 2023, a renovated version of the HVE benchmark (version 4 of November 2022) entered into force to increase its environmental ambition;
- **The obligation for school canteens to offer a vegetarian menu at least once a week**, and the obligation for collective restaurants serving more than 200 covered per day to implement a multi-annual plan for the diversification of protein sources; from the time of the enactment of the Climate and Resilience Law, the introduction of a daily vegetarian option in school catering services at the expense of voluntary communities, and since 1^{January} 2023, an obligation for state mass catering services to offer a daily vegetarian menu as long as they usually offer a multiple choice of menus (Article 252 of the Climate and Resilience Law). The aim is to **diversify protein inputs by** eating more legumes in line with the

⁹⁷<https://www.ecologie.gouv.fr/loi-climat-et-resilience-compensation-des-emissions-gaz-effet-serre-des-vols-nationaux>

⁹⁸ <https://www.statistiques.developpement-durable.gouv.fr/lempreinte-carbone-de-la-france-de-1995-2022>

objectives of the National Nutrition Health Plan 2019-2023⁹⁹; The challenge is therefore to encourage the development of a local French supply in order to meet this growing demand.

- **The objective of implementing territorial food projects (PAP)**, enshrined in the Climate and Resilience Law (Article 266), which provides for a target of at least one PAP per department on¹ January 2023 (achieved since 2022), but which also extends the objectives assigned to PAP and provides for support through a national network of PAP. Strongly supported by the Recovery Plan, the deployment of PAP has seen a particularly significant increase in recent years. On 1^{April} 2023, there were almost 430 PAP recognised by the Ministry of Agriculture and Food, the majority of which is in the process of emerging, requiring significant support in order to broaden their operational scope.
- **The objective of halving food waste** compared to 2015, in 2025 for distribution and mass catering and in 2030 for the other sectors. To that end, by the successive application of the Garot100101, EGAlim and AGECLaws, the prohibition on rendering unfit for consumption of still consumable foodstuffs and the obligation to propose a grant agreement to an authorised association (for structures above a certain threshold) applies to the agri-food industries, distributors, wholesalers and mass catering industries. A diagnosis and an approach to combating food waste are mandatory for mass catering and the agri-food industry. Finally, a national 'food waste' label was introduced by the AGECLaw in 2020, with effective implementation in 2022 for GMS and local shops, wholesalers and food trades. In addition, an experiment has been carried out since 2022 to assess the effects of food reservation solutions in mass catering on the evolution of food waste, attendance rates and user satisfaction.
- **The implementation of environmental labelling on food products** to provide consumers with simple and transparent information on the environmental impact of food products. This display will enable it to become a 'consumer-player', giving priority to food products that are good for the planet. As foreseen by law, several food eco-score (18) experiments have been carried out since 2021 (including Yuka eco-score and Planet score). On the basis of these tests, a proposal for a calculation methodology has been drawn up for food products. This initial work is intended to continue in order to deepen the methodology to better integrate the challenges of carbon storage and production models. The purpose of this display would be to allow comparison (i) between products of different categories to show the environmental impact of a change in food habits (e.g. increased consumption of plant proteins), and (ii) between products in the same category, in order to illustrate the level of performance of an ecodesign benchmark compared to a similar offer.
- **The target of 8 % of the utilised agricultural area under legumes by¹ January 2030** (Article 261 of the Climate and ResilienceLaw).
- The introduction of a new National Strategy for Food, Nutrition and Climate (SNANC), foreseen under Article 265 of theClimate and Resilience Law, which introduces a new comprehensive food governance, which is being developed through broad stakeholder consultation.

⁹⁹In France, consumption of dried vegetables (lentils, beans, chickpeas, etc.) was divided by 4 in twenty years, reaching 1.7 kg/person/year compared to 3.9 kg in the EU average. The National Nutrition Health Programme (PNNS) recommends increasing the consumption of legumes (at least 2 times a week) due to their high fibre content.

¹⁰⁰<https://www.legifrance.gouv.fr/loda/id/JORFTEXT000032036289/>

¹⁰¹<https://www.legifrance.gouv.fr/loda/id/JORFTEXT000041553759/>

These measures are **supported financially** under the French recovery plan, which has allocated EUR 816 million to accelerate the agro-ecological transition for healthy, sustainable and local food, including more than EUR 150 million to increase the production of plant proteins, including EUR 200 million for the food component. In particular, the Plant Protein Strategy foresees a campaign to promote the consumption of legumes for young people, directly or indirectly through their parents, in mass catering or healthcare workers, to be implemented in 2022. This support continues with the implementation of the acceleration strategies ‘Sustainable agricultural systems and agricultural equipment contributing to the ecological transition’ and ‘Sustainable and health-friendly food’ of the PIA4, which include support schemes for plant proteins.

Established by the Ministries of Economy and Agriculture in cooperation with ANIA (National Association of Food Industries) and Coop de France (Agricultural and Agri-Food Cooperatives), within the framework of the National Industry Council, the Strategic Contract for the Food Chain (FSB) was signed on 16 November 2018. In particular, it includes a project for the development of plant proteins in food (protein project of the future). Through support for R & D projects, general public communication, pre-standardisation and regulatory monitoring and support for start-ups, the aim is to encourage the production of sources complementary to animal proteins to meet a growing protein demand of 40 % by 2030. Some actions under this component were supported under France’s recovery and then France 2030.

- **Planned policies and measures (first orientations of the National Low-Carbon Strategy for 2030)**

The draft SNBC 3 sets out the following strategic guidelines for the agriculture sector:

(a) Culture

- **Deployment of low-carbon levers on farms, in particular to reduce the consumption of mineral nitrogen fertilisers**

The **development of low-carbon levers on farms is encouraged:**

- **through the National Strategic Plan 2023-2027 (NSP)**, in particular through the following measures: increase in coupled support for legumes, the route of ecoregime practices encouraging the extension and diversification of rotations, AECM on quality and soil protection issues, and flat-rate AECM transition of practices. In view of the French climate targets raised by 2030, **the NSP in its current wording will be evaluated** (in the light of the results of the first years) to assess whether the NSP can meet these objectives or whether changes are needed.
- **through the implementation**, in particular for new installers, **of diagnostics** on the climate resilience of farms, provided for in the Pact and the draft Food Guidance and Sovereignty Law (PLOSARGA) and ecological planning, which will make it possible to raise awareness of and support for the green transition.

The reduction in the use of mineral nitrogen fertilisers will be achieved through the **development of optimisation practices** (decision support tools, adaptation of inputs to crop needs, selection of low-input varieties, spreading practices and materials, etc.), **diversification of nitrogen sources** (legumes, cutlery, effluent, methanisation digestates and all residual fertiliser materials (MAFOR)) **and longer rotations** (to improve soil fertility and combat weed development).

Thus, with support for methanisation, **the use of methanisation digestates will be optimised**. It will contribute to the closure of the nitrogen cycle. The use of existing livestock manure will thus reduce GHG emissions (methane), improve nitrogen management in agriculture and reduce the use of mineral nitrogen fertilisers.

Beyond the existing measures to be sustained¹⁰², **an incentive to reduce the carbon impact of nitrogen fertilisers could be envisaged to reduce GHG emissions from the production and use of mineral nitrogen fertilisers.**

The France 2030 plan also **supports innovation in agriculture and food** (with EUR 2.3 billion dedicated) and **in particular the development of smart, automated or connected equipment with the aim of reducing input use.**

Finally, farmers' **sustainability efforts can be encouraged and remunerated by downstream operators**, for example by allowing them to access the low-carbon label, to sectoral bonuses or by any public or private actor introducing payments for nearby services (PES) and ultimately by consumers. The development of new low-carbon labelling methods for changing production methods will also be supported.

- **Development of agricultural systems and sectors to mitigate GHG emissions, adapt agriculture to climate change and food sovereignty**

Agro-ecological systems and sectors that are less GHG emitting and more broadly reducing pressures on the environment and resources will be accompanied by:

- **Development of organic agriculture:** the development of the organic farming sectors will be supported by the support plan deployed in 2023 and the next BIO 2027 ambition programme, through a combination of resources and measures to promote the perennisation and increase of organic land (through crisis aid for organic farmers in difficulty and structurally the organic tax credit and CAP aid), the consolidation of the organic sectors (by extending and strengthening the BIO future fund) and boosting consumption (by strengthening and sustaining communication appropriations on organic farming and supporting the achievement of Egalim's objectives, particularly in collective restoration for the State).
- **Support for plant protein sectors:** a scheme to support the structuring of sectors for the cultivation of species rich in plant protein will be deployed from 2024, as part of the national strategy for the development of plant proteins, which aims at doubling leguminous areas by 2030. With EUR 150 million from France Relance funds (2021-2023), funding for the strategy will be made permanent in order to meet the objective of doubling.
- **Development of orchard areas:** the Fruit and Vegetable Sovereignty Plan adopted in 2023 will support the renewal and development of orchard areas, with resilient varieties adapted to climatic and health hazards, linked to the evolution of diets (see 'Diet evolution').
- **Development of intermediate crops:** crops that enable nitrogen and organic matter to be stored in the soil, favourable to biodiversity, and to meet the needs of animal feed or energy will be recommended.
- **Promotion of transition dynamics at territorial level in a contractual approach, involving all links in the food system**

The **territorialisation of ecological planning** for agriculture and forestry will make it possible **to build shared agro-ecological transition projects** that intersect approaches by sector and by territory.

In this context, **the creation of a Food Sovereignty Fund** will aim to support the **development and transformation of agricultural sectors** by supporting projects targeted at the agro-ecological transition, as part

¹⁰² Policies accompanying the decrease in the use of mineral nitrogen fertilisers are based in particular on the Nitrates Directive with the 6th Nitrates Action Programme, the NSP and the Climate and Resilience Law (Article 268).

of collective approaches involving several links in the food chain. Beyond farm level action, the climate transition in agriculture requires the emergence of **shared agro-ecological transformation** projects within each production basin.

Finally, the Territorial Food Projects (PAT), supported by France Relance and confirmed by the Climate Resilience Law, provide an essential tool **for bringing together actors from the various links in the food chain at a regional level around the issue of food**. On 1^{April} 2023, PAT 430 had been labelled. **Territories will continue to be encouraged and supported to define and implement PAPs whose systemic, and in particular environmental, nature can be strengthened under the National Strategy for Food, Nutrition and Climate.**

(b) Lifts

► Changes in livestock

The planned changes in livestock are based on the slowdown in the trend decline observed, mainly as a result of the renewal and installation dynamics of livestock farmers. These developments will be **accompanied, in particular by means of the strengthened government plan to regain our sovereignty over livestock farming**¹⁰³, in order to work on consumption consistent with PNNS, to structure the sectors in line with consumption needs and patterns, to reduce our dependence on imports of animal feed, in particular on cake, and to preserve permanent grassland and associated biodiversity and carbon stocks.

Great vigilance will be exercised with regard to territorial impacts and food sovereignty, **giving priority to local and sustainable meat consumption**. The priority is to reduce imports and their negative environmental impacts.

► Herd management and farming systems

The **development of agro-ecological practices on farms will be promoted** through the NSP¹⁰⁴. These measures encourage **the extensification of livestock farming with increased grazing and the protein autonomy of farms by increasing** the production of legumes. They also promote **the close of crop and livestock cycles** at farm and territorial level, and **better manure management**.

Herd management will be optimised, in particular through support for R & D projects and knowledge transfer measures aimed at reducing animals' unproductive periods, working on their longevity, food efficiency in particular grazing, their capacity to exploit a diversity of forage resources (particularly herbaceous and ligneous) and to improve their performance through genetic selection.

The best GHG emission performance of polyculture-livestock systems will be encouraged, in particular with the development of diagnostics and the support of the Low-Carbon Label (LBC).

This **will protect permanent grassland** for the ecosystem services they provide to livestock and society.

► Management and valorisation of animal manure

¹⁰³ <https://agriculture.gouv.fr/sia2024-lancement-du-plan-gouvernemental-renforce-de-reconquete-de-notre-souverainete-sur-lelevage>

¹⁰⁴ Through enhanced cross-compliance, the ecoregion, agri-environment-climate measures (AECM), investments, the reinforcement of coupled aid for legumes and the ceilings for the ICHN and coupled bovine aid, which take account of the forage area, which is largely made up of grassland in our country.

The coverage of slurry pits will be widespread in the long term, including methane recovery systems, and **improved spreading practices** to limit ammonia volatilisation and improve the value of organic fertilisers.

(c) Evolution of diets

► National Strategy for Food, Nutrition and Climate

The National Strategy for Food, Nutrition and Climate (SNANC), currently being prepared for publication in 2024, will set out, as provided for in the Climate and Resilience Act, **the orientations for sustainable and health-friendly food and nutrition policy for 2030**, building in particular on the National Food Programme and the PNNS. The aim of this strategy is to be systemic and **to promote all dimensions of sustainability** (economic, social, health, environment, etc.), in conjunction with the guidelines defined in the context of ecological planning or the Pact of Solidarity. SNANC will provide guidance on both the food environment and consumer behaviour.

► Incentives to consume organic, local and seasonal products and legumes

The consumption of sustainable and quality products (e.g. seasonal products, from short supply chains and farming based on the principles of agroecology, in particular organic farming) will be promoted under the National Strategy for Food, Nutrition and Climate (SNANC), by strengthening the legislative framework, structuring incentives and raising awareness. **Consumers will be better informed about** healthy, sustainable and high-quality food (fruit, vegetables, legumes and plant proteins, Bio, etc.) and about the origin and seasonality of the products, in particular through environmental labelling, food education from an early age and guidance on advertising and food marketing practices.

Off-home **catering, especially mass catering¹⁰⁵**, will be a lever for access to **healthy, sustainable and high-quality** food.

Dietary **changes towards the diversification of protein sources will be accompanied** in line with SNANC, with guidelines for increasing consumption of fruit, vegetables, legumes, whole cereals and limiting meat and meat consumption.

► Combating food waste

All levers will be **mobilised to combat food waste**: anti-waste label, mobilisation of mass catering and dispensers, etc.

(D) on-farm energy consumption

► Phasing out fossil fuels for agricultural machinery and deployment of less energy-consuming crop routes

The replacement and renewal of tractors, accompanied by public aid and the desire to reduce the use of agricultural GNR in the long term, will gradually take place in favour **of biofuel use and replacement by electric**

¹⁰⁵The Climate and Resilience Law (Article 252) obliges school canteens (with a public or private manager) to offer a vegetarian menu at least once a week, collective restaurants (> 200 covered) to implement a multiannual plan for the diversification of protein sources and the State's mass catering services, and the authorities are responsible for providing a daily vegetarian menu:

or even hydrogen motors depending on their use. Structures enabling the pooling of agricultural machinery will allow investment in decarbonised equipment. In addition, agricultural systems will evolve towards agroecology with **less energy-consuming technical tillage routes.**

European manufacturers will be mobilised through innovation calls for projects to build a supply of low GHG emission machinery and a regulatory framework facilitating retrofit of agricultural machinery will be considered.

- **Establishment of financial support measures to improve the energy efficiency of equipment and buildings (including greenhouses)**

Financial support, such as the Heat Fund or the Energy Saving Certificates scheme, may be put in place or continued to facilitate **the thermal renovation and construction of energy-efficient buildings using decarbonised energy, including geothermal or waste heat.**

The Fruit and Vegetables Sovereignty Plan also aims to support energy efficiency gains and the decarbonisation of greenhouses.

(e) Bioenergy production

- **Support for agricultural methanisation of livestock manure or crop production not otherwise recovered**

The development of **methanisation**, contributing to the added value of farms and the decarbonisation of other sectors (transport, industry, energy, buildings, etc.), will be encouraged by supporting the purchase tariff for biogas injected into gas networks, the introduction of an incorporation trajectory based on biogas production certificates and the deployment of incentives for industrial consumption of biogas for heat production, the local use of bioGNVs for uses which are difficult to electrify. It will **contribute to the reduction of greenhouse gas emissions for livestock farming and renewable energy production targets.** Support for methanisation/cogeneration will be provided in specific cases, in particular to exploit the biomass available on farms away from any connection to the gas transmission network. In addition, **tighter checks on the regulation** on the feeding of methanisers (capping the tonnage of inputs from crops used for 15 % of the annual gross tonnage) will make it possible to prioritise the development of CIVE (linked to the increase in intermediate crops traps) and the treatment of livestock manure.

- **Sustainable management and enhancement of hedgerows and development of agroforestry**

The hedge pact, presented in September 2023, provides for **sustainable valorisation of hedgerow-derived products and services, in particular via the wood-energy sector.** Driven by rapid growth in biomass needs, this heritage and economic approach aims to change the view of owners and managers on the value of their hedges. In practical terms, it will be necessary **to structure chains for the valorisation of hedgerows' products while ensuring their sustainable management**, both in order to preserve biodiversity and to secure a supply of quantity and quality over time. In this context, measures to label sustainable hedges management will be encouraged. Intra-community agroforestry will also be developed on both grassland and arable land, allowing the mobilisation of non-forest biomass in the economy. It will be supported by material funding (maintenance equipment, etc.) and intangible funding (animation of awareness-raising networks, acquisition of technical and economic reference systems, etc.).

(f) Storage of carbon in soil and biomass

► Developing carbon farming levers

The¹⁰⁶ **current NSP (2023-2027) encourages carbon storage** primarily through the maintenance and maintenance of permanent grassland by livestock farming (cross-compliance, coupled beef aid, eco-scheme, MAEC and¹⁰⁷ICHN¹⁰⁸), but also through the preservation and creation of agro-ecological infrastructure, particularly hedgerows by the eco-scheme and their sustainable management by means of the eco-scheme bonus, and finally through land cover through cross-compliance or the AECM for soil quality and protection, etc. These levers will be stepped up, in particular by protecting agricultural land, protecting the stock of carbon-rich grassland through the enhancement of grazing livestock, and the massification of virtuous agronomic practices adapted to local climatic conditions.

In addition, diagnostics for carbon storage and GHG emission reductions will be encouraged, in order to make a stock-taking exercise at farm level and to identify the scope for progress. These diagnostics can then in some cases allow access to remuneration for additional carbon storage and emission reduction through the setting up of projects to obtain the **low-carbon label**, for example, opening up access to private finance.

► Sustainable development of the storage potential of hedgerows and intraparital agroforestry

The hedge pact will make it possible to continue the momentum created by the 'Plantons des hedges' measure of the recovery plan, with the aim of increasing the effort initiated under France Relance to achieve the objective of a net gain of + 50 000 km of hedges by 2030. One of the main levers **for increasing the carbon storage of existing hedgerows** is **firstly to halt their degradation** and **secondly to support the development of hedgerows linear** by introducing **sustainable hedges management practices and structuring of sectors** to make economic use of hedgerows' products. This will be developed through support for the production of plants, planting, labelling under sustainable management, technical support, training and processing tools and nurseries, as well as monitoring with the establishment of a national hedges observatory and management.

The development of intraparital agro-forestry with the aim of achieving 100 hectares in 2030 will increase the carbon storage potential of the agricultural sector.

► Fostering carbon storage in soils

Changes in production methods and tillage (less turnaround, longer rotations, etc.) and the **eventual tripling of intermediate crops** will make it possible to increase carbon farming.

Private funding will also be mobilised to increase demand for low-carbon projects, including those supporting soil storage.

3.1.1.1.1. f) Cross-cutting measures

- Existing policies and measures

Policies and measures affecting all sectors

¹⁰⁶NSP: Nationalchurch plan

¹⁰⁷AECM: Agri-environment and climate measures

¹⁰⁸ICHN: Compensation for natural handicaps

Policies and measures affecting all sectors are those affecting businesses and communities. They are also likely to have an impact on all greenhouse gases.

Even before the 2022 European Directive on ESG reporting of companies, France had a pioneering policy in this area, with first transparency requirements introduced since 2001 and regularly strengthened since.

Since 2012, an obligation to produce a **greenhouse gas emissions balance sheet** and an action plan to reduce them has applied to companies with more than 500 employees, communities with more than 50 000 inhabitants, public establishments with more than 250 employees and state services. The assessment and action plan must be carried out every three years in the case of public authorities and establishments and every four years in the case of undertakings, failing which fines will be imposed. It is an organisational approach to diagnose greenhouse gas emissions (private or public) with a view to identifying and mobilising emission reduction fields. Since Decree No 2022-982 of 1^{July} 2022, the rules make it compulsory to calculate all significant direct (scope 1) and indirect emissions (scopes 2 and 3) for a large part of the obligations. A methodological guide for carrying out the review shall be made available free of charge to organisations. In addition, a web-based platform for the publication of balance sheets was set up in 2015 to facilitate the publication and dissemination of this information to the public.

Corporate social, environmental and societal responsibility duties were reinforced by the August 2015 law on energy transition for green growth, as regards reporting obligations on climate change. Large undertakings must include in their non-financial reporting information on significant items of greenhouse gas emissions generated as a result of their activity, in particular from the use of the goods and services they produce, from the financial year ended 31 December 2016. The concept of significant emission items has thus been chosen to lead the undertaking to report on the impact of its activity on climate change, whether direct and indirect emissions, in particular those relating to the use of the goods and services it produces.

The same law also supplemented the regulatory framework on the disclosure by asset management companies of the environmental, social and governance ('ESG') criteria taken into account in their investment policy. This requires institutional investors to disclose their contribution to climate objectives and the financial risks associated with the energy and green transition. These obligations apply from the management reports published in 2017 for the year 2016.

The new EU CSRD directive, which will enter into force gradually from 2025 (for the financial year 2024), will strengthen and harmonise the transparency of companies on their environmental transition. France has taken steps to support businesses in the implementation of this Directive.

Since 2021, two **environmental conditionality schemes for public aid** have also been introduced:

- Article 66 of Law No 2020-935 of 30 July 2020 provides that undertakings with a turnover of more than EUR 500 million subject to the non-financial performance reporting obligation and benefiting from State contributions under the emergency plan put in place by the Government to deal with the health crisis must enter into commitments to reduce their greenhouse gas emissions. These commitments must be drawn up in accordance with the sectoral carbon budgets set by the Bas-Carbone National Strategy, are set out in the form of an action plan and are monitored annually, all publicly;
- Article 244 of Law No 2020-1721 of 29 December 2020 provides for a simplified greenhouse gas emissions balance to be drawn up for legal persons governed by private law receiving funding under the recovery plan following the health crisis. This report differs from the system of greenhouse gas

emission balances (BEGES), framed by Article L. 229-25 of the Environmental Code, both as regards the scope of the obligations and the scope of emissions to be taken into account:

- This applies only to undertakings not subject to BEGES, with an employee of between 50 and 500 persons (BEGES applies to legal persons governed by private law with more than 500 employees);
- Only direct emissions from stationary and mobile energy sources necessary for the activities of the legal person shall be estimated.

Several reinforcements to the BEGES rules also took place in 2023. The Green Industry Law of 23 October 2023 raised the maximum penalty for non-implementation from EUR 10000 to EUR 50000 (EUR 20000 to EUR 100 000 in the event of a repeat offence). In addition, the latter also introduces:

- Making public support for the green transition granted by public majority bodies conditional on the completion of a BEGES for bonds or a simplified balance sheet for entities with more than 50 employees and not obliged to do so.
- The possibility of exclusion from public procurement and concession contracts in the event of non-compliance with the BEGES rules

Furthermore, Decrees No 2022-538 and No 2022-539 of 13 April 2022 introduced, from 1^{January} 2023, the prohibition for advertisers to claim in advertising that a product or service is 'carbon neutral' without presenting a balance of greenhouse gas emissions over the whole life cycle of the product or service, the planned emission reduction trajectory, and the arrangements for offsetting residual emissions. These elements must be easily accessible to the public and updated on an annual basis. This mechanism, provided for in Article 12 of the Climate and Resilience Law, aims to ensure that the public is fully informed about 'carbon-neutral' claims and will gradually strengthen advertisers' commitments while combating 'greenwashing'.

With regard to communities, their climate action is based on territorial planning tools: the regional plans for regional development, sustainable development and regional equality (SRADDET) for regions, and the territorial climate and air-energy plans (PCAET) for intercommunalities with more than 20 000 inhabitants. PCAET and SRADDET are the tools for coordinating the low-carbon transition in the regions. Genuine projects for the sustainable development of territories, they define strategic and operational objectives to mitigate and adapt to climate change, develop renewable energy, control energy consumption and improve air quality, in line with national objectives.

Cross-cutting policies and measures on F-gases

Fluorinated greenhouse gases such as perfluorocarbons (PFCs), hydrofluorocarbons (HFCs) and sulphur hexafluoride (SF₆) are responsible for global warming. For this reason, these substances are subject to international, Community and national regulations designed to regulate their uses or even prohibit them.

The regulation of fluorinated greenhouse gases stems from the commitments made by the international community under the Montreal Protocol to eliminate the production and consumption of ozone-depleting substances and to reduce the placing on the market of HFCs, and the Kyoto Protocol on the limitation of greenhouse gas emissions.

Fluorinated greenhouse gases are regulated at Community level by Regulation (EU) 2024/573 of the European Parliament and of the Council of 7 February 2024 on fluorinated greenhouse gases, amending Directive (EU) 2019/1937 and repealing Regulation (EU) No 517/2014.

This regulation, published on 20 February 2024 and entered into force on 11 March 2024, strengthens measures to reduce emissions of fluorinated gases.

Under this new regulation, the consumption of HFCs will be completely eliminated by 2050 in the territory of the European Union, the production of HFCs, in terms of production rights allocated by the Commission to produce HFCs, will be reduced to a minimum (15 %) from 2036 onwards. The text also introduces bans on the placing on the market of products and equipment containing HFCs belonging to several categories for which alternatives to F-gases exist and are technically and economically feasible, including certain household refrigerators, chillers, foams and aerosols. It also sets specific dates for the complete phase-out of the use of F-gases in air-conditioning, heat pumps and electrical switchgear.

That Regulation also lays down requirements in terms of training and certification of personnel and undertakings involved in activities relating to stationary refrigeration, air-conditioning and heat pump equipment, fire protection systems and fire extinguishers, the recovery of certain fluorinated greenhouse gases from high-voltage switchgear, the recovery of certain fluorinated greenhouse gas solvents from equipment.

- **Planned policies and measures (first orientations of the National Low-Carbon Strategy for 2030)**

Preliminary work on the development of the future National Low-Carbon Strategy has made it possible to identify a number of major cross-cutting challenges.

► **Reducing our carbon footprint**

According to the most recent estimate, France's carbon footprint was 623 Mt CO₂eq or 9,2 tCO₂eq/inhabitant in 2022, made up of 44 % domestic emissions (direct emissions from households and emissions from domestic production excluding exports), and 56 % of imported emissions (emissions associated with imports for final use and intermediate consumption). This estimate is provisional and based on still fragmented data, the final estimate is 9,3 tCO₂eq/inhabitant in 2019, equivalent to the provisional value of 2022 with a slight increase in imported emissions.

After an increase between 1995 and the mid-2000s, the level of the footprint started to decline over the last decade. Given the increase in population, the change in the carbon footprint relative to the number of inhabitants decreases significantly (-18 %) between 1995 (11,3 tCO₂eq/inhabitant) and 2022. This reduction is mainly due to lower domestic emissions, partly offset by higher imported emissions. Imported emissions increase to meet increased demand, and to a lesser extent due to deindustrialisation

While France's international commitments relate to its territorial emissions, **the Government has undertaken to reduce France's carbon footprint. The SNBC 3 will thus include indicative carbon budgets in footprint and a long-term objective.**

Empreinte carbone de la France de 1995 à 2022 (en Mt CO₂eq) (Traitement SDES, 2023)

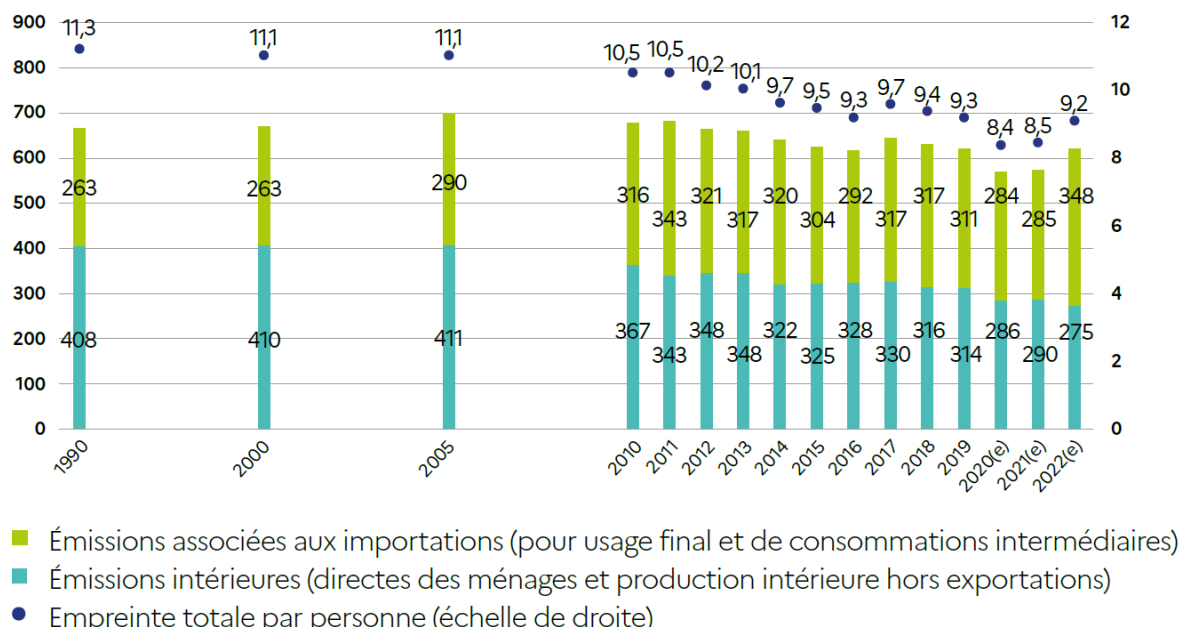


Figure46: Carbon footprint of France from 1995 to 2 022 in Mt CO₂eq

This commitment is highly dependent on the decarbonisation of France’s long-term trading partners and the ability of our economy to be more competitive and better able to relocate certain value chains.

The levers for reducing France’s carbon footprint include:

- **behavioural change** (sobriety in all sectors will be at the heart of efforts to reduce the carbon footprint);
- **green reindustrialisation**¹⁰⁹ taking advantage of our low-carbon electricity mix and the ambitious schemes put in place for green industry at national level (France 2030, Loi industrie vert, Green Industry Investment Tax Credit) and European (net zero industry act) to ensure the development of green industry and reduce the carbon footprint of France and the EU, subject to a contained increase or continued domestic consumption to prevent reindustrialisation from increasing production emissions than it reduces those associated with imports;
- **Regulatory or incentive measures to reduce the EU’s carbon footprint** (establishment of a carbon border adjustment mechanism, developments in free trade agreements, eco-design directive, battery regulation, etc.). In particular, the scale of the CBAM will reduce imported industrial emissions by: in this respect, it is crucial and consistent with the consistent positions of the French authorities that it is gradually extended to a larger number of sectors at risk of carbon leakage, with particular attention to the downstream and exporting sectors.

¹⁰⁹ *Rei ndustrialisationis* associated with lower emissions only when combined with moderation of demand, with the aim that the creation of an additional plant on the national territory effectively results in the replacement of a plant abroad

► Decarbonising digital and putting it at the service of the low-carbon transition

Digital uses are cross-cutting to all sectors of the economy and are growing strongly. In 2020, they account for **2.5 % of the carbon footprint and 10 % of national electricity consumption**. Footprint projections **are rising significantly over the coming decades** (the latest ADEME and Arcep study projects an increase of **+ 45 % in 2030 and + 180 % in 2050 compared to 2020**).

Although new digital uses can contribute to the green transition, this sector remains particularly carbon-intensive and energy-intensive. **Efficiency measures** (energy efficiency of terminals and datacenters, eco-design, etc.) **are fundamental, but will not be sufficient to control the steep trend increase** in carbon footprint. **Sobriety measures will be essential**: increase in hard use of terminals, use of repackaging, repair and reuse, limitation of online video consumption, framework for IoT development, screen size management, adapting video resolution to the terminal, etc. In general, digital measures are particularly vulnerable to upheaval effects, which therefore require specific attention when designing the relevant public policies.

The **SNBC 3 will include an indicative target for the evolution of the digital carbon footprint and an associated action plan**, setting an ambition for industry and public policies.

There are many uncertainties surrounding the definition of a digital carbon footprint trajectory: scope of terminals included in the study, taking into account imported emissions from datacenters (which could increase the digital carbon footprint in 2020 from 25 % to 57 % according to recent work¹¹⁰), uncertainties about historical data, decarbonisation of domestic and international electricity generation, decarbonisation of off-use phases, and the emergence of new technologies such as generative artificial intelligence. In this context, **the first constructed trajectories indicate a great variability of the sector's footprint according to the ranges and assumptions used**, enabling the first 'beams' of trajectories to feed into the reflection to establish the final trajectories of SNBC3.

¹¹⁰ <https://hubblo.org/fr/blog/datacenters-imported-impacts/>

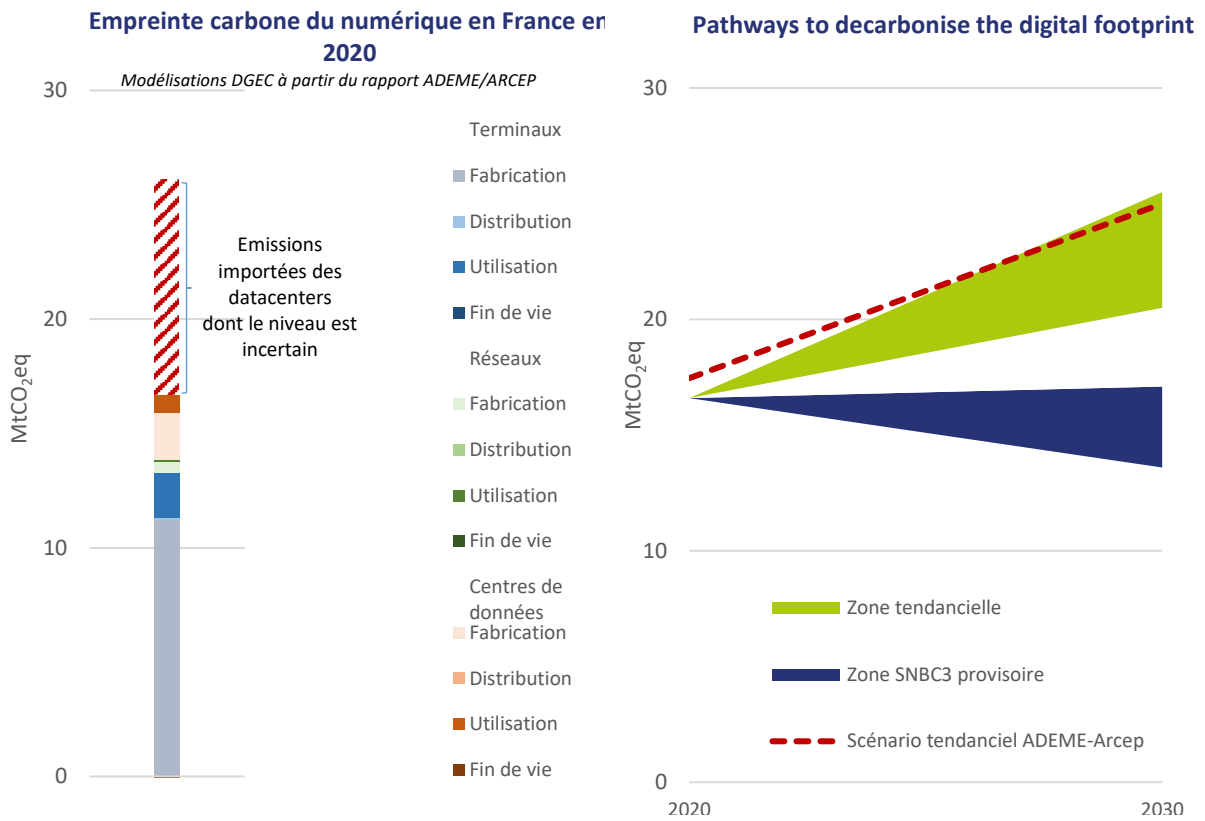


Figure 47: First projections of the digital carbon footprint for the scenario with existing and additional measures (Source: DGEC modélisations, based on the ADEME/ARCEP report)

► **Achieving collective mobilisation for a successful green transition**

The success of the green transition **requires the joint mobilisation of each and every one of us:** State, local authorities, economic actors, citizens, etc.

► **Stepping up research to succeed transitions**

Scientific research has an important role to play in supporting society in the transitions needed to cope with climate change and to meet our climate objectives (incremental research into male solutions and the invention of longer-term technological breaks, humanities and social sciences, etc.). To achieve this goal at territorial level, the regional COP initiative was launched in autumn 2023. Each of these COPs aims to define regionally the levers of actions aligned with the national targets for reducing greenhouse gases (GHG) and preserving biodiversity. In addition, it is necessary to integrate all aspects of ecological planning in a coherent manner with the involvement of all stakeholders in the territories concerned.

3.1.1.1 2 policies and measures to ensure compliance with Regulation (EU) 2018/841

The first national low-carbon strategy adopted in 2015 and the second one adopted in 2020 contain strong guidelines to develop more sustainable land management to limit land take, in particular agricultural land take,

store and preserve carbon in soil and biomass and enhance carbon removal by the forest-wood sector (see policies and measures for these sectors).

These guidelines are based in particular on the agro-ecological project for France, on the one hand, and boosting forest management on the other. In particular, as regards the wood sector, four levers are identified as complementary:

- carbon sequestration in the forest ecosystem.
 - carbon storage in wood and wood-waste products
 - substitution of energy-intensive materials by bio-based products
 - the energy recovery of bio-based products or waste from such products which replace fossil fuels
- ***Existing policies and measures***

The measures presented in this section have the main effect of reducing CO₂ emissions or contributing to carbon storage through CO₂ removal.

Schemes supporting carbon storage in soils and biomass

The preservation of permanent grassland, the development of agroforestry, the return of crop residues to the soil, agroecology, the preservation of wetlands and the fight against land take are all measures that would enhance carbon storage in soils.

Combating land take

In line with European objectives, the Climate and Resilience Law adopted in 2021 and complemented by the Law of 20 July 2023 enshrined the objective of achieving ‘net zero land take’ in 2050, with an intermediate milestone of halving the consumption of natural, agricultural and forestry areas between 2021 and 2031 compared to the period 2011-2021. For regions covered by a regional planning, sustainable development and equality plan (all regions outside Corsica and IDF), the reduction at regional level must be at least 54.5 % after national or European projects of major general interest have been pooled.

In order to monitor this development, a national observatory was set up in 2019 (<https://artificialisation.developpement-durable.gouv.fr/>). Three decrees were published on 27/11/2023, concerning the assessment and monitoring of land take, the implementation of the territorialisation of the objectives of economical spatial management and the fight against land take, and finally on the composition and working methods of the Regional Conciliation Commission on Land Use, and 3 new texts in December 2023 on the definition of ‘brownfield’ in the Urban Planning Code and on how to take photovoltaic into account in the consumption of space. This rulebook was supplemented on 31 May 2024 by a decree on the national pooling of the consumption of natural, agricultural and forestry areas for projects of major general interest at national or European level. As the latest implementing decrees have all been published, the legislative and regulatory structure is now stabilised, in particular with a view to further integrating the objectives of efficient spatial management and combating land take into regional planning and urban planning documents.

The main challenge is now to make the reform understood so as to ensure that implementation is gradual, flexible and accepted by all stakeholders in the territory. The roadmap is now clear for French local and regional authorities, in particular for the regions that have to include in their planning documents, by 22 November 2024, a pathway to net zero land take in the framework of a formalised territorial dialogue. French sub-regional

authorities will have to incorporate this trajectory into their urban planning documents by 22 February 2027 (SCoT) and 22 February 2028 (PLU (i) and municipal maps). Local information is strengthened by requiring local authorities to publish a local monitoring report on land take and consumption of spaces at least every 3 years. Tools and frames are made available to them to generate these reports (<https://mondiagartif.beta.gouv.fr/rapport-local>). Guides and training for local authorities and state officials are also in place, as well as cartographic tools to identify available brownfield sites (<https://cartofriches.cerema.fr/cartofriches/>).

Carbon farming

The “4: 1000” project aims to **increase carbon storage in soils by 0.4 %** (the global equivalent of CO₂ emissions). This international initiative 4 for 1000, launched by France on 1^{December} 2015 at COP21, consists of bringing together all voluntary public and private stakeholders (states, communities, businesses, professional organisations, NGOs, research institutions, etc.) within the framework of the Marrakesh Partnership for Global Climate Action (MPGCA). The initiative aims to show that agriculture, and in particular agricultural soils, can play a crucial role for food security and the fight against climate change. It is intended to publicise or put in place concrete actions on carbon storage in soils and the type of practices to achieve this (agro-ecology, agroforestry, conservation agriculture, landscape management, etc.).

The **France Relance plan promotes an increase in carbon storage in agricultural soils through the ‘Bon Diagnostic Carbone’ and ‘Plantons des Haie’ actions.** The ‘Bon Diagnostic Carbone’ scheme of the France Relance plan aims to encourage newly established farmers (less than 5 years ago) to reduce their GHG emissions and store carbon while adapting their farm to climate change. Its implementation consists of financing supporting structures for carbon diagnostics among farmers and the development of an individualised action plan. “Good carbon diagnostics” can thus be a first step towards the development of agricultural projects under the low-carbon label. With a budget of EUR 10 million, the measure made it possible to carry out 3 400 “good carbon diagnostics” between 2021 and 2023. It has also enabled 700 farm advisers to be trained on the issue of climate change in agriculture, in particular by carrying out diagnostics. This measure is expected to be continued in 2024 with the roll-out of the measure “Supporting farmers in the face of climate change” as part of ecological planning. With a budget of EUR 32 million, it will make it possible to finance mitigation, soil and adaptation diagnostics for agricultural holdings. As explained above, the ‘Plantons des hedges’ scheme was intended to support the planting of 7 000 linear km of hedges and alignments of domestic trees on agricultural parcels and was backed by an envelope of EUR 50 million. As a follow-up to this scheme, a “Pact of the hedges” was announced in September 2023¹¹¹, and its implementation into 25 operational actions, including the launch of a new call for projects “Aid for planting and sustainable hedges management”, was presented at the beginning of March 2024¹¹².

The NSP 2023-2027 promotes carbon farming as a continuation of the 2014-2022 CAP, promoting the maintenance of permanent grassland, the preservation and sustainable management of hedges, as well as the establishment of cutlery. In particular, the agro-ecological practices of the ecoregime consist of reducing the ploughing of permanent grassland, diversifying crops from arable and mixed cropping systems and installing inter-cropping vegetation cover into perennial crops. In addition, the ‘sustainable ghedges’ bonus remunerates holdings with a minimum of 6 % of hedges on their holding and having a certificate of sustainable management.

¹¹¹ <https://agriculture.gouv.fr/pacte-en-faveur-de-la-haie>

¹¹² <https://agriculture.gouv.fr/sia2024-marc-fesneau-presente-les-25-actions-du-pacte-en-faveur-de-la-haie-et-annonce-le-lancement>

Measures for intra parcellar agroforestry and hedges are also important levers to promote carbon storage in both soil and plant biomass and to enhance the added value of the agricultural sector. **The agroforestry development plan** launched in 2015¹¹³ consists of five strands of action: (I) strengthen knowledge of agroforestry systems, monitoring and research actions on agroforestry; (II) improve the regulatory and legal framework and strengthen financial support; (III) developing advice and training, promoting agroforestry and enhancing its production; (IV) valuing agroforestry production economically and developing them on land and territories; (v) promote European and international approaches. Following a final evaluation, a new phase of this plan is being drafted. The government has also set up, as part of the France Relance plan, a 'plantons des hedges!' programme¹¹⁴, which encourages farmers to **rebuild hedgerows**. The objective is to plant 7 000 km of hedges within 2 years and to implement the sustainable management of 90 000 km of existing hedges over time. In addition, the sustainable management of hedgerows and the encouragement for the development of woodwood from the AFAC-agroforestry association's Label Haie and payments for environmental services are added.

Organic farming also deserves to be mentioned, through its almost exclusive use of organic fertilisers, practices involving more often diversification of crops and intermediate cover, its privileged use of grass in livestock farming and/or a stronger propensity for agroforestry.

Furthermore, the implementation of **sustainability criteria for bioenergy** leads to the avoidance of the production of agricultural raw materials for energy production on certain carbon-rich soils and biodiversity-rich areas, within the European Union or in exporting countries to the European Union.

Carbon storage in forest

French forests currently have an overall positive net contribution to climate change mitigation, with emissions (including from oxidation of dead wood and removals) lower than sequestration. The forest well was -34,6 MtCO₂ in 2022.

The Forest and Wood Assises, conducted between October 2021 and March 2022, made it possible to identify, in a concerted manner, the main actions on which to focus in the short term on knowledge, forest renewal, biodiversity conservation, investment in the processing chain, governance, etc. These measures have been taken up and amplified in the context of the **'forest' section of ecological planning** carried out under the auspices of the Prime Minister. This planning will also implement the objective of replanting one billion trees over 10 years set by the President of the Republic on 28 October 2022, following the summer fires.

Substantial financial resources have been made available in recent years to finance forestry renewal, one of the main measures in place (France Relance and then France 2030). At the close of the Forest and Wood Assises, sustainable funding has been announced. Dedicated to forestry renewal, with a budget of EUR 100-150 million each year. The renewal of forests within the FranceRelance plan led to the renewal of 36 000 ha of forest for a total amount of EUR 150 million, most of which (21 000 ha) on declining forests.

¹¹³<https://agriculture.gouv.fr/un-plan-national-de-developpement-pour-lagroforesterie>

¹¹⁴<https://agriculture.gouv.fr/francerelance-50-meu-pour-planter-7-000-km-de-haies-en-2-ans>

In addition to this major axis, the various policies and measures contributing to the enhancement of the forest carbon sink include:

- **The Forest Investment Tax Incentive Scheme (DEFI)** for forest owners to be part of a sustainable forest management approach, including joining producer organisations or forest economic and environmental interest groups (GIEEF), due to a higher tax credit rate, is extended until 31 December 2020. The aim is to improve forest management with multiple benefits, including a reduction in overcapitalisation of some forests, better resilience to storm risk, but also greater mobilisation of wood;
- The **Forest Investment and Insurance Account (CIFA)** incentivising forest owners to insure themselves against the risk of storm and to build up savings to finance the prevention and, where appropriate, cleaning and restoration of damaged stands. The aim is to improve resilience to climate change and thus maintain forest sequestration;
- The **low-carbon label** created by Decree No 2018-1043 of 28 November 2018 enables the Ministry of Energy Transition to encourage the emergence of projects that prevent the emission or sequestration of greenhouse gases (GHG) and to enhance them, as part of the voluntary or compulsory compensation of public or private actors. Projects that sequester GHG emissions in addition to existing regulations and incentives can thus be labelled and then financed by public or private actors, with emission reductions ultimately being recognised for their benefit. Projects wishing to qualify as low-carbon must fall within the scope of a method approved by the Ministry of Energy Transition. The role of these methods is to define the scope of application, eligibility criteria and additionality criteria and how to calculate sequestered or reduced GHGs. These GHG sequestration projects may concern all sectors of activity, with the exception of activities subject to the EU Emissions Trading System (EU ETS). Eleven methods have already been approved, three of which are forestry. Since the creation of the label, forestry methods have potentially reduced 1,9MtCO₂e.
- The **National Biodiversity Strategy**, which plans from 2024 to 2030 the reduction of pressures on biodiversity and the protection and restoration of ecosystems. Within the SNB, the Forest Sols Action Plan and the National Old Wood Action Plan will be carried out. These plans will make it possible, through forest management recommendations for soils and deadwood, to conserve carbon stocks or even increase their sinks.
- The **National Climate Change Adaptation Plan**, which includes measures on forests. Adaptation to climate change is essential to ensure and secure the forest's carbon sink function. The ongoing work on the Third National Climate Adaptation Plan envisages the following actions:
 - Produce forest vulnerability maps at the scale of test territories, integrating climate and soil data, in order to assess their extrapolation on a larger scale
 - Develop the production, conservation and diversification of forest resources (seeds/plants)
 - Increase the production and wider dissemination of forestry and climate services to accompany changes in the practices of owners and managers
 - Restoring silvo-cyenetec balance to promote successful forest renewal
 - Extend the network for monitoring forests using instrumented plots in hexagon and overseas areas
 - Strengthen monitoring of ultramarine forests and restore degraded ecosystems
 - Mastering the mobilisation of crisis-timber in the context of climate change

In addition, a number of cross-cutting measures aim at both better forest management and greater mobilisation of wood:

- **The National Forest and Wood Programme (GNP)**, drawn up by the LAAAF and approved by decree on 8 February 2017, lays down the guidelines for forestry policy for the decade 2016-2026. In particular, it aims to optimise forest levers to adapt French forests to climate change and contribute to mitigation, taking into account the full carbon balance of the forest-wood sector (storage of carbon in living biomass above ground and underground, dead biomass, forest soils, wood products, substitution of wood to replace fossil fuels or competing materials). In particular, it sets an additional wood mobilisation target of 12 Mm³ commercial by 2026 compared to 2015. **The Regional Forest and Timber Programmes (PRFB)** are a regional breakdown of the national forest and timber programme and are being developed by the regions. The PRFB will include the structural elements of the regional multiannual forestry development plans;
- **The strategic contract for forest-based industries (FSB 2023-2026)**, signed by industry professionals and the government, aims to promote the use of wood and strengthen the sector's competitiveness. The FSB helps to clarify a new circular economy model aimed at producing sustainably, limiting waste of raw materials and ensuring recycling and recovery of wood waste. It also provides for the development of the use of wood in construction, allowing for long-term storage of carbon.
- The **Wood Forwardship Research and Innovation Plan 2025**, which describes the sector's main priorities in terms of research and development: increasing the use of wood with high added value, including broadleavers, increasing the performance of the sector, ensuring its adaptation, etc. The launch of a EUR 50 million priority research programme for the resilience and biodiversity of forests and an agile bioeconomy, a programme supported by public research, was announced on 21 November 2022¹¹⁵.
- On **10 July 2023, France introduced a law aimed at strengthening the prevention and combating of the intensification and extension of the risk of fire**. The main measures put in place are:
 - An extensification of the obligation to draw up a forest fire protection plan in departments where timber and forests are simply classified at risk
 - Better regulation of the front-urban-infrastructure interfaces by strengthening the legal obligations of scrubbing (OLD). The perimeter of LLOs must be annexed to the local urban planning plans and the fine for non-compliance with OLOs will increase from EUR 30 to EUR 50 per metre² not cleared.
 - Improving the development of forest areas by introducing a right of pre-emption by municipalities on forest parcels without a sustainable management plan and identified as being at risk. In addition, the threshold for establishing a simple plan for the management of a plot of land was reduced from 25 to 20 ha in order to allow an increase in the management of privately owned forest areas, hence their development.

Development of wood material

Wood material produced and used sustainably requires little energy for its production and allows for temporary storage of carbon: it already allows storage of around 2 MtCO₂eq annually in France and the development of

¹¹⁵<https://agriculture.gouv.fr/filiere-graines-et-plants-forestiers-plus-de-50-millions-deuros-pour-batir-lavenir-de-la-foret>

these uses would increase it. In addition, it can replace materials that generate greenhouse gases (e.g. concrete, steel and aluminium).

A number of devices are planned to support the development of wood material, particularly in construction. The **Wood Plans I and II and III (Wood Plan IV covers the period 2021-2024)** helped to remove the technical and regulatory brakes for the use of wood in medium and high construction. The purpose of the new French industrial plan, 'Large wooden buildings', is to demonstrate, in a very concrete way by building buildings, the feasibility of building wood at a high height and subsequently democratising the most appropriate technical solutions. Finally, **RE2020** (see section B.2) takes into account all the emissions of a new building over its entire life cycle (including the manufacture of materials). A significant development of bio-based products is expected in the coming years following the introduction of this new regulation.

The '**bio-based buildings**' label, which has been operational since 2013, makes it possible to give greater visibility to new buildings which make a significant effort to use materials of plant and animal origin (wood, hemp, straw, wool, feathers, etc.).

Forest-based industries also benefit from a number of **financing schemes managed by the French public investment bank Bpifrance**¹¹⁶: the Investment Development Loan (PPD) Wood and the Filière Wood Loan for low balance sheet financing, the Wood Fund for investments at the top of the balance sheet. They are also supported by the Accelerator Filière Bois, including advice, training and networking to facilitate their growth.

Finally, several national calls for projects have made it possible to accelerate the development of the wood material industry:

- The **Biomasse Chaleur call for the Wood Industry aims** to support the wood industries in setting up efficient biomass installations to meet their drying needs and ensure energy autonomy by reducing the use of fossil fuels.
- **Wood-based and bio-based construction systems to allow the emergence of solutions** for the production of carcass work and finishing work in the building. These projects will increase the mobilisation and processing of timber domestically and thus reduce the import of finished products:
- **Support for innovation in the construction of wood, bio-based and geosourcated materials**, in order to enable the financing of characterisation works leading to better knowledge of these materials (characterisation of broadleaved leaves, fire behaviour of wooden constructions, any other type of characterisation: fire, acoustics, thermal, etc.). It has a budget of EUR 30 million. To date, 10 winners have been selected for a total amount of aid of EUR 13 million. 29 projects were submitted on the last project on 30 March 2023 for an application of approximately EUR 37 million in aid.

Methods for monitoring and reporting in the LULUCF sector (Annex V of Regulation 2018/1999)

French greenhouse gas inventories have undergone significant methodological changes in recent years with the deployment of a spatial inventory methodology. The recently introduced mesh model thus already meets the requirement of an explicit spatial inventory. Work continues on the spatial development of organic soils

¹¹⁶<http://bois.bpifrance.fr/>

(significant improvement expected for the estimation of surfaces, and their differentiation from mineral soil estimates) and the previous day on the availability of new map products to be integrated into the multi-source model. For example, the 2th edition of the model had made it possible to incorporate a more detailed mapping of water zones.

In the National Inventory Report of 15 January 2024, CITEPA, responsible for French greenhouse gas inventories, identified improvements to be produced on organic soils and deadwood, bedding and soils for forest land.

Ongoing methodological improvement work also covers deadwood, based on data from the national forest inventory, for forests remaining in forests (which could be effective from the next inventory). For forest mineral soils, new results from the Safety Quality Measurement Network (latest campaign) are expected.

Other work also covers the wooden product compartment, the estimation of soil carbon on grassland, the estimation of fires and the use of satellite or map products for this topic.

- **Planned policies and measures (first orientations of the National Low-Carbon Strategy for 2030)**

(a) Forest system

- **Development and improvement of forest management and biodiversity conservation**

Adaptive forest management, with a focus on soil and biodiversity, will make it possible to optimise forest carbon stocks in the long term: soil protection, choice of resilient species, mixing of species. Conditionality measures within public funding strategies will continue. This adaptive management meeting enhanced sustainability criteria must be carried out by selective improvement cuts, by natural or artificial renewal cuts, with a choice of species adapted to the changing climate, or by means of transformations to change objective species, in order to promote productivity and the sequestration of CO₂ in forests.

Management incentive for small forest owners

Today, 9,7 Mha of private forests do not have sustainable management documents, i.e. 2/3 of the private forest and accounts for half of the French forest. However, the sustainable management of forests contributes to a better understanding of natural forest risks (in particular fire risk), greater mobilisation of long-lived wood products and the identification of wasting stands to be renewed, thus helping to meet our climate ambitions. **The reduction of the surface threshold in order to have a simple compulsory management plan** (from 25 ha to 20 ha), the main sustainable management document in private forests, under the 'fire' law of July 2023, must extend the area of private forest under the guarantee of sustainable management. Work, which is still ongoing, must also make it possible to identify proposals to boost the procedure **for taking over vacant and unskilled assets** (facilitating the identification of assets, updating the land register), combating forest land fragmentation and encouraging management consolidation.

Sustainable forest management and biodiversity conservation

The transposition of the Renewable Energy Directive RED3 will make it possible to clarify the positioning of French practices **and to provide a framework for certain practices that are currently likely to destore carbon**, potentially by introducing regulatory changes. In particular, avoiding the harvesting of strains and roots, avoiding

harvesting from vulnerable soils, ensuring that harvesting complies with maximum thresholds for large clear-cuts and appropriate retention thresholds for deadwood collection, adapt practices to limit compaction and soil degradation.

In addition, the **necessary means to preserve forest biodiversity will be put in place to ensure the multifunctionality of forests** in the context of ecological planning. Funding for forest renewal and low-carbon labelling methods will take into account the conditions for sustainable management. The preservation of biodiversity can be combined with carbon sequestration (resilient species, carbon sequestration in soils through mineralisation through present fauna, etc.) but also requires specific measures (deadwood, senescent trees, etc.).

In addition, the establishment of payments for environmental services for forests will be put in place, following the conclusions of an ongoing general inspection mission on the subject, in line with Measure 22 of the National Biodiversity Strategy.

- **Adapting by accelerating forest renewal**

Implementation of the report “Objective forêt”

On 26 July 2023 the ‘Forest Objective’ report, with a view to **drawing up the national forest renewal plan**, was submitted by the Specialised Committee on Sustainable Forest Management. This plan, reflecting the government’s ambition in the face of climate change, sets out the state of play while proposing specific measures to respond to one of the main areas of the roadmap for adapting forests to climate change and to strengthening the role of forests as carbon sinks. It aims to support public and private owners in the next ten years to adapt their forests to climate change. The implementation of the actions presented in this report will make it possible to renew forests in order to ensure the controlled planting or natural regeneration of species and forest routes resistant to future climate change by increasing the diversification of species and the complementarity of forestry management methods. It will make it possible to identify and intervene on declining stands, damaged stands, stands vulnerable to the effects of climate change (probability of spillage at short notice), and poor stands with mitigation potential, to reflect on the species and forest routes that will be most able to withstand climate change and to establish the costs of such an operation. It will help to halt the fall of the carbon sink by massively renewing in the next ten years with effects by 2050 and beyond (long forest time). This will make it possible to work on the development of the seed and planting industry, which is essential for achieving the objectives of planting and forestry renewal. The aim is to produce plants in sufficient quantity, quality and diversity.

Sustainable forest funding for forest renewal, announced at the closure of the forest and timber seises in March 2022, will be implemented as of 2024. It will allow the forestry renewal dynamics initiated by France Relance and then France 2030 to be taken over time.

Restoring forest balance – ungulates

The forest – ungulate balance will be restored to maximise forest renewal. The aim is to enable the regeneration of forests with as little protection as possible and the restoration of the biodiversity of the herbaceous and shrub floors that are important for the resilience of forest ecosystems.

To this end, 100 % of the regions will draw up a map of imbalanced areas and a national committee for the balance of forests – ungulates will be set up.

- **Encourage afforestation and reforestation**

The low-carbon label enables forest carbon projects to emerge by linking project promoters and funders. The Low-Carbon Label will continue to be rolled out on a large scale, in line with the conclusions of the Forest and Wood Conference. The existing forestry methods (“afforestation” and “restoration of degraded forest stands”) are being revised to facilitate access to them while providing the necessary guarantees on the robustness of emission savings calculations but also a nearby native requirement. A low-carbon Label methodology for overseas mangroves has also been published. New methodologies will be agreed **to increase the number of labelled projects** and associated emission reductions.

Afforestation outside existing forests will not enter into competition with agricultural land, but will take place on land that is left out of or will become farmland. Efforts will be made to identify on the territory the waves, brownfield sites and quarries which are no longer in operation and to implement restoration measures prior to afforestation on a case-by-case basis.

- **Strengthening firefighting capacity**

Amplification of the implementation of legal obligations on scrubbing

The obligation of scrubbing and stripping shall apply to owners of land situated within 200 metres of the wood and forests. The importance of complying with this obligation was confirmed by the ‘Fire’ Law promulgated in July 2023, which provides simplification and clarification measures based on feedback from the field. The aim is **to expand its implementation** through, for example, dedicated information campaigns, support for the municipalities concerned and control operations.

Strengthening fire-prevention and firefighting capacities

In order **to strengthen firefighting resources**, operational and animation resources will be developed in the areas exposed. Upstream, the means of **prevention and monitoring will be strengthened** in the forest areas affected by the intensification and extension of the fire risk. In addition, the **planning and management documents will have to evolve taking into account the fire risks** present in the territories concerned. Forest Fire Protection Plans (PPFCI) will be updated or developed in the relevant departments.

In support of these means, **the fire risk mapping will be updated** on the basis of the latest available data and simulations. A fire weather (for professional use) and a forest weather (for general public use) are introduced in each forest fire season and in the territories concerned.

- **Strengthening the resources of State operators and surveillance bodies**

The **means of acquiring data and knowledge on forests (understanding of ecosystems, forest health, state of resources and their future modelling, applied research on adapting forests to climate change, etc.) will be increased**, in particular through the work of the French Forest Observatory of the IGN and the PEPR (priority research projects and equipment) FORESTT and the establishment of a forest inventory in the overseas countries.

In addition, the **resources of State forestry operators (ONF, CNPF, IGN) will be consolidated.**

- **Develop methodologies to improve carbon accounting in forests**

Today, carbon stocks and streams in soils and deadwood are not included in national GHG inventories. Although these flows exist ‘physically’, they are not officially recorded: the current methodologies are not precise enough and the available data cannot be extrapolated to include them in the inventories.

For example, **methodologies for accounting for carbon flows within soils and dead wood will be improved** in order to be included in national GHG inventories. Accounting for these flows will make it possible to have a more complete view and in line with the reality of the well in the forest-wood sector.

(b) Wood products

- Reorganisation of the sector as a result of the increase in harvest over the coming years

This sector will be organised in view of the increase in the harvest brought about by two main triggers: increase in demand for wood at national level and adaptation of the onset caused by the effects of climate change, which increases mortality (so-called crisis wood). This organisation will **involve incentives for forest management and mobilisation of timber**, always ensuring the preservation of biodiversity: strengthen and enrich contracting procedures for timber marketing, improve the management of forest supplies and the equipment of wood-mining companies, and increase the industrial capacity for wood processing.

- Encouraging the use of wood material in construction and renovation

The label “**biobased building**” (new construction) will be revised and aligned with RE2020, and a **bio-based punishment label for renovation may be created** (after a phase of methodological and technical work). Regulatory developments will be planned for bio-based use. In addition, guidance could be envisaged to complement or replace financial incentives to encourage the incorporation of bio-based materials into renovation, in particular in line with Article 39 of the Climate and Resilience Law, which sets out a target for incorporation into deep renovations and public procurement buildings, starting in 2030.

- Support for the development and competitiveness of wood processing industries

Several project typologies are already supported: industrialisation of wood products and systems, which makes it possible to increase the mobilisation and processing of wood on national territory, heat biomass for the wood industry, which increases the energy autonomy of businesses and their drying capacity. These devices will be adapted for a relay socket from 2024. In addition, an effort to target broadleaved, lower-quality resinous trees and products of particular interest will be studied in order to **guide** investment so as to **make full use of the forestry resources available in France**.

- Improved governance of biomass uses

In order to meet the ‘cascading use’ requirement laid down by the revised RED3 Directive and the challenge of closing biomass in relation to different uses and needs, the **role of biomass cells** (bringing together state services and its agencies in regions) **will be broadened** to decide on more projects, and the **governance surrounding biomass will be improved**, on the basis of consolidated data.

- Development of recycling and energy recovery of wood products at the end of life

Innovation will be supported in the activities of industries in order to valorise the material over the longest cycle before energy use. Studies must be financed and used to increase, in particular, the use of recycled products in renovation and construction.

(c) Other LULUCF compartments – Crafts – Deboisement-Prairies

- Combating illegal clearing

Means will be put in place to combat illegal clearing: strengthen the means of contempt, remote sensing and communication on regulation. The EU regulation to combat deforestation will enter into force in 2025. In

addition, reflections will be carried out in order to limit authorised land reclamation and ensure that they are actually compensated for in the forest.

► **Use of existing building**

The mobilisation of existing buildings and urban recycling operations (optimisation of areas already urbanised with the use of vacant premises, brownfield sites, the principle of pooling the use of buildings and equipment, the transfer and densification of pavilary areas, *the deappropriation and renaturation of unused areas, etc.*) **will be promoted in order to meet** the needs of localised housing **by limiting new constructions and land take.**

Collective acculturation will support the action of elected representatives in virtuous planning policies and the actions of planning professionals, in particular by accompanying them with operations aimed at strengthening the place of nature in cities and the integration of a concerted landscape approach.

► **Maintaining grasslands**

Measures will be put in place to stop agricultural abandonment. Permanent grassland will be maintained and will allow extensive livestock farming to be developed. This approach is further developed in the Agriculture sector.

In addition, the third National Climate Adaptation Plan, currently under preparation, could include the following actions:

- Integrate the effect of climate change into knowledge and mapping of fire risk and update forest fire risk prevention plans benchmarks or danger zones
- Develop the national strategy to protect forests and non-wooded areas against fire
- Revise in the departments the list of massifs subject to legal obligations for scrubbing
- Respond to the increase in investment needs for forest defence equipment (DFCI) and prepare actors in territories with historically low forest fires
- Supporting communities to better prepare territories and protect people and property from forest and vegetation fires
- Develop risk culture to prepare the population for changing natural hazards due to climate change
- Support elected representatives to make their fellow citizens aware of the risk of fire and the implementation of regulations in order to limit their effects

3.1.2 Low carbon energy

(1) Infringement in 2024 of France's 2020 target of achieving a 23 % share of renewable energy in gross final energy consumption

The share of renewable energy in gross final energy consumption in France already amounts to 22.2 % in 2023, according to provisional data calculated in accordance with the rules of Directive (EU) 2018/2001 on the promotion of the use of renewable energy. It thus increased by 1,7 points in 2023 compared to 2022.

The sharp increase in 2023, the second largest after 2020, is explained by the increase in gross final consumption of renewable energy (+ 5.6 %), while gross final energy consumption decreases (2.6 %). **These good results demonstrate France's commitment and investment in accelerating the development of new capacities for all**

renewable energy sources (gas, electricity, heat, fuels) and in promoting efficiency and energy sobriety in order to achieve a successful exit from fossil fuels and to meet the objectives deriving from EU law.

The achievement of the target of a 23 % share of renewable energy in gross final energy consumption in 2024 is clearly confirmed both by trend trends, projecting for 2024 either the annual increase observed in 2023 or the average annual increase in 2022 and 2023. The achievement of the 23 % target is also confirmed by the modelling carried out in the context of the revision of the French Energy and Climate Strategy (SFEC).

The following table summarises these results:

| Gross final energy consumption (TWh) | 2021 | 2022 | 2023 | 2024 Trend (1 year) | 2024 Trend (2 years) | 2024 SFEC projection |
|--------------------------------------|---------------|---------------|---------------|---------------------------|----------------------------|----------------------------|
| Solid biomass | 114,3 | 104,9 | 106,3 | 107,8 DANO@@ | 102,4 DANO@@ | 110,3 |
| Hydraulic (standardised) | 61,0 | 59,9 | 59,2 | 58,5 | 58,3 | 58,5 |
| Heat pump | 42,3 | 47,9 | 53,1 | 58,2 | 58,5 | 56,1 |
| Wind (standardised) | 38,5 | 41,6 | 48,2 | 54,7 | 53,0 | 52,4 |
| Biofuels | 37,0 | 39,1 | 40,9 | 42,7 | 42,9 | 41,9 |
| Other power supply chains * | 25,8 | 30,7 | 33,7 | 36,6 | 37,6 | 39,8 |
| Renewable cooling | 1,2 | 1,9 | 2,0 | 2,1 | 2,4 | 2,0 |
| Other heat supply * * | 18,0 | 20,3 | 22,3 | 24,3 | 24,4 | 27,5 |
| Gross final consumption of RES | 338,1 | 346,4 | 365,7 | 385,0 | 379,5 | 388,6 |
| Gross final consumption | 1 744,2 | 1 691,6 | 1 648,3 | 1 605,0 | 1 600,4 | 1 614,3 |
| Share of renewable energy (%) | 19.4 % | 20.5 % | 22.2 % | 24.0 % | 23.7 % | 24.1 % |

* Solar photovoltaic, marine energy and electricity from biomass and geothermal energy.

* * solar thermal, geothermal, biogas and renewable waste.

Sources: SDES and DGEC

DanoConsumption of solid biomass may change downwards or upwards according to annual climatic conditions

Electric RER

Given the past dynamics and the installations being connected to the grid, it can be expected that the installation of new electric renewable energy capacity in 2024 will be at least at the same pace as in 2023. As a result, in 2024 there will be around 1 219 MW of onshore wind capacity and 3 200 MW of new photovoltaic capacity. Assuming respective load factors of 23 %, and 14 %, **it is therefore possible to predict at least 6.4 TWh of additional renewable electricity generation in 2024 through these new capacities.**

Production of renewable heat and recovery

At the same time, the French government confirmed its ambition in the field of energy renovation of buildings by increasing the resources mobilised in 2024 for aid for the energy renovation of housing to EUR 3.8 billion in the last budget of the National Housing Agency. In particular, this aid finances the installation of heat pumps in housing (more than 300 000 air/water heat pumps were installed in 2023, in particular through the MaPrimeRénov' aid and the Coup de pouce Chauffage of the Energy Saving Certificates scheme).

In addition, the budget of the Heat Fund to finance renewable heat production equipment (biomass, geothermal, solar thermal) was increased by almost EUR 300 million in 2024 to EUR 820 million in total.

Finally, the signed contracts for the purchase of biomethane at a regulated tariff make it possible to support the production of biomethane.

All these elements make it possible to estimate an increase in renewable heat consumption in 2024 at least at the level of previous years, around 8 TWh.

Biofuels

Finally, the targets for the incorporation of biofuels implemented through the incentive tax on the use of renewable energy in transport (TIRUERT) were increased in 2024: the target percentage for incorporation increased from 9.5 % to 9.9 % for petrol, from 8.6 % to 9.2 % for gas oils and from 1 % to 1.5 % for jet fuel. The consumption of road petrol was 116.1 TWh and the consumption of road diesel was 326.9 TWh in 2023. After taking into account a trend decline of 3 % in overall consumption in the transport sector, **the increase in TIRUERT targets in 2024 therefore makes it possible to forecast an increase in consumption of 2.4 TWh of biofuels in 2024 for road transport.**

The trajectories modelled on the basis of secure measures therefore lead to an estimated gross final renewable energy consumption of 381.5 TWh in 2024:

| Renewable | Increase in gross final consumption in 2024 estimated from secure measures |
|---------------------------|---|
| Renewable electricity | 6.4 TWh |
| Non-geothermal heat pumps | 5 TWh |
| Other renewable heat | 3 TWh |
| Road biofuels | 2.4 TWh |
| Total increase | 16.8 TWh |

| |
|---|
| Gross final consumption of renewable energy secure in 2024 |
|---|

| |
|----------------|
| 382 TWh |
|----------------|

Moreover, the trend shows an annual decrease in gross final energy consumption in France of between 2 and 3 % per year. For the sake of caution, it is proposed to consider a decrease in consumption in 2024 of 1 %, resulting in a gross final energy consumption of 1 631.8 TWh lower in 2024.

Based on secure measures, the share of renewable energy in gross final energy consumption could amount to at least 23.4 % in 2024. The target of a 23 % share of renewable energy in gross final energy consumption in France would therefore be met in 2024.

Further increase in the share of renewable energy in final energy consumption beyond 2024

This promising momentum is set to continue and expand (as shown by the queues for renewable electricity generation projects awaiting connection).

(II) Infringement of the objectives proposed under 2030 and 2035

In order to achieve the low carbon energy production targets indicated in part 2, the EPP will include the following measures:

Measures for electric renewable energy:

CROSS-CUTTING MEASURES

- Experiment with the principle of mixed tendering (part of production in addition to remuneration and a share of PPPs without support), in particular for offshore wind, and develop guarantees of the counter-risk of PPPs.
- Strengthening the incentive for residential or business self-consumption;
- Speed up the planning of RNEs at local level resulting from the 2023 Law on Acceleration of Renewable Energy Production (REPA), by assisting local authorities in defining the areas for accelerating renewable energies provided for by law and the regions in the implementation of the regional energy committees and the updating of their regional planning, sustainable development and territorial equality scheme (SRADDET);
- Support projects for the relocation of key industrial sectors in the energy transition (solar, onshore and offshore wind, geothermal energy, heat pump, network industry), following on from the working group for the reindustrialisation of renewable energy sectors launched in January 2023 and building on the measures taken in the Green Industry Act of 23 October 2023, by formalising a sectoral pact for each key sector, along the lines of the solar pact that has just been signed and that of offshore wind and by mobilising all possible facilities under the Net Zero Industry Act, in particular as regards the organisation of calls for support, in order to strengthen their strategic autonomy;
- Support the innovation and structuring of industrial sectors contributing to the energy transition and the development of renewable energies on a large scale with the tools of the France 2030 plan;
- Continue our strategy of securing supplies of critical metals from the energy transition (lithium, nickel, cobalt, copper, aluminium, rare earths, etc.) to manage value chains from extraction to recycling. In

addition to support for projects through the French 2030 call for projects (critical metals), the tax credit for green industries and the investment fund set up by the State in 2023, an update of the national mining inventory through the launch of a campaign to recognise the resources of our subsoil should start in 2024;

- Characterise skills needs and establish, as part of a co-construction between the State and the sectors, plans for the forward management of skills in order to attract, train and recruit the people needed to meet the objectives.

FOR SOLAR POWER

- Increase the rate of solar development to at least 5.5 GW/year by aiming at 7 GW/year, which we use in our central scenario.
- Work towards a balanced distribution of PV between large photovoltaic roofs, ground power plants and residential ones, taking into account in particular the potentially higher costs of certain technologies and the need to maximise stranded and anthropogenic land while exploiting the potential of agrivoltaism. The planning work for renewable energies resulting from the APER law should provide an opportunity to clarify the distribution of power stations on the ground between the various types of land that can be mobilised.
- Support the emergence of agrivoltaic projects following the recent introduction of the regulatory framework for agrivoltaism pursuant to Article 54 of the Law on Acceleration for Renewable Energy and continue to encourage its development;

FOR ONSHORE WIND

- Maintain the pace of onshore wind development at 1.5 GW/year with the objective of a balanced distribution between territories and organise a repowering plan to prepare for an efficient renewal of existing renewable parks over the period 2025-2035 by exploring the possibility of increasing the size of towers to increase production while limiting the number of towers.
- In addition to the mechanism introduced in the Renewable Energy Acceleration Law, establish a planning system for the development of compensation radars to free up areas for onshore wind in areas subject to military and weather radar servitudes;

FOR HYDROPOWER

Increase hydropower capacity and fleet flexibility (yc. Step), in particular by optimising and overfitting existing developments, in particular by adapting the existing regulatory and economic framework;

- Continue invitations to tender to support the development of small-scale hydropower by maintaining a high level of biodiversity protection and water quality, in line with France's European commitments;
- Promote the renovation of small hydropower plants by integrating ecological continuity issues.

As regards the production of electricity from bioenergy, biogas has undergone initial developments in the form of cogeneration, but is now preferred to be injected into the grids for direct, more efficient use. In order to promote the methanisation of livestock manure as close as possible to farms and with the aim of reducing greenhouse gas emissions from the agricultural sector, the use of cogeneration will, however, remain possible

in specific situations, as well as the production of bioGNV on the farm, in particular when available biomass is distant from grid connection sites.

FOR OFFSHORE RENEWABLE ENERGY AND IN PARTICULAR OFFSHORE WIND:

- Move from a project-by-project development logic to comprehensive maritime façade planning, in order to achieve the objectives set, in particular those of the offshore wind pact¹¹⁷, with public debates on our 4 maritime facades held between November 2024 and April 2023.

- Identify sufficient areas for:
 - Plan as of 2024 the development of offshore wind on the four facades to reach 18 GW in service in 2035, with one or more calls for tender being launched as soon as the public facade debates have been completed so as to allocate approximately 8 to 10 GW by the end of 2026;
 - Anticipate site characterisation studies and the initial environmental status of the project areas and the works necessary for connection upstream of competitive tendering procedures.

The Law on Acceleration of Renewable Energy Production (REPA), which entered into force on 11 March 2023, shortens the deadline for administrative permit-granting procedures for renewable installations, in line with the guidelines pursued by the Renewable Energy Directive, frees up land for massive photovoltaic deployment, provides for planning by large sea facades for offshore wind farms and identification of renewables acceleration areas by local authorities, and improves the sharing of the value generated by projects for the benefit of residents, local and regional authorities and businesses. In addition, the priorities of the State services on the ground are the accelerated appraisal of projects and the support of local elected representatives in order to connect more projects in the coming years, in particular through prefectural contact points for renewable energy in each department. Objectives are being studied for energy communities and the State is actively supporting the development of citizens' projects (bonus in AOs, etc.).

Currently, the bottom-up planning mechanism introduced by the APER law is being put in place. The objective is that the areas identified by the municipalities will make it possible to achieve the objectives of the multiannual energy programme. These areas are the equivalent of the areas to be identified pursuant to Article 15b of the REDIII Directive. The 'acceleration areas' within the meaning of the Directive may then be examined among these areas.

Measures relating to nuclear power generation

EPP 3 could retain the following detailed guidelines and associated measures:

¹¹⁷ The State and the offshore wind industry in France have collectively committed to the massive development of offshore wind and related industry by signing an Offshore Wind Pact in 2022.

- continue the operation of existing nuclear power reactors taking into account international best practices, including beyond the 50-year deadline as long as safety requirements are met and continue studies to clarify the prospects for operation of the existing fleet after 50 years and after 60 years;
- increasing the available power of existing reactors (uprating) in full compliance with the safety framework and restoring the best operational performance levels with the target of returning to nuclear production of more than 400 TWh by 2030 (including Flamanville EPR 3), while retaining a baseline of 360 TWh for planning, for resilience purposes;
- confirm the launch of the industrial programme for the construction of three pairs of new EPR2 reactors carried by EDF, successively in Penly, Gravelines and Bugey, with the objective that EDF could take its final investment decision in 2025;
- further explore a possible reinforcement of the nuclear power programme in order to be able by 2026 to take a decision on a second step of at least 13 GW, corresponding to the capacity of 8 EPR2 in their current design;
- encourage the development of small modular reactors (SMR) and small innovative reactors, with a view to at least enabling the Nuward project to achieve the milestone of a first concrete for a first reference plant in France by 2030 and the realisation by at least one innovative nuclear reactor project supported by France 2030 of a prototype;
- preserve the strategy of treatment and recycling of nuclear fuel over the period of the EPP and beyond until the 2040s and continue the work to renew the facilities downstream of the nuclear cycle to enable decision-making, in particular on the post-2040 strategy, by the end of 2026 at the latest, and by preparing an appropriate economic framework for investments in these downstream plants;
- conduct, at CEA level, in conjunction with the French nuclear sector, a programme of investment in nuclear research infrastructures in order to maintain research capacity in the nuclear sector at the forefront of all the priorities of the nuclear policy pursued by the Government;
- ask EDF, in conjunction with the relevant stakeholders, in particular Orano, to take measures to avoid any risk of saturation of existing infrastructure downstream of the cycle by 2035.

Measures on renewable thermal energy:

In order to develop renewable heat, the government has three main, largely proven schemes:

- The MaPrimeRénov' aid scheme for private individuals;
- The Heat Fund scheme to support the development of renewable and recovery heat in all sectors of activity;
- France 2030 aid for the decarbonisation of industry for the development of low-carbon heat.

Created in 2009, the Heat Fund, managed by ADEME, enabled the massive deployment of renewable heat production installations on French territory. During that period, this investment aid supported more than 7100 projects for an amount of EUR 3.68 billion of aid out of EUR 12.4 billion of investment and an annual production of 42.6 TWh of heat from ENR. Increased by 40 % in March 2022, to EUR 520 million for the whole of 2022 and EUR 601 million for 2023, it was increased again in 2024 to EUR 820 million.

The main measures are as follows:

- Set a budgetary trajectory for the Heat Fund that is consistent with the needs of our energy strategy and will support the development of all sectors and the deployment of district heating networks and look for new ways of simplifying the deployment of projects;

- Promote support for renewable heat projects in **France Rénov'**;
- Strengthen territorial animation by generalising **renewable heat facilitators** accompanying community projects, businesses, etc.

For solid biomass:

- Prioritising uses by prioritising those that are not substitutable by other renewable energies, in particular with regard to the decarbonisation of industry and by giving priority to short supply chains (a sectoral approach to be adopted for forest biomass, the wood industry being to some extent at the forefront of benefiting from the co-products it generates). It will also involve working on the best solutions that value locally available biomass resources.

For geothermal energy:

- Continue the implementation of all parts of the geothermal plan in metropolitan France;
- Promote geothermal energy as part of the school renovation plan.

For solar thermal:

- Launch calls for projects from the Heat Fund "Large solar thermal installations".
- Launch a national solar thermal plan similar to the geothermal plan.

Measures relating to the development of district heating networks:

- Provide local heating and cooling plans in municipalities with a total population of more than 45 000 inhabitants to provide an estimate and mapping of the potential to increase energy efficiency, low temperature district heating, waste heat recovery, and renewable energy for heating and cooling. These plans will make it possible to develop a local strategy on all heat energy sources and associated networks;
- Encourage network operators to develop alternatives to biomass (geothermal, solar thermal, etc.);
- Implementation by voluntary authorities of the systematic connection of buildings close to district heating networks (classification of networks);
- Integrating strong objectives for connecting to district heating networks and developing decarbonised heat consumption in major urban planning operations (e.g. OINs, ORCOD-IN (rehabilitation of degraded co-properties, SACs above a certain size), by making state/public funding conditional on these commitments and strengthening them.

Measures for industrial and tertiary waste heat recovery:

- Work towards the establishment of a Guarantee Fund to cover the risk of a failure of the industrial waste heat supplier and subsidise a biomass heat installation in the event of a failure of a waste heat supplier;
- Study the feasibility of recovering nuclear waste heat;
- Deepening the possibilities for heat recovery from waste water (networks, treatment plants): support for technology development, feasibility studies (mandatory for large installations according to thresholds to be defined), projects under the Heat Fund.

Biogas measures:

- Define a trajectory for the mandatory incorporation of biogas into gas networks, through the Biomethane Production Certificates mechanism, taking into account both the need for biomethane development and the impact on consumer costs in a context of general gas price increases, targeting at least 15 % of biogas injected into gas networks.
- Determine the level of public support for small installations (by tariff order) and larger installations (by tender), the latter being cheaper and can be more easily close to the gas transmission network but requiring the transport of biomass to these methanisters.
- Strengthen controls on dedicated crops authorised for methanisation (now set at 15 %). Extend this provision to all renewable gases.
- Develop a programme to support new biomethane technologies (pyrogasification, hydrothermal gasification) by starting with industrially sized demonstrators, directing them preferably towards resources that are difficult to mobilise (sewage sludge, wood waste, etc.).

Hydrogen measures:

New support schemes:

(1) a mechanism to support the production of decarbonised hydrogen through tenders, the terms of reference of which were in consultation until 20 October 2023, to support projects not only in CAPEX but also in OPEX, as three quarters of the hydrogen costs are those of the electricity used, up to 1 GW;

(2) An Incentive Tax on the Use of Renewable Energies in Transport (TIRUERT) could be extended.

Biofuel and synthetic fuels measures:

- Support the installation of first industrial locations for the production of advanced biofuels, in particular for aviation and the maritime sector;
- Define a multiannual trajectory of fuel incorporation targets to achieve a 14.5 % reduction in greenhouse gas emissions from transport in 2030. A consultation on this path was launched in July 2023;
- Adapting oil logistics to the development of biofuels with the build-up of strategic biofuel stocks;
- Directing consumption towards fuels with a very high biofuel content (B100, etc.) and gradually directing it towards sectors which will have few sustainable alternatives (heavy construction machinery, agricultural and forestry machinery, air transport, maritime transport, fisheries, etc.).

Development of biomass energy

Energy timber can be harvested as a co-product of timber, respecting the hierarchy of uses. It is therefore interesting to recover in the form of heat related products from timber and industry, sawmills and certain wood waste. More generally, developing the use of biomass in energy makes it possible to reduce GHG emissions in different sectors of activity when it replaces fossil fuels. The choice has been made to report measures for the development of biomass energy in this section on forest (rather than in the energy section) as they are

complementary to measures to ensure sustainable forest management. Public policy on forests and timber aims to take account of forest upstream and downstream in a complementary way.

The increased mobilisation of biomass resources is the subject of the National Biomass Mobilisation Strategy (SNMB), provided for in Article L. 211-8 of the Energy Code and published on 26 February 2018¹¹⁸. It shall draw up recommendations to improve and increase the mobilisation of domestic biomass, to cover, as far as possible from domestic resources, identified biomass needs, both for energy purposes, construction or biomaterials and green chemistry. This **national strategy is now broken down at regional level** by the regional biomass schemes provided for in Article L. 222-3-1 of the Environmental Code¹¹⁹.

Specific measures, tailored to each sector, to increase the mobilisation of the supply of biomass that can be used for energy purposes compared to a trend scenario, include:

- For agricultural biomass: the NSP 2023-2027 (ecoregime and ‘hedge bonus’, agri-environment-climate measure on the sustainable management of ecological infrastructure, etc.), implementation of the ‘hedge pact’, development of the low-carbon label for hedgerows (existing method) and for intrapara agroforestry (future method), strengthening the methanisation of livestock manure, strengthening controls on the regulation on the feeding of methanisers to increase interest in the cultivation of CIVE, etc.
- For forest biomass: sustainable financing of the renewal of forests and support for the development of the sector (forestry works, seeds, nurseries), protection of forests against fires (legal obligations for spraying, monitoring, first intervention, combating), combating fragmentation and encouraging the pooling of management, putting a greater proportion of private forests into management, boosting the increase, strengthening the low-carbon label, etc.
- For the biodegradable fraction of waste: the obligation to sort bio-waste at source, laid down in 2024 by the Anti-Waste and Circular Economy Law (AGEC), will allow more bio-waste to be directed towards methanisation and composting.

As regards heat production, the **heat fund** managed by Ademe since 2009 (see Energy section) supports many biomass boiler projects. Over the period 2009-2021, 6566 projects were supported (including 1853 wood-biomass projects) for a total of EUR 2.9 billion in aid and an annual heat production of 3,34 Mtoe¹²⁰. In addition, two **DYNAMIC wooden** calls for expression of interest were launched by Ademe in 2015 and 2016 to support innovative and operational actions to mobilise additional wood to facilitate the supply of biomass heaters financed under the Heat Fund and to improve forest stands.

Electricity generation from solid biomass is supported by contractual arrangements resulting **from tenders**. Support schemes now focus on support for renewable heat.

¹¹⁸ This strategy will be updated to take into account the new objectives of the EPP and SNBC.

¹¹⁹ These documents set out the concrete measures to be implemented, as well as the regional quantified targets for the mobilisation of new resources. The objectives defined at regional level will make it possible to adjust the SNMB accordingly.

¹²⁰ <https://fondschaleur.ademe.fr/>

Furthermore, MaPrimeRénov' devices (see Section 3.1.2. Residential/tertiary), energy saving certificates (see section Energy) and zero-interest eco-loan (cf. Residential/tertiary section) support the development of energy wood among individuals.

Speeding up permitting and further developing renewable energy technologies

France adopted a law to accelerate renewable energy production, promulgated on 10 March. This law will accelerate the deployment of renewable energy installations, focusing on anthropogenic spaces. The law also defines acceleration areas, defined by municipalities in a bottom-up planning process. These areas are indicative only, and projects may be authorised outside. These acceleration areas should ultimately make a significant contribution to the national renewable energy development objectives. These acceleration areas will serve as a basis for the identification required by Article 15b of RED III, among which acceleration areas may be defined, with associated shortened deadlines.

3.1.3 Other elements of the decarbonation dimension

3.1.3.1 national policies and measures affecting the EU Emissions Trading System (EU ETS)

National policies and measures affecting the EU Emissions Trading System (EU ETS) are:

- Support measures for renewable energy (in particular: calls for tender by the Energy Regulatory Commission, Heat Fund);
- Measures to promote sobriety and energy efficiency (in particular: CR Energy Transition Tax, Energy Saving Certificates);
- Calls for projects to support the decarbonisation of industry (e.g. DECARB IND, BCIAT 2021, etc.), as well as the carbon contract for difference scheme mentioned above;
- measures to decarbonise the housing and transport sectors in view of ETS2

These measures contribute to lower electricity consumption by individuals (especially in winter periods when the most carbon-intensive means of production are used), as well as to lower emissions in sectors subject to the EU ETS. They can be complementary to the EU ETS as the sale of allowances saved by lower emissions is often not sufficient to make low-carbon investments profitable for industry.

3.1.3.2 policies and measures to achieve other national targets, where relevant

The following policies and measures may also contribute to achieving the objectives and targets of the Energy Union.

France is currently preparing its third National Plan for Adaptation to Climate Change (PNACC) (see § 2.1.1.6.).

3.1.3.2.1 coherence between mitigation and adaptation

The French Energy and Climate Strategy aims at an integrated approach to mitigation and adaptation. The aim is to address these two imperatives in a complementary way through mutually beneficial measures, which also contribute to the protection of biodiversity.

In areas where adaptation and mitigation are highly coupled (e.g. forest, energy production and consumption), it is planned to identify possible co-benefits and trade-offs. This is a major challenge identified in the preparation of SNBC 3.

SNBC 3 will take into account uncertainties about future climate change in order for the decarbonisation strategy to be resilient.

PNACC-3 will focus on co-benefit options, i.e. that promote adaptation while also supporting biodiversity mitigation and protection, for example by choosing nature-based solutions – which are the subject of a particular focus. Indeed, the ongoing work on PNACC-3 aims at mastering the use of nature-based solutions through the following actions:

- Establish a common framework for comparison between SAfn and grey engineering, including on water risks
- Demonstrate the performance and co-benefits of SAfn as a tool to protect against natural and health hazards
- Carry out comparative studies of the financial and economic models and the humanities and social sciences of SAfn by sector
- Structuring the supply chains of SAfn in connection with the revision of the Ecological Engineering Roadmap
- Mobilise, raise awareness and disseminate knowledge related to SAfn
- Set up a national and regional animation on SAfn to facilitate the mobilisation of all actors in society
- Develop awareness raising and training on SAfn for elected representatives, community technical services and state services
- Develop general public communication campaigns including the links between climate, biodiversity and health and the role of SAfn
- Support project managers and project promoters
- Mobilising public and private funding for SAfn

3.1.3.2.2 territorial articulation of adaptation policy in metropolitan France and overseas regions

Programming tools such as the convergence plans, the State-Region plan contracts, the overseas blue book, the regional forest and timber programmes, as well as territorial planning documents specific to each of the ultra-marine territories, will include measures to adapt to climate change. Through the mobilisation of appropriate tools, these actions will aim at strengthening the development and maintenance of infrastructure, research and improvement of knowledge at regional and cross-border level, the preservation of natural resources and environments and the ecosystems they host.

The third national adaptation plan will be implemented locally through adaptation strategies adapted to the environmental and socio-economic characteristics of the regions. The national plan integrates this local dimension by proposing the responsibility of local and regional authorities and the identification of pilot areas for adaptation in order to create solutions on the ground to be generalised.

One of the 5 axes of PNACC-3 will set out the territorial dimension of the plan with actions relating to territorial water policy and the involvement of local and regional authorities in the construction of their own adaptation strategy. It should include measures to integrate adaptation challenges into public action in the territories, both in terms of project financing and territorial engineering and public planning strategy. This axis should also

display several measures to adapt public services and major infrastructure networks to climate change, such as continuity of education, resilience of transport and critical energy and telecommunications infrastructure.

While the whole of the PNACC-3 will concern overseas countries and is intended to apply it, priority will be given to certain measures in view of the specific challenges facing these territories, in particular as regards the adaptation of housing to heat and the prevention of heat risks, natural hazards, the reduction of coastline, water supply, the adaptation of agriculture, fisheries and tourism, the preservation of biodiversity and the acquisition of knowledge. These measures will be mainstreamed in climate change mitigation and adaptation strategies for each overseas territory.

3.1.3.2.3 soil

Soil contributes to atmospheric carbon sequestration. They are protected by various public policies of the Ministry of Ecological Transition. The Climate and Resilience Law sets a target of zero net take in 2050 and a target for splitting by two of net take in 10 years. As regards forest soils, the Forest and Wood Conference on 16 March 2022 announced the establishment of a Forest Soil Action Plan (FSAP), to be finalised shortly. As regards agricultural soils, the 'Bas-Carbon Label' scheme makes it possible to enhance carbon storage in agricultural soils, in particular through less ploughing, plant cover in intercropping, etc. These various measures on soil protection and restoration are included in the National Biodiversity Strategy published in 2024.

3.1.3.2.4 laws, codes, standards and technical regulations

The technical benchmarks will be reviewed by the relevant services and adapted as necessary, giving priority to the transport network infrastructure and equipment sectors (climate reliability and comfort), energy and construction infrastructure. Once new benchmarks have been established, such as the transverse standard for adaptation under development at international level, they will be incorporated into existing labels and taken into account in technical or legal standards and regulations by applying the logic of simplification and predictability initiated by the government with a view to establishing an enabling framework for adaptation.

More specifically, the third National Adaptation Plan could aim at:

- Provide an overview of ongoing work on standards to identify gaps in relation to climate change adaptation challenges
- Publish a list of criteria to be systematically taken into account when revising technical standards
- Gradually adapt all technical standards and benchmarks

Buildings will be gradually adapted to climate change to foster resilience to both natural and health risks in urban planning integrating climate change.

The ongoing work on the third national adaptation plan aims to:

- Improve knowledge of the performance of the building stock in terms of summer comfort
- Accelerating housing renovation to adapt to climate change and prepare them for the climate of tomorrow
- Improving climate change adaptation of new housing
- Raise awareness of the need to adapt housing to the future climate and promote good waves of heat waves

3.1.3.3 policies and measures for low-carbon mobility (including electrification of transport).

3.1.3.3.1 existing policies and measures

Measures to reduce CO₂ emissions from transport

The measures implemented to reduce CO₂ emissions from transport are aimed at controlling transport demand, supporting modal shift, increasing vehicle occupancy rates, massively increasing the share of low-emission vehicles in the fleet, improving vehicle energy efficiency and encouraging the development of biofuels.

Measures to reduce greenhouse gas emissions from transport have been reinforced since 2019, notably through the Mobility Orientation Law and the Resilience Climate Law.

Support for modal shift

Support for modal shift towards the least CO₂-emitting modes of transport includes improving the provision of alternative transport services and infrastructure to private cars, whether urban and interurban passenger transport or freight transport.

Incentives for cycling and walking

Various measures have been put in place since 2018 as part of the cycling plan and active mobility. They were intensified with the cycling and walking plan 2023-2027:

- Support for the purchase of new or second-hand bicycles was introduced between EUR 150 and EUR 3000: eco-friendly bonus for the purchase of electric bicycles, cargo bikes or conventional cycles; conversion premium granted for the purchase of an electrically assisted bicycle or a cargo bike, in return for scrapping an old polluting car or van. In low-emission zones, the State grants a premium of EUR 1 000, plus the amount equivalent to any aid paid by the local authority (up to a maximum of EUR 2 000). The State's premium may thus be up to EUR 3 000. For the same polluting vehicle discarded, the conversion premium may finance the purchase of up to one bicycle per person in the home.
- In order to facilitate the parking of bicycles, there is an obligation to install secure parking facilities for bikes in the construction of residential and office buildings or during work on the car parks. A programme to develop bicycle parking around stations has also been rolled out since 2022.
- There are financial incentives for cycling: durable mobile package allowing employers to finance the use of bicycles by their employees (up to EUR 800 per year); Rtax reductions for companies providing their employees with a bicycle fleet free of charge for commuting (up to a limit of 25 % of the purchase price of the bicycle fleet).
- An active mobilised fund, with the launch of calls for projects, has been created to support and scale up projects for the creation of cycling routes within communities, targeting in particular the discontinuities of routes and to ensure the safety of all users. Introduced at the first cycling plan in 2018, the active mobility fund is extended and reinforced under the 2023-2027 cycling plan, amounting to EUR 1.5 billion.
- The gradual introduction of bicycle markings and the development of secure car parks have been put in place to combat theft and collection;
- The development of learning and a cycling culture at school has been put in place.

Support for rail and public passenger transport is a priority.

National high-speed rail networks are well developed and investment in this area has been particularly important in recent years, including the construction of four new high-speed lines (high-speed lines): Tours-Bordeaux, Brittany Dutch-la-Loire, the high-speed line East Europe, and the Nîmes-Montpellier bypass (mixed passenger and freight line to relieve congestion on the Nîmes-Montpellier axis), i.e. 757 km of additional new high-speed lines put into operation between 2015 and 2020. At the level of urban transport, clean collective transport has been greatly developed in the large agglomerations of the province over the last 15 years. Since 2008, the State has accompanied the Clean Site Collective Transport (TCSP) projects of Mobility Organising Authorities by co-financing them through calls for projects. Four calls for projects for transport organising authorities with a high level metro, tram or bus project were launched between 2008 and 2021; the fourth call for projects, dating from 2021, will provide EUR 900 million to finance clean public transport projects and multimodal exchange hubs.

In Île-de-France, the Grand Paris project launched in 2013 aims to improve the public transport service offered to passengers in terms of information and network operation, modernise and develop existing networks, build a new automatic metro network and develop a direct link to Paris-Roissy airport. In the long run, it is expected that 90 % of the population of France will have access to a station within 2 km. This new network will significantly improve peripheral travel and unload the existing network. The aim is for all lines to be phased in between 2019 and 2030.

At regional level, regional express train services have been strongly developed by the regions. The State contributes to the financing of investments in network regeneration and maintenance. Regeneration of rail networks for daily transport is a priority. Regional action plans to support small railway lines have also been put in place.

The Mobility Orientation Law (LOM) created a set of measures favourable to modal shift:

- Strengthening collective and shared transport: a 40 % increase in transport investment between 2014-2018 and 2019-2023, in particular to improve daily transport;
- A framework and tools to promote the development of alternatives to private cars, particularly in rural areas (car-sharing, on-demand services, car sharing).
- Better multimodal information (opening up mobility data to reach 100 % of the mobility information accessible for a one-click journey).

For long-distance travel, and in order to promote modal shift to rail, air transport is taxed on air tickets and an emissions offsetting obligation created by the Climate Resilience Act. These measures complement European schemes (ETS and Corsia).

Support for rail and inland waterway freight transport

The **Climate Resilience Law of 24 August 2021** sets a target of doubling the modal share of rail freight by 2030 from 9 % (in 2019) to 18 %, and an increase in the modal share of inland waterways by 50 % by 2030.

For rail freight, and in the longer term, the State sets itself the target of achieving a modal share for rail freight of 25 % by 2050. To achieve this objective, the **National Strategy for the Development of Rail Freight** identifies 72 specific measures relating to the economic viability of services, the improvement of the quality of service of

the network and the improvement of the performance of infrastructure enabling the development of rail freight; the development of coordination with the port and the river.

For inland waterway freight, an inland waterway transport strategy is being drawn up with the aim of mobilising stakeholders to achieve the objectives with a view to increasing the modal share of the river.

Combined transport, a transport system that combines road transport with other modes such as inland waterways, rail or short sea shipping, is financially supported. The aid scheme aims to reduce the additional cost of load breaks in the intermodal chain compared to door-to-door road transport. This involves paying a flat-rate aid per intermodal transport unit – ITU (containers, swap bodies, semi-trailers, trailers) transhipped at a land or port terminal located on French mainland territory and integrated into a transport chain including pre- and post-road transport at the ends of the main link.

Carpooling

Increasing the occupancy rate of vehicles is a rapid means of reducing emissions and has many co-benefits, both for users (purchasing power, access to mobility, user-friendliness) and for communities (reduction of congestion and air pollution). In 2019, the government set the target of tripling the number of daily carpooling journeys by 2024 to 3 million.

Carpooling is encouraged, particularly in the context of urban transport plans, and the State provides the necessary legal certainty for this mode of transport. In this connection, the Law on the modernisation of territorial public action and the affirmation of metropolitan areas (MAPTAM) of 27 January 2014 adopted a definition of carpooling, which, for the first time, provided a legal framework adapted to this practice, in order to enable it to be developed, while clearly distinguishing it from the activity of regular public transport, taxis and private vehicles with drivers. The same law allows the Mobility Organising Authorities (AOM), in the event of non-existent, inadequate or inadequate private supply, to make available to the public paperless platforms facilitating the matching of offers and requests for car-sharing. Those authorities may also create a distinguishing sign for vehicles in a car-pooling situation, after having previously defined the conditions for its award.

The 2015 Energy Transition for Green Growth Act also provides that companies and local and regional authorities facilitate, as far as possible, carpooling solutions for commuting of their employees and agents.

The Mobility Orientation Law (2019) provides for the possibility for local authorities to subsidise carpooling offers in order to make them even more attractive and make it a solution in its own right. The Mobility Orientation Law has created a sustainable mobility package, which allows all private and public employers to contribute to the commuting costs of their employees by carpooling or cycling. This lump sum may be up to EUR 800/year free of income tax and social security contributions.

A car-sharing plan was launched in 2023. In particular, the plan includes a bonus of EUR 100 for new drivers, paid by carpooling platforms to encourage carpooling to start; support for car-builders in addition to local authorities on the principle of 'EUR 1 from the State for EUR 1 from the local authority'; mobilisation of the green fund of EUR 50 million in 2023 to support local and regional authorities in their projects for the development of carpooling infrastructure (areas, lines or experimentation of dedicated lanes).

The development of low-emission vehicles and the improvement of the energy efficiency of new road transport vehicles.

The Bas-Carbone National Strategy (SNBC) aims to decarbonise vehicles by promoting the gradual electrification of the vehicle fleet for passenger cars and heavy-duty vehicles, with the maintenance of a diversified mix for uses that are more difficult to electify in the short and medium term (solutions based on fuel cells with decarbonised hydrogen, biogas engine with incentives for the development of renewable gas as a transition solution, liquid biofuels).

Measures related to the decarbonisation of vehicles are both legislative and regulatory (EU regulations setting CO₂ emission performance standards for new vehicles, end-of sale targets for new vehicles included in the Mobility Guidance Law and the Climate and Resilience Law, obligation to incorporate low-emission vehicles when renewing fleets of legal persons), fiscal and financial (e.g. malus CO₂ and malus weight, ecological bonus, conversion bonus, support for leasing) and include measures for the development of charging infrastructure.

Passenger cars

As regards cars, **successive EU regulations** have imposed emission reduction targets for new car sales. A first regulation of 2009, as amended by a regulation of 2014, thus required car manufacturers to reduce the average CO₂ emissions ceiling for new passenger cars to 130 gCO₂/per km NEDC in 2015 and then 95 gCO₂/per km NEDC in 2020 (this target was translated into WLTP value in 2021). EU Regulation No 2019/631 of 17 April 2019 provides for a reinforcement of the targets set for car manufacturers with a 15 % reduction in emissions from 2025 and 37.5 % from 2030 onwards compared to target 2021. As part of the Fit for 55 package, Regulation (EC) No 2023/851 of 19 April 2023 amended this text by reinforcing its targets, and provides for a 55 % reduction in emissions in 2030 and 100 % in 2035 compared to target 2021, i.e. an end to the sale of new thermal cars in 2035.

At national level, the Climate Resilience Act sets a target of limiting sales of new passenger cars emitting more than 123 gCO₂/per WLTP km (95 gCO₂/km NEDC) to a maximum of 5 % by¹ January 2030.

At national level, targets for the incorporation of low-emission vehicles (electric or plug-in hybrids) during **fleet renewal have been set** since 2015, before being reinforced by the Mobility Orientation Law (2019), the Climate and Resilience Law (2021), and the transposition of the Clean Vehicles Directive (2019/1161) in 2021. The greening obligations for the fleets of legal persons, provided for in Articles L.224-7 to L.224-12 of the Environmental Code, lead legal persons holding fleets exceeding a threshold in terms of number of vehicles to integrate 'low-emission vehicles' (VFE, i.e. electric, hydrogen and plug-in hybrid vehicles emitting less than 50 gCO₂/km) when renewing their fleets. Sub-targets for the share of ultra-low emission vehicles (VTFE, i.e. electric and hydrogen vehicles) are imposed on fleets of more than 20 light vehicles managed by the state and local authorities. Light vehicles are passenger vehicles and light commercial vehicles.

This obligation applies at the time of their annual renewal (i.e. on the flow) for public procurement and fleets of private undertakings, or at certain fixed deadlines, in their fleet (i.e. stock) for taxis/vehicles with driver (PHV) and delivery platforms, in minimum proportions increasing gradually. The legal persons concerned are subject to an annual reporting obligation concerning the share of VFE/VTFE ordered as part of their renewal the previous year (or present in their parks, for taxis/PHV and delivery platforms).

In 2024, this share was 50 % of low-emission vehicles for the State's light vehicle fleets, 30 % for local and regional authorities and 20 % for private fleets. For the State, from 2026, light vehicle fleets must meet a target of 37.4 % of ultra-low emission vehicles in renewal, from 2027 the low-emission vehicle target is set at 70 % and from 2030 the target of ultra-low emission vehicles is raised to 45 %. For local and regional authorities, from 2025 the low emission vehicle target is set at 40 %, from 2026 the light vehicle fleets have to meet a target of 37.4 % of ultra-low emission vehicles in the renewal, from 2030 the low emission vehicle target is set at 70 % and from 2030 the target for ultra-low emission vehicles is raised to 40 %. For private fleets, the low emission

vehicle target is set at 40 % from 2027 and 70 % from 2030 onwards.

Various tax and financial schemes aim at incentivising the acquisition of low-emission vehicles.

Since 14/02/24, **the green bonus** for a new electric car is up to EUR 7 000 for individuals in the first five income deciles and EUR 4 000 for households in the top five deciles. If the purchase of a less emitting vehicle is accompanied by the scrapping of an old thermal vehicle, an additional premium, known as the conversion premium, is paid. Its amount for a new electric car is up to EUR 5 000 for private individuals (subject to resource and mileage conditions) and EUR 1 500 for legal persons.

For persons living in or working in a low-emission mobility zone (ZFE), access to which is restricted for the most polluting vehicles, or for undertakings established in such an area, the State shall grant a premium of EUR 1 000, plus, where appropriate, the equivalent amount of aid paid by a local authority, up to a maximum of EUR 2 000. Thus, the State's premium in ZFE territory amounts to EUR 1 000 to EUR 3 000 in addition to the conversion premium.

On 1 January 2024, the French Government launched the scheme to support the leasing of electric cars, which enables households in the first five income deciles, using their own cars for business purposes, to access a rental offer of approximately EUR 100 per month for environmentally efficient electric cars. The first wave was very successful with more than 50 000 vehicles ordered, with deliveries planned until the end of September. A second wave is envisaged for the end of the year/beginning of 2025.

A microcredit facility for the acquisition of a clean vehicle allows persons excluded from the conventional banking network to buy or rent a car, van or two- or three-wheel vehicle or quadricycle with low pollutant motor engines. Guaranteed by the State at 50 %, the amount of credit varies according to household income. Since 6 February 2022, its maximum amount has now reached EUR 8 000, repayable over seven years, compared to EUR 5 000 reimbursed over five years previously. Microcredit can be combined with the green bonus and the conversion premium.

A zero-rate loan experiment was put in place until 31 December 2025. The scheme shall be open to small households and micro-enterprises, domiciled or with proof of professional activity in the FZs exceeding air quality standards, or in an inter-community-based organisation adjacent to them, for the purchase or rental of low-emission vehicles. The loan may amount to up to EUR 30 000 (respectively EUR 10 000 in the case of long-term lease or lease with option to buy) repayable over seven years (respectively, the duration of the lease).

As regards taxation, the trajectory for the tax on carbon dioxide emissions from tourist cars, known as 'malus CO₂', was set by the Finance Law for 2021 until 2023. The threshold for triggering malus, set at 133 g/km in 2021, was lowered by 5 g/km per year to 123 g/km in 2023. At the same time, the ceiling for malus, amounting to EUR 30 000 in 2021, was also increased by EUR 10 000 per year to EUR 50 000 in 2023 (Articles L. 421-58 to L. 421-70-1 of the Code des impôts sur les biens et services). In 2024, the threshold for triggering malus CO₂ shall be lowered to 118 g/km from 1 January 2024 and its ceiling shall be increased to EUR 60 000 for vehicles emitting more than 193 g/km (vs. EUR 50 000 for vehicles emitting more than 225 g/km in 2023).

In order to combat the increase in the average weight of private vehicles (a heavier thermal vehicle emitting more CO₂ on average), the Government also introduced, with effect from 1 January 2022, a tax on the 'mass in running order' ('malus weight') of passenger vehicles upon their first registration in France, with a trigger threshold of 1 800 kg and a unit tariff of EUR 10/kg (Articles L. 421-71 to L. 421-81 of the Code des impôts sur les produits et Services). The Finance Law for 2024 strengthens this malus by lowering its trigger threshold of 200 kg for pure thermal vehicles and by 100 kg for non-plug-in and plug-in hybrid vehicles with a range of less

than 50 km, while increasing the unit rate of tax on the highest weight bands. Plug-in hybrid vehicles with a range of more than 50 km would be integrated into the malus weight from 1 January 2025, with a reduction of 200 kg.

Before 1 January 2024, the cumulative amount of malus CO₂ and malus weight was capped at 50 % of the purchase amount of the vehicle. Since the Finance Act for 2024, this cap has been abolished and the maximum ceiling now corresponds to the maximum amount of malus CO₂, i.e. EUR 60 000.

The same Finance Law provides for an increase in taxation specifically applicable to passenger cars used for economic purposes, with the threshold for triggering the annual tax on CO₂ emissions of passenger cars used for economic purposes to be reduced to 15 gCO₂/km as of 1 January 2024 and then to 5 gCO₂/km/year, in order to achieve taxation from 1 grams of CO₂ emitted in 2027. At the same time, the tax exemption scheme is also revised so that, as of 1 January 2025, only electric vehicles continue to be exempted from the tax.

Taxes on vehicles used for economic purposes are annual taxes on business cars based on: CO₂ emissions on the one hand; the energy used and the year in which the vehicle was put into service, on the other hand. Other tax advantages exist for low-emission and ultra-low emission corporate vehicles such as the increase of the maximum depreciable amount and the allowance in kind.

The measures already taken have led to a very rapid growth in the market share of electric and plug-in hybrid passenger cars in France.

As shown in the graph below, the market share of electric cars grew very rapidly, from 1.9 % market share in 2019 to 9.6 % in 2021, 13.1 in 2022 and 16.7 in 2023. In 2023, 303 900 new electric cars were registered in France. The share of plug-in hybrid cars also increased from 0.9 % in 2019 to 9 % in 2023.

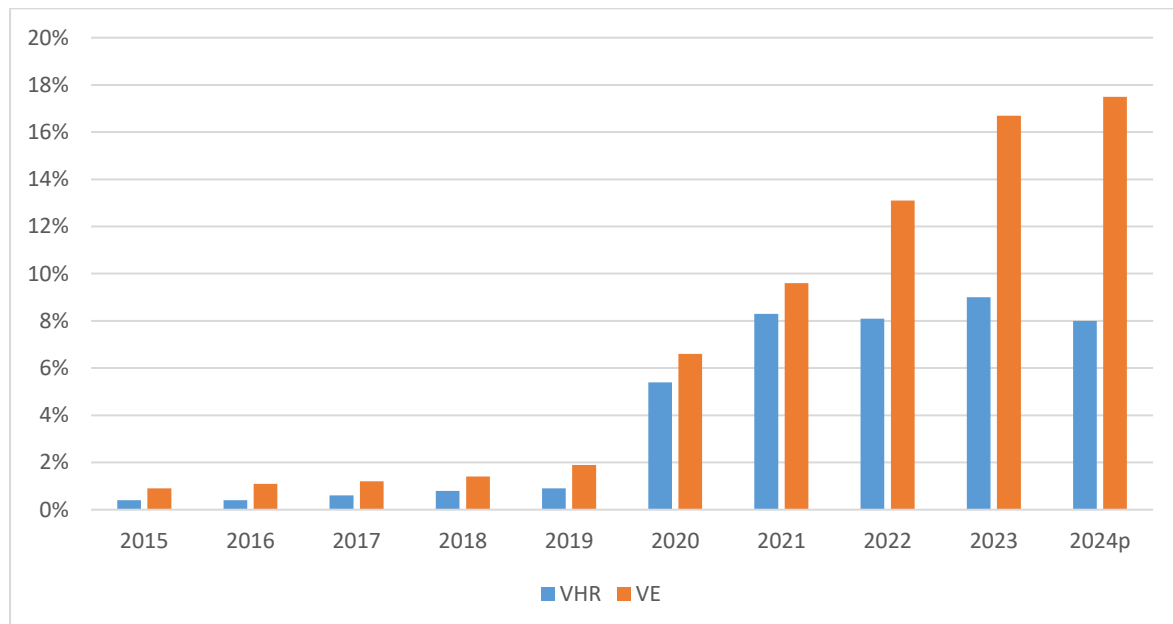


Figure48: Evolution of market shares for electric (VE) and plug-in hybrid (VHR) in annual registrations of new passenger cars Source: SDES, RSVERO 2024 (p): calculation over the first five months of the year

In addition, the unit emissions targets for new passenger cars (95 g CO₂per km, measured according to the old NEDC type-approval cycle, starting in 2020) have been met. The target is reduced, from 2021 onwards, according to the new WLTP type approval cycle, which has been set up to better assess real emissions.

Finally, as regards consumer information, the transposition of Directive 1999/94/EC makes it compulsory to display a label on energy performance and CO₂ emissions at the point of sale of new passenger cars. Advertising for these vehicles must include a promotional message on alternatives to autosolism and include a visual consisting of 7 colour arrows informing about CO₂ emissions at the tailpipe of the vehicle. The ban on advertising for private vehicles emitting more than 123 grams CO₂/km is set at 2028.

Light duty vehicles

EU Regulation 510/2011 required manufacturers to gradually reduce the average emissions of new light commercial vehicles to 175 gCO₂per km NEDC between 2014 and 2017. An average emission level of 147 gCO₂ perkm NEDC has been set for 2020 (this target is translated into WLTP value in 2021). Regulation No 2019/361 of 17 April 2019 provides for a reinforcement of the targets with a 15 % reduction in emissions from 2025 onwards and 31 % in 2030 compared to target 2021. As part of the Fit for 55 package, Regulation No 2023/851 of 19 April 2023 amended these targets and provides for a reduction in emissions of 50 % in 2030 and 100 % in 2035 compared to target 2021, i.e. an end to the sale of new thermal motor commercial vehicles in 2035.

New electric vans benefit from 14/02/2024 from a bonus of up to EUR 8 000 for a natural person in the first five decimal places of income (EUR 5 000 for individuals in the top five deciles of income and EUR 3 000 for legal persons), up to a maximum of 40 % of the vehicle's TTC amount. If the purchase of a less emitting van is accompanied by the scrapping of an old pollutant vehicle, and under certain conditions, a conversion premium may also be paid up to EUR 9 000 for the purchase of a new Class III electric van. Low-emitting vans are also eligible for micro-credit and zero-interest loan schemes.

The targets for the incorporation of low and ultra-low emission vehicles when renewing fleets described for passenger cars also apply to light commercial vehicles.

Commercial vehicles of between 2,6 and 3.5 tonnes fuelled with natural gas vehicles, biofuels, electricity or hydrogen benefit from an overdepreciation tax scheme of 20 %.

Heavy goods vehicles

EU Regulation No 2019/1242 creates obligations to reduce CO₂ emissions from certain new heavy-duty vehicles with a reduction target of 15 % by 2025 and 30 % by 2030 compared to the level of emissions from July 2019 to June 2020. This Regulation has been amended by Regulation No, which provides, inter alia, for an increase in the target for 2030 to -45 % and the addition of new targets for 2035 to -65 % and for 2040 to -90 %.

At national level, the Climate Resilience Act sets a target to end the sale of new heavy-duty vehicles used for the transport of people or goods that are predominantly fossil fuelled in 2040. Public heavy goods vehicle fleets are also subject to greening obligations. 50 % of heavy goods vehicles renewed in state fleets and 10 % of trucks renewed in local and regional fleets must be low-emission vehicles. This rate has increased to 15 % for local and regional authorities from 2026 onwards.

There are tax incentives for PL, for the development of GNV and then bio-GNV, electric and H₂ vehicles. Heavy goods vehicles fuelled by natural gas, biofuels, electricity and hydrogen benefit from an overdepreciation

scheme of 60 % for heavy goods vehicles up to 16 tonnes (and 40 % above). Since 1^{January} 2024, the over-depreciation scheme has now been extended to include heat-powered heavy goods vehicles that have been converted into electric (battery or hydrogen fuel cell) vehicles. Under the recovery plan, electric trucks and/or hydrogen received a bonus of up to EUR 50 000. In addition to this bonus, a call for projects, known as the “Heavy Electric Vehicle Ecosystem”, was launched in March 2022 until the end of 2023. With a budget of EUR 65 million for 2022 and EUR 60 million for 2023, it supported projects for the acquisition of 1 587 electric heavy-duty vehicles (heavy goods vehicles, buses and coaches) and the deployment of associated charging infrastructure. For 2024, the Order of 20 May 2024 establishes a programme under the Energy Saving Certificates scheme: the PRO-INNO-84 programme “E-TRANS”. This programme for electrification of road transport (E-TRANS), worth a total of EUR 130 million, supported by ADEME, aims to provide financial support to professional road transport operators (owners or long-term tenants of fleets) to electrify their heavy-duty vehicle fleet, through financial support for the purchase, long-term rental or retrofit of heavy goods vehicles, buses, coaches and urban battery electric shuttles. The objective is to financially support at least 2 100 heavy-duty vehicles, of which at least 85 % are heavy-duty vehicles. The remainder of the allocation is reserved for the electrification of buses, coaches and urban shuttles, in accordance with arrangements still to be specified.

Buses and coaches

At European level, since the entry into force of Regulation (EU) 2024/1610, new buses and coaches have been subject to CO₂ emission performance standards. Regulation 2019/1242, as amended by Regulation No 2024/1610, sets emission reduction targets of 15 % by 2025, 45 % by 2030, 65 % by 2040 and 90 % by 2040. It also sets a target of 90 % of new zero-emission urban buses from 2030 and 100 % from 2035.

For public transport vehicles managed by the State and local authorities (buses and coaches), the law lays down an obligation to acquire or use, when renewing the fleet, at least 50 % of low-emission vehicles among vehicles renewed from 1^{January} 2020, and then all vehicles renewed from 1^{January} 2025. The criteria defining the types of low-emission vehicles (electric, hybrid, natural gas, biogas, or biofuel that is mostly renewable) are set according to usage, the territories in which they circulate and the local energy supply capacities. These targets have been reinforced by the transposition of the EU Clean Vehicles Directive (2019/1161), notably by introducing a target of at least 50 % of low-emission vehicles (electric or hydrogen) for the largest agglomerations (over 250 000 inhabitants).

Under the recovery plan, buses and coaches running on electricity and/or hydrogen have also received a bonus of up to EUR 30 000. Alternative energy buses and coaches may also benefit from overdepreciation under the same conditions as heavy goods vehicles, to the extent that they are acquired by companies subject to corporation tax or income tax under a real tax system. Finally, electric buses and coaches were eligible in 2022 for the call for projects entitled ‘Ecosystem for electric heavy vehicles’, as was the case for electric heavy goods vehicles (with aid of up to EUR 100 per vehicle). As for heavy goods vehicles, the call for projects was renewed in 2023, for coaches (with an allocation of EUR 5 million), and in 2024 for buses and coaches (with an allocation of EUR 15 million), under the PRO-INNO-84 programme, ‘E-TRANS’. This programme for electrification of road transport (E-TRANS), worth a total of EUR 130 million, supported by ADEME, aims to provide financial support to professional road transport operators (owners or long-term tenants of fleets) to electrify their heavy-duty vehicle fleet, through financial support for the purchase, long-term rental or retrofit of heavy goods vehicles, buses, coaches and urban battery electric shuttles. The objective is to financially support at least 2 100 heavy-duty vehicles, of which at least 85 % are heavy-duty vehicles. The remainder of the allocation is reserved for the electrification of buses, coaches and urban shuttles, in accordance with arrangements still to be specified.

Charging infrastructure

The deployment of recharging infrastructure is regulated at European level by Regulation (EU) 2023/1804 on the deployment of alternative fuels infrastructure, which sets various targets in terms of power, accessibility and mesh size. At national level, there are obligations for pre-equipment and equipment for certain types of public buildings and car parks (mobility guidance law, climate resilience law).

The State has set itself the objective of reaching 400 000 charging points open to the public by 2030. The Energy Transition for Green Growth Act sets a target of 7 million public and private recharging points by 2030.

A package of budgetary measures aims to promote the **deployment of charging infrastructure** for electric vehicles.

The installation of public and private charging stations is the subject of financial support. Individuals who install home terminals are entitled to a tax credit, provided for in Article 200c of the General Tax Code, up to a maximum of EUR 500 per pilot charge system and 75 % of the expenditure.

The ADVENIR programme, financed under the Energy Economy Certificates (EEC), subsidises the installation of charging points in collective residential homes, businesses and for public persons, subject to aid rates and ceilings per recharging point and type of target. The Order of 24 November 2023 establishing and amending programmes under the Energy Saving Certificates scheme supports the Energy Saving Certificate Programme by EUR 200 million for the deployment of recharging points, in particular in collective residential, road and heavy goods vehicles. This supplement comes in addition to the EUR 320 million already mobilised on this programme since 2016.

The installation of fast charging stations in the service areas of major roads received aid from the recovery plan until the end of 2022 (EUR 100 million) and from the investment plan France 2030 until the end of 2023 (EUR 106 million). As of 2023, all the service areas of the licensed motorway network are equipped with high power charging stations. Obligations to ensure the distribution of all usual energy sources are put in place for motorway delegates.

Since 2022, the renewable share of electricity consumed for charging electric vehicles on publicly accessible infrastructure can be used by operators under the targets set by the incentive mechanism for the use of renewable energy in transport. This mechanism requires conventional fuel distributors to incorporate an increasing renewable share of the energy supplied to the transport sector in France. If this is not achieved, the latter can acquire certificates of use from charging operators. The mechanism is the first support to the operation of charging networks, after several years of support for deployments. It enables the Directorate-General for Energy and Climate to ensure that operators comply with the rules and monitor their progress, by making the issue of certificates conditional.

Thanks to the appropriations provided for in the amending finance law of 16 August 2022, exceptional aid of EUR 10 million was granted to co-finance the deployment of charging points for electric vehicles at independent service stations. From 1 December 2022 to 31 December 2023, a first window was opened by the Agency for the Ecological Transition (ADEME). Independent service stations located in a municipality with intermediate or rural density according to the INSEE municipal density grid and distributing less than 2 500 m³ of fuel are eligible for co-financing of 60 to 70 % depending on the installed capacity. The government decided to prolong this assistance by broadening the eligibility criteria and increasing the amount of co-financing to make it more incentivising. Service stations located in an intermediate or rural density municipality with a non-fuel turnover

of less than EUR 1.2 million will be eligible for this fund. These stations will be able to apply for 70 % State co-financing from ADEME, which opened a new counter in January 2024.

In addition, the installation of charging stations at home benefits from a reduced VAT rate of 5.5 % (instead of 20 %) and when the employer provides a charging station on the company's site, the in-kind benefit is considered zero for non-business travel.

The Mobility Orientation Law and subsequently the Climate Resilience Law created and strengthened provisions for the deployment of charging infrastructure. The Mobility Orientation Law simplified and extended the right to take care in order to facilitate the installation of recharging points in multi-dwelling buildings and introduced a maximum reduction rate of 75 % (instead of 40 %) to cover connection costs for publicly accessible terminals or bus charging workshops until 2022 (with exceptions until 2025). The Mobility Orientation Law also provides for the possibility for territories to draw up a blueprint for the development of publicly accessible recharging infrastructure for electric vehicles. This is a mechanism that gives the community a role in steering the charging offer in its territory, leading to a coordinated offer between the various public and private developers, consistent with local mobility policies and adapted to needs. The Climate Resilience Act has made these schemes mandatory in the ZFE. The Climate Resilience Act also provides for the possibility of installing collective electricity infrastructure (facilitating the subsequent connection of recharging points) in collective buildings at no cost for the owner or co-ownership via the network operator or a charging operator, which is reimbursed by contributions from users wishing to connect a recharging point to the collective infrastructure.

The Light Vehicles Strategy is being further developed, integrating terminals at the depot or at destination and roaming terminals.

The National Hydrogen Strategy

The National Hydrogen Strategy aims at the development of decarbonised hydrogen and includes an axis for the development of heavy hydrogen mobility based in particular on territorial hydrogen mobility ecosystems based on vocational vehicle fleets. The relevance of this solution must, however, be measured as to the uses which may be made of it in the light of the operating and economic conditions offered by other engines, in particular electric batteries.

Development of biofuels

The incentive tax on the use of renewable energy in transport (TIRUERT) provides a very strong incentive to maximise the incorporation rate of biofuels while ensuring the sustainability of their production. TIRUERT is a tax paid by operators who do not meet the national target of incorporating biofuels meeting the sustainability criteria into petrol and diesel. In 2022, the target blending rate for biofuels is set at 9.2 % for petrol and 8.1 % for diesel.

The incorporation of biofuels into aviation is mandatory at the rate of 1 % from 2022 (Finance Act). This obligation is part of a strategy for the development of biofuels set out in the roadmap for the development of biofuels, which sets an incorporation target of 5 % by 2030. In addition, a call for expressions of interest on sustainable biofuels was launched to identify investment projects in 2th generation units.

Information for users of transport services

One strand of action in the policy to support modal shift is to raise awareness among users of transport services through the GHG information system for transport services. Since 2017, providers of passenger and freight transport or removal services have been required to calculate and report on the greenhouse gas emissions

generated by the services performed on behalf of their customers. From 1 January²⁰²⁵, the obligation will be accompanied by penalties for offenders.

Urban planning measures

Urban planning measures to promote modal shift and demand management are also part of a sustainable mobility policy: rebalancing empty space towards active modes (walking, cycling); urban densification around structural public transport routes; urban policies aiming at functional mix and community-based services for a short distance city; inclusion of urban logistics in planning documents.

Measures addressing several levers

Agglomerations with more than 150 000 inhabitants, located on metropolitan territory, will **have to have introduced a low-emission mobility** zone by 31 December 2024. For low-emission zones where air quality standards are not met, the following minimum shall be prohibited: not later than 1^{January} 2025, diesel and similar vehicles with a date of first registration before 31 December 2010 and petrol and similar vehicles with a date of first registration before 31 December 2005.

Financed under the Energy Saving Certificates (EECs), the EVE programme (Voluntary Commitments for the Environment – Transport and Logistics) aims to support transport and logistics stakeholders (carriers, freight forwarders and shippers) in improving their energy and environmental performance. It builds on three voluntary pledging schemes: Target CO₂ for freight and passenger carriers, fret21 for shippers and EVcom for freight forwarders.

- The Objective CO₂ mechanism, resulting from the commitment charter launched in 2008, provides for the provision of tools to assess GHG emissions for the establishment of a 3-year action plan for reducing GHG emissions along 4 axes: vehicle, fuel, driver, flow organisation.
- The purpose of the Fret21 scheme is to encourage and support shippers to reduce the GHG emissions generated by the transport of goods linked to their activity, by quantifying the environmental impact of their transport and implementing measures to reduce their emissions over 3 years along 4 axes: loading rate, distance travelled, means of transport, responsible purchases.
- The EVcom scheme, similar to the two precedents, is intended for freight forwarders. The reduction measures over 3 years are structured around 4 axes: clean fleet, transport purchasing, customer collaboration and CSR approach (corporate social responsibility).

As part of this programme, a platform for the exchange of environmental data between transport stakeholders has been implemented in order to establish a common tool between these three schemes and to facilitate the transmission of environmental information on transport services, such as GHG information (see above).

Over the period 2018-2023, almost 3300 road transport companies are committed to the EVE programme for a reduction of almost 3 million tonnes of CO₂ each year. The EVE programme was extended until 31 December 2025.

Policies and measures addressing CO₂ emissions from international transport

Up in the air

Intra-European flights are included in the European carbon market system (EU ETS). Indeed, the European Union adopted Directive 2008/101/EC of 19 November 2008 amending Directive 2003/87/EC in order to include aviation activities in the European scheme for greenhouse gas emission allowance trading. The scheme has been applicable since 2012 for all flights departing from or arriving in the European Union. However, a temporary derogation from inclusion in the European carbon market scheme was granted from 24 April 2013 for international flights, i.e. for flights involving a country outside the EU. It is still in force today.

The revision of the EU ETS Directive adopted in May 2023 as part of the Fit for 55 package strengthened carbon pricing for the sectors covered, including aviation, by accelerating the reduction of the emissions cap, which should maintain a strong price signal for the coming years. The revision also introduced several provisions specifically promoting the decarbonisation of air transport, including: the phasing out of free aviation allowances (full auctioning from 2026 onwards), the creation of a free reserve to incentivise airlines to use sustainable fuels and the inclusion of the non-CO₂ effects of aviation in the EU ETS monitoring, reporting and verification system (with a view to potential full inclusion in the future).

France also supports the work of the International Civil Aviation Organisation (ICAO) to reduce emissions from international aviation. Under CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation), airlines will have, over the 2021-2023 pilot period, to offset their emissions above the 2019 level by purchasing carbon credits and then from 2024 to offset their emissions above 85 % of the 2019 level. In a first phase, only companies from voluntary countries (including the European Union) will participate. The 2023 revision of the EU ETS also provides a link between CORSIA and the EU ETS, and also foresees a close review that could lead to the extension of the EU ETS to all flights departing from the EU as of 2027 (if the European Commission concludes following a dedicated assessment that ICAO has not increased CORSIA's ambition).

The Climate and Resilience Act of 22 August 2021 provides for a number of measures concerning aviation, mainly: (i) the obligation for airlines to offset emissions from domestic flights (including overseas flights) according to a gradual timetable (50 %/70 %/100 % of 2022/2023/2024 emissions and thereafter) (ii) the cancellation of flights where a rail alternative of less than 2:30 exists.

Maritime transport

In 2015, the European Union adopted Regulation No 2015/757 establishing a system for monitoring, reporting and verification (MRV) of CO₂ emissions from ships. Since 1 January 2018, shipping companies have to monitor and report annually the emissions of their ships for all intra-EU voyages, all voyages arriving in the Union (between the last non-EU port and the first port of call in the Union), all voyages between a port located in the Union and the first port of call outside the Union, as well as CO₂ emissions from Union ports. These rules apply without discrimination to all ships, regardless of their flag.

The revision of the EU ETS Directive adopted in May 2023 as part of the Fit for 55 package extended the scope of the EU ETS to gradually cover emissions from the maritime sector (100 % on intra-EU journeys and 50 % on EU-third and third country journeys). In addition, in 2023 the European co-legislators also adopted the FuelEU Maritime Regulation, which aims to accelerate the use of low-carbon fuels in maritime transport, as well as the AFIR (Alternative fuels Infrastructure Regulation), which promotes the deployment of alternative fuels infrastructures in ports.

France also supports the work of the International Maritime Organisation (IMO) to reduce emissions from international maritime transport.

Finally, at national level, France supports efforts to decarbonise the maritime sector. The Commission submitted to the government in April 2023 its decarbonisation roadmap, which identifies and analyses the technological levers available for the sector (energy efficiency, energy change, sobriety due to the reduction of the speed of ships) and proposes a transition scenario.

Measures to reduce F-gas (HFC) emissions from transport

European Directive 2006/40/EC of 17 May 2006 and the measures taken in France to transpose it (Decree of 21 December 2007 on the approval of motor vehicles with regard to air-conditioning systems) prohibit the use of fluorinated gases with a global warming potential (GWP) of more than 150 in air-conditioning systems in motor vehicles and lays down measures to limit leaks. Since 1^{January} 2011, the air-conditioning of all new vehicle types has to operate with a refrigerant with a GWP of less than 150. Since 1^{January} 2017, that prohibition applies to all new vehicles. In practice, this leads to a replacement of refrigerant gas R-134a (GWP 430) by R-1234yf gas (GWP 4), resulting in very substantial gains.

3.1.3.3.2 planned policies and measures (first orientations of the National Low-Carbon Strategy for 2030)

The Clean Mobility Development Strategy (SDMP) sets out the transport sector's orientations for 2030-2035.

The Clean Mobility Development Strategy (SDMP) sets out the transport sector's orientations for the EPP (2030 and 2035) in order to comply with France's objectives and commitments to combat global warming and reduce energy consumption. It is annexed to the EPP and operationally reflects the objectives of SNBC in terms of mobility. Work on the development of the SDMP has been launched, in consultation with the various stakeholders in the transport and logistics sector. The consultation will focus on broad themes, with the aim of achieving operational decarbonisation measures: sobriety in passenger and freight transport, modal shift towards less carbon modes, territorial developments and infrastructure needed to reduce GHG emissions from transport, energy issues in the transport sector.

In the longer term, SNBC 3 sets out the following guidelines for this sector:

Passenger transport

- ▶ **Limiting urban sprawl and reducing commuting**

Linked to the net zero land take objective for 2050 and the intermediate objective of halving the rate of land take by 2030:

- **Urban fabrics will be densified** by optimising and reusing already built surfaces, encouraging overhauls of existing buildings, limiting the size of the land of individual houses, mobilising land already under artificial land and deappropriation and renaturation of unused areas, in particular brownfield sites and favouring collective dwellings over individual houses.
- The **'city of short distances' will be promoted**, in order to make as many daily journeys (to shops, services, equipment and employment areas) in active mode. The locations of new buildings will be designed in connection with public transport networks and their future deployments, in particular station districts, in order to promote the use of public transport.

On the other hand, mobilising employers to telework and reassignment to multi-site businesses as close as possible, part of the greenhouse gas emissions of people using carbon-based modes of travel to their workplace could be avoided. However, it will be necessary to monitor the rebound effect of teleworking (i.e. the impact on travel of teleworkers moving away from their place of work).

- Reducing the most emitting journeys

Employers will be encouraged to give priority to videoconferencing, in **order to avoid distant journeys**, including work-related travel by air.

The carbon pricing of air transport will also be gradually increased (extinction of free ETS allowances, full application of the mandatory offsetting of emissions from domestic flights, changes in the tax on air tickets, etc.).

Regulating **the advertising of** thermal vehicles (such as the ban on advertising for the most polluting cars from 2028 under the Climate and Resilience Law), greater **transparency on GHG emissions from** air transport, and the **promotion of local tourism** will make it easier for the public to take account of its impact on global warming and to control the increase in mobility demand.

- Deployment of cycling infrastructure

The provision of safe and continuous cycle tracks and tracks, the development of the ‘Browing bybike’ from an early age and aid for the purchase of mechanical and electric bikes will make it possible to develop cycling. Three quarters of appropriations in the 2023-2027 cycling and walking plan will be invested in developing cycling infrastructure and doubling the network to 100 000 km by 2030. Financial and infrastructure efforts will be maintained after 2030 to support the momentum.

- Development of rail transport and metropolitan ERNs, public transport and multimodality

Rail offers a safe, fast and low-carbon alternative to the car. Together with the SNCF, the European Union and local authorities, the State wishes to launch a **new railway deal** with the dual objective of putting an end to the ageing of the network and investing in the development of the rail network. For users, moderation of the rail network will result in more trains, better punctuality and shorter journey times. The development of the network will make it possible, in addition to the continuation of the plans for new routes, to develop daily transport by putting into service regional metropolitan express services, which is the main priority of the Government, and encouraging the introduction of lighter trains on railway lines serving fine services in the territory, in particular by means of a safety regime adapted to and proportionate to usage.

Where there is no railway infrastructure, these services may take the form of **express services, with, where possible, dedicated lanes** to avoid congestion at the entrance to urban areas, which can also accommodate carpooling.

These measures may be financed in part by fiscal measures on emitting modes of transport, such as taxes on motorway companies and taxes on air tickets.

For **daily journeys**, the expected modal shift can only be achieved at the cost of **strengthening collective transport**, by improving its reliability, time range, frequencies and commercial speed, by improving user experience, in particular through multimodal digital services for travelling, booking and payment, and by means of appropriate pricing policies. Local and regional authorities, which organise mobility, will have a key role to play in the development of public transport. The State will support them as it did with the calls for TCSP projects (“Clean Site Collective Transport”), in particular for rural mobility.

In addition, the **deployment of electric microcars and other intermediate vehicles** (quadricycles, cars without permits, etc.) for daily journeys will diversify individual modes of transport and increase energy efficiency.

- Greening labour mobility

The **tax advantages associated with official vehicles and company fleets will be revised with a view to** encouraging the use of car pooling, collective transport modes or electric vehicles. Employers will be mobilised to ensure the implementation of employer mobility plans and the Sustainable Mobility Forfait. Every year, businesses are responsible for more than half of new car registrations, and business vehicles drive twice as much as passenger cars on average. Moreover, vehicles purchased by companies are, on average, held for a shorter period than those purchased by private individuals, and thus supply the second-hand vehicle market with recent and inexpensive models. Fiscal and financial incentives and fleet **greening obligations will be reassessed** to allow a rapid increase in the share of electric vehicles purchased by companies. Moreover, through the management of their public fleets, local and regional authorities and the State will also play a key role in decarbonising the vehicle fleet.

- **Implementation of the carpooling plan**

Unveiled in December 2022, the new car-sharing plan aims to increase the number of daily journeys by three times, shared by 2027. **Concrete solutions** (green lanes, employers' commitment offering sustainable mobility to their staff, local authorities drawing up a local strategy and action plan such as car-sharing lines, car-sharing areas, etc.) will help **to develop these practices and continue the momentum beyond 2027**.

At the same time, the **development of car sharing** will contribute to the decline in the total car fleet.

- **Roll-out of charging stations**

In early May 2024, more than 130 000 publicly accessible recharging points and almost 2 million private recharging points (at home or in businesses) are in operation throughout the national territory for light-duty vehicles. The public authority will continue its efforts, with **the objective of developing around 400 000 public terminals accessible in 2030** (which will be modulated according to the power of the terminals installed), to enable electric vehicle users to charge their vehicles as soon as necessary, on roads for normal charging, and in the vicinity of major roads for high-power charging, in addition to individual and collective residential deployment. Piloting opportunities will be encouraged and facilitated to have the least impact on the distribution network.

Market services are already providing 40 % of the recharging points currently accessible to the public (Avere-France Barometer). In order to continue this effort and ensure a minimum rate of equipment for each car park at 5 % of the seats (cf. LOM Law), the support and incentive schemes will be strengthened.

- **Support for the construction and procurement of electric vehicles**

The State is engaging with the French automotive sector as a whole to enable and **speed up the electrification of the ecosystem** (car manufacturers, subcontractors, equier-mendersand other suppliers in the automotive value chain) through France 2030 measures to support electrification projects, with a production target of 2 million electric vehicles per year by 2030. In 2035, the share of electric vehicles in sales of new light vehicles is expected to reach 100 %.

As regards demand, incentive levers such as the green bonus will evolve over time, in particular to maintain or strengthen their environmental dimension, as has been achieved on the environmental bonus with its focus on vehicles with a low carbon footprint. Finally, **a social leasing** scheme to facilitate the equipping of small households with electric vehicles was introduced in 2024.

- **Electrification of buses and coaches**

Electrification will also progress in collective transport vehicles, driven by obligations to renew fleets with clean vehicles, the gradual reduction in the cost of purchasing electric vehicles, as well as European regulation defining CO₂ emission standards for new heavy-duty vehicles.

The State will be able to use various budgetary, fiscal and regulatory levers to encourage passenger transport companies to give preference to electric engines over thermal engines. Support for the installation of charging stations in depots will be strengthened in order to ensure that energy is accessible at all points in the territory at uniform and economically acceptable costs for those involved.

- **Hardening malus for the most emitting and most material consuming vehicles, eco-driving**

The purchase of light passenger vehicles, which consume less resources than heavier alternatives, will be encouraged by tightening the 'weight' malus (purchase tax on heavier vehicles). Similarly, the sale and purchase of the most emitting vehicles will be discouraged by the tightening of malus CO₂.

In addition to the arrival of new vehicles with less fuel consumption, **changes in driving patterns such as eco-driving or lower speed**, particularly on major roads, will be encouraged, for example, through training or navigation applications in order to reduce fleet consumption.

- **Deployment of sustainable fuels**

The **obligations for the incorporation of alternative fuels and electricity into transport**, imposed on fuel distributors, will be gradually strengthened. A trajectory to reduce the carbon intensity of energy carriers used in transport is foreseen in the EPP. The development of biofuels will be accompanied by increased sustainability and monitoring under the EU Renewable Energy Directive ("RED3").

Biofuels will also be developed in rail, where a need of 1 TWh is identified, and in the river, for which a need of 0.5 TWh is identified.

The Government will support first plants for the production of advanced fuels produced from residues and waste and synthetic fuels (hydrogen, methanol, e-methane, etc.) for the aviation and maritime sectors.

Aviation will increase its use of sustainable alternative fuels, in line with the minimum incorporation obligation trajectories set out in European legislation.

Maritime transport will increase its use of sustainable fuels, going even further than the trajectory for reducing the carbon footprint of fuels used by ships and set by European legislation. In order to limit emissions at berth and recharge batteries from electric or hybrid propulsion ships, electric connection and charging points will be deployed in commercial ports and platforms of water passages.

- **Reducing the carbon intensity of passenger ships with a public service mission**

The State will support the **deployment of passenger vessels with low CO₂ emissions engaged on routes falling within the scope of a public service mission** (serving the islands, crossing rivers, amphidromous containers). In addition to energy efficiency research, these vessels will need to deploy technologies adapted to the distance travelled and use energy (sustainable fuels, electricity) suitable for the port infrastructure concerned.

Transport of goods

- **Adoption of a sector-by-sector approach**

Freight transport activities are carried out on behalf of the economic activities which commission the transport services necessary for their activity. The reduction of GHG emissions from freight transport is therefore largely dependent on the logistical choices of the sectors of activity.

A first analysis to identify the respective contributions of sectors of activity to GHG emissions from freight transport was carried out on HGV traffic for the year 2019. Of the 30 MtCO₂eq accounted for by HGV emissions, the respective contributions from sectors of activity are:

- construction sector: 7 MtCO₂eq;
- agri-food: 9 MtCO₂eq;
- transport of fossil and non-fossil fuels: 2 MtCO₂eq;
- transport of general goods: 11 MtCO₂eq;
- transport of waste: 1 MtCO₂eq.

These factors are brought to the attention of the sectors in order **to enable them to optimise their emissions globally over a wider scope covering both their production activity and the associated transport**. The reductions in transport emissions by 2030 and 2050 should be broken down by sector of activity in the SNBC 3 Outcome Document to provide a more detailed view of the targets for each sector.

► **Control of freight demand and optimisation of logistics flows**

Territorial planning will take account of logistical issues, in particular the development of short supply chains and the management of rapid and/or free delivery (responsibility of shippers, consumer information, limitation of free delivery and return, etc.) or the evolution of just-in-time industrial processes. The transformations in the construction and industrial sectors will reduce certain freight needs, which are sometimes offset by the logic of reindustrialisation.

In addition, **strategies for pooling and masking logistical flows will be put in place** to optimise the loading rate and distances travelled by heavy goods vehicles: digital solutions for identifying and anticipating future flows, optimising the delivery frequencies of professionals, tools for pooling flows between sectors, using a double floor, developing logistical hubs on the outskirts of cities, etc. The State will endeavour to **promote a sector-by-sector approach to identify** the brakes and levers specific to each type of goods.

► **Development of rail and inland waterway freight**

Published at the end of 2021, the **National Strategy for the Development of Rail Freight** identifies 72 concrete measures to double the modal share of rail freight by 2030 (national blueprint for combined transport, ramp-up of infrastructure services platforms, etc.), addressing four major challenges: ensuring the viability of services and the sustainability of the business model of rail freight operators, improving the quality of service provided by SNCF Réseau, strengthening the performance of infrastructure enabling the development of rail freight, and developing coordination with ports and inland waterways. Better pricing of the externalities of the different modes of transport (in particular road freight) would facilitate this modal shift.

The objective and performance contract for Voies navigable de France, signed in April 2020, gives priority to the regeneration and modernisation of the network and the development of the Seine-Scheldt network as part of the ongoing construction of the Seine-Nord Europe Canal. The commitments made by the sector for green growth include support for the greening of the fleet through the renewed modernisation and innovation aid plan for the period 2023-2027.

In addition, the Mediterranean – Rhône – Saône project aims to increase the number of waterborne containers by 2,5 and the share of rail freight by 2 by 2030.

- Support for the purchase of electric vehicles, promotion of decarbonised commercial modes of transport and empowerment of the most important fleets

In order to speed up the electrification of freight transport, the State will be able to use various budgetary, fiscal and regulatory levers to encourage freight transport companies to give preference to electric engines over thermal engines. The owners of the largest fleets will be responsible for rapidly greening their heavy-duty vehicle fleet.

Donors will also be accompanied to shift their transport demand towards less emitting modes (modal shift, use of decarbonised road vehicles) through incentives or obligations. In particular, incentives for clients to green and electrify transport requests would make it possible not to impose the burden solely on fleet owners.

For short **distance journeys** for the delivery or transport of equipment, bikes and **intermediate transport vehicles** (between bicycles and commercial vehicles) will be favoured.

- Reinforcement of distribution networks and deployment of charging stations

In addition to the network of charging stations for light-duty vehicles, **high-power terminals for heavy duty vehicles will be deployed**, in particular at carriers' depots, in the logistics bases, urban nodes, freight zones and on major roads in consultation with the operators of road networks or logistic sites (motorway concessionaires, state, local authorities, ports, etc.), as well as with the electricity network operators to ensure the development and strengthening of distribution networks in line with needs, in particular with regard to power calls.

Support and financial support for the installation of charging points at depot and destination at the main logistics or industrial centres will be developed in order to ensure energy accessibility in the regions at uniform costs that are economically acceptable to the stakeholders.

- Changes in driving patterns

In addition to the arrival of new vehicles with less fuel consumption, **greater changes in driving patterns** such as eco-driving, especially on major roads, will be encouraged, thereby reducing the consumption of the fleet.

- Deployment and use of sustainable maritime transport fuels (biofuels, synthetic fuels, etc.)

The European legislation (target for the incorporation of at least 1.2 % of renewable fuels of non-biogenic origin into the maritime sector in line with RED3¹²¹ and a 6 % reduction in the carbon intensity of energy used by ships in 2030 in the FuelEU Maritime Regulation, equivalent to about 9 % biofuel incorporation rate) supports the target of 11 % biofuel incorporation rate and 5 % e-fuels in the scenario.

3.1.3.4 where applicable, national policies, timetables and planned measures to end energy subsidies, in particular for fossil fuels

France has a long-standing commitment not to subsidise fossil fuels. Apart from the very specific context of the energy crisis linked to the war in Ukraine, it does not incur any such expenditure. It continues to apply reduced excise duties on motor fuels or fuels benefiting certain sectors exposed to competition or particular difficulties. In this sense, for a number of years it has embarked on reforms to phase out these tax expenditures.

Moreover, fossil fuel subsidies are often calculated on the basis of tax expenditures as calculated by member countries. This is particularly the case for the work of the European Court of Auditors or the OECD. For developed countries, the identified tax expenditures generally account for the vast majority of fossil fuel subsidies.

¹²¹EU Renewable Energy Directive ("RED3")

However, this tax expenditure suffers from a problem of comparability, both over time and across countries, due in particular to the use of full rates as the reference tax standard. Indeed, the higher the full rate, the higher the tax expenditure. These limits are now clearly displayed in the latest OECD publication on the subject 'Methodological Note: This briefing note covers the 2023 update of the Inventory of Support Measures for Fossil Fuels, which deals with 48 countries. Methodological remarks: The aggregated values taken from the Inventory correspond to the budgetary cost of fossil fuel support measures. They should not be interpreted as corresponding to the level of support for fossil fuels or as indicating the extent to which the schemes considered are favourable or unfavourable to combating climate change. The tax expenditures indicated in the Inventory are the estimated amount of tax revenue lost to fossil fuel producers or consumers as a result of the application of measures reducing or postponing tax payments, compared to the reference tax systems of a jurisdiction. Estimates of tax expenditures may therefore increase over time, as a result of an increase in the tax advantage granted (compared to the reference systems) or the reference value itself. It might also be ill-circumspect to compare the tax expenditures of several countries on this basis because of the differences between their reference tax systems."

France therefore considers that comparisons involving amounts of fossil fuel subsidies as currently calculated are not relevant.

In addition, the current SNBC 2 has an orientation to phase out environmentally harmful public subsidies (ECO 1). Indeed, policies aimed at reducing certain niches:

- The amount of the partial refund on gas oil used by road haulage was reduced by 2cEUR/L, increasing the rate of excise duty from 43,19cEUR/L to 45,19cEUR/L in 2020. Article 130 of the Climate Resilience Law provides that the government shall submit to Parliament a report setting out a path to abolish the reduced excise duty on diesel used by heavy goods vehicles by 2030. This trajectory should take into account the progress made in the revision of the Energy Taxation Directive and the availability of sufficient supply of alternative energy vehicles to diesel.
- On recreational aviation, excise duties on jet fuel and aviation petrol have been aligned with the excise duty on petrol used in road transport.
- The air ticket tax on commercial aviation has been increased.
- The excise duty on non-road diesel (excluding agriculture) was increased from EUR 18,82/hL to EUR 24,81/hL in 2024.

Further elimination of tax niches is desirable, but for sectors subject to international competition, the European and international level seems to be more suitable for dealing effectively with carbon pricing in certain sectors. Fiscal convergence in Europe would address this difficulty.

France also supports actions at international level within ICAO and IMO to strengthen carbon taxation in aviation and maritime.

3.2. Dimension energy efficiency

Measures to achieve the 2030 energy consumption targets.

New levers to move towards the target of reducing energy consumption in France by 30 % in 2030 compared to 2012 can be identified. They will focus on energy efficiency and sobriety, two complementary pillars to achieve the energy consumption reduction targets:

- energy sobriety: the aim is to reduce energy consumption through changes in lifestyles and social transformations, by reconsidering needs (for example: using active modes of transport such as cycling or walking rather than car for short distances or lowering the heating temperature, encouraging teleworking, increasing public transport routes to limit distances);
- energy efficiency: obtain the same service with minimised energy consumption. (For example, replace luminaires with LEDs).

a – The Energy Efficiency First (EEPP) principle

The EEPP is not modelled in the projections, so its effects will be cumulative with current models. At this stage, the transposition of this measure of the Directive has not yet been carried out, but **the French authorities intend to extend the concept of the EEPP to that of primacy to energy efficiency and sobriety** (i.e. the ‘first of reducing energy consumption’). This principle would be taken into account when designing a plan or programme, law, project or major investment decision (> EUR 100 million or EUR 175 million for transport infrastructure).

It is envisaged to link the energy efficiency first principle (EEPR) to the environmental assessment process¹²².

The French authorities would like to mobilise this existing mechanism in order to simplify the implementation of the evaluation of the proper taking into account of the EEPP and to avoid excessively increasing the administrative burden on project owners. The environmental assessment is already well framed in French legislation and legislation, it has been operational for several years and has been well suited by project promoters. The scheme also has environmental authorities which give opinions on projects, plans and programmes subject to assessment.

Thus, the EEPP will be taken into account in many projects subject to development consent or declaration as soon as the environmental impact assessment report is drawn up (impact assessment for projects, environmental report for plans and programmes). The environmental assessment also provides for several consultations, including consultation of the environmental authority, which delivers an opinion on the project, plan or programme. Finally, the environmental assessment process provides for a review by the authority authorising the project or approving the plan or programme of the information contained in the assessment report and received as part of the consultations. As such, the EEPP should therefore be included in the project

¹²² **Environmental assessment:** it is a process aimed at integrating the environment (in the broad sense) into the preparation of a project, or a planning document, starting from the early stages of reflection. This assessment serves to inform the project owner and the administration on the action to be taken on the project in the light of environmental and human health issues in the territory concerned, as well as to inform and ensure public participation. It must give an account of the potential or actual effects on the environment of the project, plan or programme and shall make it possible to analyse and justify the choices made in the light of the issues identified in the territory concerned. The environmental assessment must be carried out as early as possible, in particular, in the case of multiple authorisations or decisions, from the time of the first authorisation or decision, and must cover the whole of the project and its impact.

The environment must be understood in its entirety: population and human health, biodiversity, land, soil, water, air and climate, material assets, cultural heritage and landscape, and the interactions between them.

Link for more information: <https://www.ecologie.gouv.fr/evaluation-environnementale>

impact assessment/programme impact report, an environmental authority's opinion and then reviewed by an authority.

b – Deployment of energy sobriety measures

One of the levers identified is **the acceleration of the deployment of energy sobriety measures**, in direct application of the energy sobriety plan published on 6 October 2022¹²³. The plan provides for sectoral actions:

- Cross-sectoral commitments: reducing energy consumption in buildings, building cleaner mobility
- Sectoral commitments from nine dedicated working groups: Exemplary status, local and regional authorities, businesses, digital establishments receiving the public, tertiary activities, industry, housing, transport, culture and sport, etc.

The call for general mobilisation to reduce energy consumption was heard by the major players – the state, local authorities and large companies, where the room for manoeuvre was greatest – and by the French.

In addition, the shift in consumption patterns towards less energy intensive uses, in particular through the deployment of eco-design measurement and responsible public procurement, will make it possible to reduce energy consumption.

c – Electrification of uses

One of the levers for reducing energy consumption is the acceleration of electrification of many uses (heat in buildings, electrification of transport) that allows for intrinsic energy efficiency by improving overall efficiency.

D – Energy audits and energy management systems

Currently, French legislation requires an energy audit to be carried out every four years (ISO 50 001 certification or audit according to standards NF EN 16247) for large companies (more than 250 employees with a balance sheet total of more than EUR 43 million or with a turnover of more than EUR 50 million)¹²⁴ in order to put in place a strategy to reduce energy consumption. This audit must cover at least 80 % of the energy bill.

This provision is intended to enable the largest professional consumers to identify their energy savings potential. If the investments recommended by the audit are made, energy savings can, depending on the nature of the activity and the potential to reduce energy consumption, lead to savings of up to 30 %, or even a reduction of more than 50 % of the energy consumption related to the building¹²⁵.

In the context of the transposition of the Energy Efficiency Directive (EED, 2023/1791), transposition work is ongoing. However, it is envisaged to impose:

- businesses consuming more than 23.6 GWh annually (85 TJ): implement an energy management system (EMS);

¹²³ Access link to the energy sobriety plan, published on 6 October 2022 by the French Government: <https://www.ecologie.gouv.fr/sites/default/files/dp-plan-sobriete.pdf>

¹²⁴ Criteria defined in Article R. 233-2 of the Energy Code: https://www.legifrance.gouv.fr/codes/article_lc/LEGIARTI000031748065

¹²⁵ Ministry of Ecological Transition, Energy Audit of Large Enterprises: <https://www.ecologie.gouv.fr/audit-energetique-des-grandes-entreprises>

- businesses consuming more than 2.75 GWh (10 TJ) annually and not implementing an energy management system (EMS): to carry out, every four years, an energy audit of their activities in France;

The EMS shall be certified by a certification body accredited by an accreditation body signatory to the multilateral recognition agreement established by the European Coordination of Accreditation Bodies. In addition, the energy audit is carried out independently by recognised competent auditors.

It is also proposed that these companies draw up a concrete and feasible action plan on the basis of the recommendations arising from the energy audit or the energy management system. The action plan should identify the measures to be implemented for each recommendation, specify whether they are technically or economically feasible and assess their return time on the investment. It is proposed that the failure to implement a measure with less than five years' return on investment should be justified in the action plan.

In addition, it is foreseen that the action plan referred to above will be submitted to the company's management and then published in the company's annual report, specifying the rate of implementation of the measures of the action plan. The above-mentioned action plan and the rate of implementation of the measures should be made available to the public with due regard for business confidentiality.

Finally, it is noteworthy that the Agency for the Ecological Transition (ADEME) has set up, at the request of the government, a platform for collecting data on the realisation of energy audits of enterprises. The platform can be accessed at: <https://audit-energie.ademe.fr/>

This platform is currently being updated to take into account the criteria requested by the revised EED (2023/1791/EU).

e – Other consumption reduction measures

In addition to the measures listed in the previous paragraphs, the following measures are envisaged:

- **Building:**
 - Land buildings of more than 1 000 m² owned by public bodies are already subject to the tertiary decree (Decree No 2019-771 of 23 July 2019), which calls for the absolute energy consumption of the building to be reached or which calls for their energy consumption to be reduced by 40 %, 50 % and 60 % in 2030, 2040 and 2050 respectively. This decree, in force since 2019, public bodies have already started work to reduce the consumption of their buildings (change of heating mode, etc.) and renovate them.
 - For the purposes of applying Directive (EU) 2023/1791, provision is made for:
 - Make available to public bodies a platform for the inventory of all buildings belonging to them as well as the collection of data on energy consumption and built-in data;
 - How the provisions of the EED are applied to the various public bodies to ensure that the objectives laid down are met:
 - 1.9 % reduction in energy consumption in the public sector;
 - On average, the renovation of 3 % of buildings over 250 m² at NZEB level
- **Industry:**
 - Financial incentives for industry, reinforced by the Emissions Trading System (ETS) and the Energy Saving Certificates (EWC) scheme;

- Mobilisation of the heat fund, which has been cumulative since 2020 with the EWC system under certain conditions, as well as calls for projects in France Relance and France 2030.
- **Travelling:**
 - Promotion of sobriety for air, sea and land transport;
 - Increase in sales of electric vehicles:
 - 66 % of new cars sold in 2030, 100 % in 2035 in accordance with EU rules;
 - 51 % of new commercial vehicles sold in 2030, almost 100 % in 2035 (including 23 % hydrogen) in line with EU regulations;
 - 50 % of new heavy goods vehicles sold in 2030 electric or hydrogen, 68 % in 2035;
 - Deployment of related recharging infrastructure.
 - Modal shift for passenger traffic:
 - Public transport traffic increased by 25 % by 2030 (35 % by 2035);
 - A sharp increase in cycling traffic (from 5 to 19 Mds/km in 2030);
 - Tripling of covered journeys by 2027/pursuit of the trajectory to 2030.
 - Modal shift for freight traffic:
 - Doubling the modal share of rail freight by 2030;
 - A 50 % increase in the modal share of inland waterway freight by 2030.
 - Aviation safety
 - Control of demand for air transport;
 - Improving the energy efficiency of aircraft through support for R & T and aeronautical innovation;
 - Use of sustainable aviation fuels (+ 6 % in 2030 and 20 % in 2035 in line with the European trajectory).
 - By sea:
 - Managing demand for maritime transport and reducing speed;
 - Improving the energy efficiency of new and retrofit ships.
- **Agriculture:**
 - An increase in the share of non-fossil fuelled agricultural machinery to 7 % in 2030 and then to 20 % in 2035;
 - Improving the energy efficiency of equipment and buildings (including greenhouses), and deployment of alternative heating systems.
- **Fishing:**
 - Improving the energy efficiency of new and retrofit fishing vessels.

France also published an energy sobriety plan in October 2022. It was updated in June 2023, in particular to take better account of summer comfort. This plan is an operational roadmap for energy saving measures to be implemented by the state, public administrations, local and regional authorities and businesses. These roadmaps are specific to the following sectors: “ Exemplary state”, “ undertakings”, “ establishment receiving the public and tertiary and market activities, “ industries”, “ housing”, “ transport”, “ numérique”, “ sport”, “ local and regional authorities”.

The aim is to maintain the reductions in consumption observed in 2024 and in the long term. The good performance in terms of consumption reductions seems to continue in various sectors, as confirmed, for example, by ENEDIS's analysis of 19 July on the fall in street lighting consumption in 2022-23 beyond the winter period.

To go further towards a sobriety in everyone's daily lives, five new announcements were unveiled on Thursday 12 October 2023¹²⁶ by the Minister for Energy Transition Agnès Pannier-Runacher following a dedicated symposium on the subject:

- continue mobilising large French companies by involving the 120 largest companies (those registered in the SBF 120),
- enable French people to better steer their energy consumption by means of a thermostat plan, including greater support for the installation of programmable devices part by piece, which allow for greater energy savings (15 % compared to 810 % for more conventional devices);
- strengthen the regulation on light pollution in showcases and offices, by reducing the hours at which ignition is allowed, and by increasing the related penalties;
- promote own mobility in enterprises, in addition to support for car-pooling, with a grant of EUR 100 to new car-drivers, which was launched in 2023, which already involved 160 000 drivers,
- offer offers to capitalise on energy savings and lower bills for energy suppliers.

The operational details of the points substantially amended in the context of the recast of the Energy Efficiency Directive published in the Official Journal of the European Union on 20 September 2023 are still under discussion, in particular on the following subjects:

- How to apply the energy efficiency first principle for plans, projects and policy decisions;
- Determination of the list of public bodies;
- Determination of the level of obligation for^{the}6th period of the energy saving certificate scheme;

Modification of the list of companies subject to the energy audit or the establishment of an energy management system, and updating the dedicated collection platform.

Several financial measures to accelerate the implementation of energy-saving actions will be deployed:

- **Reinforcement of aid for the renovation of the housing stock, in particular MaPrimeRénov' (MPR)** to accelerate the efficient renovation of residential buildings. A total of EUR 4 billion has been lost in 2024 for the energy renovation of buildings.
- **Maintaining the VAT reduction** at 5.5 % for energy renovation works
- **Maintenance of the zero-interest eco-loan (eco-PTZ)** for the renovation of residential buildings and increase of the ceiling for overall renovations since 2022 (EUR 50 000)
- **Establishment of an industry decarbonisation fund** (EUR 1.2 billion under the recovery plan, and EUR 4.5 billion in the framework of France 2030)

¹²⁶ Energy sobriety plan, October 2022, access link:
https://www.ecologie.gouv.fr/sites/default/files/Plan_Sobriete_energetique_un%20an%20apres.pdf

- **establishment and continuation of the Green Fund:** since January 2023, this fund, endowed with EUR 2 billion in 2023, has been extended to EUR 2 billion in 2024. The aim of this scheme is to finance projects submitted by local and regional authorities and their public or private partners in three areas: environmental performance, adaptation of the territory to climate change and improvement of the living environment.
- **Support to local authorities, in particular from the ERDF Fund:** some local authorities put in place renovation aid, in particular indexed to the BBC Renovation label. This is particularly the case for certain regions, which use part of the ERDF funds for this purpose.
- **Green bonus (mobility):** this helps to support the purchase of an electric vehicle. In 2023, the criteria for obtaining the bonus were amended to take account of the carbon impact of vehicles (environmental score)¹²⁷, and thus in particular their mass.

To facilitate the implementation of these measures, the France Rénov' one-stop shop will speed up the implementation of work in the residential sector.

3.2.1 National energy efficiency obligation scheme and alternative policy measures in accordance with Articles 7a and 7b of Directive 2012/27/EU, to be prepared in accordance with Annex II

Under Article 7 (1) of Directive 2012/27/EU (or Article 8 of Directive (EU) 2023/1791), France plans to use the energy savings certificates (EEC) scheme to fulfil its energy efficiency obligation for the period from¹ January 2021 to 31 December 2030.

3.2.1.1 Description of the energy efficiency obligation scheme

The Energy Saving Certificates (EWC) scheme, created in 2005 and governed by Articles L.221-1 et seq. of the Energy Code, is a central tool of French energy demand management policy.

EWCs (1 EEC = 1 kWh of final energy) are allocated by the departments of the Ministry responsible for energy to eligible actors (obligated parties but also other unobliged legal persons, such as local and regional authorities, social landlords, etc.) who have carried out energy saving operations complying with certain criteria laid down by decree (standardised operations or specific operations). These EWCs may freely be exchanged.

Standardised operations sheets, defined by ministerial orders, are drawn up, for the most frequent operations, to facilitate the setting up of energy-saving measures. They are classified by sector (residential, tertiary, industrial, agricultural, transport, networks) and define lump sums for energy savings in “kWhcumac” and the lifetime of operations. These operations correspond to ‘expected savings’ and are regularly updated. The list of standardised transaction sheets is available on the Internet.

These standardised operations fiches are drawn up by thematic expert groups, led by the Technical Association Energy Environment (ATEE) and bringing together stakeholders. The sheets are then reviewed by ADEME and validated by the Ministry of Energy.

¹²⁷ Presentation of the green bonus: <https://www.service-public.fr/particuliers/vosdroits/F36844> <https://www.service-public.fr/particuliers/vosdroits/F36844>

The specific operations make it possible to value the energy savings achieved outside the standardised operations. These correspond to uncommon operations which could not be standardised, in particular as regards defining a lump sum of energy savings certificates to be issued. The applicant must follow six steps for a specific operation:

- Carry out an energy diagnosis;
- Establish the situation prior to the operation;
- Determine the baseline situation and give reasons for its choice;
- Determine the post-transaction forecast by including theoretical energy balances before/after;
- Justify the amount of the certificates applied for and, in particular, the choice of the lifetime of the equipment;
- Justify the calculation of the return on investment time (IRR).

The Environment and Energy Management Agency (ADEME) and the National Centre for Energy Saving Certificates (PNCEE) check the validity and veracity of the requested energy savings.

The Energy Saving Certificates scheme is detailed in the National Energy Efficiency Action Plan (NEEAP) submitted to the European Commission in 2017. The evolution of the mechanism from a logic of lump sums (average obligation) towards a logic of amounts established on the basis of measured energy efficiencies (obligation to achieve results) is under consideration: the introduction of a periodic reassessment on the basis of feedback from the EEC sheets is a first step in this development, which is the main direction of evolution of the EWC regime over the coming years.

3.2.1.2 Expected cumulative and annual savings and duration of the period (s) covered by the obligations

The first four periods of the Energy Saving Certificates (EWC) scheme were marked by a sharp rise in energy saving obligation levels:

- 1stperiod (P1): 54 TWhc out of 2006-2009;
- 2thperiod (P2): 447 TWhc out of 2011 – 2014;
- 3thperiod (P3): 850 TWhc out of 2015-2017, of which 150 TWhc benefited households in energy poverty (this new obligation was introduced as of 1^{January} 2016 by the Energy Transition and Green Growth Act);
- 4thperiod (P4): 2133 TWhc out of 2017-2021, of which 533 TWhc benefited households in precarious situations;
- 5thperiod (P): 3 100 TWhc out of 2022-2025, of which 1 130 TWhc benefits households in precarious situations.

The scheme is currently in its fifth period (P5): 2022 – 2025. Decree No 2022-1368 of 27 October 2022 waives the obligation of P5 to 3 100 TWhc, of which 1 130 TWhc will benefit households in energy poverty.

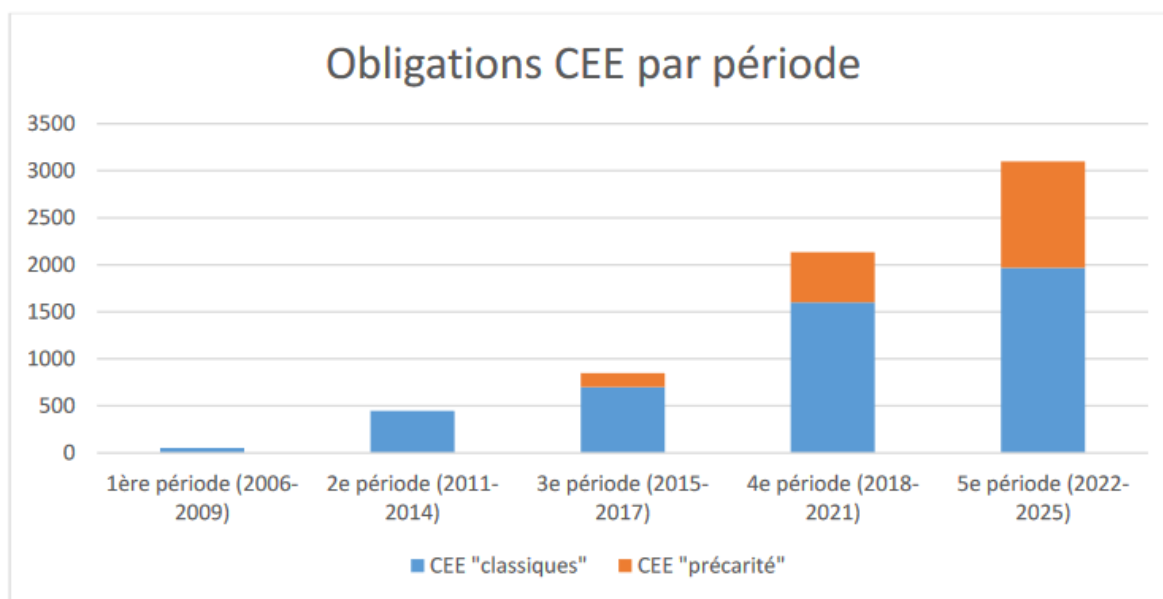


Figure49: Evolution of the level of obligation under the EWC system over successive periods¹²⁸

The cumulative amount of energy savings for the period 2021-2030 should be at least equal to that of the energy savings obligation as notified in paragraph 2.2.2 of this report for the period 2021-2030 under Article 8 of Directive (EU) 2023/1791 (i.e. 1 063 TWh cumulative over the period 2021-2030). The current dynamic is positive as energy savings for the year 2021 amount to 24 TWh while the obligation level for 2021 defined by Directive (EU) 2023/1791 is around 13 TWh.

The two periods covered by the bonds in the period 2021-2030 should have a duration of 4 and 5 years (P5: 2022 – 2025 and P6: 2026 – 2030).

3.2.1.3 Obligated parties and respective responsibilities

The EEC scheme is based on a three-year obligation imposed by public authorities on energy vendors (electricity, gas, fuel, fuel, etc.), described as 'obligated', whose energy sales are above statutory thresholds.

When requesting certificates, obliged sellers must show that they have played an active and encouraging role. In order to prove this, they must be able to produce, in the event of a check:

- a description of the applicant's active and encouraging role,
- evidence that the contribution is direct and was made before the operation started,
- a sworn declaration signed by the beneficiary of the energy efficient operation stating the applicant's active and encouraging role in its execution.

¹²⁸5thEWC Period 2022-2025, Annual Report – Year 2022, Ministries of Energy Transition, accessible at: <https://www.ecologie.gouv.fr/sites/default/files/Bilan%20annuel%20CEE%20P5%20-%202022.pdf>

At the end of the obligation period, obligated energy vendors must prove, subject to a dissuasive penalty, that their obligations have been fulfilled by holding certificates of an amount equivalent to those obligations.

3.2.1.4 Sectors targeted

The aim of the EWCs scheme is to mobilise energy saving opportunities, particularly in the sectors where they are most diffuse. Thus, the system of EWCs concerns all sectors: residential, tertiary, industry, transport and agriculture.

3.2.1.5 Eligible actions foreseen under the measure

According to Section 2 of Chapter I of Title II of Book II of the Energy Code, the allocation of EWCs follows two main principles to ensure the additionality of the scheme:

- Only operations going beyond the regulation at the beginning of the period may give rise to the issue of EWCs;
- The baseline for the calculation of energy savings packages corresponds to the technical and economic state of the market for the product or service at the most recent date for which data are available and incorporating the effect of regulatory developments (notably EU regulations under the ecodesign of energy-related products). In the case of work to improve the heat performance of the outer walls of an existing building or its in-built heating system, the reference situation for energy performance takes into account the general state of buildings of the same type and the level of performance of the material or equipment used on the most recent date for which data are available.

Where an individual initiates actions as part of a specific energy saving operation, these can only be taken into account for the issuance of energy savings certificates if the savings made compensate for the cost of the investment only beyond a minimum payback period (3 years).

3.2.1.6 Alternative policy measures in accordance with Articles 7a and 7b of Directive 2012/27/EU (or Article 9 and 10 of Directive (EU) 2023/1791)

France does not intend to use alternative policy measures as permitted by Articles 7a and 7b of Directive 2012/27/EU for the period 2021-2030 (or Article 9 and 10 of Directive (EU) 2023/1791).

3.2.2 Long-term renovation strategy to support the renovation of the national stock of residential and non-residential buildings, both public and private (4), including policies, measures and actions to incentivise cost-effective deep renovations and policies and actions to target the worst performing segments of the national building stock, in accordance with Article 2a of Directive 2010/31/EU.

A reference in terms of planning remains the long-term renovation strategy to mobilise investment in the renovation of the national stock of residential and commercial buildings, public and private¹²⁹. These elements will be updated with the renovation plans requested in the revision of the Energy Performance of Buildings Directive (EPBD, (EU) 2024/1275).

Compliance with the MEPS (minimum energy performance standards) established for the rental park does not give rise to checks and penalties on the part of the State. However, a tenant occupying an indecent dwelling may

¹²⁹ Long-term strategy of France to mobilise investments in the renovation of the national stock of residential and commercial buildings, public and private – 2020: https://energy.ec.europa.eu/document/download/309d159d-6315-4535-b0af-8c41f249ed2b_en (europa.eu)

bring an action before the court and the court may order the performance of works and reduce or suspend the payment of the rent until such work is carried out. Moreover, indecent housing should not be offered for rental, and should therefore not be referenced in advertisements.

Finally, France continues to encourage energy renovations carried out by private individuals, with the Ma Prime Rénov' (MPR) or Energy Economic Certificates (CEE) schemes. The two systems take advantage of renovations of energy passoires (in particular with the standard operation fiche BAR-TH-174). Since 2024, a single route has now been offered to individuals to benefit from EWCs and the MPR premium. The amount of aid has also been significantly increased to 90 % of the amount of work for households with very modest income owners of energy passoire. In addition, before carrying out their work, households with modest and very modest incomes may receive an advance of 70 % of the premium.

| | PLAFONDS DES DÉPENSES ÉLIGIBLES | MÉNAGES AUX REVENUS TRÈS MODESTES | MÉNAGES AUX REVENUS MODESTES | MÉNAGES AUX REVENUS INTERMÉDIAIRES | MÉNAGES AUX REVENUS SUPÉRIEURS |
|---|---------------------------------|-----------------------------------|------------------------------|------------------------------------|--------------------------------|
| GAIN DE 2 CLASSES | 40 000 € (HT) | | | 45 % (HT) | 30 % (HT) |
| GAIN DE 3 CLASSES | 55 000 € (HT) | 80 % (HT) | 60 % (HT) | | |
| GAIN DE 4 CLASSES OU PLUS | 70 000 € (HT) | | | 50 % (HT) | 35 % (HT) |
| BONIFICATION « SORTIE DE PASSOIRE ÉNERGÉTIQUE » | | +10 % | | | |
| ÉCRÈTEMENT (TTC) | | 100 % | 80 % | 60 % | 40 % |

Figure50: Table of bonus amounts for individuals for the major renovation of their house (MPR + CEE): https://www.anah.gouv.fr/sites/default/files/2024-02/202402_Guide_des_aides_WEBEBA.pdf

Improving energy efficiency in the context of building renovations is mainly based on MaPrimRénov' (MPR) aid and the energy saving certificates (EWC) scheme for the private stock.

The other main measures are:

- **Construction of nearly zero-energy buildings complying with environmental regulation (RE2020) of buildings**, in force since 2020. Its aim is to further improve the energy performance and comfort of buildings, while reducing their carbon impact. Addressed by the Law Evolution of Housing, Planning and Digital (ELAN), RE2020 is structured around three main axes:
 - Improving the energy performance and reducing consumption of new buildings (RE2020 goes beyond the requirement of RT2012, focusing in particular on the performance of insulation regardless of the heating mode installed, by strengthening the requirements on the bioclimatic need indicator, Bbio).
 - Reducing the climate impact of new buildings;
 - Living in a place of living and working adapted to future climatic conditions with the objective of comfort in summer.

- Transforming renovated buildings into nearly zero-energy buildings:
 - For tertiary buildings over 1 000 m², apply energy efficiency obligations to existing tertiary buildings of 40 % in 2030, targeting all sectors of activity and limiting derogations to very specific cases (Eco Energie Tertiaire).
- Energy efficiency of residential stock:
 - Replacement of 300 000 oil boilers and 350 000 old gas boilers per year by low-carbon heating systems;
 - Connection of 300 000 to 360 000 dwellings per year to a district heating network;
 - 400 000 individual houses and 200 000 collective dwellings renovated per year on average over the next decade, with a focus on energy passives;
 - For the social park, in addition to EWCs, specific support measures are provided.
- Energy efficiency of the tertiary park:
 - Progressive reduction of fossil gas in the tertiary park;
 - Reducing the energy consumption of tertiary buildings, in particular through the application of the Eco Energie Tertiaire scheme, appropriate support and increased penalties;
 - Exemplary nature of the public sector.

In view of the recent publication of the Energy Efficiency Directive (2023/1791/EU), which substantially changes the objectives of the Directive currently in force, work is still ongoing to clarify the measures to achieve the objectives set out in the new text.

In order to support the deployment of energy savings in the public sector, the following schemes have been put in place:

- **Provision of a standard contract for the award of a public contract relating to the implementation of an energy performance contract (EPC)¹³⁰.** The claurer contains general administrative provisions (CCAG), special administrative provisions (CCAP), models for public call for tenders and consultation rules, as well as this User Guide.
- **Introduction of a tool to facilitate access to the energy saving certificates system for the State.**

3.3. Dimensionenergy security

Since the previous plan, the war in Ukraine, and the resulting decrease or even stop of Russian gas and oil imports, have put our security of supply under severe strain.

¹³⁰ The standard clauder can be found at the following link: https://lexcity.fr/2022/10/10/publication-du-clausier-cpe-fnccr-fnccr-g_perrin-clausier-cpe-lexcity/

As regards natural gas, the rapid decline in Russian gas exports has created supply tensions at European level. Much of Europe's historically assured supply of Russian pipeline gas has had to shift to liquefied natural gas (LNG) imports per ship.

This has required a short-term reinforcement of our import and storage capacities, but in a reasoned way to avoid investing in infrastructure that will be less useful in the medium term. Similarly, solidarity mechanisms at European level have been put in place.

The next plan reassesses the relevance of gas storage infrastructure in the light of the evolution of our consumption and the new natural gas supply context.

On electricity, the plan will explore and foster the resilience of our electricity system through stress tests. It will also pursue the objective of controlling consumption at the forefront and the development of the available flexibility mix in particular demand management (including consumption modulation, battery storage, pilotable means of production such as STEP pumped power transfer stations) and interconnections. In 2024, France launched a new support scheme by means of a call for tenders open to decarbonised flexibilities (AOFD), i.e. including demand-side response but also storage, approved by the Commission on 21 December 2023 under State aid for the period from 2024 to the first quarter of 2026. Discussions are ongoing to define the design of the next capacity mechanism in order to enable the development, through it, of a target "package of flexibilities" for 2030 and 2035, currently being defined with RTE.

The 2022s and 2023s demonstrated Europe's ability to agree collectively on sanctions and France's ability to clear itself from Russian oil and refined products in particular.

3.3.1 Security of fuel supply

Sanctions on Russian petroleum products:

Following Russia's invasion of Ukraine, the European Union introduced sanctions against Russia. Council Regulation (EU) 2022/879 of 3 June 2022 reinforced these sanctions. This 6th package of sanctions, which entered into force on 4 June 2022, establishes a ban on imports by sea of crude oil or petroleum products originating in or exported from Russia.

The regulation provided for a 6-month transition period for crude oil, which ended on 4 December 2022, and a transition period of 8 months for finished products, which ended on 4 February 2023. During these transitional periods, importers could continue to source Russian petroleum products provided that the long-term contracts had been signed prior to 4 June 2022 and that such contracts had been notified to the European Commission before 24 June 2022. As regards spot contracts, during these transitional periods, they could still be concluded subject to notification to the European Commission 10 days after the vessel was unloaded.

At the end of the transition period, it should be noted that finished products obtained from refining Russian crude oil in a country other than Russia can be imported into the European Union, as indicated by the European Commission in its replies on the application of the sixth package of sanctions.

France's dependence on Russian petroleum products:

France is the 1st^{country} importing diesel in Europe and one of the countries most consuming diesel. Dependence on Russian diesel has been growing sharply since 2017. The proportion of refined products from Russia increased from 25 % in 2017 to more than 35 % in 2021 and may, in some periods of the year, exceed 40 %.

The Atlantic coast is most exposed to an embargo on Russian distillate.

The supply of diesel to Brittany, Rouen and South-West France is by sea. The infrastructure of the oil ports Bordeaux, Brest, Lorient and Rouen has a maximum tanker reception capacity of 35 kt. This vessel format is used for short logistic links between producer and consumer, which in Europe resulted in a quasi-monopoly of the market by Russian vessels and products.

Solutions implemented:

In 2023, with the implementation of the embargo, the supply model changed.

This has led to diversification of supplies and adaptation of infrastructure.

Diversification was monitored and encouraged by the state services throughout the transition period in order to anticipate as much as possible and secure supplies by early 2023. To this end, DGEC has put in place a desensitisation plan. As part of this plan, operators had to mention the origin of the finished products they planned to purchase for 2023.

While in December 2022, 30 % of diesel imports still came from Russia (for economic reasons), in April 2023 0 % from Russia; 47 % of the volumes come from Saudi Arabia. As regards crude oil, no imports from Russia have taken place since September 2022.

Oil vessels come from more distant countries. Their loading capacity is 100 kt the supply chain needs to adapt. These vessels must unload in the largest French ports with suitable infrastructure (Le Havre, for example). Cabotage operations are then necessary to supply ports with a maximum ship reception capacity of 35 kt.

3.3.2 Security of gas supply

Despite the very sharp drop in Russian imports, France did not experience a security of supply crisis in winter 2022/2023, thanks to the resilience of our infrastructure and measures to reduce consumption by businesses and individuals. However, the government remains vigilant. A new floating methane terminal, operational since 15 September 2023 and for a maximum of five years, will increase our capacity to import natural gas and be more resilient to a possible technical failure on a gas infrastructure, especially during periods of high consumption. The projected reduction in gas consumption by the measures taken will make this terminal unnecessary from 2028 onwards.

In the event of a crisis, and where preventive measures are not sufficient to guarantee the supply of natural gas to French consumers, specific devices may be activated. These could lead to depleting or rationalising the consumption of natural gas in order to avoid a widespread or even widespread supply disruption.

3.3.3 Security of electricity supply

The new French energy programme will include:

- Set the conditions for closure, or conversion with a decarbonised fuel, of the latest coal-fired power plants, for an effective coal phase-out by 2027 at the latest, and of fuel oil plants by 2030;
- Remove regulatory disincentives to decarbonise existing fuel oil combustion turbines using biofuel (including hydrotreated vegetable oil), with a particular focus on converting production tools in overseas countries;

- Launch studies and/or pilot sites for the conversion and construction, where appropriate, of other thermal power plants to decarbonised energy sources, paying particular attention to the challenges of biomass availability;
- Continue to encourage consumers to choose incentive pricing offers, promote mobile cutting-edge offers and supply response (EJP/TEMPO type) and support the industry to develop;
- Update the framework for peak and off-peak hours;
- Setting new targets for interconnections in line with projected needs;
- Introduce economic incentives or regulatory obligations for the piloting of new equipment, in particular for water heaters, charging points for electric vehicles and heating or air-conditioning systems (e.g. heat pump), assuming standardisation of home equipment setting practices where appropriate;
- Anticipate the ability of electrolysis projects to be able to run out during peak consumption periods without unduly affecting downstream hydrogen consumption;
- Study the desirability of using other still underdeveloped technologies, such as inertial systems, for example
- Develop mechanisms or incentives to exploit the entire available demand-side response field (explicit, diffuse and industrial, and inseparable response from supply), in order to continue the deployment of modulated tariff offers, in particular at the mobile peak, which has been hired for a year;
- Launch tenders for STEP to reach a minimum of 1.7 GW by 2035;
- Perpetuate the capacity mechanism after 2026 and examine the need for adaptation to it, in particular with regard to the criterion of security of supply in the light of changes in the electricity mix. Base the mechanism on technology neutrality, where all capacities contribute in proportion to their contribution to meeting the security of supply criterion, and make it more efficient and readable for participants.

These initial measures will have to be supplemented and deepened, in particular by means of the analyses of RTE requested by the Government on the security of electricity supply and the flexibility chapter of its forecast balance sheet of 20 September 2023, and more precise assessments of the biomass that can be mobilised.

3.4 Dimension internal energymarket

3.4.1 Energy infrastructures

3.4.1.1 Grid technologies

Measures on electricity grids:

- Take into account the network development costs related to each technology in the allocation of generation capacity targets to be installed and better reflect in the connection tariff the costs of each project for the system, taking into account local flexibility or storage means;
- Continue to implement long-term planning under the supervision of the Energy Regulatory Commission (CRE), through the Ten-Year Transmission Network Development Plan (SDDR) or the Network Development Plans for Public Distribution System Operators, whose control by CRE could be strengthened;
- Provide a framework adapted to anticipating network developments and gradually move from a project-by-project approach to a supply-side approach, in particular in certain dynamic industrial areas in terms of connection, in particular in port areas for the connection of hybrid or electric vessels, or to

accompany the deployment of high-power charging stations or anticipate the development of RNEs in certain areas;

- Ensure that investments are sustainable for network operators and control their impact on the tariff for the use of public networks (TURPE);
- Securing and strengthening the industrial value chain associated with electrical materials and equipment by developing the French and European offer, in particular with a view to drawing up the future TURPE 7, while ensuring that its impact on consumers is kept under control;
- Secure and strengthen the industrial value chain associated with electrical materials and equipment by developing the French and European supply.
- Modernise the network by developing flexibilities and the use of digital solutions while ensuring its resilience to climate change.
- Study the need to adapt the regulatory framework and the principles for grid operation to enable the connection of renewable hybrid installations (PV, wind, storage, H2, consumption)
- Study the arrangements for the development of the project management delegation for connections to the distribution network.

The ten-year transport network development plan to be published by RTE by early 2025 will also set out the objectives for the development and commissioning of interconnections in line with projected needs, in particular as regards projects of common interest.

3.4.1.2 Gas networks

The measures:

- A widening of the equalisation between natural gas distribution networks will make it possible to smooth the impacts associated with reducing methane gas consumption.
- A ban on new natural gas distribution concessions and a framework for the extension of existing networks will limit stranded costs.
- Local consumption reduction planning will have to be carried out over the coming years in order to identify areas where natural gas will no longer be used except at prohibitive costs for consumers, in the light of changes in consumption and the possibilities for substitution by other energy sources.

3.4.1.3 Oil logistics

In order to achieve the objectives mentioned in part 2.4.2, the EPP 3 will provide for an in-depth study on the adaptation of oil infrastructure in order to:

- directing refineries towards active participation in the fight against climate change while seeking to maintain capacities at the level necessary to ensure security of supply (co-processing of crude oil and bio-based oils, Replacement of fossil hydrogen by electrolytic hydrogen, CO2 capture);
- adapting the network to future needs: transport of CO2 and pure sustainable aviation fuels by 2030/2035 in pipelines not used for current fuels;
- adapting deposits to future needs while ensuring security of supply;
- anticipating the grid at service stations.

The EPP 3 will also provide for the introduction of an objective criterion reflecting the network of service stations, which will be monitored, to anticipate the creation of “white areas”.

The 3th National Adaptation Plan, currently under development, could include the study of oil and gas supply and logistics vulnerabilities and the adaptation of transport infrastructure hazard studies to the extent that hazards are updated.

3.4.1.4 Hydrogen infrastructure

France has several projects applying for inclusion in the list of PCI projects for hydrogen.

The French priority for the hydrogen network is its deployment within hubs, and their connection to storage infrastructure, in order to ensure the possibility of decarbonisation for industry as soon as possible. This represents about 500 km of the network. These deployments shall be explored together with the decarbonisation solutions of the main industrial areas. Following the priority development of intra-hub networks and their connection to storage infrastructure, the development of the hydrogen transport network between the hubs will be the second phase of the deployment of the hydrogen network.

Some hubs, in particular close to Dunkirk, will seek cross-border links in the short term.

For the development of hydrogen infrastructure, part of the funding may come from the Connecting Europe Facility (EFC) for projects admitted to the PCI list. For these and other projects deemed relevant, complementary funding mechanisms of the French State or means of mobilising private financing. At the time, no mechanism dedicated to the financing of hydrogen pipelines exists in France.

3.4.2 Energy market

In order to better protect consumers, the following measures should be put in place:

- Complete the reform of the electricity market in order to protect all consumers from market price developments and better reflect the costs of the electricity system in the interest of decarbonisation in the prices they pay. In particular, provide for the post-Arenh nuclear regulatory framework or lay down the basic principles thereof and guarantee a cost of financing new competitive nuclear reactors in order to ensure that all French consumers have access to the costs of the national nuclear power plant;
- Encourage suppliers to pursue a prudent and long-term sourcing practice, including a minimum share of long-term products to be established with the help of CRE;
- The arrangements for the development of the energy voucher after the abolition of the housing tax are being studied. Improvements to the scheme could also be explored as part of this reform. The partnership between the DGEC and the French Services houses since 1 January²⁰²⁴ has made it possible to increase information and support for beneficiary households to facilitate the use of the energy voucher and associated rights.

3.4.3 PReEnergy ecarity

The EPP 3 will include:

- To address the need to support the most vulnerable consumers, mobilise the financial resources needed for the transition;

- Work will be launched to be able, in the event of a new price crisis, to deploy new targeted arrangements for exceptional household protection, also in connection with the reform of the electricity markets;
- In order to support small households in the energy transition, aid for small households may be mobilised (e.g.: energy cheque). For example, some current schemes for increased support for small households (MaPrimeRénov ') or targeted at them (energy poverty obligation in the EEC scheme)

3.5 French regional research for innovation, deployment of new technologies and competitiveness

3.5.1 Industrial challenges and competitiveness of the energy system

EPP 3 will include the following measures:

For solar:

- Implementation of the Solar Reindustrialisation Pact, signed in April 2024 by more than 30 companies and federations in the sector, which contains commitments:
 - The sector in terms of **local project content** and solidarity between stakeholders, **training and the number of jobs** created by 2030, social and environmental **exemplary**;
 - From the State, **in order to promote the social and environmental exemplary role in public support** schemes (invitations to tender, desks, etc.) and in public procurement, accompanied by **targets for the industrial production of photovoltaic components**;
- Creation of an indicator on the model of the solar core for Made in France and made in Europe to highlight those with real French and European added value of panels and to enhance the value of emerging players in the sector.

For offshore wind:

- Continuation of the actions of the Offshore Wind Pact signed in 2022;
- Implementation of calls for projects for industrialisation and development of port infrastructure under France 2030;
- Drawing up a roadmap on adapting ports to the needs of floating wind power.

For biomass, geothermal, and heat pumps:

- Launch of a call for projects to strengthen our energy sovereignty and the production of pellets in France to ensure that they come from alternative resources or for priority uses;
- Exploit the French 2030 calls for projects to relocate key components for heat pumps;

Implementation of the geothermal action plan for the development of geothermal energy in France, overseas countries and exports.

3.5.2 French strategies for investment in low-carbon technologies

The France 2030 plan consists of several ‘Strategies nationale d’Accélération’ (SA), which set out the means and measures associated with achieving the various sectoral objectives described in point 2.5.

SAs enable the State, in cooperation with economic, social and local players, to identify the main economic and technological challenges of the future in order to define its investment priorities. They target priority sectors, markets or technologies, so as to invest exceptionally and comprehensively (financing, standards, taxation, etc.). Each strategy sets out development objectives on key technology bricks, concentrating research and industry efforts towards the creation and consolidation of sectors contributing to French carbon neutrality. The implementation of a strategy mainly results in the launch of calls for projects and calls for expression of interest within each relevant action. These selective procedures are managed by the operator in France 2030 which is the highest among the Agence Nationale de la Recherche (ANR), Bpifrance, the Caisse des dépôts et Consignations (CDC) or the Environment and Energy Management Agency (Ademe).

In line with the ambition to drive real sectoral transformations from research to large-scale deployment, the French Acceleration Strategies 2030 accompany industrialisation projects in the same way as those for the design of innovative products. By supporting key stages of development depending on the maturity of innovations, AS promote a better link between upstream and downstream of the deployment of a technology. The SAs include a Programme and Priority Research Equipment (PEPR) to target technological locks prior to the introduction of a demonstrator (TRL 1 to 4) on the innovative sector in question.

- The **‘decarbonised hydrogen’ SA** supports the creation of a competitive renewable and low-carbon hydrogen sector, in order to make France one of the world leaders in hydrogen decarbonised by electrolysis. This vector offers key solutions for the decarbonisation of industry and heavy mobility sectors.
- **Innovative Nucl Emission SA** supports the development of modular nuclear reactors, supports the emergence of new technologies and actors, develops innovative solutions for the management of radioactive materials and waste, studies and develops the technical options offered by multi-recycling into pressurised water reactors (MRREP), and supports the sector’s innovation efforts through the deployment of efficient and refurbished research tools.
- The **“Decarbonation of Industry” SA** promotes the development of disruptive technologies to be integrated into industrial processes. The strategy therefore accompanies existing solutions, with the aim of scaling up, industrialisation and deployment, and projects for the demonstration, patenting and commercialisation of an innovative solution. It targets a coherent set of technologies, through improved energy efficiency of processes, decarbonisation of the energy mix of industry, deployment of decarbonised processes and carbon capture, storage and recovery.
- **Batteries SA** supports research, innovation and industrialisation of automotive batteries, materials and components essential for the manufacture of these batteries, as well as batteries and systems for other relevant markets (aeronautics, space, electric buses, special appliances, stationary storage, etc.). It also supports the development of a recycling and repackaging sector and, in connection with the ‘recyclability, recycling and reincorporation of materials’ SA, the recycling of these batteries, in particular lithium-ion. The strategy includes complementary components designed to capitalise on the strengths of this national supply, to support demand by accelerating the transition in the field of transport and to meet the high recruitment and training needs of the sector.

- The **‘Advanced Energy Systems’ SA (tase)** aims to promote the development of a French sector of new energy technologies capable of meeting current and future global demand for the growing development of renewable energies and the electrification of uses. The strategy identifies three priority sectors: photovoltaic, floating wind and energy networks.
- The **Sustainable City and Innovative Buildings SA** is part of a desire to overhaul urban development at a time of climate change, as part of a co-construction process with all relevant stakeholders. The strategy aims to develop innovative and effective design tools and methods in an integrated sustainable and resilient city approach. Low construction technologies and processes, promoting energy efficiency and the use of low-carbon materials, are particularly monitored.
- **‘Greening the digital’ SA** aims to improve knowledge of the various impacts of digital on the environment, so as to give France the means to reduce these impacts, in particular on GHG emissions and energy consumption. This strategy suggests that the development of cheaper digital products and services represents an opportunity for French and European stakeholders, and requires ambitious R &D.
- The **‘Digitalisation and Decarbonisation of Mobility’ SA** aims to step up French R &D in the mobility sectors, in particular road mobility, to reinvent modes of travel that are more environmentally friendly and adapted to users’ needs. Focusing on intermodality and deployment in the territories, the strategy covers the mobility of passengers and goods.
- The **SA ‘Bio-based Products – Sustainable Fuel for Fuel’** aims to promote the development of industrial biotechnology in France and the manufacture of bio-based products, in particular as a substitute for petro-based products. This includes fuels derived from sustainable resources: biofuels (from agricultural, forest or algal biomass) and synthetic fuels produced from renewable energy.

In addition, in June 2023 the government consulted its main strategic lines of support for the development of **CCUS technologies**. This strategy aims to accompany the industrial deployment of carbon capture, utilisation and storage solutions, in line with industrial needs and the capacities offered by French infrastructure.

The related innovation challenges for the energy transition: skills, recyclability, reindustrialisation

As France finalises its path towards achieving carbon neutrality, its strategic approach is evolving by encompassing challenges indirectly linked to the reduction of the country’s GHG emissions.

Firstly, France anticipates the evolution of material supply constraints by supporting the development of recycling, repair and re-use of products. The idea is to avoid the collapse of an energy transition, the purpose of which would be to move from one dependence (fossil fuels) to another (materials, which are increasingly scarce and produce energy, consume water and natural areas).

The SA on Recyclability, Recyclability and Reincorporation of **Recycled** Materials is a first step to develop more efficient recycling solutions, in particular for critical metals needed for the energy transition. The strategy extends to training and skills development, as well as industrial deployment, in particular the deployment of industrial battery recycling units and the adaptation of the industrial tool to reintegrate recycling raw materials into new production cycles.

The large-scale deployment of innovative technologies also requires anticipating the need to adapt training and the availability of labour. The skills challenge is fundamental to ensure a just and effective transition: France 2030 plan is a first step by unlocking significant resources to develop the training offer for the transition professions. The call for expression of interest 'Skills and professions of the future' (CEI CMA) supports the emergence of talent and the adaptation of training to the skills needs of the new sectors. Operated by the ANR and the Caisse des dépôts, it has EUR 2.5 billion in France 2030: it makes a strong contribution to the training of talent on the objectives and levers France 2030, with a high priority for decarbonisation industries.

On the one hand, the AMI (Skills and Future Occupations) finances skills and training needs diagnostics by sector at different levels (employment area, region, country). On the other hand, CMA supports the deployment of training courses identified as having the potential to contribute to the success of the objectives of France 2030 (mentioned in 2.5.).

Finally, in order to ensure that these objectives are met, France's energy research and innovation policy must actively and effectively mobilise the private sector. France 2030 acts as an accelerator of the private sector's R & I efforts on the most strategic sectors for the country's economic future. Companies of all sizes (GE, ETI, SMEs, startups) are at the heart of France 2030 as stakeholders in the National Acceleration Strategies.

Other measures complement the French State's support for research and innovation efforts by the private sector for the energy transition. In particular, France has a system of tax credits which encourages initiative in the field of R & I and strengthens the links between public research and industry. Examples include the research tax credit (CIR), the innovation tax credit (CII), the tax credit for collaborative research (CICO), and the Industrial Research Training Conventions (CIFRE), which allow companies to receive financial support to recruit a doctoral degree in their research work. These measures will be complemented by the 2024 budget law introduced a new tax credit for green industries (C3IV) to encourage companies to carry out new industrial projects in four key sectors of the energy transition: batteries, wind, solar panels and heat pumps.

These investments, combined with funding mechanisms at European level, enable large-scale projects to be carried out. The opening up of the first gigafactories (electrolysers, wafers, batteries, etc.) in France is a sign of a progress in the French reindustrialisation project on key technologies, and of the increasing integration of the industrial stages of the low-carbon energy value chains.

Digital and energy transition

France visualises the challenges of the digital transition and those of the energy transition as intrinsically linked, as digitalisation is a factor that exacerbates climate change, in particular by increasing electricity consumption. However, it could at the same time contribute to the decarbonisation of other sectors.

Most of France's 2030 Acceleration Strategies are based, to different degrees, on digital solutions to optimise our use of low-carbon energy. In the sectors of low-carbon hydrogen, batteries, renewable energy or decarbonisation of industry, projects financed by France 2030 may have high levels of complexity in their implementation, which may require digital support. The advanced technologies for energy systems (tase) strategies include advanced digital solutions. For example, it identifies energy networks as one of the strategic sectors to which research and innovation investments are directed: however, electricity grids have to cope with the increasing complexity caused by the massive integration of intermittent renewable energies and the parallel development of new flexibility solutions. Therefore, the calls for projects under the strategy tap the development of smart solutions to exploit the electricity grids of the future.

The Digitalisation and Decarbonisation of Mobility strategy establishes a direct link between energy and digital in the transport sector: to continue and initiate the profound transformations that mobility needs to face in an energy transition, the strategy explores the potential of digital to reinvent more environmentally friendly modes of transport.

France 2030 identifies a “prerequisite for achieving” the programme’s objectives (see 2.5.) directly linked to digital. The Condition 3 calls on France to step up its efforts to master sovereign and secure digital technologies. This condition enshrines the need for trusted, efficient and innovative digital solutions to meet the challenges of today and tomorrow.

Finally, France is at the forefront of assessing and reducing the digital environmental footprint, with a dedicated strategy. ‘Greening the digital’ SA aims to improve knowledge of the various impacts of digital on the environment, so as to give France the means to reduce these impacts, in particular on GHG emissions and energy consumption. This strategy suggests that the development of cheaper digital products and services represents an opportunity for French and European stakeholders, and requires ambitious R & D. The ‘SPIN’ Programme and Priority Research Equipment (PEPR), led by the CNRS and the CEA, is in line with the ‘Digital greening’ SA, proposing to explore the possibilities offered by spintronics to implement digital solutions placing energy frugality as an essential performance criterion.

A European and international framework

The French research and innovation strategy for the energy transition is part of a European and international framework.

At European level, France is actively participating in the Strategic Energy Technology Plan (SET-Plan), the aim of which is to establish a Community cooperation policy to accelerate the development and deployment of low-carbon technologies. The coordination of European R & I policies is essential for the development of decarbonisation solutions and for preserving the competitiveness of the various Member States in the context of the energy transition. Of the 14 sectoral working groups defined by the SET-Plan, France leads the group on batteries, and co-directs the group on nuclear safety. In these working groups, as in all those in which France is a party, the French national research and innovation programme is in line with those of the other Member States.

France also participates in the Horizon Europe programme, in particular Cluster 5 of the second pillar ‘Climate, Energy and Mobility’. France also supports the European Institute of Innovation and Technology (EIT), in particular within the thematic Knowledge and Innovation Communities (KICs). The KICs ‘Climate’, ‘InnoEnergy’ and ‘Raw Materials’, which offer international communities of expertise in which French laboratories are involved.

At international level, France participates in the Mission Innovation initiative, alongside 24 other States. Mission Innovation enables France to strengthen its cooperation with the Member States on the R & D actions needed for the energy transition. At the same time, France encourages the development of international collaborations on research, particularly in the field of energy. It participates in the Technology Collaboration Programmes (TCP) of the International Energy Agency (IEA), which enable governments and companies in 55 countries to carry out collaborative projects on a wide range of energy technologies and related issues. Initiatives such as the International Atomic Energy Agency (IAEA), the International Renewable Energy Agency (IRENA) and the International Hydrogen and Fuel Cell Partnership (IPHE) also feed into French research and innovation programmes in the strategic sectors of the energy transition. These multilateral bodies make it possible to

establish a continuous dialogue between French and international laboratories so that they converge towards common objectives.

SECTION B: ANALYTICAL BASE

The Directorate-General for Energy and Climate is building energy and climate scenarios:

- The scenario “With Existing measures” aims to assess the effect of the policies and measures in place on the energy consumption and greenhouse gas trajectories.
- The scenario “With Supplementary Measures” aims to **describe a target trajectory for reducing greenhouse gas emissions up to the 2030 targets and reaching carbon neutrality in 2050.**

This comprehensive modelling exercise of our economy, our energy supplies, the availability of the various resources, their economic close, and emissions **is based on a set of sectoral modelling** using internal tools and external services (CIRED, Solagro, Enerdata, etc.). See details in part 5.1.1

Parts 4 and 5 are based on the latest scenarios constructed:

- Part 4 is based on the scenario ‘AME 2023’, constructed in winter 2022-2023 and reported to the Commission in spring 2023.
- Part 5 is based on the scenario “AMS run 2” by 2030 built in summer 2023.

These scenarios are being updated (AME 2024 and AMS run 3 by 2050).

4. CURRENT SITUATION AND PROJECTIONS WITH EXISTING POLICIES AND MEASURES

4.1. Projected evolution of the main exogenous factors

4.1.1 *Macroeconomic forecasts (GDP and population evolution)*

The following hypotheses were used:

- Population

For the population, the assumptions taken are those for the central scenario 2021 of the Insee (National Institute of Statistics and Economic Studies) population projections.

| Population projections | | | | | | | | |
|------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| million hab | 2018 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
| France as a whole | 66,99 | 67,29 | 67,96 | 68,55 | 68,98 | 69,23 | 69,28 | 69,21 |
| <i>Metropolis</i> | 64,85 | 65,14 | 65,77 | 66,34 | 66,73 | 66,93 | 66,95 | 66,84 |
| <i>Beyond sea</i> | 2,14 | 2,15 | 2,18 | 2,22 | 2,25 | 2,29 | 2,33 | 2,37 |

Table5: Projected population trends, Source: INSEE, 2021

- Economic growth

The scenario taken is the framing of the European Commission, adjusted by the difference in population path (the latest population projections by INSEE lead to lower population growth than the EU scoping).

| GDP growth rate | | | | | | | | |
|-----------------|------|------|------|------|------|------|------|------|
| % | 2019 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |

| | | | | | | | | |
|------------|------|--------|------|------|------|------|------|------|
| GDP growth | 1,80 | — 8,00 | 0,87 | 0,98 | 1,25 | 1,54 | 1,50 | 1,45 |
|------------|------|--------|------|------|------|------|------|------|

Table6: GDP growth rate

4.1.1.1 Sectoral changes that may have an impact on the energy system and GHG emissions

In particular, such changes are not identified.

4.1.1.2 Global energy trends, international fossil fuel prices, EU ETS carbon price

The price trajectories of imported fossil fuels (in particular oil prices and imported gas prices) and the price trajectory of the ETS stem from the European Commission's 'Recommended parameters for reporting on GHG projections in 2023' of May 2022.

| | Fuel and gas import price (in constant EUR/boe 2020) | | | | | | | |
|----------------------------------|--|------|------|------|------|------|-------|-------|
| | 2019 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
| Oil (Brent crude oil) | 57,7 | 36,8 | 87,6 | 87,6 | 87,6 | 92,6 | 100,5 | 111,5 |
| Coal (CIF ARA 6000) | 11,8 | 9,1 | 17,4 | 17,7 | 17,8 | 18,9 | 19,8 | 20,8 |
| Gas (NCV, CIF average EU import) | 25,6 | 17,6 | 75 | 64,2 | 64,2 | 64,2 | 64,2 | 67,1 |

Table7: Imported oil and gas prices

| | EU ETS carbon price | | | | | | | |
|---|---------------------|------|------|------|------|------|------|------|
| | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
| Euro constant EUR 2013/tCO ₂ | 7,5 | 15 | 22,5 | 33,5 | 42 | 50 | 69 | 88 |

Table8: Price of carbone in the EU ETS

| Current Euro (EUR/hL HTT) | Assumptions for changes in fuel prices (diesel and gasoline e10) in France by 2050 | | | | | | | |
|---------------------------|--|-------|-------|-------|-------|-------|-------|-------|
| | 2019 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
| Diesel | 45,13 | 29,59 | 68,28 | 68,28 | 68,28 | 72,21 | 78,37 | 87,5 |
| Essence | 41,71 | 26,3 | 63,1 | 63,1 | 63,1 | 66,73 | 72,43 | 80,87 |

Table9: Projected changes in fuel prices

4.1.1.3 Evolution of technology costs

Cost of electric vehicles

The evolution of battery costs for cars and light commercial vehicles is based on the assumption of a decrease in battery cost per kWh until 2030 and stability until 2050.

| | Changes in the cost of batteries | | | | | | | |
|------------------------------------|----------------------------------|------|------|------|------|------|------|------|
| | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
| EUR constant EUR/kWh battery | 320 | 200 | 150 | 100 | 100 | 100 | 100 | 100 |

Table10: Projected changes in the cost of batteries

4.2. Decarbonisation dimension

4.2.1 *Greenhouse gas emissions and removals*

4.2.1.1 *trends in current GHG emissions and removals*

Trends by sector of activity

The table and graph below show the historical evolution of greenhouse gas emissions and removals in France (scope of the Kyoto Protocol) between 1990 and 2022, by major sector of activity and then sub-detailing the energy sector (CRF categories), based on the 2024 inventory. Emissions from transport and buildings are reflected in the energy sector.

| | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2022/ 1990 |
|--|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------------|
| 1 Energy | 367,27 | 365,26 | 381,02 | 387,49 | 381,38 | 388,94 | 264,35 | 285,96 | 276,34 | — 25 % |
| 2 Industrial processes and use of products | 75,18 | 68,51 | 62,42 | 61,33 | 62,52 | 62,34 | 39,98 | 42,32 | 38,26 | — 49 % |
| 3 Agriculture | 78,14 | 75,39 | 78,62 | 78,34 | 76,86 | 73,71 | 67,43 | 66,04 | 63,65 | — 19 % |
| 4 LULUCF | — 18,29 | — 22,43 | — 23,06 | — 37,57 | — 47,31 | — 51,93 | — 21,35 | — 19,05 | — 18,50 | 1 % |
| 5 Waste | 17,25 | 20,30 | 21,48 | 21,71 | 21,92 | 22,03 | 16,91 | 16,46 | 16,57 | — 4 % |
| Total (excluding LULUCF) | 537,84 | 529,46 | 543,55 | 548,87 | 542,68 | 547,03 | 388,66 | 410,79 | 394,83 | — 27 % |
| Total (with LULUCF) | 519,55 | 507,03 | 520,49 | 511,30 | 495,37 | 495,10 | 367,31 | 391,75 | 376,33 | — 28 % |

Table11: Emissions and removals of greenhouse gases between 1990 and 2022 in MtCO₂e, Kyoto perimeter, Source: CITEPA/MTES, submission 2024, UNFCCC/FIU format – Kyoto perimeter

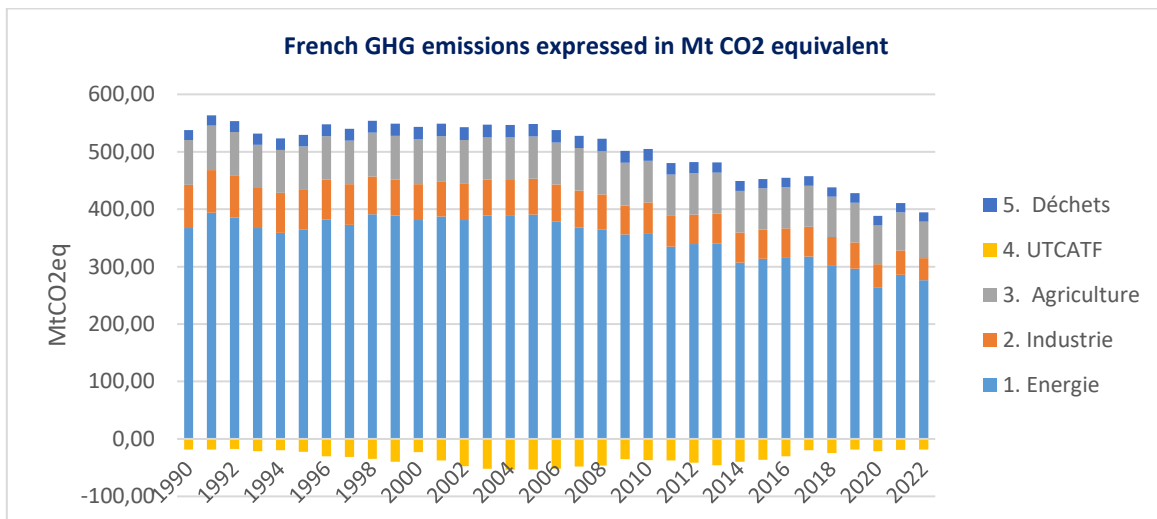


Figure51: French GHG emissions, Source: CITEPA/MTES, submission 2024, UNFCCC/FIU format – Kyoto perimeter

In 2022, France’s greenhouse gas emissions (excluding LULUCF) amounted to 394,8 MtCO₂e. They decreased by 27 % compared to 1990. French emissions per capita on the same perimeter increased from 9,3 tCO₂eq to 5,8 tCO₂eq between 1990 and 2022, i.e. a reduction of 37 %.

Energy use is the main source of greenhouse gas emissions in France, accounting for 70 % of emissions in 2022. For emissions from energy combustion, the most emitting sector is transport (46 %), followed by ‘other sectors’ (according to the CRF classification) including energy emissions from residential, tertiary and agriculture (24 %).

Details for the different energy sub-sectors (CRF categories) in MtCO₂e:

| | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 |
|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Energy industry | 66,30 | 67,77 | 68,85 | 56,60 | 53,02 | 55,76 | 60,48 | 56,91 | 69,47 |
| Handling industry and construction | 64,50 | 77,52 | 67,45 | 64,56 | 65,53 | 67,89 | 69,92 | 67,94 | 67,09 |
| Transport | 121,91 | 124,55 | 129,09 | 129,13 | 130,21 | 132,08 | 133,82 | 136,32 | 138,57 |
| Other sectors (residential, tertiary, agriculture) | 102,77 | 112,50 | 108,77 | 105,36 | 98,36 | 97,75 | 107,14 | 101,66 | 106,25 |
| Fugitive emissions | 11,79 | 11,51 | 11,67 | 11,66 | 12,02 | 11,78 | 10,56 | 9,84 | 9,66 |

Table12: Emissions from energy sub-sectors

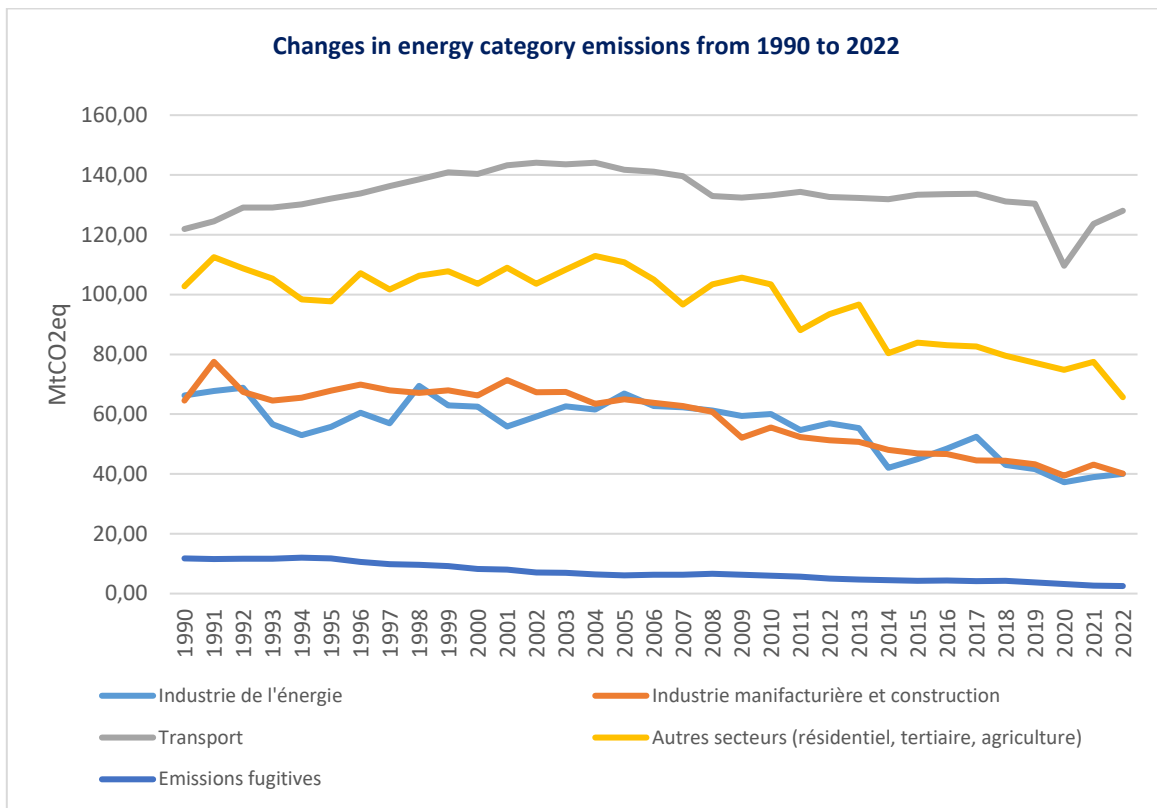


Figure52: Changes in energy category emissions from 1990 to 2022

Trends in emissions from the ETS and ESR sectors

The table and graph below show the evolution of GHG emissions from the ETS and ESR sectors between 2005 and 2021. It should be noted that ETS emissions between 2005 and 2012 include verified emissions and an estimate to reflect the current scope of the ETS in order to be able to compare the evolution of these emissions over time.

| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| ETS | 153,2 | 148,1 | 147,1 | 138,7 | 124,7 | 127,5 | 116,8 | 114,4 | 114,6 | 100,3 | 99,7 | 101,7 | 106,8 | 97,5 | 94,3 | 82,1 | 87,6 |
| ESR | 397,2 | 391,7 | 382,7 | 385,7 | 378,2 | 379,4 | 365,0 | 369,1 | 368,4 | 350,8 | 354,8 | 354,6 | 352,1 | 342,9 | 336,8 | 310,2 | 327,2 |

Table13: Greenhouse gas emissions from the ETS and ESR sectors in MtCO₂e

* includes the scope correction for the years 2005 to 2012

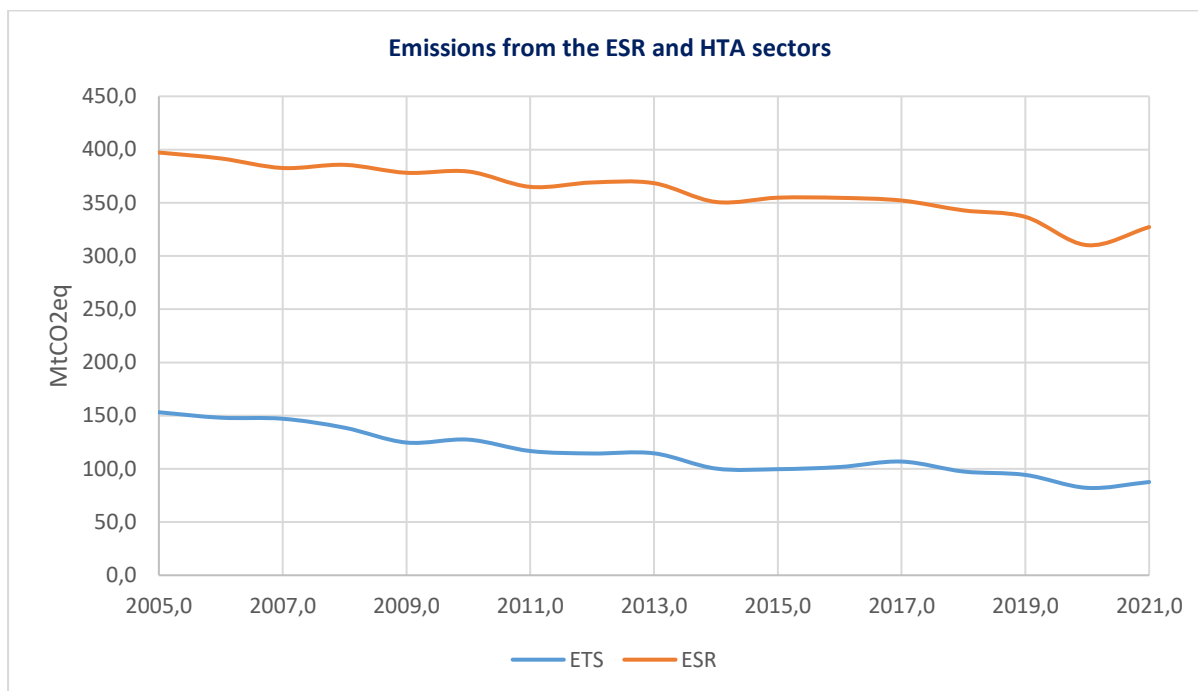


Figure53: Emissions from the ESR and HTA sectors

Emissions from the ESR sector decreased by 17.6 % between 2005 and 2021. ETS emissions (with a constant perimeter of the third period) decreased by 42.8 % over the same period.

4.2.1.2 Sectoral emission projections with existing Union and national policies and measures until at least 2040 (including for the year 2030)

France conducted a forward-looking scenario exercise between September 2021 and December 2022 with the revision of France’s trend trajectory for greenhouse gas emissions until 2050 (‘scenario with existing measures’ or AME 2023) as part of the European reporting (Article 18 of the Regulation on the Governance of the Energy Union and Climate Action). This new trajectory incorporates the latest available data, as well as the impact of policies and measures adopted until 31 December 2021.

General results

The table and graph below show the historical and projected evolution of GHG emissions (Kyoto perimeter) in the AME scenario. Excluding LULUCF, the emission reduction is:

- 36.8 % between 1990 and 2030
- 50 % between 1990 and 2050.

| CO2e emissions (Mt/year) Scope: Kyoto | 2018 | 2019 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | | | | | | | | | |

| | | | | | | | | | |
|---------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| National total excluding LULUCF | 438,3 | 428,2 | 388,7 | 377,1 | 343,6 | 315,1 | 292,8 | 276,3 | 270,8 |
| National Total with LULUCF | 413,9 | 409,6 | 367,3 | 341,2 | 302,9 | 278,2 | 257,0 | 244,9 | 243,9 |

Table14: Historical and projected GHG emission trends in the AME scenario in ktCO₂e

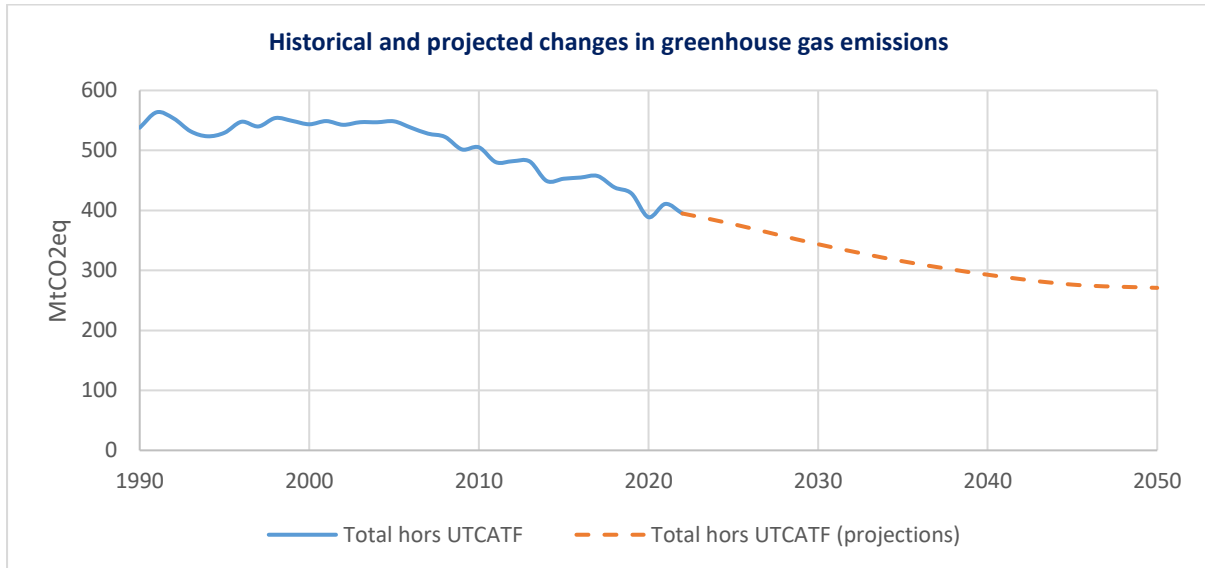


Figure54: Historical and projected changes in greenhouse gas emissions (excluding LULUCF) – AME scenario, Source: Kyoto scope inventory, CITEPA/MTES, submission 2024 and emission projections AME MTE scenario, 2023

Results by sector of activity

The tables and graphs below show the breakdown by sector of activity of France’s emission projections, initially by major sector of activity and then by sub-detailing the energy sector. The results shall be presented using the FIU categories defined in the IPCC Guidelines for National GHG Inventories.

| ktCO ₂ eq | 1990 | 2010 | 2015 | 2018 | 2019 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Energy | 367 268 | 358 248 | 335 138 | 339 435 | 339 661 | 306 850 | 253 832 | 226 481 | 204 826 | 187 455 | 175 327 | 173 651 |
| Industrial processes, | 75 177 | 53 744 | 53 282 | 51 153 | 52 890 | 52 329 | 37 569 | 33 215 | 29 775 | 27 640 | 25 763 | 23 903 |
| Agriculture | 78 141 | 72 238 | 71 960 | 71 800 | 71 007 | 72 597 | 68 908 | 68 145 | 66 997 | 65 852 | 64 709 | 63 959 |
| LULUCF | — 18 289 | — 36 640 | — 37 710 | — 41 205 | — 46 028 | — 39 688 | — 23 134 | — 22 804 | — 19 471 | — 18 348 | — 17 116 | — 15 674 |
| Waste | 17 251 | 20 921 | 20 016 | 19 633 | 17 954 | 17 252 | 16 788 | 15 793 | 13 539 | 11 833 | 10 458 | 9 329 |

| | | | | | | | | | | | | |
|--------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Total (excluding LULUCF) | 537 837 | 505 152 | 480 397 | 482 022 | 481 511 | 449 028 | 377 098 | 343 634 | 315 137 | 292 779 | 276 258 | 270 842 |
| Total (with LULUCF) | 519 548 | 468 511 | 442 687 | 440 817 | 435 484 | 409 340 | 353 964 | 320 830 | 295 666 | 274 431 | 259 142 | 255 168 |

Table15: Historical and projected GHG emission trends in the AME scenario by major sector of activity (ktCO2e)

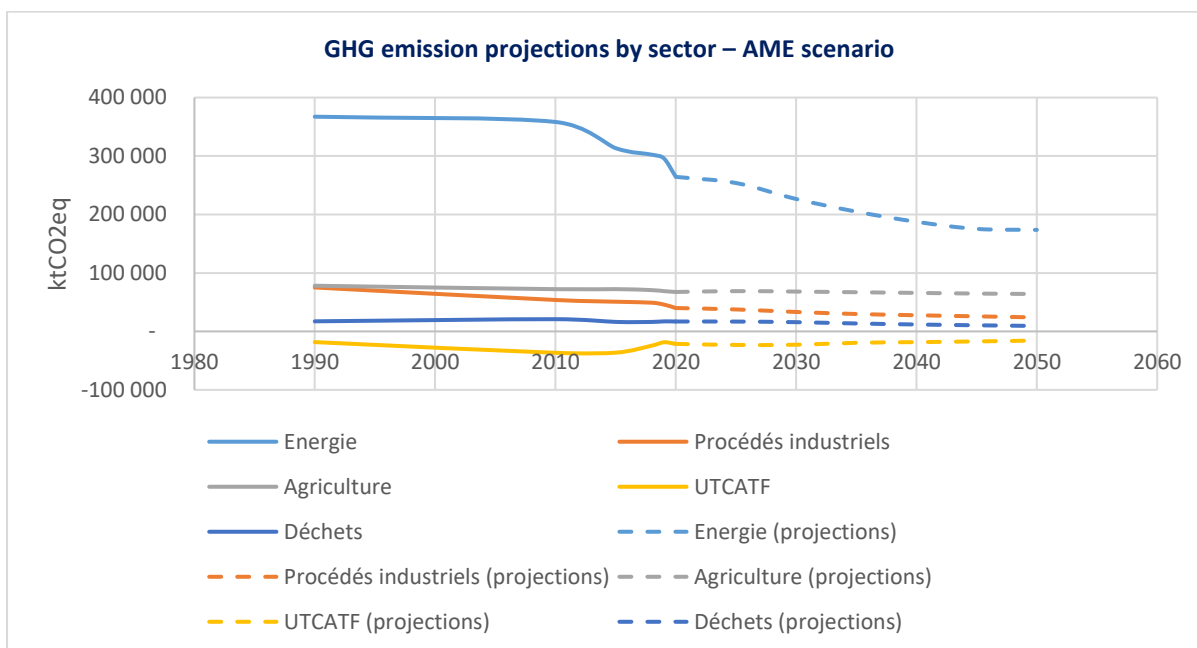


Figure55: Sector projections – AME scenario

| | 1990 | 2010 | 2015 | 2018 | 2019 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|--|---------|---------|---------|---------|---------|---------|---------|---------|--------|--------|--------|--------|
| Energy industry | 66 302 | 60 093 | 44 959 | 43 031 | 41 639 | 37 239 | 27 678 | 28 088 | 27 470 | 26 881 | 26 560 | 32 327 |
| Manufacturing industries and construction | 64 496 | 55 541 | 46 911 | 44 448 | 43 194 | 39 433 | 37 388 | 35 474 | 33 879 | 32 423 | 31 003 | 29 393 |
| Transport | 121 908 | 133 180 | 133 401 | 131 091 | 130 420 | 109 636 | 118 401 | 102 014 | 89 350 | 78 967 | 73 035 | 70 871 |
| Other sectors (residential, tertiary, agriculture) | 102 773 | 103 459 | 83 878 | 79 538 | 77 192 | 74 871 | 66 003 | 56 691 | 50 314 | 45 916 | 41 578 | 37 971 |
| Fugitive emissions | 11 790 | 5 975 | 4 312 | 4 225 | 3 727 | 3 168 | 4 361 | 4 213 | 3 813 | 3 267 | 3 151 | 3 089 |

Table16: Details of energy sector categories (ktCO2e)

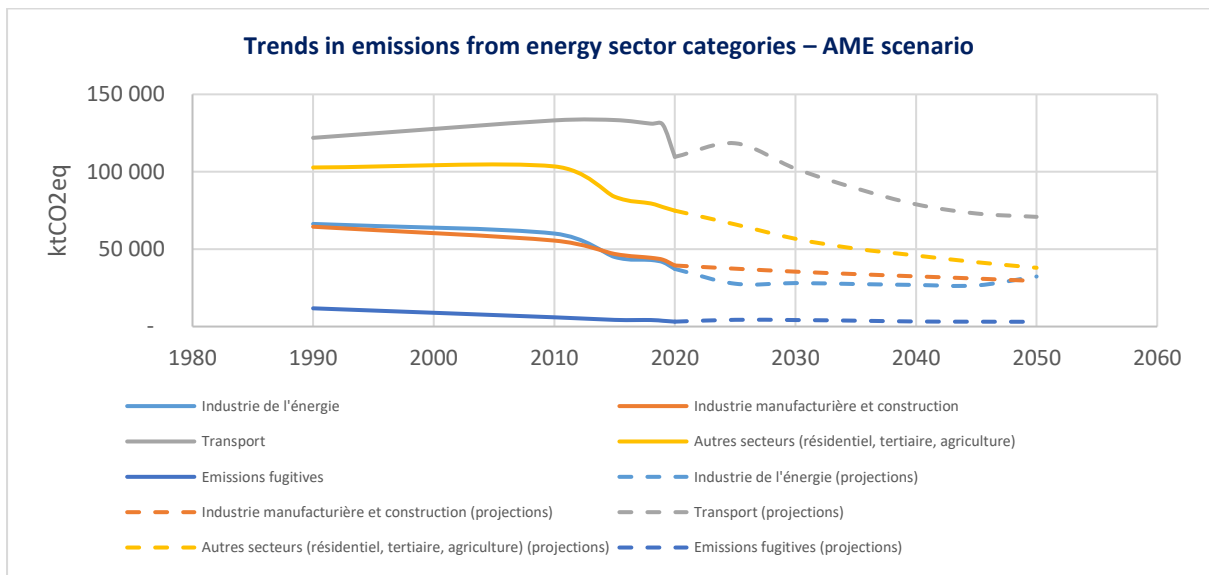


Figure56: Details of energy sector categories – AME scenario

Previous graphs show that existing measures reduce or stabilise emissions from different sectors of activity.

In particular, existing measures allow for:

- a decrease in transport emissions (energy emissions) by 24 % in 2030 and 47 % in 2050 compared to 2015.
- a sharp decrease in emissions from the residential/tertiary sector. Emissions from the other energy sectors including residential, tertiary and agriculture (which accounts for a minor share of the category) decrease by 32 % in 2030 and by 55 % in 2050 compared to 2015;
- a reduction in emissions from the manufacturing sector by 24 % in 2030 and 37 % in 2050 compared to 2015;
- a reduction in emissions from industrial processes, agriculture (excluding energy) and waste treatment by 35 %, 6 % and 3 % respectively between 2015 and 2030 and 53 %, 12 % and 43 % between 2015 and 2050.
- a reduction in greenhouse gas removals of 37 % in 2030 and 57 % in 2050 compared to 2015 levels.

Results of AME projections for the ESR sector

The AME projections were broken down into ETS and ESR emissions in order to assess the achievement of France's European targets in the AME scenario.

The figure below shows the total emission projections, the ESR emission projections, as well as the annual emissions allocations of the Effort Sharing Decision (ESD) and the target set by the Effort Sharing Regulation (ESR) in 2030 for France (a reduction of 37 % compared to 2005, or approximately 248 MtCO₂e in 2030).

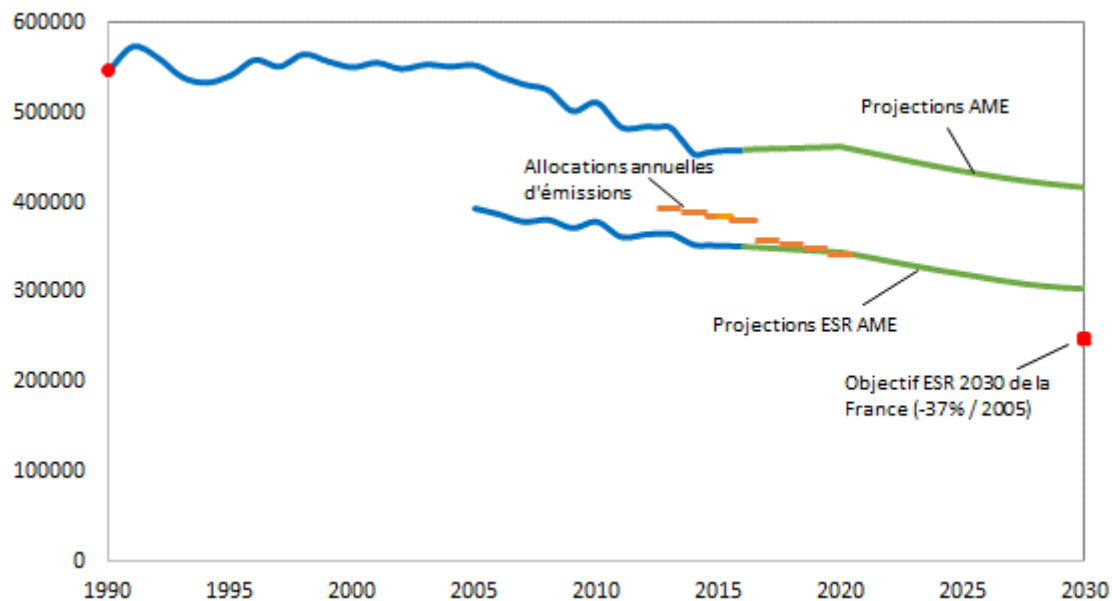


Figure 57: Projections of the AME scenario for ESR

In 2020, the projected ESR emissions of the AME scenario amount to 345 449 ktCO₂e, which is very slightly above (+ 0.3 %) the annual emission allocation of the Effort Sharing Decision for France in 2020 (344 300 ktCO₂e). According to projections, and in view of the surplus annual emission allocations accumulated since 2013, the existing measures therefore enable France to comply with the Effort Sharing Decision in 2020.

In 2030, the projected ESR emissions of the AME scenario reach a level of 303 378 ktCO₂e, which is around 21 % above the 2030 ESR target for France. The existing measures (i.e. those taken on 31 December 2021) therefore do not allow France to comply with the provisions of the Effort Sharing Regulation (ESR) for 2030. This is why the government has since started ecological planning, which provides additional pathways and concrete measures to achieve them.

4.2.2 Low carbon energy

The share of renewable energy in final energy consumption increased to 20.5 % in 2022, showing a net acceleration compared to 2021 (+ 1.1 %), and putting France at a level comparable to its main European partners, in particular Germany. It amounts to 22.2 % in 2023, based on provisional data calculated in accordance with the rules of the EU Directive 2018/2001 on the promotion of the use of renewable energy. It thus increased by 1,7 points in 2023 compared to 2022.

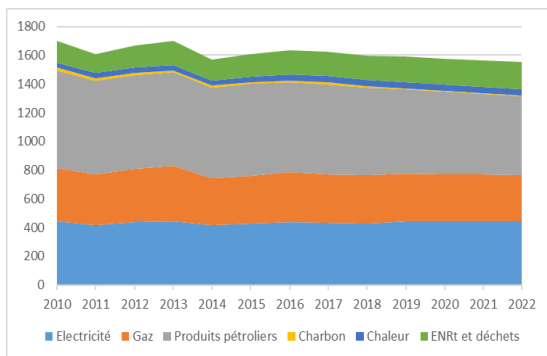


Figure58: Evolution of the real energy mix (2010-2018) and projected in EPP 2 (2019-2022) per energy carrier

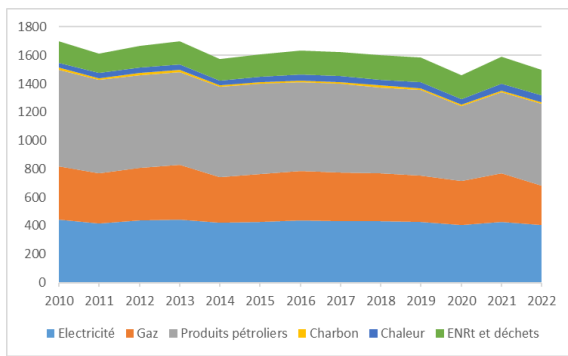


Figure59: Changes in the energy mix recorded (2010-2022) – Final (2010-2021) and provisional data (2022) – Source: SDES

The French objectives are being updated to take account of the developments brought about by the ‘Fit for 55’ package and the national energy policy guidelines laid down in the multiannual energy programming law. They will incorporate a significant effort to accelerate the deployment of renewable and low-carbon energy to meet climate objectives and ensure our security of energy supply.

Clear and concrete pathways are set for the exit from fossil fuels. A significant decline in coal, gas and oil consumption will be committed to halving fossil consumption by 2030 and by 3 by 2035 compared to 2012.

Guidelines are set, sector by sector (construction, industry, transport and agriculture), in order to achieve the objectives of reducing our energy consumption, which have been strengthened at European level (target of a 30 % reduction in 2030 compared to 2012, in accordance with the Energy Efficiency Directive (EU) 2023/1791).

There is a marked shift in the production of decarbonised energy, through the electrification of uses, an increase in the development of photovoltaic electricity (2-fold increase in the annual rate of development of new photovoltaic capacities) and offshore wind (acceleration of the allocation of offshore wind capacity), the development of bioenergy and renewable heat (more than twice the amount of renewable heat and recovery by 2035; increase in the proportion of biogas injected into networks to 15 %, deployment of hydrogen by 6.5 GW of production capacity in 2030, support for the establishment of biofuel production capacities on national territory) and revival of the nuclear sector (including continued operation of all reactors as long as safety permits, construction of 6 EPR2 and study for 13 GW of new nuclear capacities, innovation programme in new reactors and safety of the fuel cycle).

In 2022:
1543 TWh of energy consumed¹³¹

In 2030 according to the modelling:
1410 TWh of energy consumed

In 2035:
1302 TWh of energy consumed

=

¹³¹ According to the definition of Ef consumption under the EED (2023/1791/EU): consumption in 2021: 1 603 TWh or 7.9 % reduction in final energy consumption compared to 2012 (1 741 TWh, SDES)

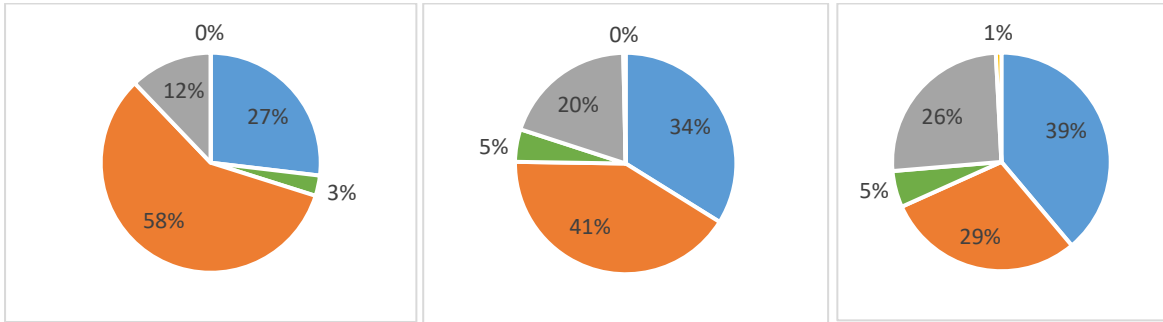


Figure60: Projected changes in the energy mix (in final energy consumption, excluding losses, excluding internal uses for electricity and non-bunkers; sources: DGEC, provisional modelling)

■ Electricité ■ Energies fossiles ■ Chaleur vendue ■ EnR hors électricité ■ H2 et e-fuel

Figure 40: Projected changes in the energy mix (in final energy consumption, excluding losses, excluding internal uses for electricity and non-bunkers; sources: DGEC, provisional modelling)

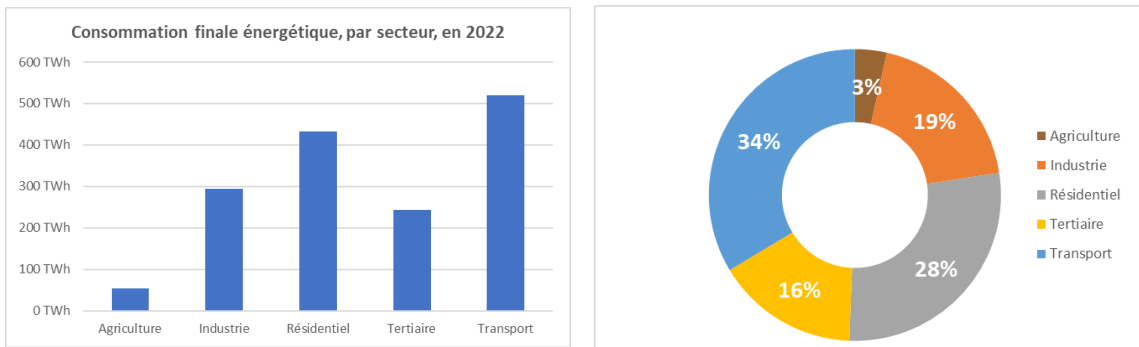
4.3. Dimension energyefficiency

Energy consumption in 2 022 in France

In France, energy consumption data for 2 022 are as follows:

- Primary energy consumption¹³²: 2 372 TWh
- Final energy consumption¹³³: 1 556 TWh

The final sectoral energy consumption by sector for 2022 is as follows:



¹³² Within the meaning of the Energy Efficiency Directive (2023/1791/EU)

¹³³ Within the meaning of the Energy Efficiency Directive (2023/1791/EU)

Figure61: Final energy consumption in France¹³⁴, by sector (excluding bunkers), for 2022

National heating and cooling planning

As regards heating and cooling, maps of the national territory of heating and cooling demand and supply contribute to meeting the requirements of the Energy Efficiency Directive (Article 14, Annex VIII – or Article 26 in its revised version (EU) 2023/1791) which provide for a comprehensive assessment of national heating and cooling potentials that includes a map of the national territory indicating:

- heating and cooling demand points in municipalities, conurbations (*urban units consisting of several urban nuclei whose suburbs end up joining*) and industrial areas with an estimate of this demand in the coming years;
- existing and planned district heating and cooling infrastructure;
- potential heat and cold supply points with electricity generating installations with a total annual electricity production exceeding 20 GWh, waste incineration plants and cogeneration plants.

The maps are prepared by the Centre for Studies and Expertise on Risks, Environment, Mobility and Planning (CEREMA) on the basis of a preparatory study by SETEC Environment. France had submitted to the European Commission an analysis of its potential for the use of high-efficiency cogeneration and efficient district heating and cooling networks. This analysis shall be updated in accordance with Directive (EU) 2023/1791 (EED).

The maps are prepared by the Centre for Studies and Expertise on Risks, Environment, Mobility and Planning (CEREMA) on the basis of a preparatory study by SETEC Environment. France had submitted to the European Commission an analysis of its potential for the use of high-efficiency cogeneration and efficient district heating and cooling networks. This analysis shall be updated in accordance with Article 25 of Directive (EU) 2023/1791 (EED).

The following table details the energy consumption projections for 2030 for the ‘with existing measures’ scenario (i.e. the measures taken on 31 December 2021). The government has since embarked on ecological planning, which allows for more ambitious trajectories and identification of additional concrete measures to achieve them.

¹³⁴ SDES, Long series of France’s prorelated energy balance in 2023, access link: <https://www.statistiques.developpement-durable.gouv.fr/bilan-energetique-de-la-france-en-2023-donnees-provisoires-0>

| Main energy consumption indicators in 2030 according to AME | 2030 value of scenario AME 2023 |
|---|--|
| Final energy consumption (TWh) ¹³⁵ | 1 464 |
| - Final energy consumption in industry (TWh) | 286 |
| - Final energy consumption in transport (TWh) | 423 |
| - Final energy consumption in residential (TWh) | 409 |
| - Final energy consumption in the tertiary sector (TWh) | 217 |
| - Final energy consumption in agriculture (TWh) | 129 |
| Reduction in final energy consumption in 2030 of the AME scenario compared to Ef consumption of 2012 | 15.9 % |
| Primary fossil consumption (TWh) | 999 |
| Primary fossil coal consumption (TWh) | 49,2 |
| Consumption of primary fossil oil (TWh) | 605,8 |
| Primary fossil gas consumption (TWh) | 344,0 |
| Reduction of primary fossil consumption compared to 2012 | 32 % |
| Reduction of primary fossil coal consumption compared to 2012 | 66 % |
| Reduction in primary fossil oil consumption compared to 2012 | 28 % |
| Reduction of primary fossil gas consumption compared to 2012 | 22 % |

Table17: Main energy indicators in 2030

4.4. Dimension Energy security

Elements have already been clarified in the previous sections on energy security.

4.4.1 *Security of electricity supply*

¹³⁵ Final energy consumption is estimated according to the scope of the EED (2023/1791/EU), i.e. subtracting ambient heat and adding aviation bunkers

According to RTE's forecast balance sheet 2023-2035 published in September 2023¹³⁶ electricity supply security.

- **Security of supply risk has increased for 15 years, notably due to reduced availability of nuclear power plants and closure of thermal means**

Over the past 15 years, the level of risk to security of electricity supply has gradually increased in France, although food has always been ensured. This has been notable since 2020, with a risk level, assessed before each winter, which exceeded the target set by the State (i.e. a risk of supply-demand imbalance limited to 3 hours per year on average over all possible configurations). This situation has given rise to specific communications from RTE in order to mobilise all available levers to avoid load shedding. The conditions observed in practice (a significant drop in consumption from the end of 2022, relatively mild winter and the smooth functioning of European trade) ultimately made it possible to avoid any disruption due to supply-demand imbalance.

The recent crises (Covid-19, forced corrosion) partly explain the sharp deterioration observed over the past three years, but the increase in risk has several structural causes: closure of the oldest and most polluting thermal power plants: it had long been anticipated in the forecast report and was the result of technical (obsolescence of certain installations, whose operating time could not in any event have been extended), economic (lack of profitability and/or need for massive investment) and environmental (reduction of pollutant and particulate emissions).

Deteriorating availability of nuclear power: RTE had correctly identified the period 2020-2024 as a pivotal, with many post-Fukushima works being carried out and reactors extended beyond 40 years, but the actual decrease in their availability largely exceeded the worst case scenarios. Part of this is due to specific causes, such as forced corrosion, another is structural and corresponds to the rise in the work of the large shelling. The closure of the Fessenheim power plant, which has not yet been compensated for by the commissioning of Flamanville's EPR, added to that table but constitutes only a minority part of it.

Among these two factors, the degradation of the availability of nuclear reactors is predominant: if the nuclear power station had been able to maintain the same availability rate over the winter, the level of food safety would now be better than ten years ago.

Conversely, several factors have contributed positively to the security of electricity supply over the last decade, including the development of renewables (despite their variable nature) and the decline in peak consumption. Similarly, interconnection with neighbouring countries has played a positive role. The winter of 2022-2023 showed that, despite widespread tension over the energy supply of the European continent, electricity exchanges between countries had worked very effectively, in accordance with European rules.

- **The situation has stabilised: security of supply will increase over the coming years**

The French electricity system has now gone through the most delicate period identified in previous studies, which has recently been aggravated by the health crisis and unpredicted corrosion phenomena identified on part of the nuclear fleet.

¹³⁶ <https://www.rte-france.com/analyses-tendances-et-prospectives/les-bilans-previsionnels#Lesbilansprevisionnels>

For the coming years, studies show a reduction in the risk of imbalance between electricity supply and demand, which should be closer to the regulatory criterion. This corresponds to a high level of food safety, but not 'zero risk': the electricity system will remain sensitive to cold spells, especially if they are accompanied by low winds in Europe.

This gradual improvement will be achieved mainly by increasing the availability of nuclear power, although it is not expected to return to its level in the early 2010s: control of stopping times, particularly in the vicinity and during winters, is an imperative for security of supply. It will depend to a lesser extent on the development of renewables, and in particular on the commissioning of the first offshore wind farms (which have a significant load factor, in particular winter): further development is essential for security of supply.

The level of risk will finally depend on the short-term evolution of electricity consumption, which has decreased in recent years and in particular since autumn 2022, thanks in particular to the sobriety plan put in place by the government. While the long-term dynamics of consumption are clearly expected to rise, there is considerable uncertainty as to whether this path will materialise in the short term, in a context of economic uncertainty and rising electricity prices.

In this context, the measures deployed in recent years to raise awareness of the risks and enable collective action to limit the risk of blackouts in the event of a degraded situation (Ecowatt) must be maintained. The same applies to the adjustment of tariff signals and the development of flexibility in consumption, particularly in the service sector.

Finally, definitive shutdown of the last two coal-fired power plants is possible but under strict conditions in terms of security of supply: the restoration of a high availability of the nuclear power station, and specifically the nominal operation of the Flamanville EPR for the Cordemais power plant due to the specific constraints on Brittany's supply. The periods of operation of these plants required for security of supply shall not exceed the limits laid down by law and regulation.

In the event that there is a significant risk of imbalance between electricity supply and demand, the following actions shall be implemented to safeguard the grid:

- Calling for citizen gestures at peak times (8-13h and 18h-20h);
- Secondly, the interruption of supply to certain large voluntary industrial customers in exchange for a financial consideration;
- Thirdly, lower voltage on the distribution network;
- As a last resort, if none of these measures has been sufficient, load shedding.

The risk-preparedness plan required under Regulation (EU) 2019/941 shall describe in detail the crisis prevention and management measures in the electricity sector.

4.5. Dimension internal energy market

4.5.1 *Energy infrastructures*

See parts 2.4 and 3.4.

4.5.2 *Energy March*

See parts 2.4 and 3.4.

4.5.3 PReEnergy ecarity

See parts 2.4 and 3.4.

4.6. French innovation research strategy, deployment of new technologies and competitiveness

France is increasing its spending on research and innovation in the field of energy, so as to facilitate and accelerate its exit from fossil fuels. The latest available data on public expenditure on energy R & D, collected in 2021, show this upward trend (see the chart below). Public funding for new energy technologies (renewable energy, energy efficiency, storage, hydrogen, etc.) has been on the rise for two decades: they accounted for 36 % in 2021, i.e. EUR 614 million. Nuclear research is the first item of expenditure (56 %, or EUR 962 million), with a significant rebound since 2020. In steady decline since the end of the last century, R & D from fossil fuels represents only a marginal share of public spending on research.

Sources: Energy Technology RD & D Budgets (IEA); World Bank Open Data (GDP)

Graphique 1 : dépenses publiques nationales de R&D en énergie par domaine de 2002 à 2021

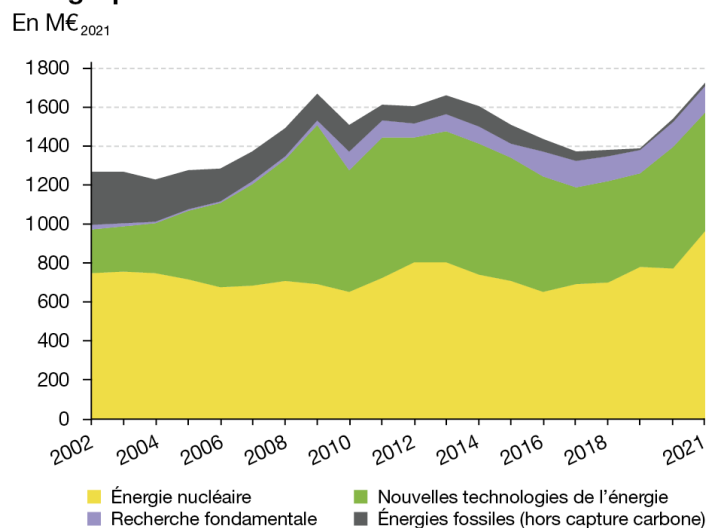


Figure62: National public expenditure on R & D on energy by domain 2002-2021

The figures presented in this graph do not include the public expenditure of the EUR 2 030 billion France 54 plan.

The French R & D ecosystem is at the forefront of global excellence on all energy issues. French research is present throughout the innovation value chain, from basic research (public laboratories, universities, engineering schools) to industrial research (enterprises, public institutions) and pre-industrial experimentation (industrial enterprises, in partnership with public institutions).

France also has a set of Institutes pour la Transition Energiques (ITE), which act as interdisciplinary platforms between public research and industry in the field of decarbonised energy, so as to encourage the logic of public-private co-investment and strategic convergence between the various players. ITE labelled organisations thus target the industrial development of a comprehensive sector, from technological innovation to the industrial

demonstrator and prototype. In particular, they are characterised by the setting up of R &D-supported programmes by industrialists. Today, seven ITE certified campuses of excellence bring together academic research, large groups and fabrics of SMEs on the topics of the energy transition: Efficacity (energy and ecological transition of cities), France Energies Marines (marine renewable energy), IPVF (solar technologies), Ines.2S (integration of PV energy), Supergrid (electricity grids), VeDeCoM (sustainable mobility) and Nobatek INEF4 (building).

5. ASSESSMENT OF THE IMPACT OF POLICIES AND MEASURES

5.1. Impacts of policies and measures detailed in section 3

5.1.1 Projections of the evolution of the energy system and GHG emissions and removals and, where applicable, emissions of air pollutants in accordance with Directive (EU) 2016/2284 as part of planned policies and measures at least up to 10 years after the period covered by the plan (including for the last year of the period covered by the plan), including relevant Union policies and measures.

The development of the French energy and climate strategy is based on **important foresight modelling work**. The Ministry for Ecological Transition and Territorial Cohesion (MTECT), through the Directorate-General for Energy and Climate, is constructing an energy and climate scenario to **describe a target trajectory for reducing greenhouse gas emissions up to the achievement of the targets set for 2030 and carbon neutrality in 2050** (scenario 'with additional measures' or AMS). This work is not a forecasting exercise but a planning exercise: the aim is for the State to establish, among the various possible trajectories, a scenario that coordinates the various sectoral objectives, taking into account all social, economic and nearby constraints, based on a set of measures and assumptions.

This scenario makes it possible **to establish the carbon budgets** and to **determine the roadmap to be followed through a set of levers of actions identified to reduce our emissions of gases**. It also serves as a **reference for other planning documents**, whether they are produced by the State, local authorities or businesses.

This comprehensive modelling exercise of our economy, our energy supplies, the availability of the various resources, their economic close, and emissions **is based on a set of sectoral modelling** using internal tools and external services (CIRED, Solagro, Enerdata, etc.). Sectoral modelling, fuelled by almost 2000 hypotheses agreed following consultation and dialogue with stakeholders and established taking into account the necessary additional policies and support measures, allows the estimation of some data on sectoral activities, such as vehicle traffic, the number of energy renovations of dwellings, livestock size or energy consumption. The models are used in such a way as to understand which types of public policies would make it **easier to secure the achievement of the sectoral targets defined by upstream reflection**.

The results of the sector modelling are then aggregated, first in the form of energy balances and then in the form of GHG emission inventories, in a manner consistent with the statistical data published annually.

Finally, the modelling exercise is complemented by a **specific verification to ensure overall consistency ("loop")**. It is for each time horizon, and for each of the sectors (transport, agriculture, buildings, industry, energy, waste) and energy carriers, to **verify the adequacy of resources** (energy quantity, industrial capacity of the sectors and the availability of skills, financial resources, etc.) **to the needs** arising from the scenario, to **monitor its economic**

impact and acceptability, and to **confirm the overall stability of the model and its robustness**, building on the work of the Government and all stakeholders.

An important aspect of this modelling exercise is also to **anticipate the role that each actor (elected, economic actor, citizen) can play in providing solutions and connecting the various environmental issues**.

The baseline scenario:

- Takes into account existing national policies and their extension or even strengthening in order to achieve our objectives;
- Takes into account the climate and energy objectives laid down in European legislation;
- Takes into account all EU climate and energy legislation that has an impact on energy prices or creates incentives for decarbonisation;
- Takes account of European legislation which gives guidance in the development of certain technologies, such as regulations on CO₂ emission standards for vehicles or the Directive on the energy performance of buildings;
- Aims to comply with the international objectives of the bodies in which France participates and which commit our country, for example the decarbonisation objectives set by the International Maritime Organisation (IMO) for international maritime transport.

The evolution of the main social dynamics is also taken into account in this scenario exercise. This aims both to ensure internal coherence between the different assumptions of the scenario and to better explain the expected changes in the scenario in terms of lifestyle. For example, when it comes to health and well-being, the baseline takes into account 'non-climate' policies, which aim to reduce pollution (light, noise¹³⁷, air, etc.), and which encourage people to adopt balanced diets with more plants and more fresh, local, seasonal and quality foods (labels), to exercise more regularly. Where possible, these developments are reflected in the assumptions of the scenario¹³⁸.

This modelling work is subject to several sources of uncertainty. They affect both historical data related to the construction of the Secten greenhouse gas emission inventory produced by Citepa¹³⁹ and the forward-looking trajectories (up to 15 %), with uncertainties about the evolution of emission factors, technological developments and the impact of climate change. **These uncertainties shall be integrated, as far as possible, in the decision-making process to develop a scenario that is as robust as possible**.

The method of ecological planning, including through this prospective modelling **work, is iterative**: it consists of readjusting trajectories and levers of action along the way, in order to ensure that the objectives are met by identifying additional measures to compensate for the risk areas identified in the modelling. The iterative nature of this method means identifying levers, assessing its impact, comparing it with the overall climate target and restarting it if it is not achieved. These elements will therefore continue, until the adoption of the SNBC and even

¹³⁷For example: policies to combat noise and air pollution support assumptions for converting the vehicle fleet to electric and light pollution policies feed into the assumptions of falling street lighting and showcase lighting.

¹³⁸ In the case of the above examples, developments are reflected in the assumptions about street lighting, food and the modal share of bicycles.

¹³⁹ Citepa's national greenhouse gas emission inventories are established according to internationally shared accounting and control rules. However, uncertainties, varying according to source types, substances, etc. accompany the inventories. In 2022, the combined uncertainty in% of total emissions, with LULUCF is estimated at 6.9 %.

afterwards, to **be reassessed in the light of new knowledge on each of the levers in order to put themselves on a long-term path in line** with the achievement of our objectives.

5.1.1.1 Summary of the 2030 scenario

GHG emission projections in the AMS scenario

The provisional version of the baseline scenario produced as part of the preparation of SNBC 3 **sets out a more ambitious scenario than that of SNBC 2.**

At this stage, this provisional version of the SNBC 3 baseline scenario makes it possible **to achieve the national target of -50 % gross GHG emissions in 2030, at¹⁴⁰ 2MtCO₂eq gross emissions in 271** compared to 1990.

Reaching this target means reducing by about 124 MtCO₂eq. No emissions between 2022 and 2030. This effort is considerable: between 1990 and 2022 our emissions were reduced by 144 Mt.

This acceleration requires all efforts and transformations in all GHG emitting sectors of our economy.

By 2030, in the provisional version of the baseline scenario, the LULUCF sector remains a net carbon sink and France's main means of generating CO₂ removals. However, in a context where forests are already severely affected by global warming, with the impact of climate change accelerating and amplifying the impacts of climate change, this sink is smaller than that envisaged in SNBC 2. The provisional models with measures planned on date show that we would achieve a carbon sink (LULUCF) of -18 Mt in 2030, **representing a -51 % reduction in net greenhouse gas emissions in 2030 compared to 1990, with 253 MtCO₂eq¹⁴¹.**

The **Government will continue and expand its action**, by means of a balanced approach to the various challenges relating to forests, in **order to preserve the carbon sink**: massive support for forest-based industries under the France Relance and France2030 plans (in particular through calls for forest renewal projects, which will make it possible to adapt forests and develop the carbon sink in the long term, and those for the development and processing of the forest-based sector, which are necessary in order to produce more carbon sequestering biomaterials), incentives for afforestation, strengthening the means of preventing and combating fires, etc.

These elements may change at the margin in line with future modelling iterations. In particular, the baseline scenario will be revised to take account, in particular, of stakeholders' feedback from this public consultation and the work carried out in parallel (post-2030 horizon, territorial COP, work with the sectors).

The graph below shows **the results of this modelling exercise, sector by sector (excluding carbon sinks).**

¹⁴⁰ Ecological planning has set a target of 32 Mt CO₂ eq for the buildings sector by 2030. Additional measures remain to be secured in the coming months to reach this target. Taking this target into account, the overall target for 2030 would be around 268 Mt CO₂eq.

¹⁴¹The absolute level of sinks to be achieved by France in 2030 for the LULUCF sector (application of the EU Regulation on emissions and removals from land use, land use change and forestry ("LULUCF")) will only be finalised in 2032. The LULUCF Regulation indeed sets the target for France to increase the sink by 6.693 Mt CO₂e between the average of the years 2016-2018 and the year 2030, as measured in the inventories to be submitted in 2032. Compliance with the Regulation will be examined against various flexibilities such as extreme weather events (forest fires, storms, etc.).

In addition, additional measures will be identified to reduce emissions from the buildings sector in subsequent iterations to less than 32 Mt CO₂ eq in 2030, which could lead to 250 Mt CO₂eq net emissions.

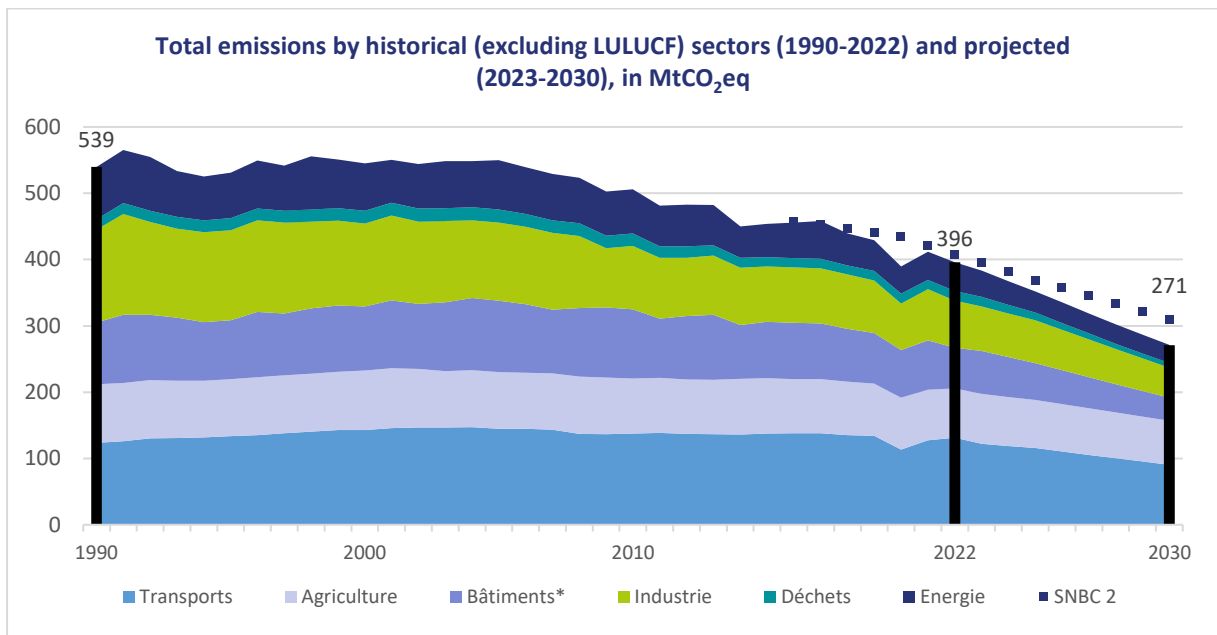


Figure63: Developments in territorial greenhouse gas emissions (Sources: national greenhouse gas emissions inventory, DGEC modelling) (* Taking into account the target of 32 Mt CO₂ eq for the buildings sector, the overall target for 2030 would be around 268 MtCO₂eq).

The graph below shows **the sectoral effort distribution by sector by sector by 2030** resulting from the results of the provisional modelling.

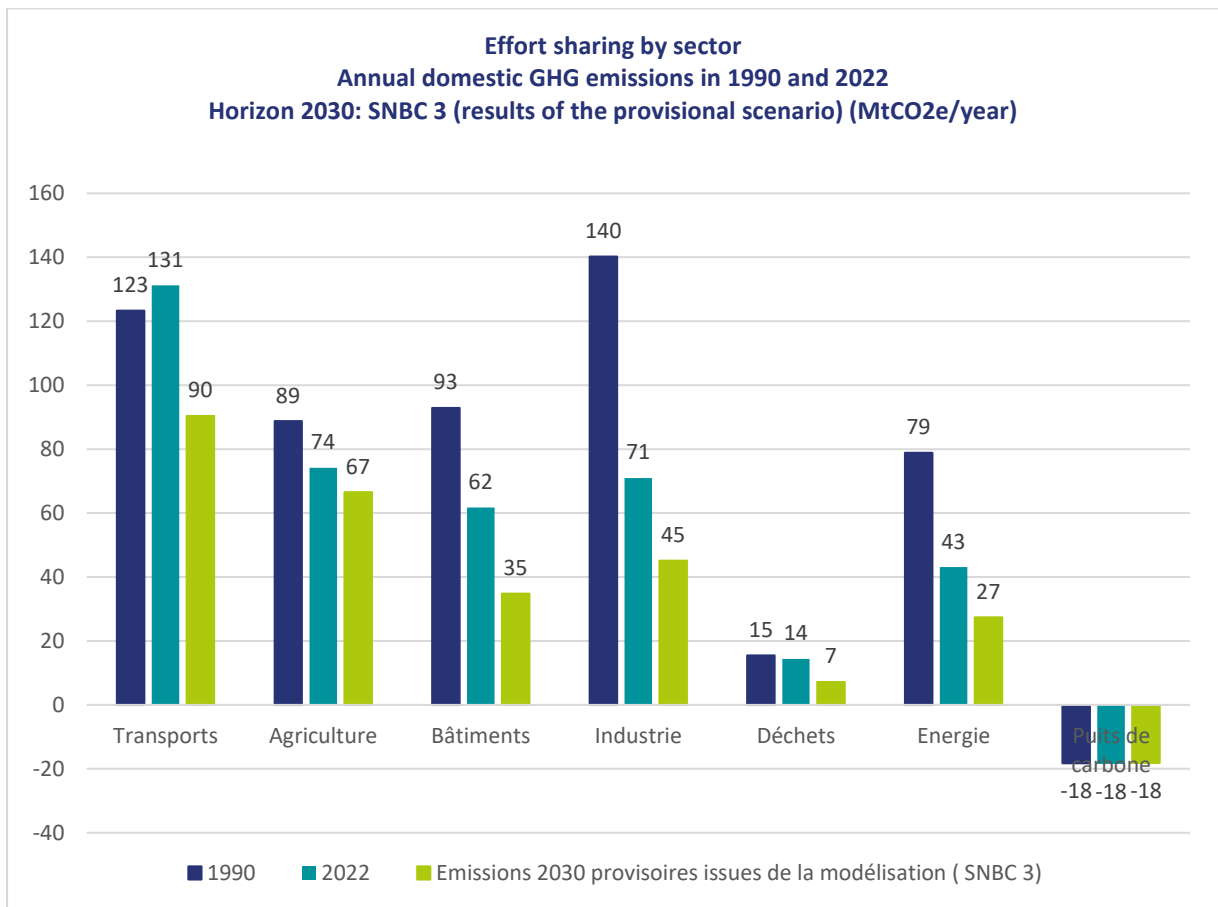


Figure64: Effort sharing by sector (sources: national greenhouse gas emissions inventory – CITEPA – SECTEN 2024; DGEC Models)

(* The modelling exercise at this stage allows the buildings sector to reach 35 Mt CO₂ eq by 2030. The sector's residual emissions by 2030 are above the government's target for the sector. Additional measures remain to be secured in the coming months to reduce emissions from the sector to less than 32 Mt CO₂ eq in 2030)

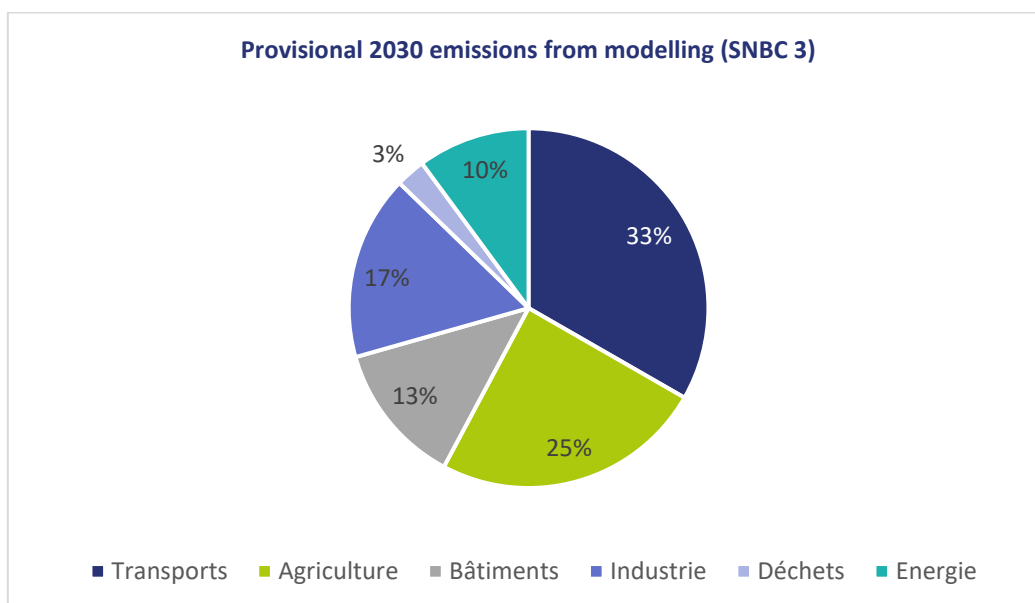


Figure65: Sectoral distribution of fish by 2030 (DGEC modellations). (* The modelling exercise at this stage allows the buildings sector to reach 35 Mt CO₂ eq by 2030.)

The emission reductions per sector by 2 030 are presented in the following table:

| Sectors | Reduction of emissions per sector in the AMS scenario par compared to 1990 |
|---|--|
| Transport | — 27 % |
| Building | — 63 % |
| Agriculture/forestry (excluding LULUCF) | — 25 % |
| Industry | — 68 % |
| Production of energy | — 65 % |
| Waste | — 53 % |
| Total (excluding LULUCF) | — 50 % |
| Total with LULUCF | — 51 % |

Specifically for methane, the provisional version of the SNBC 3 baseline allows for a 21 % reduction in emissions¹⁴² in 2030 compared to 2020 (-38 % in 2030 compared to 1990).

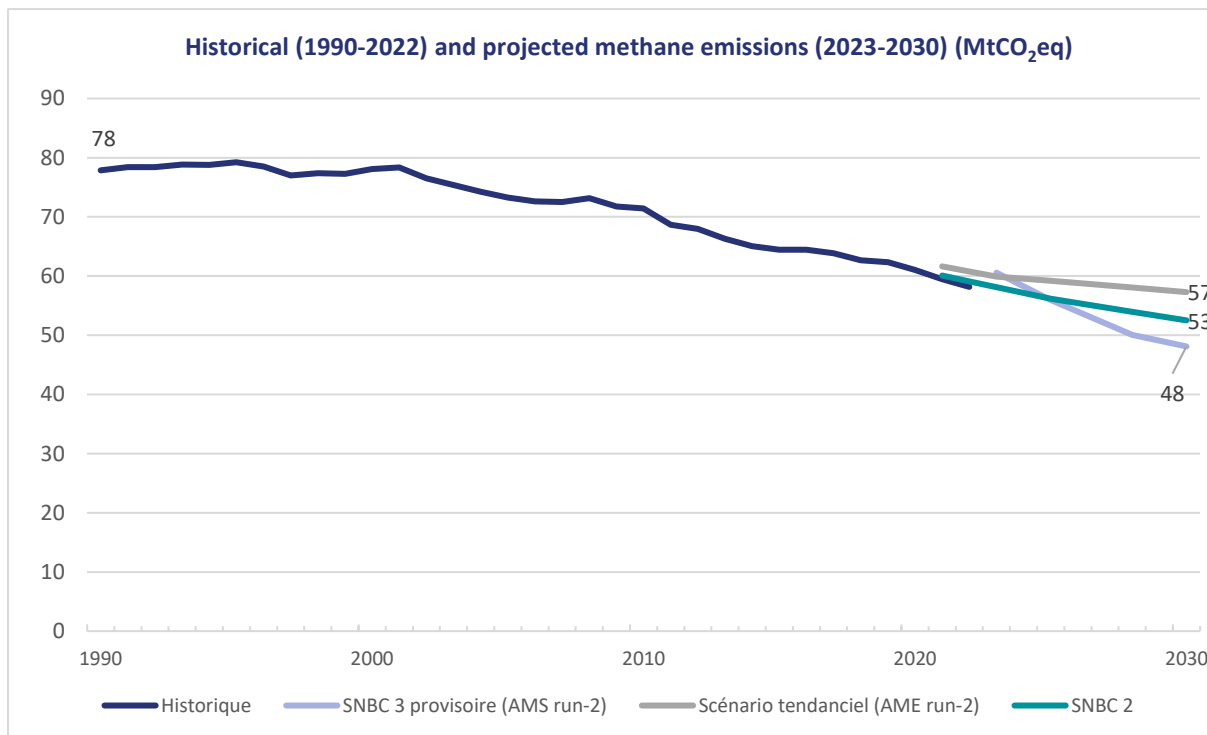


Figure66: Trends in historical methane emissions (CH₄) and projections according to the trend scenario, that of SNBC2 and provisional SNBC3, in Mt CO₂ eq between 1990 and 2030 (source: national greenhouse gas emissions inventory, CITEPA, Secten 2024; DGEC Models)

Projected emissions of air pollutants in the AMS scenario

The emissions of air pollutants in the AMS scenario have not yet been quantified in the last reference scenario, but will be available at the time of the further iteration of the modelling work. The following table, taken from the PNIEC 1, is given as a reminder.

| | 2005 | 2020 | 2030 |
|------------------------|--------|-------|-------|
| SO ₂ (kt) | 457,9 | 94,8 | 81,8 |
| NO _x (kt) | 1416,9 | 656,5 | 376,8 |
| NM _{VOC} (kt) | 1163,5 | 590,9 | 521,1 |
| NH ₃ (kt) | 624,7 | 596,9 | 517,1 |

¹⁴²The SNBC 2 baseline scenario projected a decrease of 14 % between 2020 and 2030. The trend scenario projects a decrease of 6 % between 2020 and 2030.

| | | | |
|------------|-------|-------|-------|
| PM2,5 (kt) | 259,7 | 151,9 | 118,4 |
|------------|-------|-------|-------|

5.1.1.2 Summary of the WAM scenario and projections by sector

Domestic transport

Transport is the largest greenhouse gas (GHG) emitting sector in France: its emissions amounted to 131 Mt CO₂eq in 2022, or about 33 % of national emissions. Its two main sub-sectors are passenger transport, where GHG emissions from passenger cars are 69 Mt CO₂eq in 2022 and freight transport, where GHG emissions from heavy goods vehicles amounted to 31 Mt CO₂eq in 2022 (Citepa, Secten 2024).

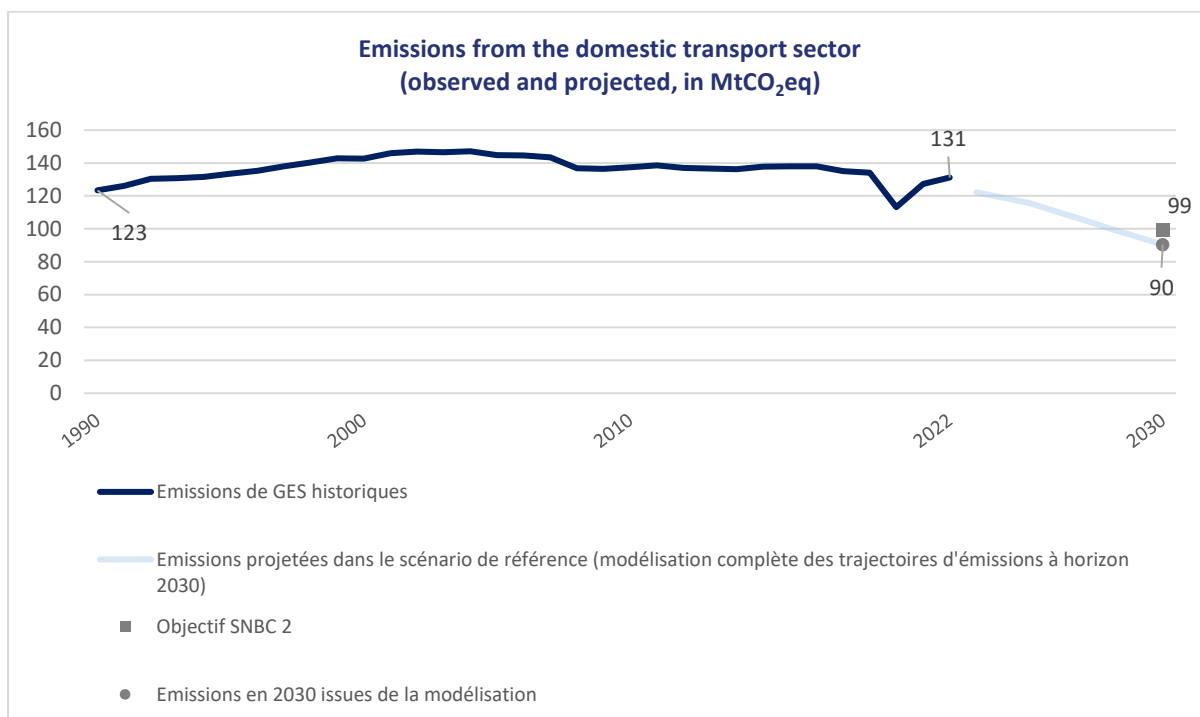


Figure67: Emissions from the domestic transport sector (observed and projected)

Reducing emissions from the transport sector requires action on all levers: demand management, modal shift, increase in occupancy rates for passenger transport (or load rate of vehicles for freight transport), improvement of the energy performance of means of transport, increase in the share of electric vehicles produced in France and electrification of means of transport/use of decarbonised energy such as biofuels.

The modelling exercise at this stage allows the transport sector to reach 90 Mt CO₂eq and a final energy consumption level of 396 TWh (excluding international bunkers) by 2030.

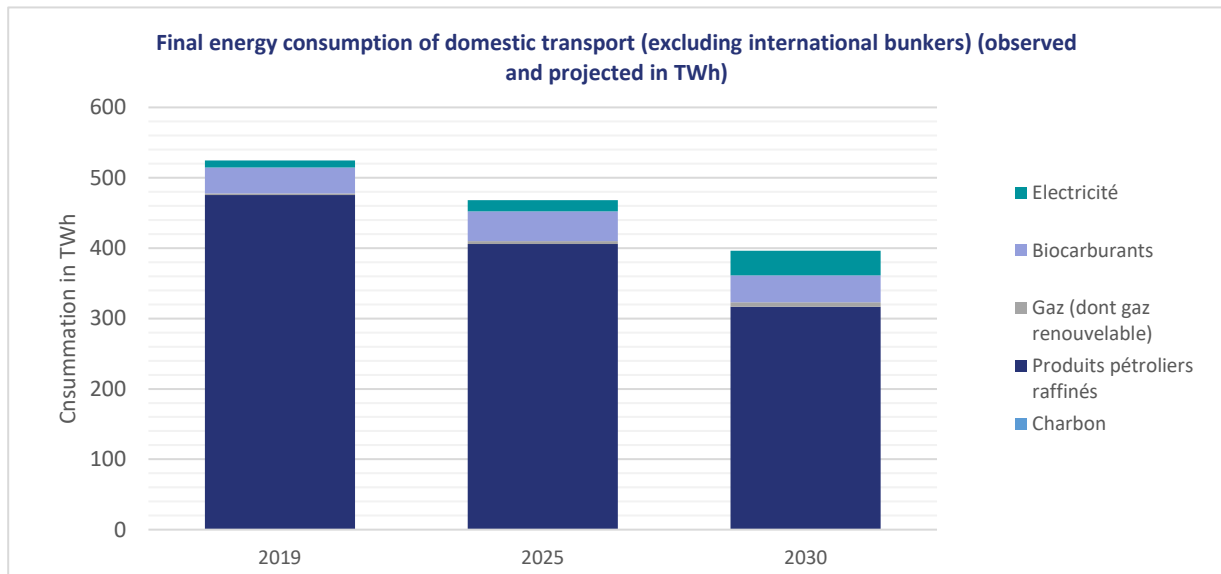


Figure68: Final energy consumption of domestic transport (excluding international bunkers) (historical and projections) (source: France’s energy balance, SDES, 2022 edition; DGEC Models)

The GHG emission reductions achieved by levers are described in the following figure¹⁴³.

¹⁴³ For the transport sector, reductions are calculated from 2019, given the atypical nature of 2021 due to Covid.

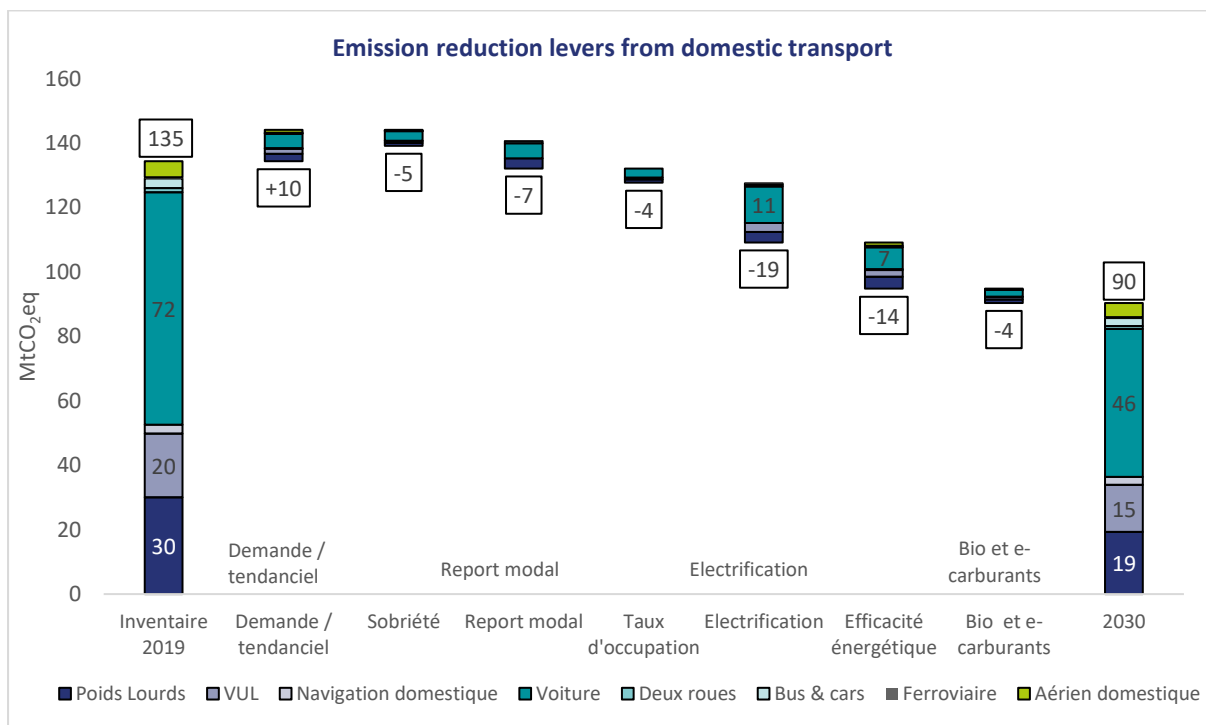


Figure69: Indicative decomposition of the effects of the various levers based on MTECT modelling work

The Clean Mobility Development Strategy (SDMP) sets out the transport sector's orientations for the EPP (2030 and 2035) in order to **comply with France's objectives and commitments** to combat global warming and reduce energy consumption. It is annexed to the EPP and **operationally reflects the objectives of SNBC in terms of mobility**. Work on the development of the SDMP has been launched, in consultation with the various stakeholders in the transport and logistics sector. The consultation will focus on broad themes, with the aim of achieving operational decarbonisation measures: sobriety in passenger and freight transport, modal shift towards less carbon modes, territorial developments and infrastructure needed to reduce GHG emissions from transport, energy issues in the transport sector.

International transport

Emissions from international transport attributable to France, i.e. international bunkers (excluded from the national total) rose sharply until 2019 to 25 Mt CO₂eq (+ 42 % between 1990 and 2019), driven by the rise in international aviation emissions, before recording a record decline in 2020 (11 Mt) and a rebound which is still partial (18 Mt in 2022).

As with domestic transport, **reducing emissions from international transport requires action on all levers:** managing demand, improving energy performance and developing sustainable alternative fuels.

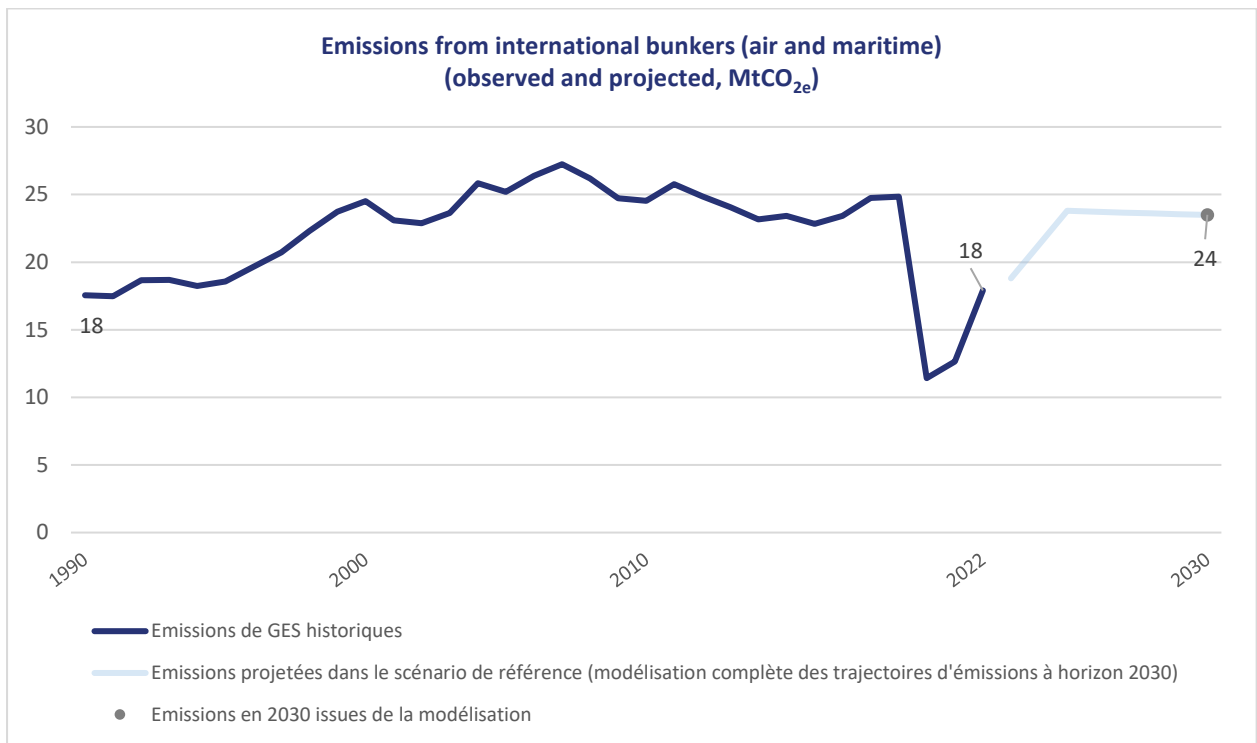


Figure70: Emissions developments (historical and projected) from international aviation and maritime bunkers in Mt CO₂ eq between 1990 and 2030 (source: national greenhouse gas emissions inventory, CITEPA, Secten 2024; DGEC Models)

The GHG emission reductions achieved by levers are described in the following figure¹⁴⁴.

¹⁴⁴ For the transport sector, reductions are calculated from 2019, given the atypical nature of 2021 due to Covid.

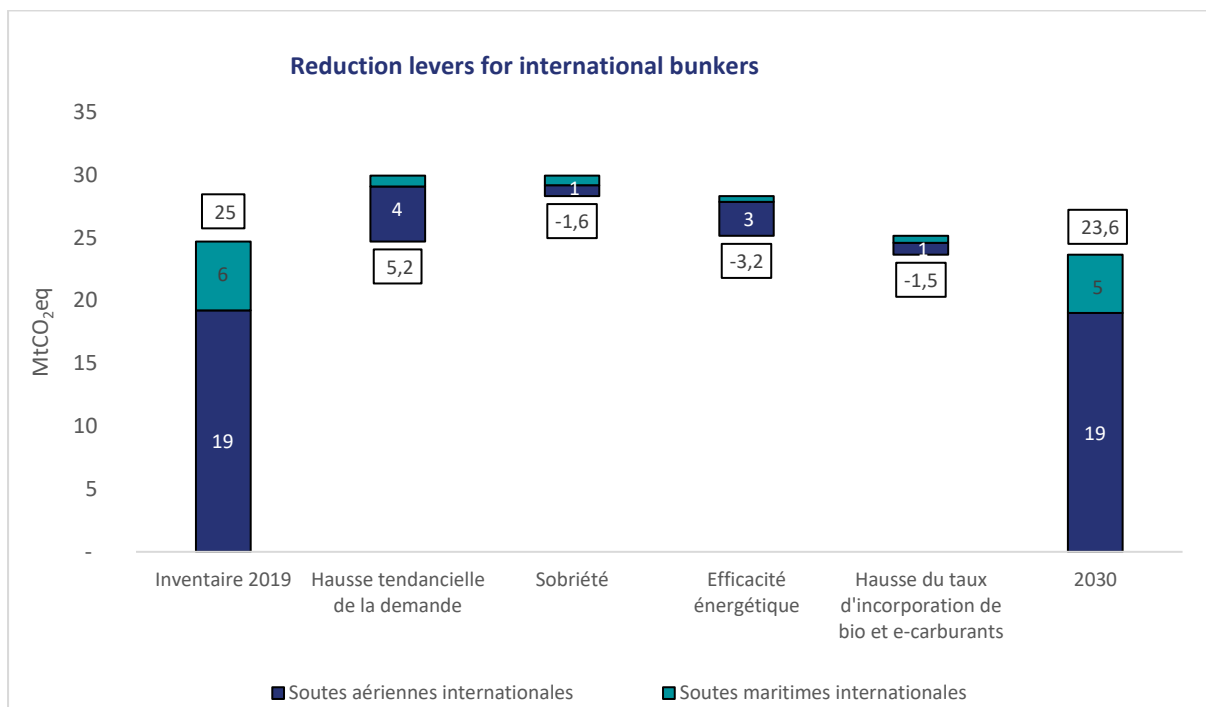


Figure 71: Indicative decomposition of the effects of the various levers based on MTECT modelling work

The main assumptions of the 2030 baseline are compiled below.

Passenger transport

- **Managing demand for land transport:** stabilising the number of kilometres travelled per person per year for all modes (excluding international transport) (at 15 150 km/year), while it increases in trend (at 15 750 km/year).
- **Modal shift:** increase in public transport traffic (bus, car, train) by 25 % by 2030. A sharp increase in cycling traffic (from 5 to 19 Mds/km).
- **Car-sharing:** the average number of people per car for short distance journeys (journeys of less than 100 km) increases from 1,43 to 1,51 by 2030, which corresponds to a tripling of the number of covoled journeys by 2027 and a continuation of the trajectory until 2030. In total, all types of journey combined, the number of persons per car rose from 1.61 in 2020 to 1.7 in 2030.
- **Electrification of light-duty vehicles:** the share of electric cars in sales of new vehicles is growing rapidly, reaching 66 % in 2030, bringing the share of electric cars in the fleet to 15 %. As of 2035, in line with EU legislation (Regulation (EU) 2023/851), the sale of new thermal, plug-in hybrid and hybrid light-duty vehicles will cease.
- **Electrification of buses and coaches:** the share of electric buses and coaches is growing rapidly: 90 % of new buses in 2030 were electric and 30 % of new buses in 2030 were electric.
- **Improving the energy efficiency of light-duty vehicles:** the consumption of new thermal passenger cars shall decrease by 16 % by 2030 compared to 2019, supported by a shift towards lighter, less consumer vehicles

and eco-driving, and remains stable thereafter until 2035. The share of new electric cars shall decrease by 12 % by 2030 compared to 2019.

- **Use of biofuels and synthetic fuels:** the use of sustainable fuels in aviation and maritime, the development of electricity in (predominant) road transport and short sea shipping (islands and water flows), the increase in the incorporation rate of biofuels in land transport with the primary focus on the development of sustainable fuels, achieves a target of reducing the carbon intensity of energy used in transport by 2030, compared to the 94 gCO₂/MJ fossil petrol or diesel fuel_{benchmark}.
- **Managing demand for air transport:** demand for air transport (total and per capita) increases in the scenario by 2030, differentiated by segment, with a decrease of 12 % on domestic hexagon flights compared to growth of 22 % to the sea and 18 % in international traffic, with a lower level of growth than in trend scenarios (5 % decrease in the baseline scenario for metropolitan France, 26 % growth for offshore and 23 % growth for international flights).
- **Improving aircraft energy efficiency:** the development of more efficient aircraft to replace the current fleets, combined with an increase in average transport, reduces unit consumption (per passenger-km) by 14 % by 2030 compared to 2019.
- **Use of sustainable aviation fuels:** the use of sustainable alternative fuels (including a share of synthetic fuels) in aviation grew to 6 % in 2030 and 20 % in 2035, in line with the EU regulation on aviation.
- **Improving the energy efficiency of ships and increasing use of sustainable marine fuels:** the use of energy efficiency solutions, assistance to vel propulsion, the use of sustainable alternative fuels can reduce emissions from the maritime sector, including for passenger ships. The objectives and regulations of the European Union (notably the FuelEU Maritime Regulation) and the International Maritime Organisation (IMO) support this strategy.
- **Implementation of the new carbon market (ETS 2)** as of 2027 and thus increased incentives to decarbonise transport.

Transport of goods

- **Demand management:** total demand for freight transport increased by 4 % compared to 2019, which is lower than in a trend scenario (7.5 %), notably due to industrial transformations (decline in fossil fuel industries, electric vehicle industry requiring less parts and therefore freight than thermal vehicle, recycling, reuse, etc.) and buildings (decrease in new construction).
- **Optimisation of truck load ratio:** the average load will increase from 8.1 tonnes in 2019 to 8,4 by 2030.
- **Modal shift:** the modal share of rail freight double between 2019 and 2030 to reach 18 %, in line with the national rail freight strategy. The modal share of the river has risen from the current 2 % to 3 % in 2030.
- **Electrification of vehicles:** the share of electric heavy goods vehicles (LVs) in new registrations is rapidly increasing to 50 % in 2030, in line with the announcements of the main manufacturers in the context of the revision of the EU regulation on CO₂emissions from new heavy-duty vehicles (Regulation (EU) 2019/1242). Unlike SNBC 2, the use of GNV/bioGNV remains limited in the medium and long term to cases where electrification is impossible: thus, 4 TWh of GNV were consumed by heavy goods vehicles in 2030. The share of battery electric light commercial vehicles (LCVs) in new immatriations is also growing rapidly, from 5 % in 2022 to 51 % in 2030.
- **Energy efficiency:** the consumption of new diesel LCVs shall decrease by 14 % by 2030 compared to 2019, and the consumption of new electric LCVs by 20 %. Consumption of new diesel LPs is down by 15 % by 2030

compared to 2019, and new electric LPs by 10 %. With regard to maritime transport, significant energy efficiency gains are projected as a result of three new EU and IMO regulations entering into force between 2023 and 2027, resulting in a reduction in ship speed (-12 % by 2030), the use of wind energy for propulsion and the development of lower-performing ships.

- **Sustainable liquid fuels:** sustainable liquid fuels from first generation raw materials (1G) are gradually being directed towards modes with the least alternative, such as inland waterway transport, heavy construction machinery and agricultural machinery. The blending rate of biofuels in road transport is increasing by relying primarily on the development of sustainable fuels, contributing to the decarbonisation of the sector in the transition phase. For maritime transport, the use of sustainable liquid and gaseous non-1G fuels is becoming more widespread, achieving a 12 % reduction in the carbon intensity of energy used on-board by ships in 2030 (more ambitious than the EU FuelEU Maritime Regulation target of 6 %). The uptake of sustainable fuels takes place in conjunction with the deployment of innovative low-emission technologies (electric or hybrid propulsion, fuel cells, innovative propellers, efficient carpenes, etc.).
- **Managing demand for maritime transport:** maritime traffic increases by 1.5 % per year until 2035 and then stabilises with a target of repatriating the bunkering of sustainable fuels in France.

Buildings

Emissions from the buildings sector are 62 Mt CO₂ eq in 2022, representing 16 % of France's gross emissions. These **emissions started to decline from the late 2000s onwards**. **The two sub-sectors are residential**, i.e. housing (including the social stock), responsible for 63 % of the sector's emissions, and **the tertiary sector**, comprising offices, commercial or institutional areas owned by public (in particular government and local government buildings) and private entities, responsible for around 37 % of emissions (Citepa, Secten 2024). In Secten accounting, only direct emissions are accounted for in this sector, with emissions from electricity generation accounted for in energy production and transformation, emissions from construction materials in industry and emissions from land take in the well. These indirect emissions account for about half of the direct emissions.

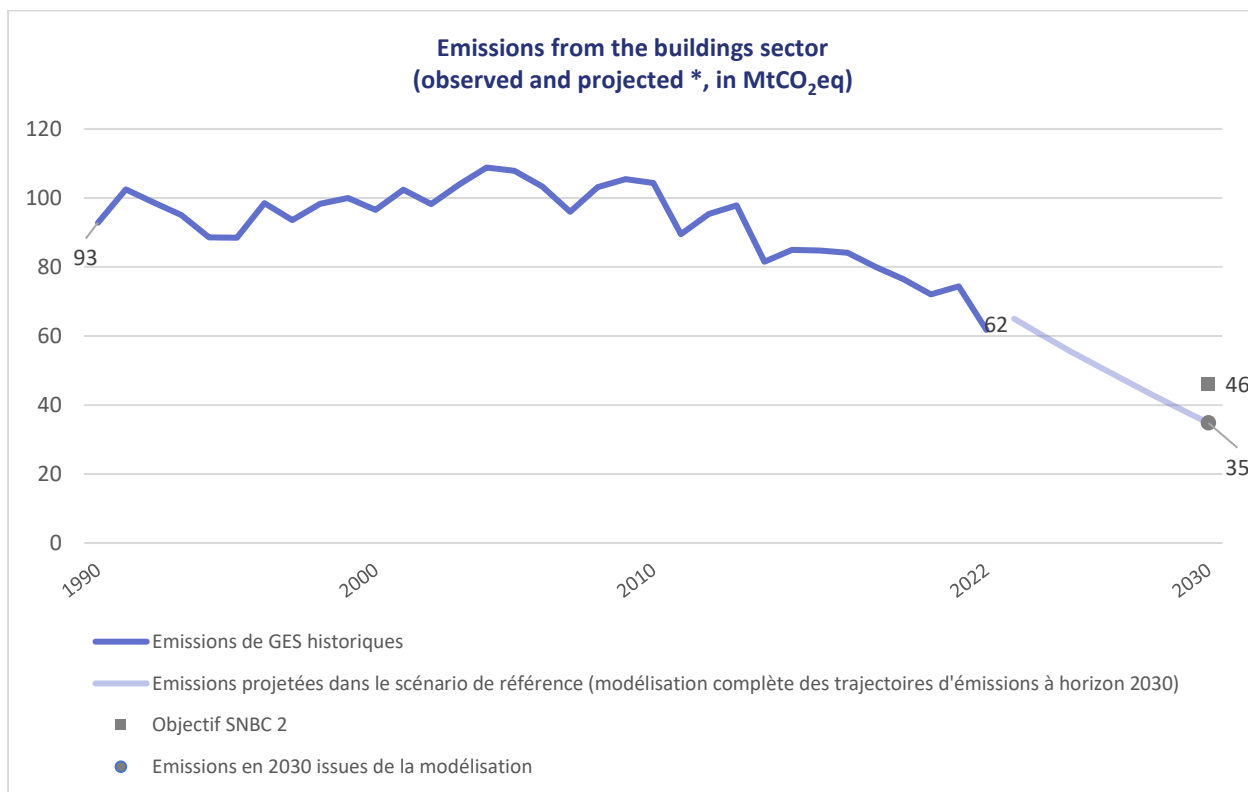


Figure72: Evolution of emissions from the buildings sector in Mt CO₂eq (source: national greenhouse gas emissions inventory, CITEPA, Secten 2024; DGEC Models).

* The modelling exercise at this stage allows the buildings sector to reach 35 Mt CO₂ eq by 2030. The sector's residual emissions by 2030 are above the government's target for the sector. Additional measures remain to be secured in the coming months to enable emissions from the sector to be reduced in subsequent iterations to less than 32 Mt CO₂ eq in 2030.

Faster reduction of direct emissions from the buildings sector requires accelerating the decarbonisation dynamics of heating vectors and a significant reduction in energy consumption (including through efficient renovations, and sobriety), with the challenge of closing electricity¹⁴⁵.

¹⁴⁵ See draft multiannual energy programming, in particular p. 86: https://www.ecologie.gouv.fr/sites/default/files/23242_Strategie-energie-climat_VFF.pdf

The modelling exercise at this stage allows the buildings sector to reach 35 Mt CO₂ eq and a final energy consumption level of 647 TWh by 2030. The sector's residual emissions by 2030 are above the government's target for the sector. Additional measures remain to be secured in the coming months to reduce emissions from the sector to less than 32 Mt CO₂ eq in 2030.

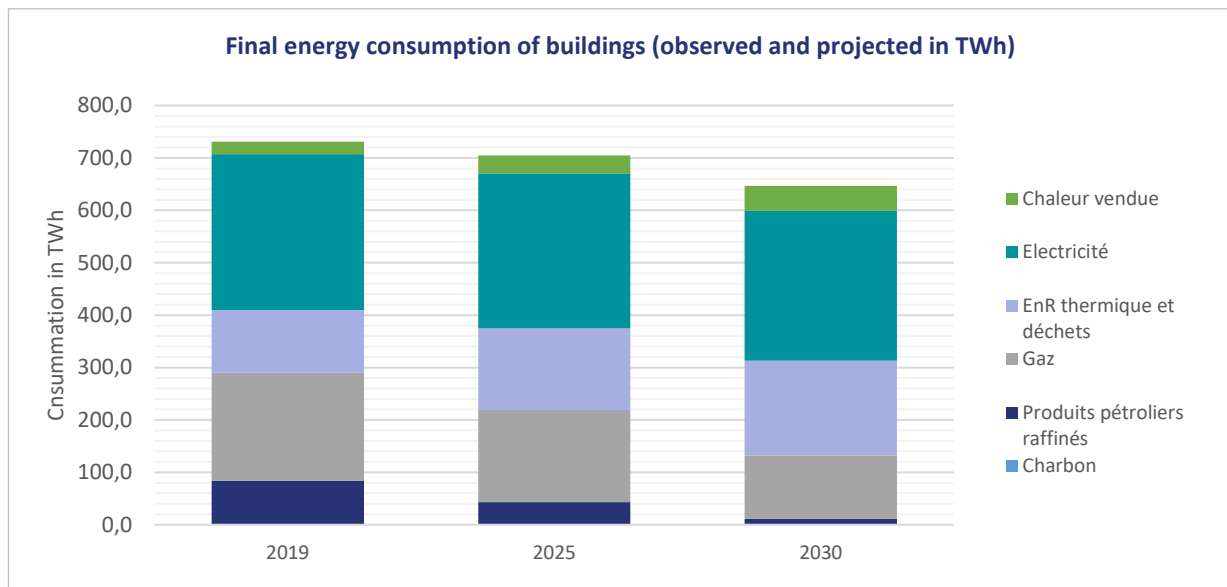


Figure73: Final energy consumption of buildings (historical and projections)
(source: France's energy balance, SDES, 2022 edition; DGEC Models)

The GHG emission reductions expected by levers are described in the following figure.

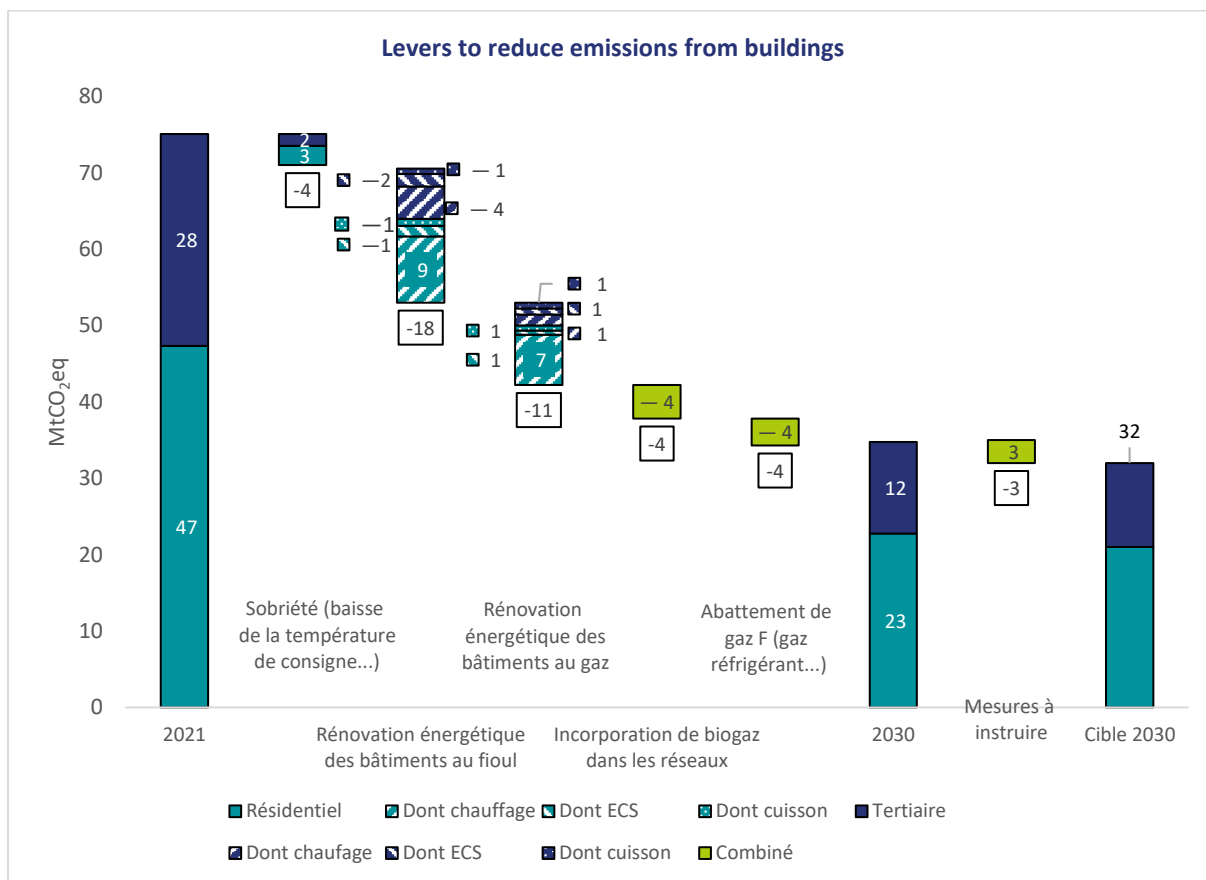


Figure74: Indicative decomposition of the effects of the various levers based on MTECT modelling work.

The main (provisional) assumptions of the 2030 baseline are compiled below:

Residential

- **Oil exit:** the baseline scenario foresees the replacement by a decarbonised heating system of 75 % of oil-fired boilers by 2030, i.e. around 300 000 households per year. Half a million households were still heated by fuel oil in 2030.
- **Gradual replacement of gas boilers:** the baseline scenario foresees the replacement by a decarbonised heating system of 2025 % of gas-fired boilers by 2030, or around 350 000 households per year. Around 9 million households were heated by gas in 2030.
- **Decarbonised heating systems:** the oil exit and the drop in gas imply a massive development of decarbonised heating systems. The number of dwellings using a heat pump (aerothermal and geothermal) as the main heating mode increased from 2,5 to 9 million in 2030. In dense urban areas, 360 000-300 000 dwellings per year can reach between 3,5 and 4 million dwellings connected in 2030. To a lesser extent, the installation of biomass boilers to replace heating oil or LPG boilers in rural areas contributes to the decarbonisation of housing.
- **Horse-heating:** for cooking and domestic hot water uses, the decarbonisation dynamics are comparable to that for heating. Improving energy efficiency also helps to control electricity consumption.

- **Renovation of dwellings:** the number of innovations (aided and unaided) will increase sharply by 2030, with a stronger focus than today on major renovations and thermal passives. The number of major renovations (where appropriate per step) is around 400 000 individual houses and 200 000 collective dwellings per year on average by 2030 for the private and social stock. Some of these renovations are triggered by rental decency obligations, some of which enter into force before 2030, changes in aid and the introduction of incentives or regulations for the renovation of thermal passives (building on the energy audit already mandatory today).
- **Sobriety:** see the sobriety point of the 'Buildings' chapter.

Tertiary

- **End of fuel oil:** in 2030, the use of fuel oil in tertiary areas became very marginal. Around 1 % of surfaces continue to be heated with fuel oil, in situations where the transition to a decarbonised system is technically or economically very complex.
- **Gradual replacement of gas boilers:** the baseline scenario foresees the replacement by a decarbonised heating system of 1520 % of gas-fired boilers by 2030, leading to around 350 000 thousand m² of gas in 2030.
- **Gradual output of electric convectors:** the share of tertiary surfaces heated by electric convectors is falling sharply, replaced by more efficient air/air heat pumps.
- **Decarbonised heating systems:** the replacement of fuel, gas and electric convector boilers involves the massive installation of decarbonised and energy-efficient heating systems. This requires the deployment of heat pumps (approximately 200 000 thousand m² in 2030 heated via this mode), the connection of surfaces to the heat network (approximately 200 000 thousand m² in 2030), and a more moderate increase in biomass boilers.
- **Excluding heating:** for cooking and domestic hot water uses, the decarbonisation dynamics are comparable to that for heating. Improving energy efficiency also makes it possible to control electricity consumption, despite an increase in consumption linked to data centers as a result of increased usage.
- **Renovation of the tertiary park:** reductions in consumption and emissions are allowed by improving the energy performance (and sobriety) of tertiary buildings: sites with more than 1 000 m² of tertiary areas are subject to the tertiary eco-energy system. This should reduce the energy consumption of taxable sites by 40 % in 2030, 50 % in 2040 and 60 % in 2050 compared to a reference year which cannot be earlier than 2010, or alternatively allow an absolute value expressed in kWh/m²/year to be achieved. The baseline scenario assumes an ambitious achievement of the tertiary eco-energy scheme with 50 % of areas reaching the target of -40 % in 2030 and the remaining 50 %: 25 % target absolute values, with 25 % already reaching absolute values. The premises from 500 to 1 000 m² also reduce their consumption in a way comparable to areas subject to tertiary eco-energy, particularly in the public sector.
- **Sobriety:** see the sobriety point of the 'Buildings' chapter.

Sobriety

- **Decrease in energy consumption:** the sobriety plan is respected and extended over time, reducing energy consumption by 7 % in 2030. In the tertiary sector, the objectives of the tertiary eco-energy scheme also lead to sobriety and steering measures of -10 to 15 % of consumption, in addition to renovation measures.

- **Sobriety of heating and cooling of buildings:** lifestyles are moving towards lower heating and cooling consumption, facilitated by the rapid generalisation of intelligent building control systems (thermostat type) in all dwellings and service areas. The target temperature is 19 °C in winter and 26 °C in summer for the use of air conditioning.

All other things being equal, global warming leads to a decrease in heating consumption and an increase in electricity consumption for air conditioning, leading to a net decrease in consumption in the modelled scenario.

Agriculture

Emissions from the agriculture sector are 74 MtCO_{2e} in 2022, representing 19 % of France’s gross emissions, including **59 % of livestock emissions, 26 % from crops and 14 % from combustion in the sector’s machinery, engines and boilers** (Citepa, Secten 2024). At the same time, the sector can sequester or decompose carbon in soils (including permanent grassland) and agroforestry systems, which is accounted for in the LULUCF sector.

Emissions from the sector have been slowly declining since the early 2000s, driven by a combination of declining livestock and lower consumption of mineral fertilisers. Emissions from agriculture are mostly inherent in the production process itself.

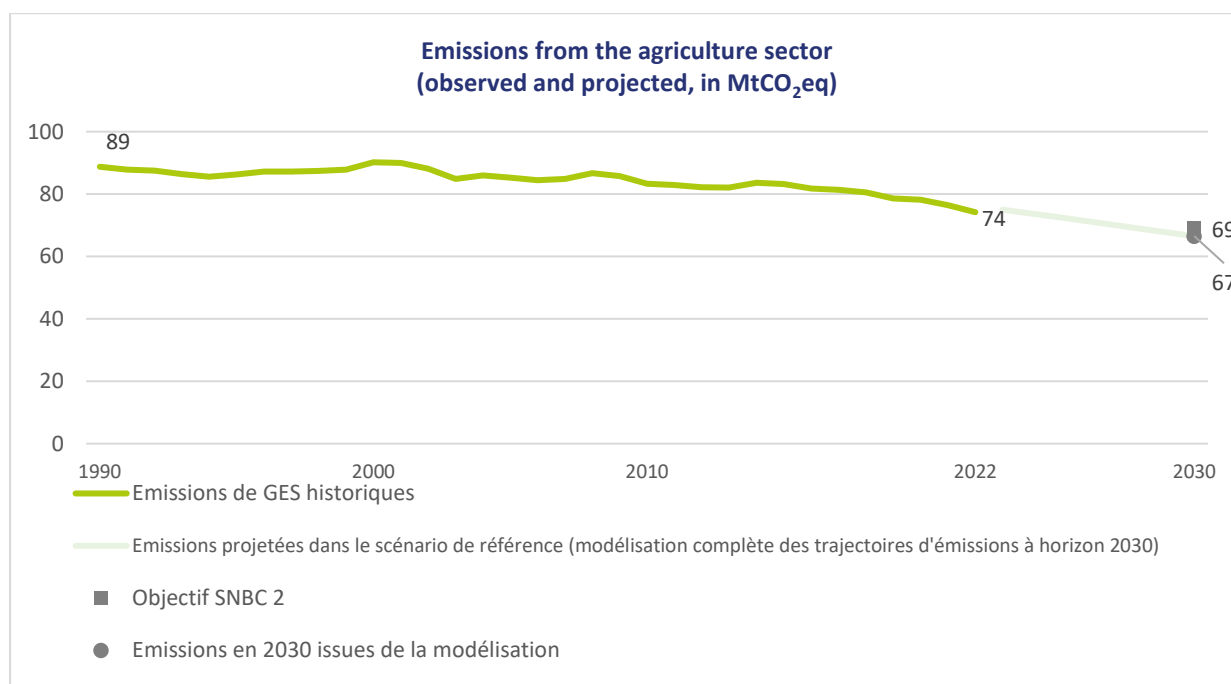


Figure75: Emissions from the agriculture sector in Mt CO_{2e} (source: national greenhouse gas emissions inventory, CITEPA, Secten 2024; DGEC Models)

The **agricultural sector faces many challenges in the green transition:** ensuring the country’s long-term food sovereignty while adapting to climate change and reducing GHG emissions, making agricultural soils a net carbon sink as they are today a source, preserving biodiversity and water and producing bio-based energy and materials for the decarbonisation of the French economy.

The ecological transition of agriculture is also linked to **socio-economic challenges** such as the renewal of farmers and the maintenance of their incomes.

Climate change mitigation in agriculture is not addressed in isolation, but is **consistent with a variety of interrelated challenges**. Mitigation challenges will result in a broad application of the principles of a less GHG emitting agro-ecological agriculture (such as the development of mixed livestock farming systems, with increased protein autonomy and a return to grass, longer rotations and the introduction of more leguminous crops to reduce the use of fertilisers, etc.) and promoting carbon storage in the soil, through practices to preserve and increase their organic matter content (e.g. increased soil cover through the establishment of intermediate crops, etc.).

In order to build a competitive, sustainable and resilient food system and avoid carbon leakage, the **trajectory shall also include guidance on dietary changes**, consistent with health, environmental and production system transition objectives.

The **modelling exercise** allows the agriculture sector to achieve at this stage **67 MT CO₂eq and a level of final energy consumption of 48 TWh by 2030**.

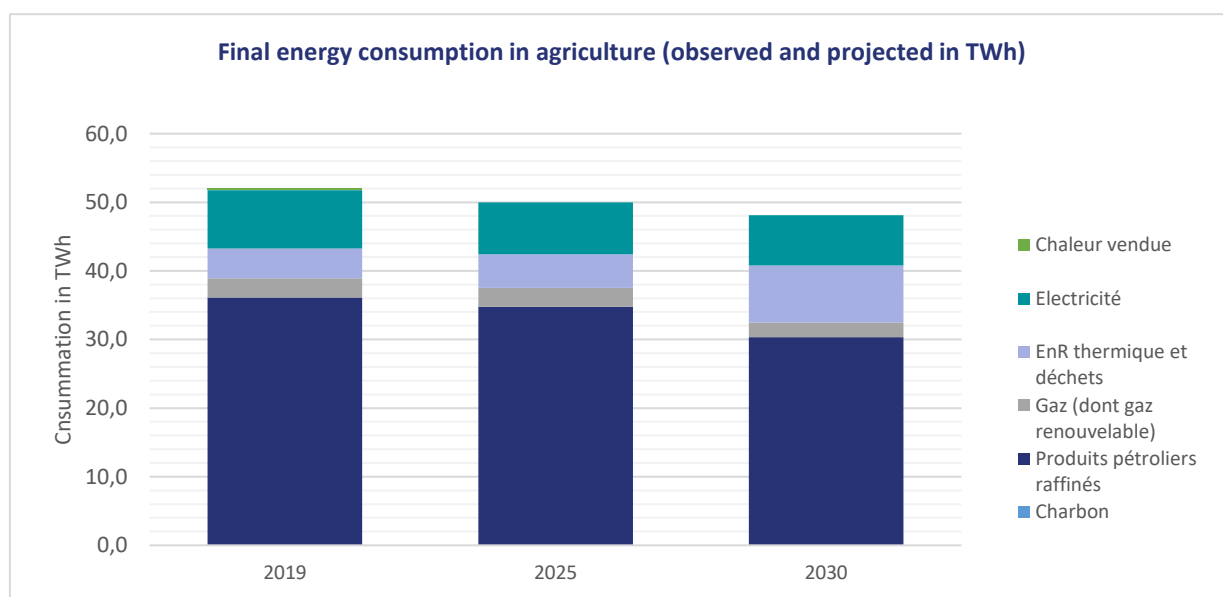


Figure76: Final energy consumption in agriculture (historical and projections)
 (source: France's energy balance, SDES, 2022 edition; DGEC Models)

The GHG emission reductions achieved by levers are described in the following figure.

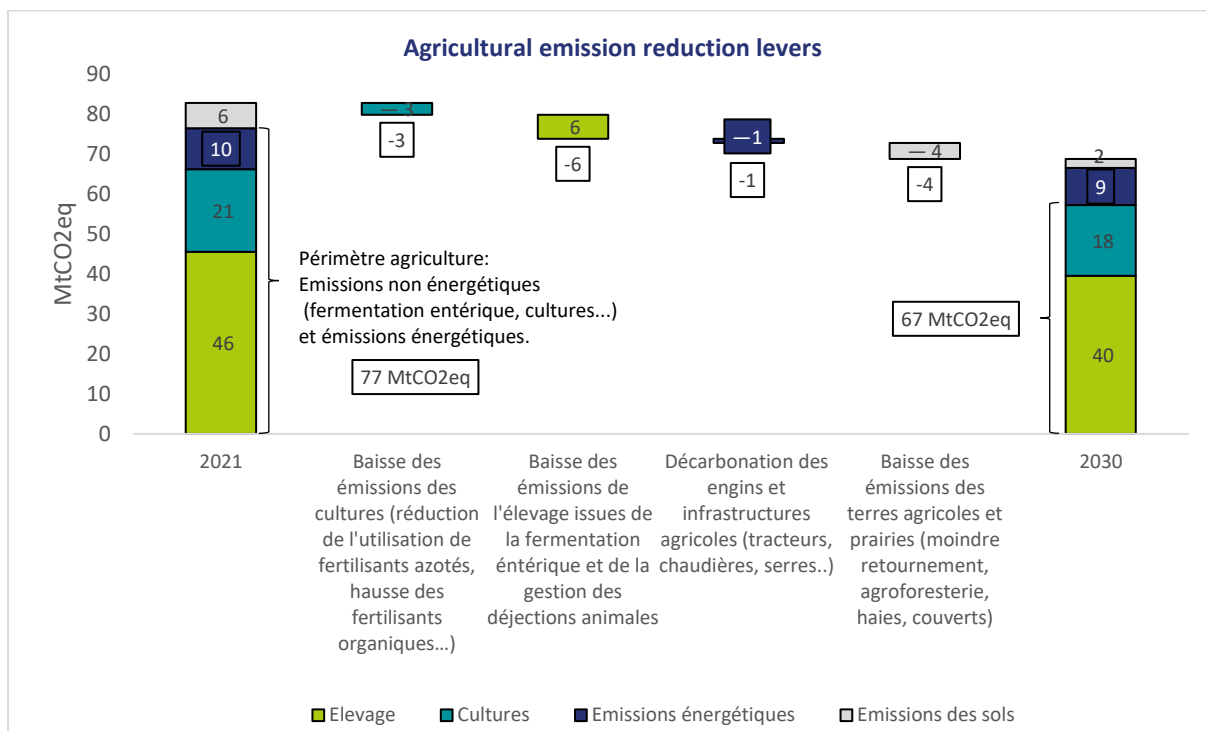


Figure77: Indicative decomposition of the effects of the various levers based on MTECT modelling work¹⁴⁶

The main (provisional) assumptions of the 2030 baseline are compiled below.

Cultures

- Changes in production methods:
 - **Changes from arable crops to low-input systems (50 % in 2030)**, of which 21 % were in organic farming as of 2030.
 - **Extension of rotations and diversification:** 2 Mha of legumes achieved in 2030 (doubling compared to 2020).
 - **Development of intermediate crops:** reached 4,8 Mha in 2030.
 - **Increase in practices to preserve soil structure**, such as semion-direct: reached 1,9 Mha in 2030.
- Reduced use of mineral nitrogen fertilisers: —26 % in 2030.
- **Development of agro-ecological infrastructure:** increase of intra-community agroforestry land by 2030 (on grassland and arable land) and development of hedges (see sections 'Bioenergy production' and 'Storage of carbon in soils').

Lifting

¹⁴⁶ Emissions from agricultural land and grassland are accounted for in the land use, land use change and forestry sector. Agricultural land emits 7 Mt in 2021 and grassland absorbs 1 Mt.

- **Livestock trends:** Deceleration in the rate of decapitalisation of livestock in recent years; upgrading livestock farming at the heart of the farming system and maximising its ecosystem benefits by promoting local, sustainable and grazing models; evolution of diets towards compliance with the PNNS recommendations; all these developments contribute to maintaining or restoring agricultural sovereignty over these sectors. The change¹⁴⁷ would be -12 % in 2030 compared to 2020 for bovine animals; -10 % in 2030 for pigs; stable for poultry.
- **Production methods:** the share of cattle farms under the dominant grazing system increased from 28 % in 2020 to 45 % in 2030; labelled chickens and organic farming (AB) grew from 32 % in 2020 to 39 % in 2030; certified pigs and AB increased from 4 % in 2020 to 7 % in 2030.
- **Protein autonomy:** increased protein autonomy of herds through increased grazing of cattle and increased production of protein crops and fodder legumes to reduce soya imports by 50 % in 2030.
- **Herd management:** optimisation of herd management by adapting feed and health management¹⁴⁸, and improving animal performance through genetic selection.
- **Enteric fermentation:** 25 % of cattle benefit from adjustments to their rations to limit enteric fermentation (-14 % for addition of 3.5 % fat to the ration, e.g. with flax seed inputs¹⁴⁹)
- **Management and valorisation of animal manure:** generalisation of slurry pits blankets, improvement of application practices (see 'Crops' section) and methanisation of effluents (increasing share of methanised animal manure to 20 % in 2030; see section "Bioenergy production").

Changes in diets

- Diets:
 - **Gradual shift towards diets in line with the nutritional benchmarks** of the National Nutrition Health Programme (PNNS), coupled with higher consumption of fresh fruit and vegetables, legumes and whole cereals, and a lower overall consumption of animal proteins to the benefit of other sources of protein, in particular by reducing overconsumption.
 - **Changes in demand:** assumption of sustained consumer demand for local, seasonal and quality products.
 - **Significant reduction in food waste.**

On-farm energy consumption

- **Decarbonisation of agricultural gear:** the share of agricultural machinery running on non-fossil fuels (biofuels, HVO100, electricity, H₂, BioGNV) increased from 0 % to 7 % in 2030.
- **Energy efficiency of equipment, greenhouses and buildings:** increased energy efficiency of installations and deployment of alternative heating systems (heat pumps, geothermal, waste heat, biomass, etc.).

Production of bioenergy

¹⁴⁷ These developments are not objectives but are the provisional assumptions of the scenario. They have been built against current and anticipated short-term dynamics.

¹⁴⁸ For cattle milk this is reflected in particular in the increase in the longevity of the animals and the lowering of the age of first calving.

¹⁴⁹ Pellerin et al, 'Quelle contribution of French agriculture to reducing greenhouse gas emissions', INRA, 2013.

- **Methanisation:** the share of energy-based intermediate crops (CIVE) among intermediate crops has increased from 4 % today to 19 % in 2030. Methane production reached 15 TWh in 2030 from energy intermediate crops. An increasing share of animal manure is methanised to more than 20 % in 2030. Increasing mobilisation of crop residues, fodder crops, bio-waste and CIVE will increase biogas production to around 50 TWh of biogas production in 2030.
- **Bioenergy:** the development of agro-ecological infrastructure is promoted (see section 'Storage of carbon in soils and biomass') by stopping grubbing-up, developing the sustainable management of hedges, increasing the area of hedgerows and intraparcellar agroforestry, and increasing the production of energy wood by 3 TWh in 2030.
- **Biofuels:** + 9 TWh of liquid biofuels production in 2030 compared to 2019 to ensure the development of advanced biofuels (crop residues and lignocellulosic crops).

Storage of carbon in soils and biomass

- **Intermediate crop cover:** intermediate crops cover in winter and summer grow to 4,8 Mha by 2030.
- **Development of hedges:** while hedgerows are now declining six times faster than they can be reconstructed, the baseline scenario reverses this trend as soon as possible, and aims at + 50 000 kg net linear meters of hedges planted between 2020 and 2030.
- **Agroforestry:** significant increase in intra-parcellar agroforestry land by 2030 to reach 100 000 ha on grassland and arable land.
- **Preservation of permanent grassland:** currently, the area under permanent grassland is 9,6 Mha. This number remains at 9,5 Mha in 2030. The turning of the meadows is contained.

Forest/Land Sector

The **LULUCF** (Use of Land, Change in Land and Forestry) sector is an overall **CO₂ removals** sector. In 2022, the absorption of the sector was 18 Mt CO₂ eq (Citepa, Secten 2024). The carbon sink of this sector has fallen sharply over 10 years, largely due to the effects of climate change, resulting in increased mortality and lower growth in forests (drought, heatwave, fires, pests).

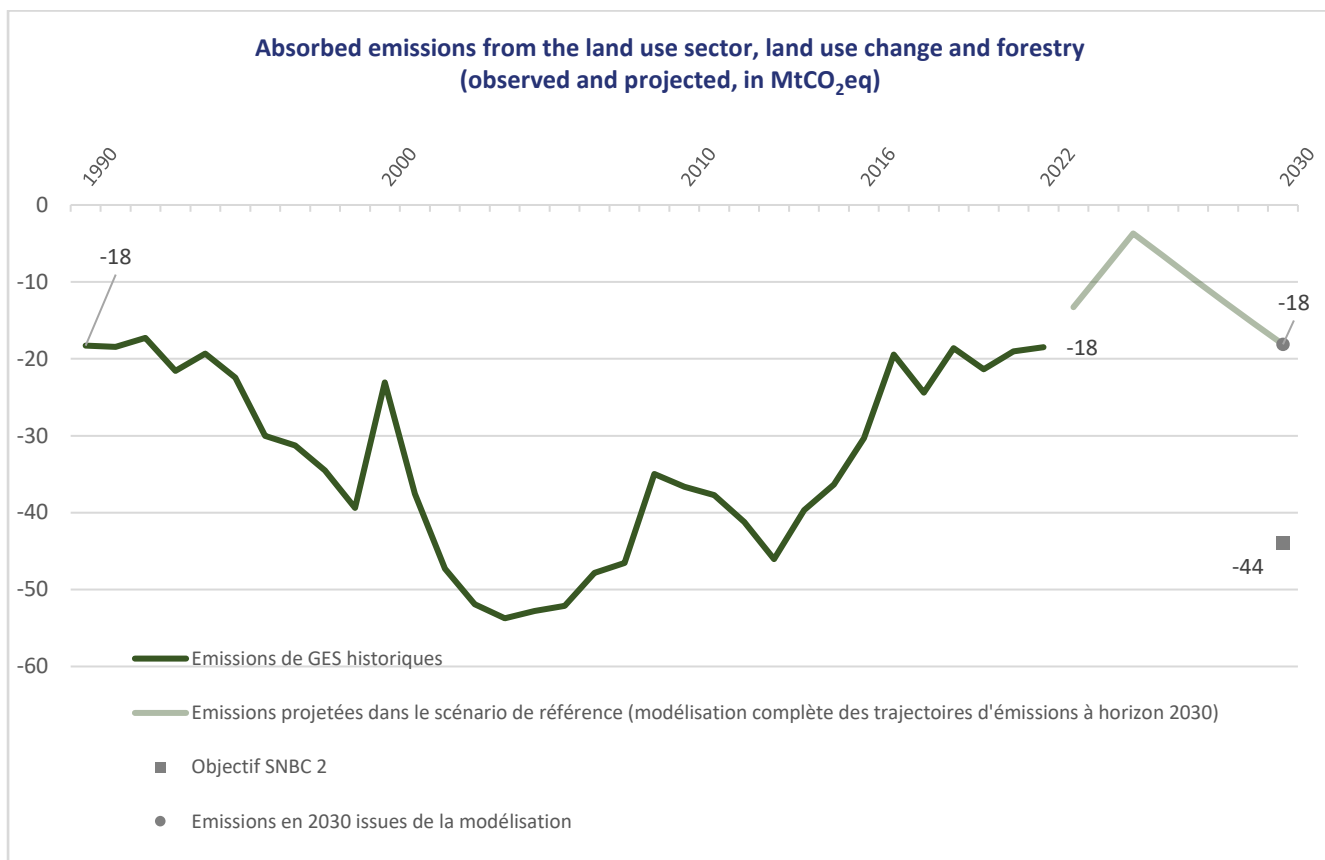


Figure 78: Trends in LULUCF emissions in Mt CO₂eq (source: national greenhouse gas emissions inventory, CITEPA, Secten 2024; DGEC Models)

There is a **general need to be cautious about the figures put forward** within the LULUCF sector, where the sink is highly dependent on the forestry sector. The calculation of the main compartments in the forestry sector (increase, mortality, etc.) for year n corresponds to an average over 5 years from $n-2$ to $n+2$. Each year, a representative sample of the whole territory is visited. It is cumulative with the samples of adjacent years to produce more accurate results based on several annual samples. The standard results thus cover five successive years and provide estimates for the median year of the window. Taking into account an additional year to carry out the inventories, the final results are therefore known only at $n+3$. However, in order to obtain emissions and removals in “real time”, extrapolations are made over the last 2 years. For example, for 2023, the final results will be known in 2026 and will take into account the averages from 2021 to 2025, but in order to estimate the emissions for 2023, extrapolations are made for 2022 and 2023. On the other hand, the levels of absorption and emissions of forest compartments are high as they are mainly dependent on growth, mortality and harvesting (the increase is about 130_{MtCO₂e}). A slight change in one compartment leads to a *de facto* fluctuation of the final well which may be significant from year to year.

As a result of climate change, the French forest, which is highly dependent on climate change, is currently experiencing a **crisis of mortality and significant growth leading to a fall in its carbon sink**. Both researchers and experts have difficulties in deciding on its duration and a potential exit from the crisis. Thus, the choice has

been made to focus on a central scenario (the one presented here) but also to establish a 'strong climate change' scenario, where the forest sink will be modelled in the light of a continuous crisis and which will prepare for possible less favourable situations. In order to emerge from this crisis, adaptation measures are and will be put in place to renew forests and plant species adapted to France's future climate. However, the impact of these renewal plans on the carbon sink can only be observed in the long term and sometimes after 2050, when stands planted in the next ten years reach maturity and sequester significant amounts of carbon each year.

The main sub-sectors dealt with here are the forest ecosystem, timber products and other LULUCF compartments (deforestation, land take, grassland).

Furthermore, with regard to the sub-sectors concerned, **the LULUCF sector has a strong link with ecosystems and biodiversity in general.** In some cases, the preservation and restoration of natural and semi-natural ecosystems will generate co-benefits. carbon removal. The restoration of degraded ecosystems or actions conservation, like deadwood in forests, makes it possible to obtain biodiversity and carbon benefits.

Policies and measures in this sector are based in particular on agro-ecological practices (planting and sustainable management of hedgerows, agroforestry, carbon farming, etc.), on the one hand, and boosting forest management on the other, but also in the longer term of a strategy for adapting French forests. **In particular, as regards the wood sector, four levers are identified as complementary:** carbonequestration in the forest ecosystem, carbon storage in wood and wood-waste products, the substitution of energy-intensive materials by bio-based products and the energy recovery of bio-based products or waste from such products that replace fossil fuels.

The modelling exercise allows at this stage **to reach -18 Mt CO₂eq for the LULUCF sector by 2030.**

The emission reductions achieved by levers are described in the following two figures. The first shows developments in each of the LULUCF sub-sectors and refers directly to the figure above, the second is specific to the evolution of two sub-sectors included in LULUCF: forest and timber products.

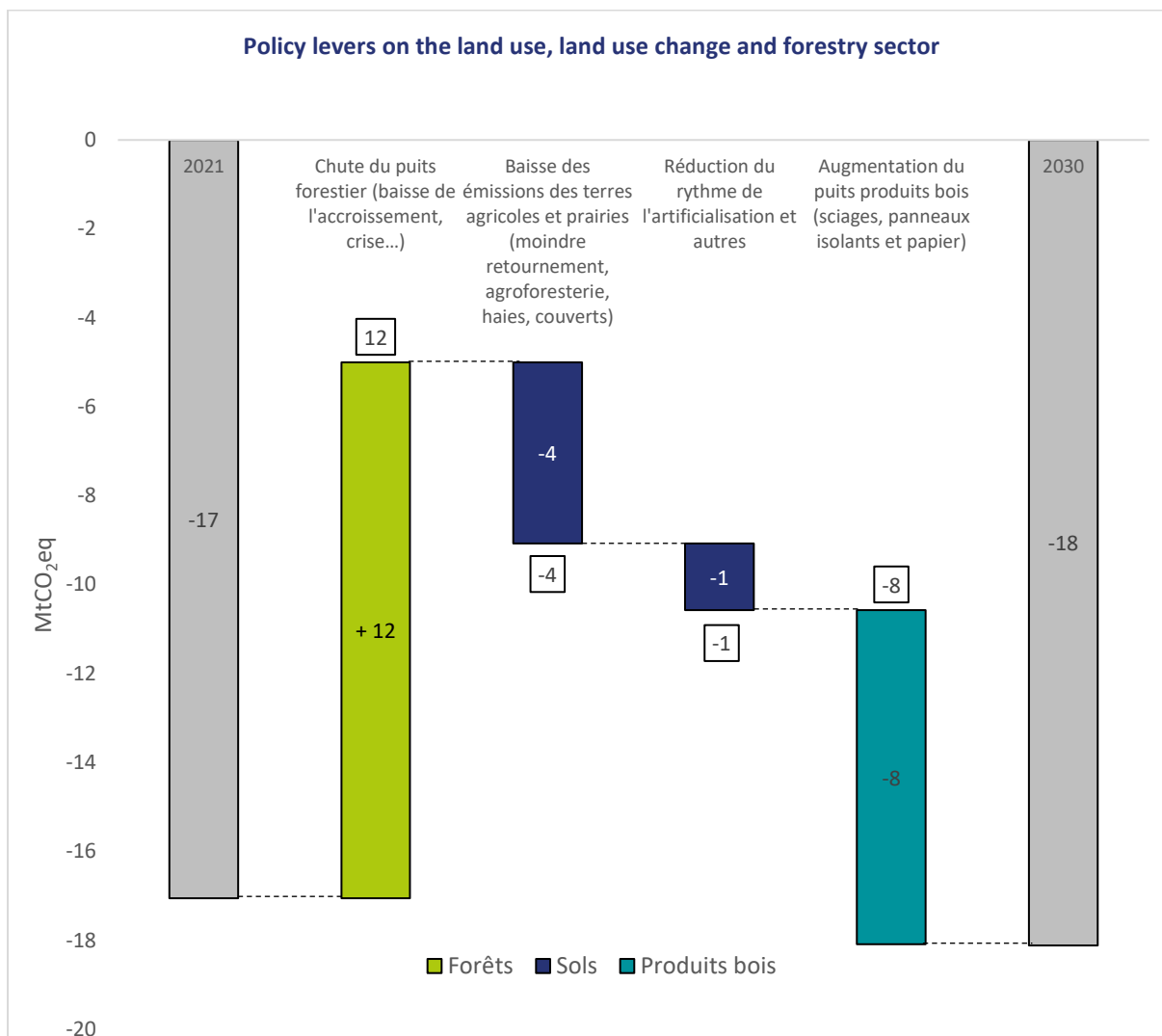


Figure79: Indicative decomposition of land sector developments based on MTECT modelling work

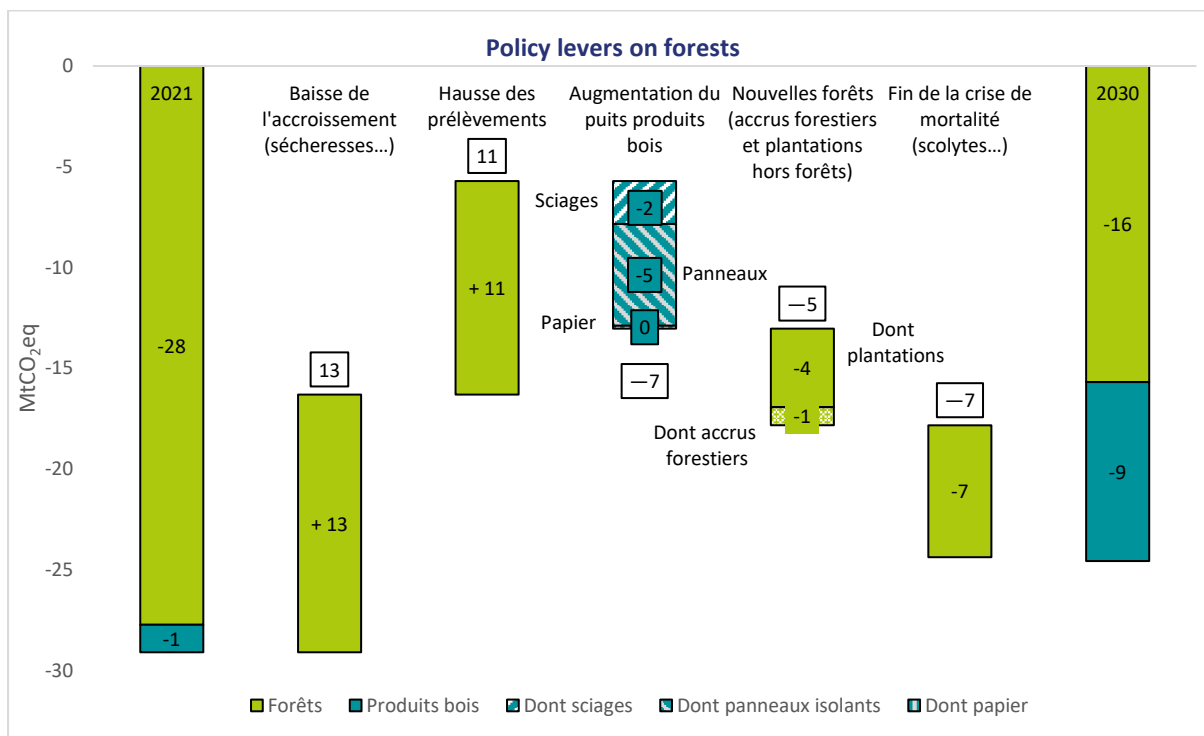


Figure80: Indicative decomposition of the evolution of forest carbon sinks and wood products based on MTECT modelling work

The main (provisional) assumptions of the 2030 baseline are compiled below:

Forest ecosystem

- **Forest renewal:** the planting of one billion trees and forest renewal of the order of 10 % of the forest area put in place over the next 10 years.
- **Mortality:** as the evolution of the absorption potential of forests is uncertain, the severe crisis (in particular linked to the **succession of droughts and heatwaves and induced scolyte crises**) suggests that the mortality rate continues to increase until 2025-2027, and then decreases in a mild exit from the crisis to around 2030, lower than at the top of the crisis but remaining relatively above the pre-crisis level (pre-2015).
- **Firefighting:** the preliminary estimates estimate fires of around 22 ha/year in the coming years, taking into account the evolution of extreme weather events and the efforts put in place to protect forests (prevention and fight) against fires¹⁵⁰, i.e. a release of around 0.5 Mt CO₂ per year into the atmosphere. In order to monitor fires, SNBC 3 integrates them into forest mortality.
- **Biological increase:** it is considered that the increase continues to decline as a result of the current crisis (succession of periods of drought, heatwaves, scolytes) and then benefit from a partial exit from the crisis in

¹⁵⁰ By way of comparison, 59 000 ha lived in 2022, and the average over the last 6 years is 21ha/year.

2030. The Amazon forest in Guyana is a generally balanced primary forest and its carbon sink is now estimated to be zero. In fact, it is not integrated into the organic increment model¹⁵¹.

- **Timber harvesting:** see 'Wood products'.
- **Non-forest afforestation:** non-forest afforestation increased from 100 ha/year in 2021 to 15 000 ha/year by 2030. This non-forest afforestation mainly concerns plantations on areas under agricultural abandonment, which is becoming increased forestry ("increased piloting"). This afforestation does not therefore compete with areas dedicated to agriculture. Afforestation also takes place on brownfield areas, although the latter remain marginal.
- **Afforestation:** see below under 'Other LULUCF compartments'
- **Deadwood and soil carbon sinks:** carbon sinks of deadwood and soil are subject to assumptions in a specific scenario (called INV +). These wells and their developments are not so far counted in the national inventories due to lack of sufficient data but are subject to work to be integrated. The current assumptions on these compartments, in particular the forest soil sink, show a positive evolution of the well in view of their better consideration within forest routes.

Wood products

- **Harvesting:** Realisation of the National Forest Wood Plan, reaching + 12 Mm³ in 2026 compared to 2016 (increase of + 1.2 Mm³/year over 10 years) and 63 Mm³ per year from 2030.
- **Carbon sequestration in wood products:** the share of harvesting processed into 'sawmill' products has risen from the current 9,5 % to 12 % in 2030. The share of harvesting entering the 'panels and insulation' compartment has increased from the current 13 % to 18 % in 2030. Carbon sequestration in wood products increases from 1 Mt CO₂ eq/year today to 9 Mt CO₂ eq/year in 2030. This will be the subject of an in-depth analysis prior to the final modelling.
- **Development of the circular economy of wood products:** the lifespan of the materials used increases: the half-life of the frames is 50 years, parquet/lambris for 30 years, panels for 25 years and paper for 7 years. The rate of incorporation of recycled raw materials into panels increases: 50 % in 2030 compared to 40 % in 2021.

Other LULUCF compartments – Artificialisation – Deforestation – Houses

- **Deforestation/deforestation:** two-thirds of deforestation today takes place in hexagon and accounts for 10 kha/year. Emissions from deforestation increase from 12 Mt CO₂ eq/year today to 7 Mt CO₂ eq/year in 2030.
- **Land take:** the 'Zero Artificialisation Nette' objective set by the Climate and Resilience Law, which aims to divide the consumption of natural, agricultural and forestry areas over the decade 2021-2031 by two from the decade 2011-2021, has been achieved. Commercial land take is divided by 10 and housing by 2 in 10 years.

Some LULUCF compartments, such as removals and emissions from arable crops or grassland may refer to the developed guidance on agriculture. The guidance presented in the Agriculture sector can have an impact on

¹⁵¹ Primary forests are considered to be unexploited, so a default neutrality hypothesis is established by considering the forest in balance. As the forest is not exploited, the trees of which it is composed reach their natural mortality age and decompose carbon when decomposition, this destocking will be counterbalanced by organic production, hence the assumption of carbon neutrality.

land use and land use change and thus be directly passed on to the LULUCF sector. It should be recalled that removals and emissions of aerial and root biomass and soil for the whole territory are accounted for within the LULUCF sector.

Industry

In 2022, **emissions from industry** amounted to 71 Mt CO₂ eq, or about 18 % of national emissions. Three sectors account for 72 % of industry emissions: metallurgy (16 Mt CO₂ eq), chemistry (17 Mt CO₂ eq) non-metallic minerals and building materials (19 Mt CO₂ eq) (Citepa, Secten 2024). In addition, the 50 most emitting industrial sites are responsible for 55 % of the sector's emissions.

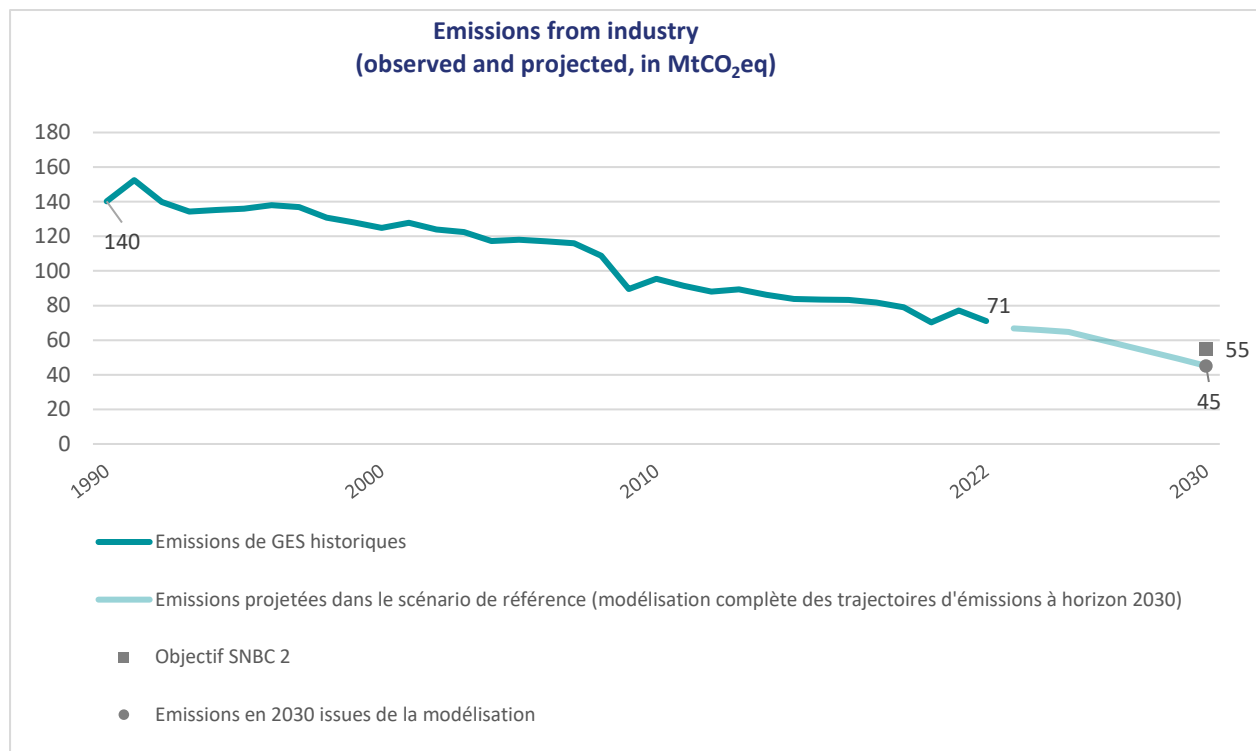


Figure81: Trends in emissions from the industry sector in Mt CO₂eq (source: national greenhouse gas emissions inventory, CITEPA, Secten 2024; DGEC Models)

Reducing industry emissions requires a profound transformation of this sector through the mobilisation of various technological levers, including energy efficiency, the substitution of low-carbon (electricity) or renewable energy (biogas or biomass) to fossil fuels, decarbonisation of production processes (use of decarbonised hydrogen, carbon capture and storage, abatement of fluorinated gases or nitrous oxide), changes in inputs in industry (increased recycling, reduction of clinker rates, etc.) and sobriety (reduction of clinker rate in cement, lower plastic consumption, etc.).

The challenge of decarbonising industry is also economic: the deployment of decarbonised production processes on an industrial scale is a key factor in competitiveness for France in the future, particularly with a view to increasing the carbon price. Indeed, in parallel with the decrease in the emissions cap on the EU ETS market, around half of European industry's emissions will be affected by the phasing out of free allowances, scheduled between 2026 and 2034 and linked to the implementation of the Carbon Border Adjustment

Mechanism (CBAM). This scheme, which imposes a carbon price on imported products, is designed to limit carbon leakage by subjecting non-EU producers of certain intensive products to the same level of carbon pricing as European producers. In this perspective, putting our industry at the top at European and global level in its decarbonisation is a key challenge for the most emitting sectors.

Our climate goals require **industry to continue its decarbonisation efforts**: by 2050, decarbonising industry means keeping only uncompressed emissions, and in particular limiting the use of fossil inputs to material use and for manufacturing processes for which there are currently no decarbonised alternatives. Industry can also contribute to removals of CO₂ through the capture and storage of its biogenic emissions.

The modelling exercise at this stage allows **industry to reach 45 Mt CO₂eq and a final energy consumption level of 336 TWh by 2030**. This modelling takes into account the elements of the decarbonisation roadmaps carried out by the top 50 emitting sites in the first half of 2023 as well as by the pathways.

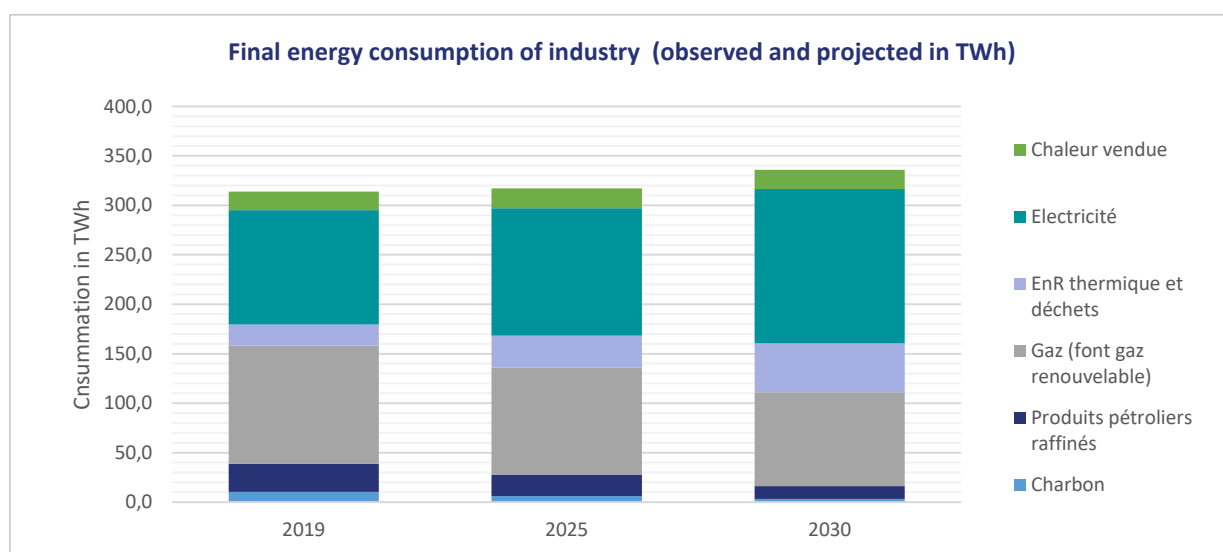


Figure82: Final energy consumption of industry (historical and projections)
(source: France's energy balance, SDES, 2022 edition; DGEC Models)

The emission reductions achieved by levers are described in the following figure.

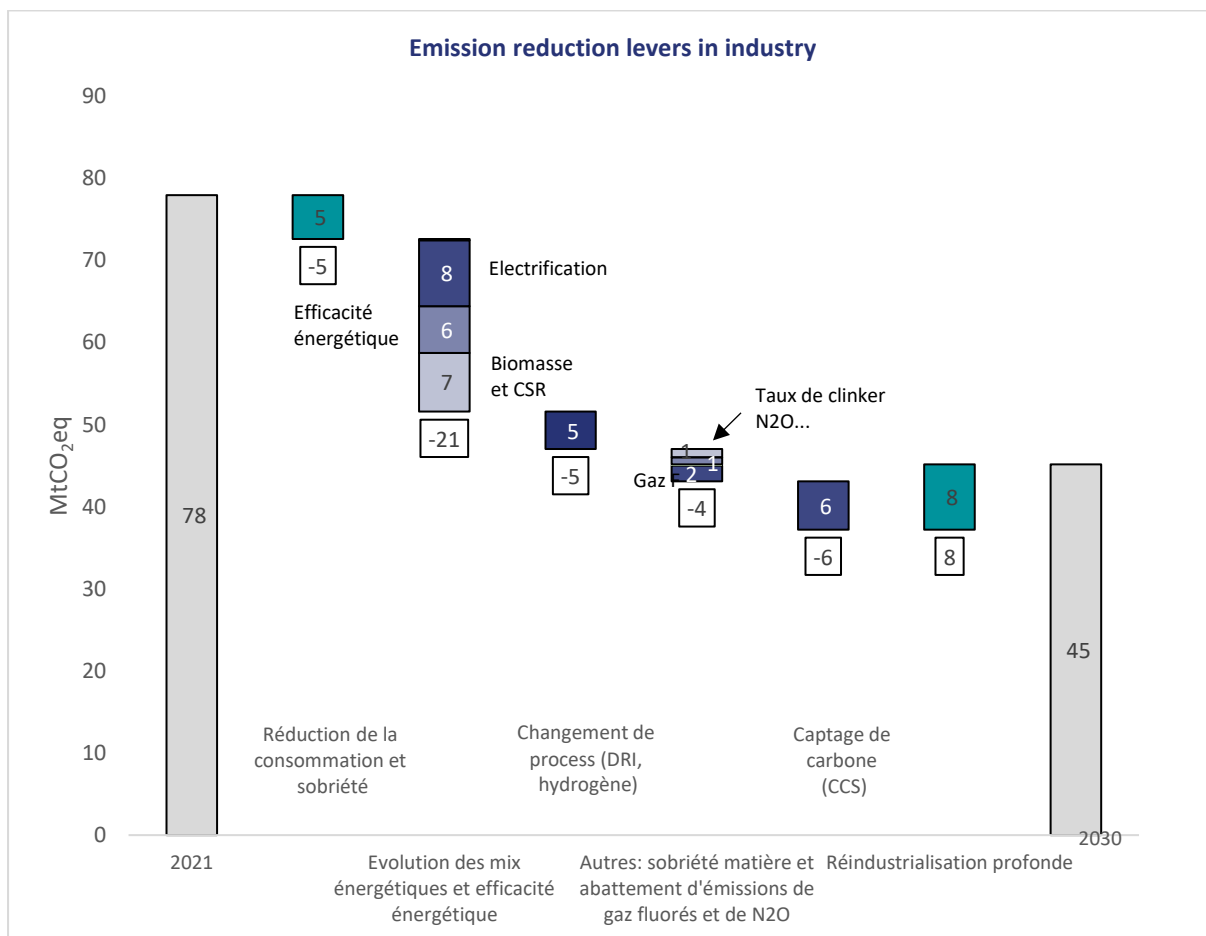


Figure83: Indicative decomposition of the effects of the various levers based on MTE modelling work, based on MEFSIN and MTECT data

The main (provisional) assumptions of the 2030 baseline are compiled below:

- Reducing energy and resource consumption:
 - **Sobriety:** industry is adapting to meet the needs of society with more sobriety, offering products that consume less energy and natural resources, in particular fossil fuels. This includes, for example, offering alternative construction materials (such as cement with low clinker content or bio-based materials), or packaging, moving towards an exit of single-use plastics.
 - **Energy efficiency:** energy efficiency gains already achieved in recent years continue. They vary greatly from one industrial sector to another: between 5 and 25 % in 2030 compared to 2021 (with the exception of certain sectors such as ammonia where the use of decarbonised hydrogen leads to a loss of energy efficiency). Almost all waste heat is reused on-site, for example for preheating, and then to feed industrial or residential heat networks. Energy efficiency reduces emissions by at least 5 Mt CO₂ eq for industry by 2030.
 - **Alternative material inputs and recycling:** the incorporation rates of recycled raw materials in the steel, aluminium, petrochemical and glass sectors increase between 10 and 30 %. The clinker rate is reduced by 9 % for cement production.

- Decrease in French carbon footprint: **Green reindustrialisation**: reindustrialisation in France meets the objectives of reducing the carbon footprint, when domestic production replaces imports. It is decarbonised to limit its impact on territorial emissions. Reindustrialisation includes the production of technologies essential for the decarbonisation of industry and the economy as a whole. While these policies are essential to drive the transition, they can lead in the short term to a relative increase in national emissions, offset in the medium term by a decrease in the imported carbon footprint.
- Changes in the energy mix:
 - **Electrification of the sector** (with low-carbon electricity): the sector is undertaking electrification work, in particular by installing heat pumps (for low temperatures), electric boilers (e.g. for chemistry or agri-food to produce heat) or electric furnaces (particularly for metallurgy and glass). The electricity used is decarbonised¹⁵² and at a price compatible with the competitiveness of industry. This electrification also leads to energy efficiency gains in many cases (e.g. with the installation of heat pumps or the use of mechanical vapour compression).
 - **Energy use of biomass and RSC¹⁵³**: in industry, biomass derived in particular from sustainable forest management is primarily¹⁵⁴ geared towards high temperatures, which are difficult to electrify. Gas decarbonised gradually thanks to the injection of biogas (see energy sector). Solid recovered fuels (RSC), the use of which reduces emissions from the waste sector, is used in the cement sector as an alternative to fossil fuels or for heat production in other sectors. In general, they replace fossil fuels when the biomass field is limited.
- Alternative processes and capture of residual carbon:
 - **Low-carbon or renewable hydrogen: decarbonised** hydrogen produced by electrolysis of water is used as an alternative to fossil material inputs and as an alternative to fossil fuels, where no alternative is possible. In chemistry, it is used as a partial substitution of hydrogen produced by vapour reforming methane (ammonia and petrochemical sectors). In the steel industry, several blast furnaces are replaced by direct iron ore reduction plants coupled with electric arc furnaces.
 - **Abatement of fluorinated gases and nitrous oxide emissions**: industry continues its efforts to reduce fluorinated gases (including agri-food) and nitrous oxide (including chemistry) by adapting its production processes (e.g. using non-fluorinated refrigerants or using catalysts for N₂O). The abatement of these gases with a high global warming potential makes it possible to avoid 2 Mt CO₂eq by 2030.
 - **Carbon capture, storage or valorisation**: the purpose of carbon capture and storage or recovery is to remove residual emissions, i.e. those that cannot otherwise be reduced at acceptable costs such as process emissions (e.g.: capture of emissions from the decarbonisation of limestone for lime or cement production) with a volume captured in industry in the order of 7 Mt CO₂ in 2030. By this time, almost all the carbon captured is stored in geological formations, but a small proportion of captured CO₂ is also used in the production of e-fuels for aviation or maritime, or material inputs for industry.

Waste

The waste sector emitted 14 Mt CO₂ eq in 2022, representing 3.6 % of France's gross emissions (Citepa, Secten 2024). These **emissions are mainly related** to methane from the degradation of fermentable waste in non-

¹⁵² To ensure that indirect emissions from electricity generation are much lower than those of fossil technologies (e.g. gas-fired heat production)

¹⁵³ Solid recovery fuels

¹⁵⁴ The biomass resource is by definition limited and its use must be sustainable, i.e. compatible with the renewal of resources and the preservation of the carbon sink, soil fertility and biodiversity in particular.

hazardous waste storage facilities (NHWD), as well as methane and nitrous oxide from wastewater treatment. To a lesser extent, the treatment of solid waste (composting and methanisation) and incineration without energy recovery (including hazardous waste) contribute to the sector's emissions. Emissions from recycling are counted in industry and emissions from incineration with energy recovery are counted in energy (Secten nomenclature).

These emissions are comparable to those in 1990, but declining since the mid-2000s.

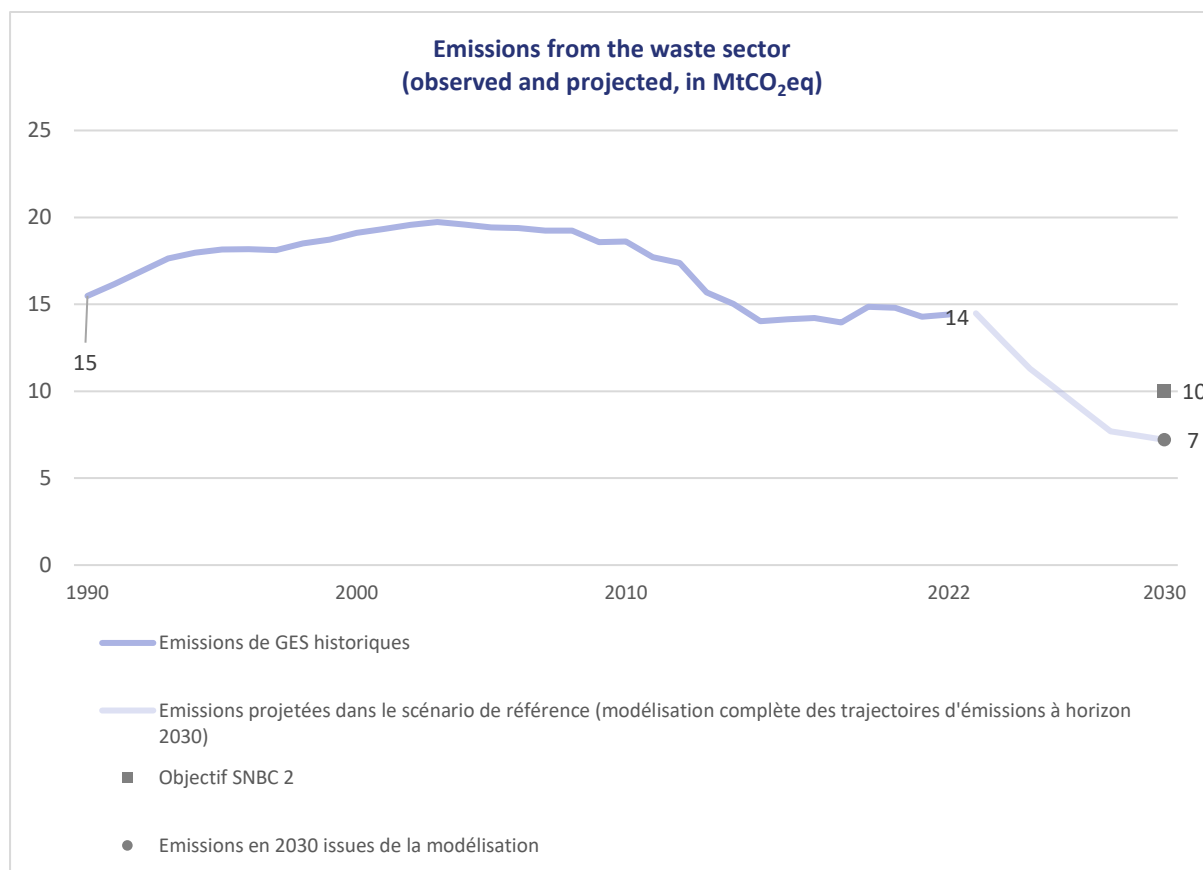


Figure84: Emission trends from the waste sector in Mt CO₂eq (source: national greenhouse gas emissions inventory, CITEPA, Secten 2024; DGEC Models)

The waste processing and recovery process also helps to limit France's carbon and material footprint through the recycling of raw materials.

Reducing emissions from the waste sector requires action on the prevention of waste generation, the redirection of waste towards material and energy recovery and the capture of methane in storage sites.

The modelling exercise at this stage allows **the waste sector to reach 7 Mt CO₂eq by 2030.**

The GHG emission reductions achieved by levers are described in the following figure.

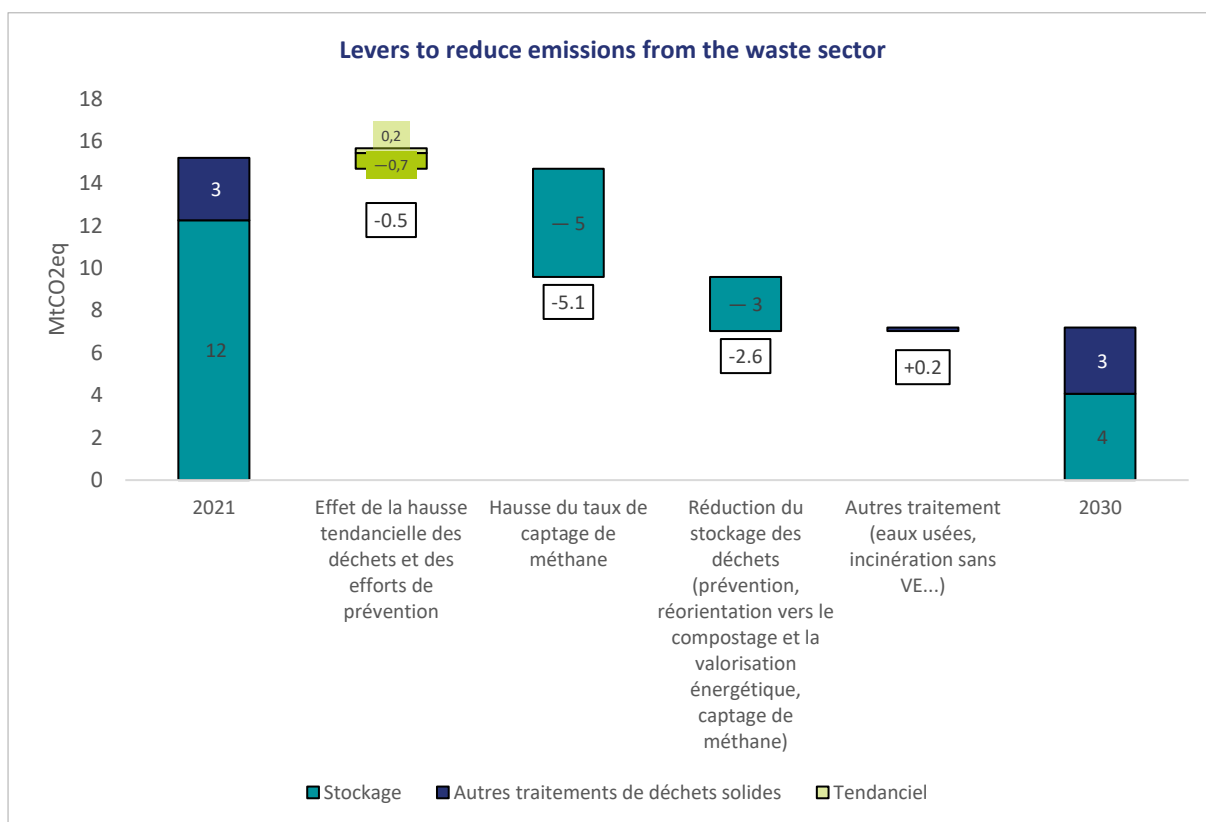


Figure85: Indicative decomposition of the effects of the various levers based on MTECT modelling work

The main (provisional) assumptions of the 2030 baseline are compiled below:

- **Prevention:** stable tonnage of non-inert non-hazardous waste around 80 Mt, with a reduction in household waste but an increase in industrial waste linked to reindustrialisation.
- **Redirecting waste towards material and energy recovery sectors:** the wastestreams generated each year in France are redirected massively towards the material and energy recovery sectors, particularly with the aim of reducing the quantity of waste stored from 19 to 8 Mt in 2030. The tonnage of recycled waste increased from 39 to 42 Mt, methanised (excluding agriculture) from 1 to 3 Mt, composted from 9 to 10 Mt, the production of solid recovered fuels reached 4 Mt in 2030.
- **Methane capture in storage locations:** the capture rate of BIOMethane in non-hazardous waste storage facilities (ISDND) increased from 47 % in 2020 to 85 % in 2030. The recovery rate of captured biomethane is increased from 77 % to 85 %.

Energy

The **energy production and processing sector** emitted 43 Mt CO₂eq in 2022, representing 11 % of France’s gross emissions. These **emissions have been declining since the 1990s**, in particular as a result of the decarbonisation of our electricity system. Energy emissions are divided into electricity generation (51 %), district heating (9 %),

oil refining (16 %), waste-to-energy (17 %) and other transformations and losses (8 %) (Citepa, Secten 2024). 70 % of the sector’s emissions are covered by the European carbon market (EU ETS).

Note: this sector covers energy production and transformation, not its end use, other sectors. All sectors together, *energy use* is the main source of greenhouse gas emissions in France (around 70 % of total emissions excluding LULUCF in 2021¹⁵⁵).

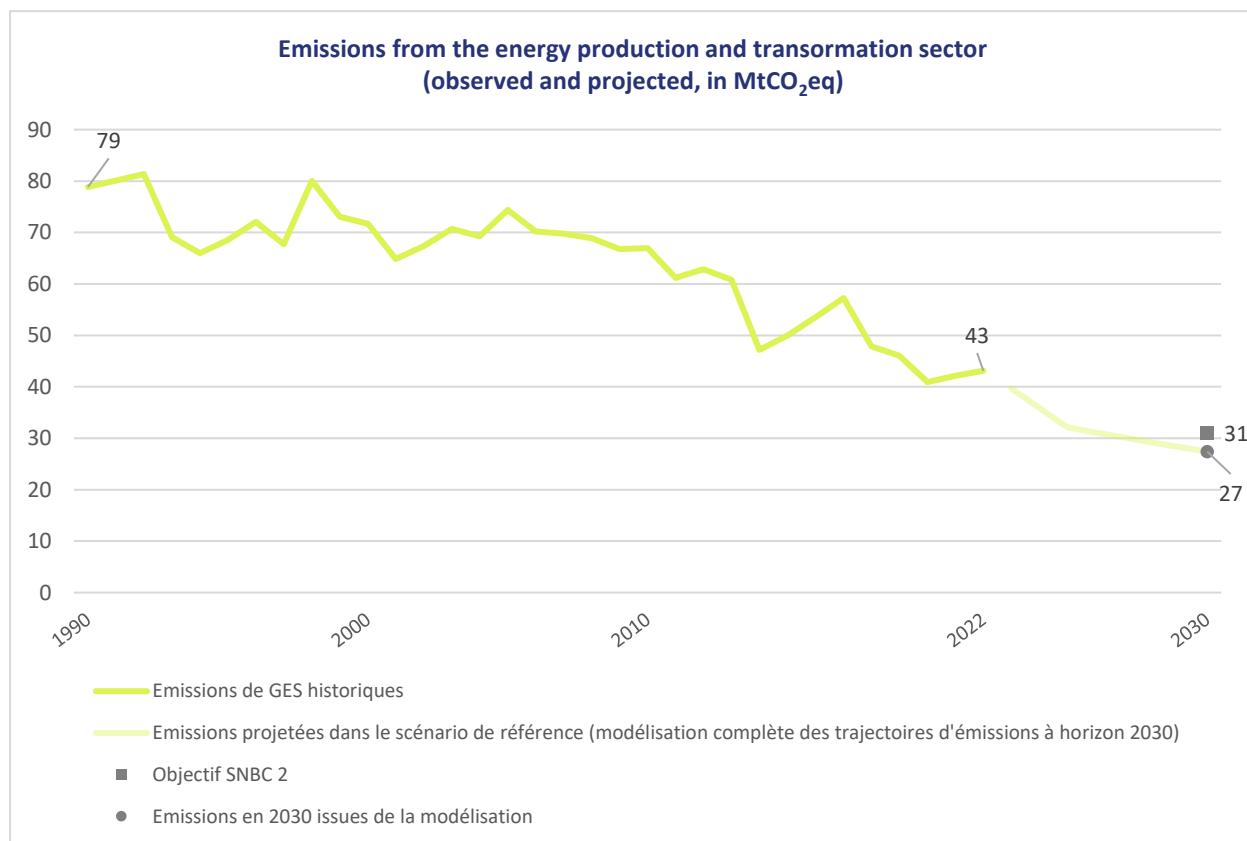


Figure86: Trends in emissions from the energy production and transformation sector into Mt CO₂eq (source: national greenhouse gas emissions inventory, CITEPA, Secten 2024; DGEC Models)

The decarbonisation of the sector must be seen in terms of both electricity and heat production, but also refining, and the response to the growing demand for decarbonised energy. In addition, fugitive fuel emissions (methane leaks) are intended to be reduced.

The modelling exercise at this stage allows **the energy sector to reach 27 Mt CO₂eq** by 2030.

The GHG emission reductions achieved by levers are described in the following figure.

¹⁵⁵ National Inventory Report (NIR) 2023

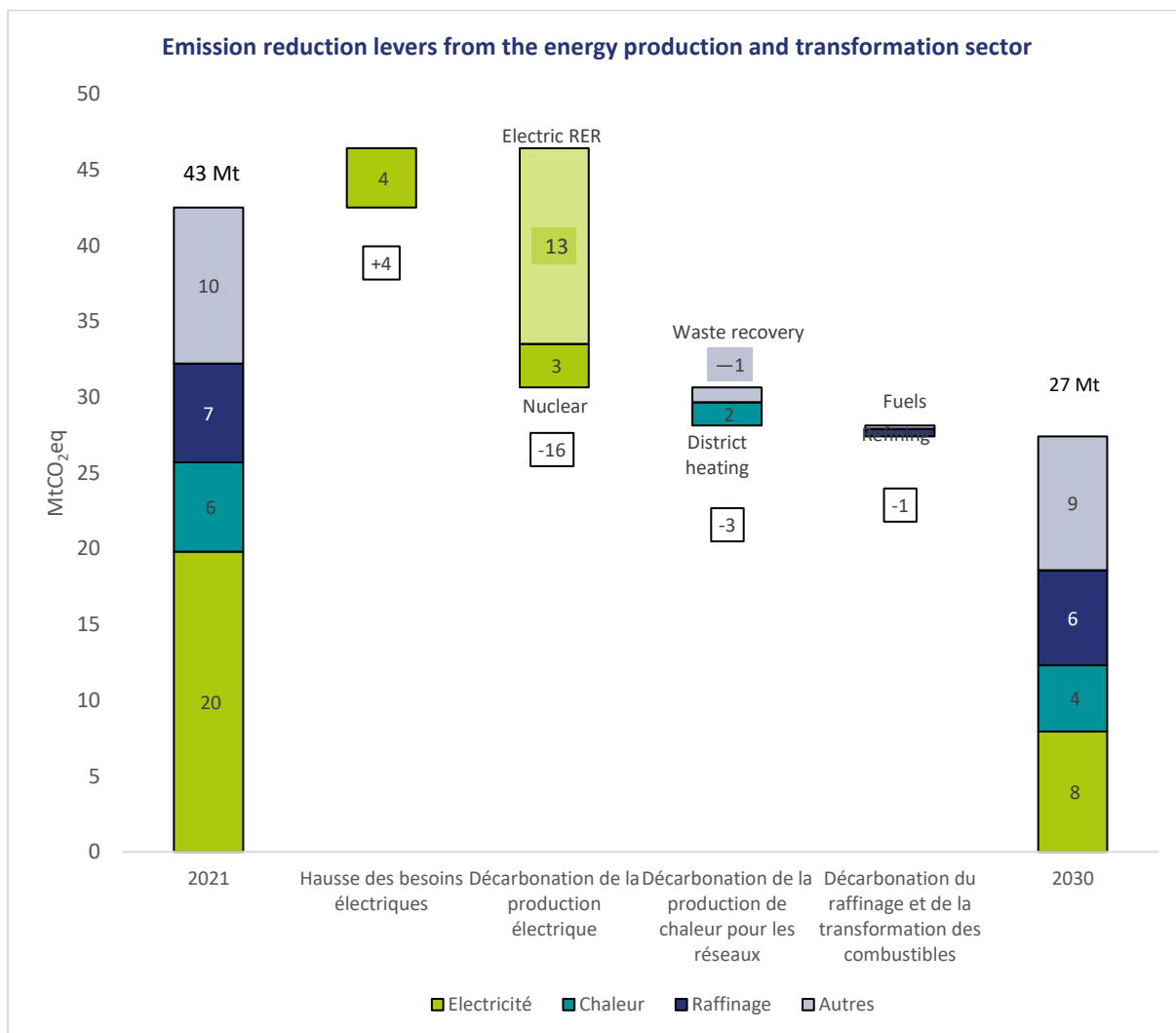


Figure87: Indicative decomposition of the effects of the various levers based on MTECT modelling work

The main (provisional) assumptions of the 2030 baseline are compiled below:

Generation of electricity

- **Deployment of decarbonised energy:** electricity mix at 96 % decarbonised in 2030 (61 % nuclear, 35 % renewable energy)
- **Deployment of electric renewable energy:** in 2035, at least an additional 177 TWh of electricity from renewable energy will have to be produced compared to 2022 to meet the growth in demand and ensure our security of supply. This will be achieved by the proactive deployment of all the sectors (photovoltaic, wind and hydropower), reaching around 120 GW installed in 2030 and between 160 and 190 GW in 2035, which means in particular:

For photovoltaic: double the annual rate of new capacity development, to reach 54 to 60 GW of installed capacity in 2030 and 75 to 100 GW in 2035, working on a balanced distribution between ground, large rooftop and residential power plants;

For onshore wind: maintain the current pace, in order to reach 33 to 35 GW of installed capacity in 2030 and 40 to 45 GW in 2035 both by ensuring a more balanced distribution of installations within the territory and by investing in the repowering of existing installations;

Taking into account the allocated projects and commissioning times, the installed offshore wind capacity in 2030 is expected to be 3.6 GW. However, the ongoing procedures and the extensions already identified have already made it possible to identify 10.4 GW of offshore wind farms. The challenge will then be to achieve the objective of the Offshore Wind Pact of 18 GW put into operation in 2035, while creating the conditions for further ambitious development in the following years (around 2 GW/year);

For hydropower, which is today the largest source of renewable electricity (42 % of renewable electricity generation and a total capacity of 25.7 GW), the objective will be to increase installed capacity by 2.8 GW by 2035, largely on existing installations. This 2.8 GW will include around 1 700 MW of pumped power transfer stations – essential to increase our electricity storage capacity – 640 MW on installations above 4.5 MW and 485 MW on installations below 4.5 MW.

- **Nuclear energy:**

Commissioning of Flamanville 3 EPR, continued operation of existing nuclear reactors as long as all applicable safety requirements are met and the availability of the existing nuclear fleet is increased through operational performance gains and increased reactor power;

Construction and commissioning of new nuclear reactors: EDF's commitment to build three pairs of new EPR 2 reactors at the Penly, Gravelines and Bugey sites, aiming for a final investment decision by its board of directors by the end of 2025, and to deepen the study of a reinforcement of the nuclear power programme by at least 13 GWe additional, corresponding to the capacity of 8 EPR2 in their current design, in order to enable informed decision-making by 2026;

Achievement of the first concrete milestone in 2030 for a reference power plant for small modular nuclear reactors of Nuward technology and launch of an advanced reactor prototype by 2030;

Validation of the sustainable treatment/recycling orientation of the fuel cycle and, with this in mind, continuing work by the end of 2026 at the latest for decision-making, including on the post-2040 strategy, ensuring that measures are taken to ensure that existing infrastructure needs are met by 2035;

Contribution to strengthening European uranium conversion and enrichment capacities.

- **Fossil thermal energy output:** end of coal-fired electricity generation in 2027 and exiting dependence on fossil fuels in 2050, compared to an energy mix of almost 60 % fossil fuels in 2021;
- **Non-interconnected areas:** in line with the specific PEPs of non-interconnected areas, by 2030, achieving a decarbonised electricity mix of more than 99 %, allowing for a good level of electricity service quality, through the development of renewable electric energy sources coupled with storage solutions (STEP, battery) and thermal power plants using bioliquids (partly imported from hexagone). Conversion of thermal power plants to decarbonised energy sources, with particular attention to the challenges of biomass availability.

Generation of heat

- **The objectives of the EPP3:** must increase the consumption of renewable heat and recovery from 183 TWh in 2021 to at least 330 TWh in 2035;
- **Development of renewable and recovery energy (ENR) delivered by networks:** increasing the share of renewable energy and recovery in the district heating mix. The quantities of heat delivered by the networks will have to increase from 30 TWh, of which 60 % is heat EnR in 2021 to 68 TWh, of which 75 % is heat from EnR in 2030 and then up to 90 TWh, of which 80 % is heat ENR in 2035.
- **Heat Fund:** the rapid development of district heating networks and renewable heat and recovery is achieved through support from the Chaleur Fund, which was increased by 40 % in March 2022, reaching EUR 520 million in 2022, EUR 595 million in 2023 and EUR 820 million in 2024. In the following years, it will continue to support projects to support the development of all the energy supply chains and the deployment of district heating networks and thus to comply with the EPP objectives.

Biofuel and low-carbon gas production

- **Increase in biogas production:** the EPP Broad Paper foresees a target of 50 TWh of biogas production in 2030, of which 44 TWh was injected into the gas network distributed in France, and up to 85 TWh in 2035;
- **Increase in biofuel production:** in 2030, the need for biofuels and bioliquids is estimated at 48 TWh within hexagon and 5 TWh in overseas countries.
- **Production of hydrogen from electrolysis** for all new production capacity and with the objective of achieving 100 % electrolytic capacity in the long term.

Refining of petroleum products

- **Decline in refining activity:** refining activity decreases as the use of petroleum products decreases in France (-31 % of refined quantities in 2030 compared to 2019). Despite a decrease in consumption in 2 030.15 million tonnes of diesel and 9.5 million tonnes of super-fuel will still be consumed.
- **Decarbonisation of refinery sites:** refinery sites are decarbonised through optimisations to improve their energy efficiency and electrification as a first step, in parallel with the use of low-carbon hydrogen for their needs and carbon capture and storage technologies, which will be deployed in the medium term. At the same time, it will be necessary to supply increasingly decarbonised energy products (biofuels, e-fuel oil, sustainable aviation fuels, bio LPG, etc.), to existing refineries, where appropriate closed and reconverted (fully or partially), or at other sites.

5.1.1.3 some challenges around the scenario

Energy: a double challenge of reducing our consumption and producing enough to meet new needs

Reducing our energy consumption is essential in order to be able to meet our energy needs from decarbonised energy in the short, medium and long term.

- Electrification in transport, buildings and industry to meet European and French climate ambitions;
- Reindustrialisation, which will require new energy needs;
- The potentially limited availability of decarbonised energy carriers, including biomass.

Moreover, the levers to control electricity consumption (sobriety and efficiency) will not be able to counterbalance the sharp increase in electricity needs, driven upwards by the factors set out above. It is therefore imperative in the French energy strategy to **push all the curators for the production of decarbonised energy as much as possible**.

The issues involved in closing electricity will concern both the **amount of electricity available** (energy loops) but also the **ability of the electricity system to meet peak demand**, at the time when consumption is most significant (power looping). This means both **reducing our energy consumption**, in particular fossil energy consumption, through sobriety and energy efficiency, and **massively increasing decarbonised electricity production** by restarting nuclear power and accelerating the deployment of renewable energy. However, some of them will only be operational in several years (new reactors, offshore wind)

The decarbonisation of energy requires a transition that requires electrification of uses and the reinforcement of uncontrollable means of power generation. This transition makes the development of flexibilities and the management of energy consumption all the more strategic.

Flexibilities take place at all time scales, from the long time of structural and regular flexibilities to close to real time balancing. They also have a dual interest in ensuring security of supply and optimising the electricity system.

Studies thus show that **demand flexibility must become a crucial tool for the functioning of the electricity system by 2030**, with the need for a “scale-up” and enhanced steering.

This should make the most of the electrification of uses, which leads to more consumption that can be modulated or shifted over time, especially in order to smooth peak consumption in the morning and evening. This is typically the case for charging electric vehicles (charging time lag, installation of vehicle to grid), domestic hot water or any other erasable high-power equipment. There is significant potential in real estate, based on the development of steering tools and thermal inertia, in a country where only 6 % of the building is equipped with BMS (technical building management).

As it stands, with the proposed measures of the provisional version of the baseline scenario, **the balance between generation and consumption (loop) of electricity is ensured by 2035**.

Biomass to be mobilised to meet our decarbonisation needs without calling into question the priority given to food and environmental protection

The modelling work carried out as part of the preparation of SNBC 3 is in line with previous ones and **supports the hypothesis of a foreseeable increase in biomass consumption for energy purposes in a context of decarbonisation of all sectors of the economy** and limited possibility of using other vectors, in particular electricity, for all energy consumption.

Faced with this foreseeable increase in biomass consumption, a first challenge is to **deploy sector-specific measures to increase the supply of biomass that can be used for energy purposes compared to a trend scenario**, without prejudice to the priority to be given to food uses (for agricultural biomass), carbon sinks and production for non-energy industrial uses, in particular in the form of molecules and materials (for agricultural and forestry biomass).

At this stage, the provisional version of the reference scenario foresees an **increased production of biomass for energy purposes of 230 TWh NCV Ew by 2030, compared to 209 TWh NCV Ef** in a trend scenario, as illustrated

in the following figure¹⁵⁶. **This development is based both on improved collection arrangements and on significant changes in the cultivation practices and/or areas concerned**, reflected in the assumptions of the provisional SNBC 3 reference scenario and in the guidelines and levers of this strategy.

As it stands, the total consumption of biomass in its various forms of final energy could amount to **238 TWh in 2030 according to the reference scenario (compared to 186 TWh in 2030 under the trend scenario)** for an estimated output of 230 TWh of NCV by that date. The provisional version of the reference scenario thus points to **an imbalance in biomass supply/demand in 2030**. On the other hand, uncertainties about the **projected figures suggest caution as early as 2025**, as a number of sub-sectors may see their consumption increases.

Greater mobilisation cannot therefore fully address the issue of matching biomass supply and demand in particular at longer horizons (post 2030): securing this long-term closure is **one of the challenges of complementary work on planning**, which must continue in the coming months.

Regarding the underlying of bioenergy development, elements of the (provisional) baseline scenario:

- The total area with intermediate crops increased from around 3 Mha in 2020 to 4,8 Mha in 2030, and CIVE's share increased (4 % in 2020 compared to 19 % in 2030)
- The total intermediate crop production is multiplied by 2 (9 MtMS in 2020 to 18 MtMS in 2030);
- Areas under perennial energy crops increased from 0 kha to 96 kha in 2030;
- The proportion of methanised CIVE increased from 4 % in 2020 to 35 % in 2030. The amount of crop residues used in 2G fuels increased from 0 to 357 kt in 2030.
- The amount of methanised manure or manure is multiplied by 3 by 2030 (874 kt in 2020 compared to 2 872 kt in 2030), while overall livestock numbers are decreasing, reflecting an improvement in the percentage of methanised manure (6 % in 2020 compared to 22 % in 2030).
- Hedgerows line increases by 50 000 km by 2030 (from 734 000 km in 2020 to 784 000 km in 2030)

5.1.2 Assessment of the interactions between existing and planned policies and measures and between those policies and measures and measures of the Union's climate and energy policy

The graph below makes it possible to compare the projections of the AME and AMS scenarios.

¹⁵⁶ A significant effort is to be made in the agricultural sector on intermediate crops (+ 14 TWh Ef between 2019 and 2030), lignocellulosic crops (+ 7 TWh Ef between 2019 and 2030), crop residues (+ 11 TWh Ef between 2019 and 2030), livestock manure (+ 5 TWh Ef between 2019 and 2030), wood from agroforestry (+ 2 TWh Ep between 2019 and 2030). **For woody biomass**, the main quantitative gain would be expected on the mobilisation of primary biomass and correlations linked to the increase in harvest (+ 9 TWh Ep between 2019 and 2030) and on end-of-life wood waste. (+ 3 TWh Ep between 2019 and 2030).

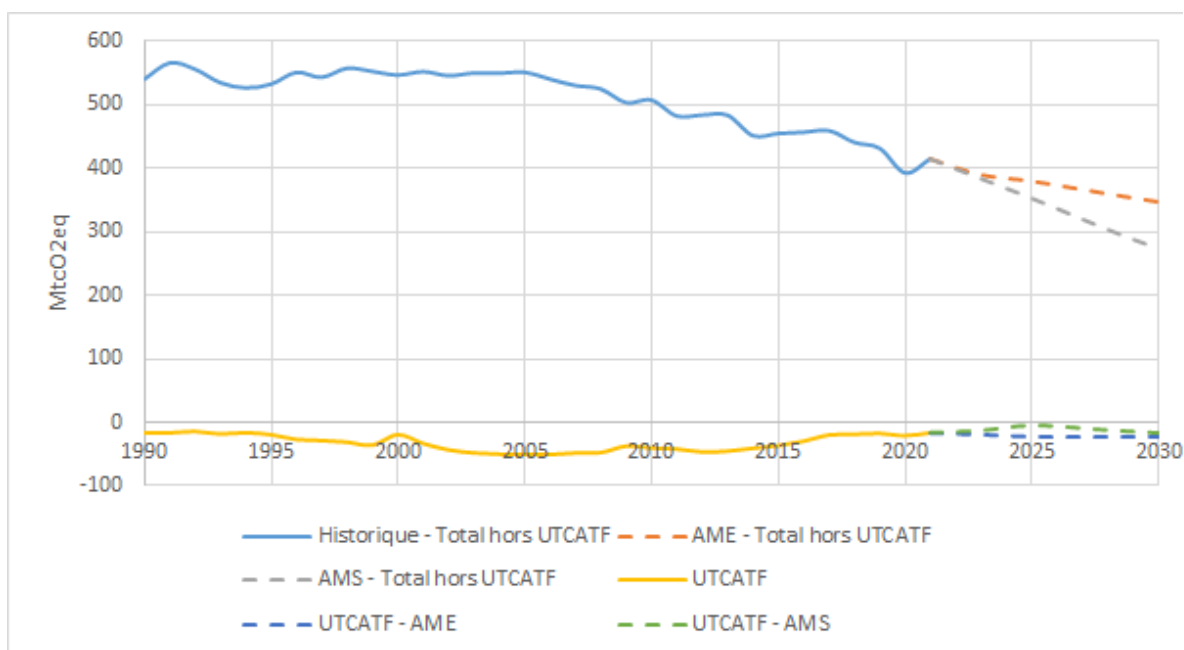


Figure88: Comparison of AME and AMS projections

Emission reductions in the AMS scenario compared to the AME scenario by 2030 are presented in the following table:

| Sectors | Reduction of emissions per sector in the AMS scenario compared to the AME scenario 2030 |
|---|--|
| Transport | — 13 % |
| Building | — 34 % |
| Agriculture/forestry (excluding LULUCF) | — 15 % |
| Industry | — 30 % |
| Production of energy | — 17 % |
| Waste | — 48 % |

| | |
|--------------------------|--------|
| Total (excluding LULUCF) | – 21 % |
| LULUCF | – 21 % |
| Total (with LULUCF) | – 21 % |

Table of emission 18 reductions in the AMS scenario compared to the AME scenario by 2030

In particular, the AMS scenario drives much further efforts to improve energy efficiency and renewable energy development compared to the AME trend scenario.

5.2. Macroeconomic impacts on health, environment, employment, training, skills and social

5.2.1 *Macroeconomic impacts*

Support to households in particular small households

The SNBC and EPP baseline should be subject to a macroeconomic assessment. The results of this evaluation are then reflected in the SNBC’s accompanying report.

This macroeconomic assessment is carried out by comparing the ‘AME’ or ‘with existing measures’ scenario with the ‘AMS’ scenario or ‘with additional measures’. **It provides valuable elements in terms of the social and economic impact of the assumptions and orientations adopted in SNBC and EPP.**

For SNBC and EPP 3, this assessment on the final scenario. It will contribute to the reflections on the operational planning of SNBC 3, thus complementing the challenges identified in the report “The economic impacts of climate action ” by Jean Pisani-Ferry and Selma Mahfouz published in May 2023 ¹⁵⁷ on the economic impact of the transition.

- The **climate transition has the scale of an industrial revolution** but will have to be twice as fast, and will be driven by public choices more than innovation and markets.
- The **transition is based on three economic mechanisms**: the **redirection of technical progress from brown to green, the beneficial effects of which will materialise in the medium to long term; sobriety**, which implies a change in collective practices and standards and can bring welfare; **capital substitution** (public and private investment) for fossil fuels (main mechanism in 5-10 years)
- While the transition may have a negative effect on economic activity in the short term due to lower corporate productivity growth, an orderly and sufficiently predictable transition for households and firms to anticipate measures and adjust their behaviour as a result could **generate long-term activity gains**. However, these gains are uncertain and will only materialise under the right conditions: there is no friction on capital and labour allocations, international coordination of transition policies, orderly transition, etc. The transition also

¹⁵⁷ <https://www.strategie.gouv.fr/publications/incidences-economiques-de-laction-climat>

poses an inflationary risk, which public policies should focus on containing. In any event, the cost of action is much lower than that of inaction.

- There is a **competitiveness challenge for European industry**. Support for the development of green sectors is needed.
- The **transition raises challenges in terms of equality and just transition**. The transition requires the ability to finance public and private alternatives. Although sometimes profitable in the long term, some green investments may be unbankable without public support for small households or even intermediate deciles. As a result, the French strategy will continue to provide the necessary public support to households, especially the most fragile ones, to ensure the feasibility of the transition for all. The issue of financing green investments will also arise for businesses, especially the smallest ones, which will not necessarily be able to finance all decarbonisation costs. They should also be accompanied. Finally, sobriety efforts must also be shared by all stakeholders.

The **profound changes** linked to the transition **will therefore continue to be accompanied by**: aid for energy renovation of housing, aid for the payment of energy bills, premium for converting the most polluting vehicles, etc. **with increased targeting**.

The **macroeconomic evaluation of SNBC3 currently being carried out is intended to continue the work of the report “The economic impacts of climate action” by Jean Pisani-Ferry and Selma Mahfouz published in May 2023**. According to the report, the green transition would ultimately generate economic and environmental co-benefits compared to a scenario of climate inaction, i.e. without sufficient mitigation policies to avoid materialising the negative effects of climate change. However, the green transition could lead to a slowdown in economic growth, especially in the coming decade. The report shall also include an *ex ante* assessment of the macroeconomic impact of several additional decarbonisation measures (fiscal and sectoral measures in buildings, road transport, industry and energy production). In the event of a negative productivity shock justified by the foreclosure effects that additional decarbonisation investments could induce on productive investments, these additional measures could lead to lower activity and inflationary effects compared to a baseline scenario integrating existing measures. Overall, the report highlights the uncertainty surrounding the macroeconomic impact of transition policies and calls for further work on evaluations.

As part of the revision of the SNBC, a new trajectory for the value of climate action (VAC) will be proposed. VAC represents the value for the community of efforts to avoid the emission of one tonne of CO₂ equivalent. This is a reference point for the community to select actions relevant to the fight against climate change by assessing the path to achieving carbon neutrality enshrined in the 2015 Paris Agreement and the Climate Energy Law of 11 November 2019. A VAC trajectory, constructed around a pivotal value of EUR 250 per tonne of CO₂e in 2030, was proposed by the committee chaired by Alain Quinet in February 2019. Its revision will provide information on the impact of the upward revision of climate objectives. **Work is currently underway in a new committee**.

5.2.2 Social impacts

5.2.2.1 support to households in particular small households

The **energy transition is characterised by a significant investment in capital that can then generate energy savings**. But even when these investments are profitable in the long term, they are not always bankable by small households. To enable a just transition, the French strategy provides for a number of support measures that depend on household income levels (see section 3.1).

As regards housing and transport, many measures exist for support to small households, as explained in detail in section 3.

For example, a study published in October 2023¹⁵⁸ indicates that for the first decimal place of the population, the difference in the cost of purchasing a new new urban electric vehicle compared to its thermal equivalent, taking into account all aids and possible malus, is – EUR 5 550 (it is therefore more attractive to purchase an electric vehicle over its thermal equivalent). The schemes under consideration for 2024, including leasing and revision of the green bonus, should give access to as many decarbonised mobility as possible.

5.2.2.2 support for territories leaving coal

The provisions of Article 12 of Law No 2019-1147 of 8 November 2019 on energy and climate limit CO2 emissions^{from} 1 January 2022 for installations producing electricity from fossil fuels. The effect of these provisions is the closure of several coal-fired power plants located in the following municipalities: Le Havre and Cordemais, owned by EDF, and Gardanne and Saint-Avoid, belonging to GazelEnergie Generation. It is therefore approximately 700 direct employees who are affected by these decisions.

As regards the plants operated by EDF, only Le Havre was effectively closed in April 2021. Cordemais continues to operate and should be closed by 2027 at the latest. For those operated by GazelEnergie, the Gardanne business was closed in May 2021 (coal tranche). Finally, Saint Aavoid was closed in March 2022 and immediately re-opened (MUPPA Law) in order to ensure security of supply in the context of the energy crisis. It has been operating since then and is expected to be closed by 2027 at the latest.

In order to support the employees of these coal-fired power plants, but also the employees of the ports affected by the abolition of the handling activity and the employees of the subcontractors of those installations, Order No 2020-921 of 29 July 2020 laying down various measures to accompany employees in connection with the closure of coal-fired power plants created arrangements derogating from the general labour code law on redeployment, justified by the rapid nature of the decision to close coal-fired power plants. Thus, the employees of the undertakings operating the electricity generating installations whose employer intends, as a result of the closure of those installations, to terminate the employment contract as part of an employment protection plan, who have not returned to employment at the end of the redeployment leave, are entitled to specific support leave to remain in employment for a period of 12 months. This can be extended to 18 months under certain conditions.

For the employees concerned in the Electriques and Gazières Industries (IEG) sector, these measures are taken by the State in addition to the financing by the company of a plan to safeguard employment (PES) and redeployment leave (CR) followed by specific accompanying leave (CAS). The State reimburses employers via the prefectures of the regions concerned, who are entrusted with the 174 programme of the mission “Sustainable Ecology, Development and Mobility”. The purpose of this leave is to enable them to return to work as soon as possible, while taking into account the specific situation of these employees.

The monitoring of former employees showed that the scheme planned for 2020 needed to be updated. Employees came out of the current support scheme from August 2023, with no reclassification solution for many of them for several months, in particular as regards the Gardanne site. The Government, in order to prevent

¹⁵⁸ <https://www.i4ce.org/wp-content/uploads/2023/10/La-transition-est-elle-accessible-a-tous-les-menages.pdf>

such persons from interrupting payment, has accordingly extended the duration of their specific accompanying leave (LF2024) for 28 months.

A total of EUR 35.5 million in State social funds are used to support staff, in addition to the PES of enterprises.

In addition, a minimum of EUR 40 million is provided to support regions in the exit from coal.

Concerning the Cordemais coal power plant (operated by EDF)

Given the rather favourable social context and the industrial projects being developed nearby, it was decided to support EDF's approach so far not to convert it further to biomass and close it within a deadline to be set.

The plant is operated by EDF. In the event of closure, a scheme identical to that used for Le Havre would be put in place: reclassification of staff by EDF, support for subcontractors by local government departments. With regard to the territorial dimension, the Pact signed in 2020 includes more indirect actions (concerning the port area), which, moreover, are already largely committed, than actions to convert the site. There will be no need to adapt the territory project

On the St Avold coal plant (operated by GazelEnergie)

In view of the plant's past, which has already been closed for the first time, and the rather favourable social context, it was decided to close it within a deadline to be set. The plant should in any case be closed before 2027.

Just Transition Fund (JTF)

The French part of the JTF covers all coal territories, which, however, does not mean that it is limited to them. It consists of two components: the first "economic development" is based on the ERDF and is implemented by the relevant regional councils. The second "social and employment" component is implemented by the State at regional level (DREETS).

Measures are currently being taken to mobilise these funds in the four territories still affected by the closure of coal-fired power plants (Bouches du Rhône, Loire Atlantique, Moselle) but without final arbitration at that date, be it projects or applications under investigation or for which business decisions are pending. As regards the coal plant already closed in Le Havre (Normandy), no JTF mobilisation is envisaged.

Alignment with territorial just transition plans

As regards the two plants still officially in operation (Cordemais and Saint-Avold), the relevant passages in the PTTJ of the Pays de la Loire and Grand Est regions are drafted in the same way: *'The closure of the Cordemais power plant is expected to take place between 2024 and 2026, in accordance with the planned dates of commissioning of the Flamanville nuclear power plant in order to secure supplies to the French West. With regard to Saint Avold, the originally planned shutdown for 2022 is suspended due to the security of supply of the electricity system, in view of the war in Ukraine. However, the 2030 and 2050 climate neutrality commitments are maintained.'*

For these plants, the objective remains the cessation of their operation or their conversion by 2027 at the latest, as set out above.

In conclusion, the territorial just transition plans are factually in line with the current French situation.

5.2.2.3 skills and jobs challenges

Stakes

Green planning could cover almost 8 million jobs and create a net of 150 000 jobs by 2030. However, this is accompanied by profound reconfigurations, as this figure, in detail, is explained by 400 000 Full Time Equivalents (FTE) created for 250 000 FTEs destroyed.

Ecological planning aims to set ecological objectives in a coherent manner and articulated with the reality of implementing the levers to achieve them. In this context, the **strategy aims to incorporate a genuine industrial and skills dimension**. This means identifying the underlying industrial sectors and associated value chains, then identifying the need for investment in the French economic fabric and the human resources needed for this transition, and finally equipping ourselves with the means to attract, train and recruit the people who will contribute to it. As part of the “employment and skills” project of ecological planning, this work to identify and build the necessary actions, which has already given rise to a first publication of the SGPE, is ongoing, covering the whole spectrum of the green transition.

Ecological planning will therefore require **mobilising all economic sectors**, taking into account the country’s ambition to reindustrialise and developing innovation for the transition. **Action plans, co-built** between the occupational sectors and the State, will **be implemented in all sectors**, along the lines of the action plan to promote skills in the nuclear sector.

In particular, green planning should create **jobs in certain sectors, some** of which require specific skills, such as:

- Energy renovation of buildings;
- Development of low-carbon energy (nuclear and renewable energy);
- Reindustrialisation, in particular for green industries;
- Conversion and removal of infrastructure necessary for the distribution of fossil fuels;
- Agro-ecological transition.

At the same time, the conversion or even closure of certain sites, and the decline or even abandonment of certain activities, will require **accompanying measures at territorial level** to encourage labour movements from one territory to another, through the mobilisation and coordination of all bodies and services that can contribute to this.

There is a high degree of uncertainty in several key sectors, such as construction or agriculture. The net employment path of these sectors will depend on societal choices: new buildings, agroecology, etc.

The problem of generational renewal arises, for example in agriculture. Tensions are expected by occupations and sectors by 2030:

- agriculture: farmers, livestock farmers, foresters, loggers (deficit of 75 000 FTE);
- building: skilled workers (-206 000 FTE) and machinery operators (-16 000 FTE);
- industry and energy: mechanical technicians and technicians (-60 000 FTE) and textile and leather workers (-17 000 FTE);
- travelling: skilled handling workers (-158 000 FTE), drivers (-201 000 FTE), operating agents (-25 000 FTE).

While in these sectors 1.9 million new entrants are expected, the workforce to be found by 2030 is 2.8 million, or almost 880 000 jobs to be anticipated. Many of these occupations are already under tension.

Occupations with an increasing number of people in employment are often physically more demanding. This may affect the choices of future assets. This lack of attractiveness could worsen with global warming.

Measures

Training is at the heart of ecological planning, including initial training. This implies a thorough overhaul of a large part of professional education.

There is a difficulty in reconciling training and job needs:

- different classifications;
- incomplete monitoring of jobs after initial training;
- “evaporation” of graduates...

Important developments in the provision of training will be supported, enabling the acquisition of transversal skills required by the horizon of carbon neutrality, as well as sectoral skills, as close as possible to the professions. All training organisations and institutions, both initial and continuing training, will thus be mobilised. Skills and training needs not covered will be identified by occupation, level of qualification and, where appropriate, by region, in order to encourage the introduction of new training pathways or changes to existing pathways. Sectoral skills needs diagnoses established in the context of France 2030, in particular, will be mobilised to draw up the necessary plans. In addition, a label for ‘schools of the energy transition’ could be introduced, within the framework of France Nation vert, to improve the readability and attractiveness of the existing and future offer.

In order to achieve these various objectives by ensuring the commitment of all stakeholders, the French strategy will pursue in the economic field the actions undertaken under the plan France relaunch, the ‘France 2030’ investment plan and the law of 23 October 2023 on green industry in order to:

- Work with the sectors to bring the ambition of their decarbonisation roadmaps into line with planning challenges, taking into account the need for jobs and skills and the constraints of crosscutting;
- **Mobilise large companies** (especially publicly owned companies) to develop ambitious transition plans, thus creating a knock-on effect;
- **Enhancing** the attractiveness of future sectors and occupations, through negotiation by the social partners, recognition and enhancement of skills, questioning working conditions and wages, as well as measures aimed at students or employees affected to discover these occupations and opportunities;
- Develop tools facilitating the matching of job vacancies and applications by identifying and characterising acquired/required skills;
- **Support large and medium-sized enterprises** in the implementation of new regulatory requirements;
- **Making** transition aid easier to read for VSEs/SMEs;
- Support reindustrialisation projects compatible with the green transition;
- **Encourage** investment in green innovation.

In addition, the transformation of education systems and continuous training already under way will be continued to integrate the challenges of decarbonisation and the wider green transition, and bring the necessary skills to all targets: elected representatives, public and private decision-makers, employees, consumers.

Finally, the evaluation work carried out at that date suggests constructing:

- a reference for diplomas and occupations contributing to ecological planning in connection with ongoing work (for example, the Operational Register of Occupations and Jobs 4.0 [ROME 4.0]);
- a database on the feeding methods of the professions involved in ecological planning;
- a place-based strategy for jobs and skills, supporting regions in order to build a diagnosis and appropriate action plans, through inter-ministerial steering and in conjunction with France Travail.

5.2.3 Environmental Impacts

The EPP and SNBC need to be subject to an **environmental assessment**.

Environmental assessment is a process aimed at integrating the environment into the preparation of a project, programme or planning document, starting from the early stages of reflection. It serves to inform on the action to be taken on the plan in the light of environmental and human health issues. It must give an account of the potential or actual environmental effects of the project, plan or programme and shall make it possible to analyse and justify the choices made in the light of the challenges identified.

Strategic Environmental Assessment is a process consisting of:

- **The preparation of an environmental impact assessment report;**
- **Carrying out planned consultations**, including consultation of the Environmental Authority, which delivers an opinion on the plan and on the environmental impact assessment report, and consultation of the public;
- **The examination by the authority approving the plan** of the information contained in the assessment report and received in the context of the consultations.

The environment must be understood in its entirety: population and human health, biodiversity, land, soil, water, air and climate, material assets, cultural heritage and landscape, and the interactions between them.

The strategic environmental assessments of SNBC 3 and EPP 3 **are ongoing. They will be finalised simulated when these documents are finalised and will be the subject of dedicated reports submitted to the environmental authority. The preliminary stages of this work have made it possible to identify the following challenges:**

- **Protection of biodiversity enabling biodiversity** issues to be taken into account at an early stage (example: adaptive forestry management, soil and biodiversity attention, maritime spatial planning integrating future offshore wind development areas), knowledge development (national offshore wind observatory launched in 2022, observatory for renewable energy and biodiversity created by the law on the acceleration of renewable energy production known as the 'APER law'), improvement of avoidance measures, reduction, compensation, improvement of air quality (reduction of nitrogen oxides and particulate matter from fossil fuels and fuels, pollutant emissions from nitrogen fertilisers, reduction of pollution from wood heating).
- **Development of an anticipatory strategy on strategic metals and minerals** in the follow-up to Philippe Varin's report on critical metals, to secure supplies to French industry in these key components of the energy transition. The aim is to increasingly control the metal value chains that are essential for reducing our emissions (nickel, cobalt, lithium, etc.) in connection with the Critical Raw Materials Act at European level. This strategy means being present both on the refining and extraction stages for certain metals. The President of the Republic announced the forthcoming launch of a national mining inventory entrusted to the Geological and Mining Research Office (BRGM), with the aim of knowing the critical metal resources in our basement.

- **Efficient use of space and limitation of land take**, in connection with the objective ‘Zero Artificialisation Nette’: spatial planning integrating these issues, priority use of land that is already artificial where relevant (for green reindustrialisation, mobilisation of existing buildings, urban recycling), conservation of agricultural and forest land, limitation of clearing and systematic compensation;
- **Mobilisation of biomass in accordance with the sustainability criteria laid down by European and national legislation**, including the limitation of dedicated energy crops, the development of intermediate crops with energy recovery (CIVE), sustainable forest management geared towards the production of timber;
- **Mobilisation of biomass as solid fuels, ensuring that the impact on fine particulate matter emissions is limited**. This could include differentiated local targets for the development of individual residential biomass that works according to the challenges facing the regions in terms of air quality;
- **Quantitative management of water resources in a context of climate change**: impact on electricity production, articulation between energy and other issues (including water supply support), local water consumption for hydrogen production. In March 2023, the President of the Republic presented an action plan for resilient and concerted water management. The plan contains 53 concrete measures that respond to the major challenges of sobriety in usage, availability and quality of the resource;

5.3. Overview of investment needs

5.3.1 *climate investments in France*

Achieving the green transition requires significant, primarily private and public funding needs in a subsidiary way. In 2022, according to the latest edition of the Climate Finance Panorama of the I4CE, climate investment, private and public, amounted to EUR 100 billion, up 9 % compared to 2021 (increased by energy renovation of housing and low-carbon vehicles).

The additional climate investments needed in 2030 were estimated in 2023 by Jean Pisani-Ferry and Selma Mahfouz report on the economic impacts of climate action at + EUR 101 billion per year of low-carbon investments and + EUR 66 billion per year net of reductions in carbon investments (-EUR 35 billion per year of brown investments). The need for net investment is around 2,3 percentage points of GDP per year compared to a scenario without climate action. This estimate corresponds to a net approach, i.e. estimating the difference between green investments needed for the transition and certain avoided investments in fossil technologies. The estimate also takes into account some sobriety measures that reduce the weight of investments. Finally, it proposes a scenario for the public-private distribution of low-carbon financing (between EUR 25 and EUR 34 billion per year for the public, just under half of the total).

The Directorate-General for the Treasury estimates, in a working document published in April 2024, that decarbonisation will require additional private and public investment that could amount to around + EUR 110 billion per year in 2030 compared to 2021. They would be capped at around + EUR 63 billion per year of additional net investments per year (less investments in carbon alternatives and decrease in new construction). For example, the increase in electric vehicles would reduce brown investments in thermal vehicles by around EUR 29 billion per year in 2030. Sobriety measures also play a key role in moderating these investment needs: in their absence, the requirements for electric vehicles would be increased by + EUR 13 billion per year. However, investment needs are not yet known by 2050. These investments will lead to energy savings that could be partly covered by these additional costs. These amounts are broadly consistent with those of Jean Pisani-Ferry and Selma Mahfouz (cited above) and cover more sectors.

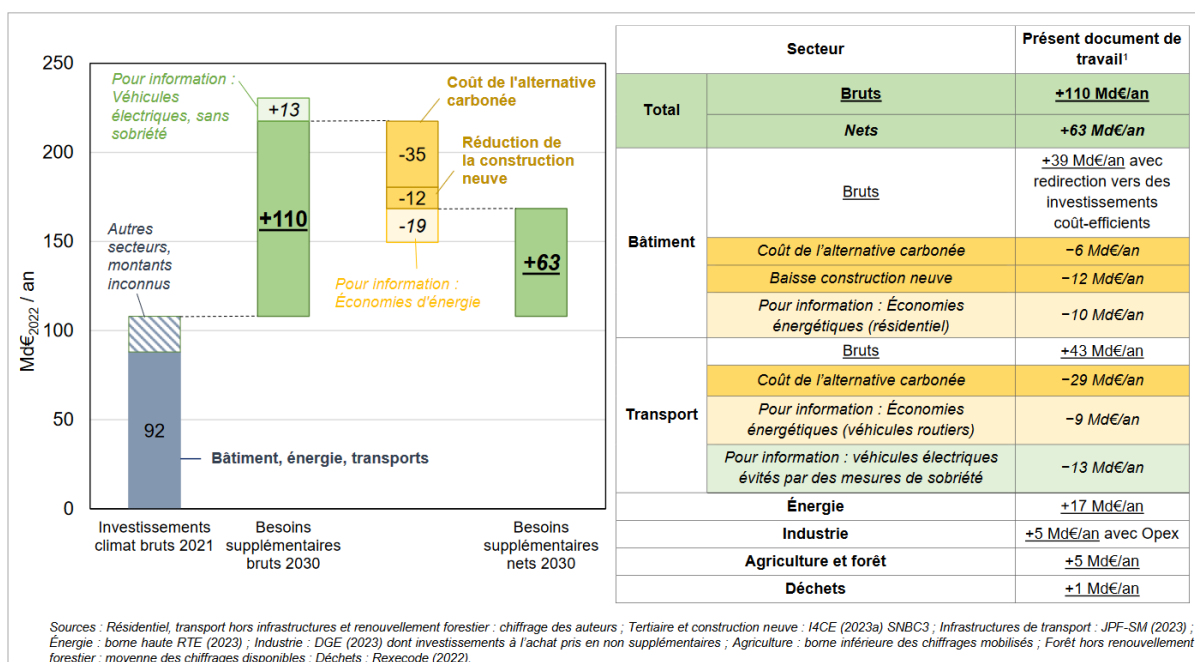


Figure 89: Additional low-carbon investment needs in 2030 compared to 2021, as estimated in the working document of the Directorate-General for the Treasury (Source: What investments for the French decarbonisation objectives in 2030, April 2024, Logan Gourmand)

For its part¹⁵⁹, the Institute of Economics for Climate (I4CE) estimates that every year on average between 2024 and 2030 there will be a need for climate investment + EUR 58 billion more than in 2022. The needs are concentrated in the energy renovation of buildings, electric vehicles and the rail network. By 2030, these needs are close to those identified by Jean Pisani-Ferry and Selma Mahfouz.

These investment needs are estimated on the basis of a bottom-up and sectoral approach describing a chronic investment in gross fixed capital formation and consumption of low-carbon sustainable goods, making it possible to meet the objectives of SNBC 3 and thus of the PNIEC. Needs are mostly calculated in current euro and do not allow price changes to be internalised as a result of macroeconomic mechanisms.

Sectoral analysis of investment needs for 2030

In 2021, I4CE estimates the climate investment in the buildings sector at EUR 15 billion for residential renovation and EUR 5 billion for the tertiary sector. The Directorate-General for the Treasury (referred to above) estimates that the need for additional investment in 2030 is particularly high in the building sector (+ EUR 39 billion per year). They would reach + EUR 39 billion per year, of which + EUR 22 billion per year for the renovation of residential buildings under the assumption of targeted renovations towards cost-effective actions. The total amount of investments to be made in this sector should be affected by those mobilised in new construction,

¹⁵⁹2023 edition of the Climate Finance Panorama, available at: <https://www.i4ce.org/publication/edition-2023-panorama-financements-climat/>

which may lead to reallocations in the nature of investments within the sector. Current investments in new construction could indeed be reduced to meet our climate objectives and reduce land take.

In the transport sector, climate investment reached EUR 27 billion in 2021, still according to I4CE (+ EUR 11 billion compared to 2019), and will have to be increased by + EUR 43 billion per year in 2030, again according to the Directorate-General for the Treasury, mainly for the acquisition of low-carbon vehicles (between + 27 and + EUR 33 billion per year for passenger cars and + EUR 12 billion per year for LCVs and heavy goods vehicles) and for transport and charging infrastructure (between EUR 6 and EUR 15 billion per year). Sobriety assumptions have an impact on total investment since in a scenario of lower total vehicle registrations they would be around + EUR 13 billion per year in electric vehicles and + EUR 6 billion per year in thermal vehicles.

In the energy sector, additional investment needs in 2030 are estimated at + EUR 17 billion per year, mainly in the electricity generation sector (to ensure increased needs and low-carbon production) and low-carbon fuels, as well as in networks (transmission, distribution and flexibility). Among these, under the EPR2 programme, the government has estimated the investment costs for the construction of 6 new nuclear reactors, which are estimated to be connected to the network of the first reactors by 2035. These are estimated at EUR 51.7 billion, spread over a total construction period of 25 years, corresponding to average annual investments of around EUR 2 billion per year.

The need for additional investment in the decarbonisation of industry is estimated at between + 2 and + EUR 3 billion per year on average 2024-2030 for the achievement of the SNBC2 targets, compared to the observed emission reduction trend. They could reach up to + EUR 4 billion per year in 2030 to reach SNBC-3, and + EUR 5 billion per year, including operational expenditure (maintenance and energy expenditure), which is very uncertain but could reach + EUR 1 billion per year.

The need for additional gross investment in agriculture and the forest and land sector has been the subject of few recent studies. The existing figures identify minimum additional gross needs of around EUR + 1 billion per year for agriculture¹⁶⁰, driven by the acquisition of new low-carbon machinery, and around EUR 1 billion per year for forests on average by 2030 compared to today for achieving the SNBC2 targets, on a limited scale of investments. Restoring forest carbon sink storage capacities, having fallen by two thirds since the 2000s, alone would require up to EUR 28 billion of non-additional gross investment, or + EUR 3 billion per year by 2030, bringing the additional needs for the forest to around EUR 4 billion per year.

With regard to adaptation to climate change, the Institute of Economic Affairs for the Climate (I4CE) estimates that some sectors have a first order of cost. According to these estimates, work on the adaptation of road and rail networks could require several hundred million to a few billion euros of additional investment in the coming decades. Adapting agriculture would also require around EUR 1.5 billion per year to deploy measures to maintain the yields of the main French crop crops in a context of high climate sensitivity. Finally, adapting buildings to heatwaves could represent additional costs of around EUR 1-2.5 billion per year for new construction and even

¹⁶⁰ These figures will need to be further developed, mostly partial, focused on the energy transition of the sector. Furthermore, they do not include all the costs of the environmental transition for the sector: costs related to certain changes in farming practices and training, research and development, investments needed to meet specific non-CO2 objectives (in particular non-energy emissions, e.g. methane). Needs for agriculture could increase to around + EUR 5 billion per year by 2050, including expenditure on staff and daily consumption.

more for the existing stock. The prevention of the risk of clay and flood risk is also estimated at several hundred million euros.

5.2.2 funding instruments and distribution by actors

The effort must be fairly shared between businesses, local and regional authorities, the State and all French people. **To this end, the Committee on Financing the Ecological Transition (CFTE) has been set up to coordinate action by industry, funders and public authorities in mobilising the financial resources needed for the green transition in France.** Ongoing work on ecological planning is also intended to target public funding on the basis of efficiency, incentives and social justice, from a multi-annual perspective, as well as to reduce certain 'brown' expenditure. In order to provide this visibility and multiannual perspective, the law on the programming of public finances for the years 2023 to 2027 provides that the Government now submits to Parliament each year a 'multiannual strategy defining the financing of the green transition and national energy policy'¹⁶¹. This strategy will provide guidance on the distribution of investments between the public sector and communities, businesses, and households.

In 2024, the appropriations for ecological planning increase by around EUR 5 billion in payments (and by around EUR 8 billion in commitments) compared to 2023. This brings total expenditure favourable to the State's environment to EUR 40 billion. **This additional funding will support the main levers of ecological planning** (renovation of housing, aid for the purchase of clean vehicles, protection of biodiversity, etc.) **and empower the regions.** In particular, this unprecedented State investment will focus on the energy renovation of buildings, the development of public transport, the decarbonisation of industry, the acceleration of renewable energies and the agricultural transition. The Green Fund also supports the action of local and regional authorities. The Caisse des dépôts group is also mobilised to help finance the transition of communities and businesses, and has announced an unprecedented contribution to the green transition of EUR 100 billion over the period 2024-2028. As part of the green reindustrialisation project, it was also decided to step up Bpifrance's support for the green transition. State action corresponds to investments on its own, but above all to aid to other actors to encourage them to make the transition: support for individuals through aid for the renovation of housing and the purchase of clean vehicles; support for businesses, in particular through calls for projects for the decarbonisation of industry, heat fund, etc.

In the process of greening investment, the **reorientation of household savings will be fostered**, in particular by new schemes such as the future climate savings plan (PEAC) provided for by the Green Industry Law. The management companies could also be supported in this reorientation with the creation of the Transition Obligations (TOs), two staging funds guaranteed by the State, also provided for by the 2024 Finance Law (Article 185). In addition, a new financial support facility for decarbonisation investments is in public consultation as part of the CCUS strategy, including calls for tenders for large industrial decarbonisation projects that would trigger new investments in energy efficiency, electrification or carbon capture by covering, for example, part of the costs associated with catching units, the phasing-in of new transport infrastructure or access to final storage.

Alongside these investments, **innovative financing is developing:**

- For example, **the Bas-Carbone¹⁶² label provides an incentive to reduce national greenhouse gas emissions** by formally framing and recognising emission reduction and carbon sequestration projects in France, the final balance of which is counted as 'Remissions reductions' (RE), where 1 RE corresponds

¹⁶¹ The first annual report presenting the multiannual strategy for financing the green transition will be published around summer 2024.

¹⁶² <https://www.ecologie.gouv.fr/label-bas-carbone>

to a tonne of CO₂eq¹⁶³. The low-carbon label is a mechanism that provides tangible funding for the emergence of virtuous climate projects. It has also established itself as one of the reference schemes on climate compensation in Europe and could inspire the European framework, which is being built by the Carbon Removal Regulation. Finally, it is highly territorialised in order to meet the expectations of funders to get involved in local compensation projects, which are exclusively French.

- Innovative financing arrangements such as third-party financing, financial rental and energy performance contracts have been developed for the renovation of the building. The third funding was opened up to the State, public institutions and local authorities¹⁶⁴ on an experimental basis by the March 2023 Third Funding Act.
- As regards **emissions offsetting** in particular, several schemes have intervened in recent years and have increased demand for financing low-carbon projects with high environmental integrity in France and globally. This should include:
 - The gradual offsetting of greenhouse gas (GHG) emissions from domestic flights for aircraft operators subject to the EU Emissions Trading System and generating more than 1 000 tonnes of CO₂ per year on national territory (climate law and resilience);
 - Offsetting emissions from extended coal-fired power plants to address the energy crisis linked to the war in Ukraine (MUPPA law¹⁶⁵);
 - Offsetting the GHG emissions of all flights operated by officials of the State and public institutions, whether national or international (Circular Public Services Ecoresponsible).

In addition, **the reform of the EU Emissions Trading System (EU ETS)** foresees an accelerated reduction of the emissions cap (62 % in 2030 vs. 2015, compared to 43 % before the revision) and a pathway to phase out free allowances as the Carbon Border Adjustment Mechanism is put in place, for the sectors covered by the mechanism. **This will lead to an increase in the revenues that the State and the European Union derive from the European carbon market**, in particular through a reinforcement of the Innovation Fund, which **finances innovative low-carbon technology projects in European industrial sectors**. One challenge in the coming years will be **to make efficient use of these increased resources for France's green transition**, in line with the EU budgetary universality framework: Member States now have to spend 100 % of EU ETS revenues on climate spending (compared to 50 % before the reform).

¹⁶³ To date, more than 2 MtCO₂eq can be avoided and/or sequestered in the next 30 years by labelled projects, and it can be expected to reach 15 MtCO₂eq in 2030 (which will therefore be avoided and/or sequestered between 2030 and 2060).

¹⁶⁴ Law No 2023-222 of 30 March 2023 to open up third-party financing to the State, its public institutions and local authorities to promote energy renovation works

¹⁶⁵ Law on 'Emergency measures for the protection of purchasing power' known as^{the} MUPPA Law